Fill the Nutrient Gap

Nutrition situation analysis framework and decision tool

Photo: WFP/Francisco Fion

Key findings from Guatemala

November 2017

Fill the Nutrient Gap Guatemala

Contents

Acknowledgements

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- SESAN
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- FAO
- PAHO
- FANTA
- FEWSNET
- CRS
- PATH
- NUTRI-SALUD
- DevTech
- ASIES

List of Acronyms

ASIES	Asociación de Investigación y Estudios Sociales (Association of Research and Social Studies)
BMI	Body Mass Index
CD	Country Director, World Food Programme
CO	Country Office, World Food Programme
CotD	Cost of the Diet
CONASAN	National Council on Food Security and Nutrition
CRS	Catholic Relief Services
DCD	Deputy Country Director, World Food Programme
Devtech	DevTech Systems, Inc.
DHS	Demographic and Health Surveys
ENRDC	National Strategy for Reduction of Chronic Undernutrition
FANTA	Food and Nutrition Technical Assistance Project
FAO	Food and Agriculture Organization
FCS	Food Consumption Score
FEWS NET	Famine Early Warning System Network
FNG	Fill the Nutrient Gap
GLV	Green leafy vegetables
HAZ	Height-for-Age Z-Score (indicator used to define stunting)
IFPRI	International Food Policy Research Institute
IYC	Infants and Young Children
IYCF	Infant and Young Child Feeding
MAGA	Ministerio de Agricultura Ganadería y Alimentación (Ministry of Agriculture, Livestock and Food)
MIDES	Ministerio de Desarrollo Social (Ministry of Social Development)
MMT	Multiple Micronutrient Tablet
MNP	Micronutrient Powder
MSPAS	Ministerio de Salud Publica y Asistencia Social (Ministry of Public Health and Social Assistance)
NGO	Non-Governmental Organization
NTAE	Non-traditional agricultural exports
NutriSalud	USAID Community Project of Nutrition and Health
OR	Odds ratio (a measure of association between an exposure and an outcome)
PAHO	Pan American Health Organization
PESAN	Strategic Plan for Food Security and Nutrition
PLW	Pregnant and Lactating Women
PPH0	Plan Pacto Hambre Cero
RNI	Recommended Nutrient Intake
SBCC	Social and Behaviour Change Communication
SD	Standard Deviation
SESAN	Secretaría de Seguridad Alimentaria y Nutricional de la Presidencial de la República (Secretariat of Food and Nutrition Security of the President of the Republic)
SINASAN	National System for Food Security and Nutrition
SNF	Specialised Nutritious Food
SNUT	Staple-Adjusted Nutritious Diet

SUN	Scaling-Up Nutrition
USAID	United States Agency for International Development
UNICEF	United Nation's Children's Emergency Fund
WASH	Water, Sanitation and Hygiene
WAZ	Weight-for-Age Z-Score (indicator used to define underweight)
WFP	World Food Programme
WHO	World Health Organization
WHZ	Weight-for-Height Z-Score (indicator used to define wasting)
WRA	Women of Reproductive Age

Executive Summary

Please refer to separate summary of Fill the Nutrient Gap Guatemala.

Background

'Fill the Nutrient Gap' (FNG) is a decision-making tool to support the identification of context-specific strategies for improving nutrient intake of vulnerable populations, especially during the first 1,000 days. The tool builds on a comprehensive situation analysis and has been developed by WFP, UC Davis, IFPRI, EPICENTRE, Mahidol University and UNICEF. FNG follows a stepwise process of secondary data review and linear programming analysis to understand a country's nutrition situation, compare the potential impact of interventions and identify programme and policy entry points addressing inadequate dietary intake, or 'nutrient gaps' (Figure 1).

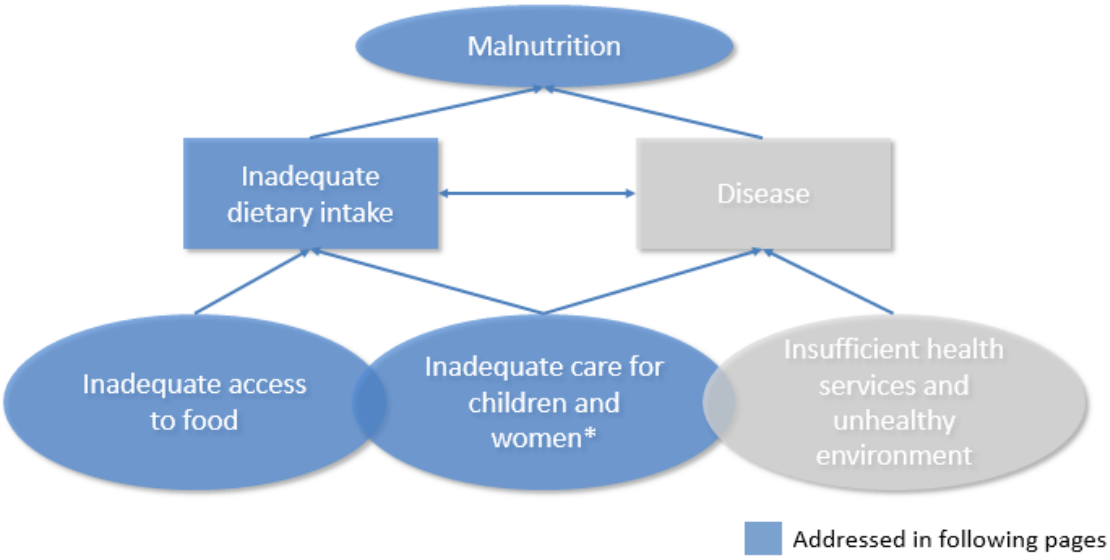

Figure 1: UNICEF Conceptual Framework for Causes of Malnutrition in Society. (Source: UNICEF)

The framework for analysis depicted in Figure 2 guides consolidation and analysis of secondary data at country level based on the following categories:

i) **Malnutrition Characteristics** - Prevalence data on malnutrition characteristics (stunting, wasting, anaemia, underweight, overweight) and if possible data on micronutrient deficiencies. Seasonal patterns of various nutritional problems within populations can be considered. Malnutrition characteristics are reviewed in the initial stage to define target groups for the analysis.

ii) **Enabling Policy Environment** – National policy, legal and regulatory frameworks and identification of policy gaps to assess whether the policy environment adequately facilitates access and availability of nutritious foods. This section identifies current or potential entry points for nutrition interventions. Enforcement of policies and regulations is key to the analysis; for example, there may be a mandatory national fortification policy that has low compliance.

iii) **Availability of nutritious foods in the local market** – Information on local availability of nutritious foods (natural and fortified) as well as on local production and

processing capacity to assess whether it would be possible to meet nutrient needs from locally available foods.

iv) **Access to Nutritious Foods** – Can target groups access nutritious foods in lean and non-lean seasons and in different parts of the country? This section seeks to gain a better understanding of nutrient intake at the household level and the ability of households to cope with shocks.

v) **Nutrient Intake** - Likely or confirmed gaps in nutrient intake at the individual level, in particular related to infant and young child feeding practices (IYCF) and the coverage of supplementation and fortification programmes. Each age group has different nutrient requirements (e.g. a 6-11 month old child will require a diet with much higher content of iron and zinc per 100 kcal than an adult male).

vi) **Local Practices** - Socioeconomic and cultural factors influencing food purchasing patterns and feeding practices that act as barriers to adequate nutrient intake or could in the future limit the effectiveness of certain food-based interventions, particularly among specific target groups. Information gathered with tools such as ProPAN can be useful to gain insights into local preferences and inform strategies such as social and behaviour change communication (SBCC) to improve feeding practices. Focused ethnographic studies or focus group discussions carried out by local academia or non-governmental organizations (NGOs) can provide key insights into this often overlooked area of analysis.

vii) **Cost Optimization** - Linear programming tools such as Cost of the Diet (CotD) and Optifood estimate the minimum cost of a locally available nutritious diet, with insight on what proportion of the population can afford this diet in different geographic areas or among social safety net beneficiaries compared to non-beneficiaries. CotD can be used to model possible intervention options to improve affordability, such as lowering prices of naturally nutrient-rich foods, introduction of fortified foods and/or specialised nutritious foods (SNFs) through market channels or social protection programmes and cash transfers.

After the secondary data has been consolidated and analysed context-specific optimal packages of policy and programmatic interventions can be identified. Strategies and possible entry points can be collectively identified by different stakeholders when preliminary results of analysis are available.

Pilot testing of the “Fill the Nutrient Gap” tool was carried out in El Salvador, Ghana and Madagascar. Early learning from the initial pilots demonstrated that the operationalization of the framework at country level varies by context. The piloting phase and consolidation of lessons learnt were wrapped up in Q3 2016. At this point a further roll out of the FNG to Guatemala, Tanzania and Pakistan was initiated.

The analytical and decision-making framework is provided below in Figure 2 showing the different steps of analysis reflected in the structure of this report.

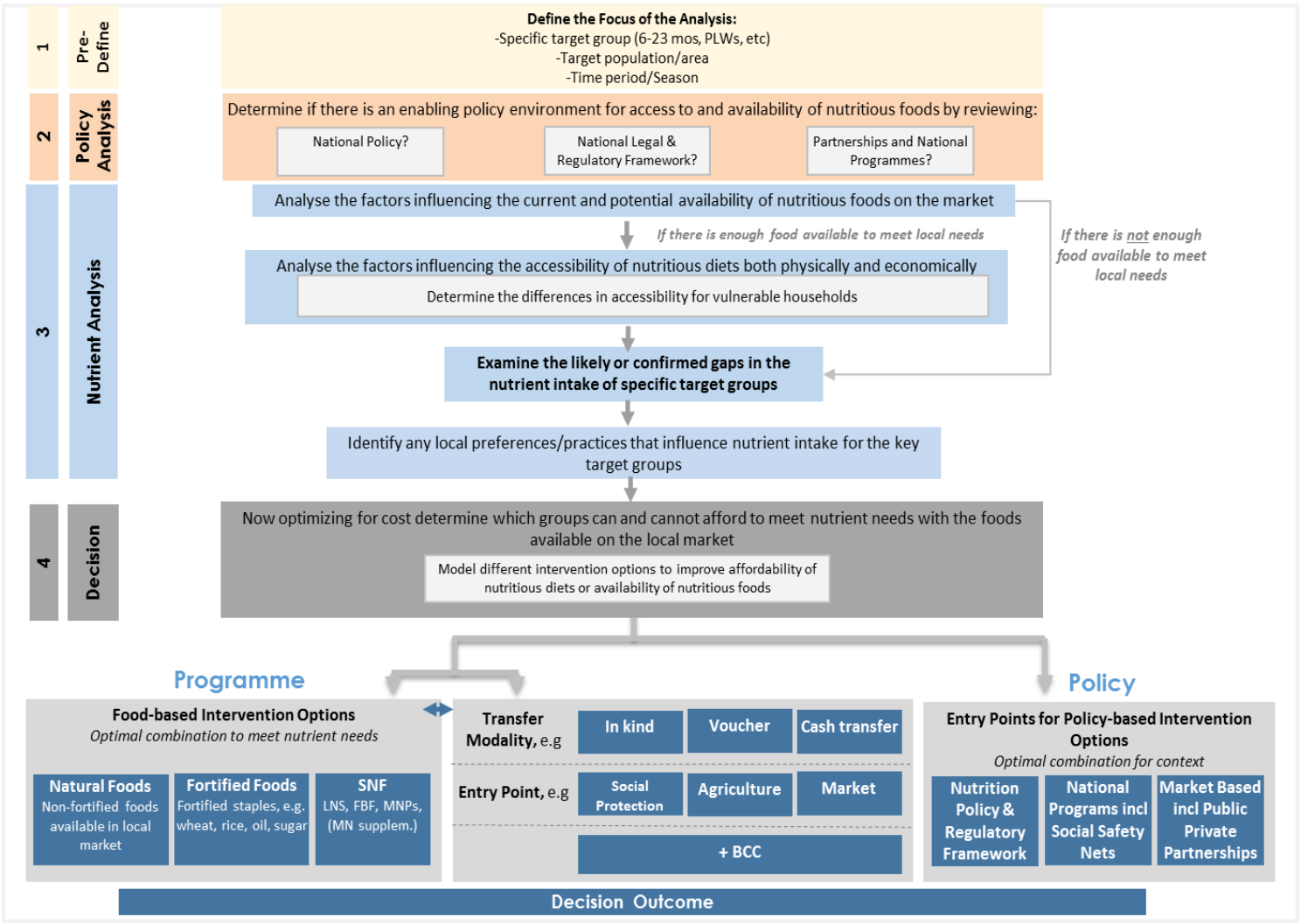

Figure 2. "Fill the Nutrient Gap" analytical and decision-making framework

The Process in Guatemala

Phase 1: Introduction of the FNG process to government stakeholders, UN Agencies and other partners in bilateral meetings and establishment of the technical working group – *August 2016*

In August 2016, the framework and analysis methodology was presented by the FNG team and Guatemala Country Office (CO) to key government partners: SESAN (Secretary of Food Security and Nutrition), the Presidential Commissioner for the Reduction of Chronic Malnutrition, MIDES (Ministry of Social Development) and MSPAS (Ministerio de Salud Publica y Asistencia Social) and key stakeholders: INCAP, USAID projects (FANTA), FAO, UNICEF, PAHO, FEWS NET, Nutrisalud, CRS and PATH. The FNG process was subsequently introduced to a wider audience at the joint SESAN, USAID, CRS, INCAP, WFP and UNICEF forum *Determination of Nutrient Gaps in Children 6-23 Months and Their Mothers*.

A technical working group was established to define the level of analysis and key target groups, identify entry points and possible interventions and compile secondary data. Members of the

technical working group included: WFP CO, SESAN, MIDES, MSPAS, UNICEF, FAO, WHO, INCAP, FANTA, FEWSNET, CRS, PATH and Nutrisalud.

Phase 2: Secondary data compilation, bilateral follow-ups with key stakeholders, validation of intervention modelling with technical working group and data analysis – *August to November 2016*

Secondary data was compiled, including information gathered from follow-up bilateral meetings with stakeholders and additional key informants, such as FEWS NET, DEVTECH and FANTA. A modelling plan of existing and potential interventions was established and validated by the working group. The FNG team conducted further analysis of secondary data and conducted intervention modelling and affordability analysis using CotD.

Phase 3: Presentation of preliminary results and development of recommendations – *November 2016*

Preliminary results were presented to the technical working group, collaborating stakeholders, SESAN, INCAP and the Zero Hunger Strategic Review team led by ASIES. Each presentation included a discussion on how to further strengthen analysis and develop recommendations. A stakeholder workshop that included representatives from government agencies (nutrition, agriculture and social protection), academia, NGOs and other development partners provided further opportunity for discussion of preliminary analysis and recommendations. Through these consultations joint recommendations and actionable strategies were developed.

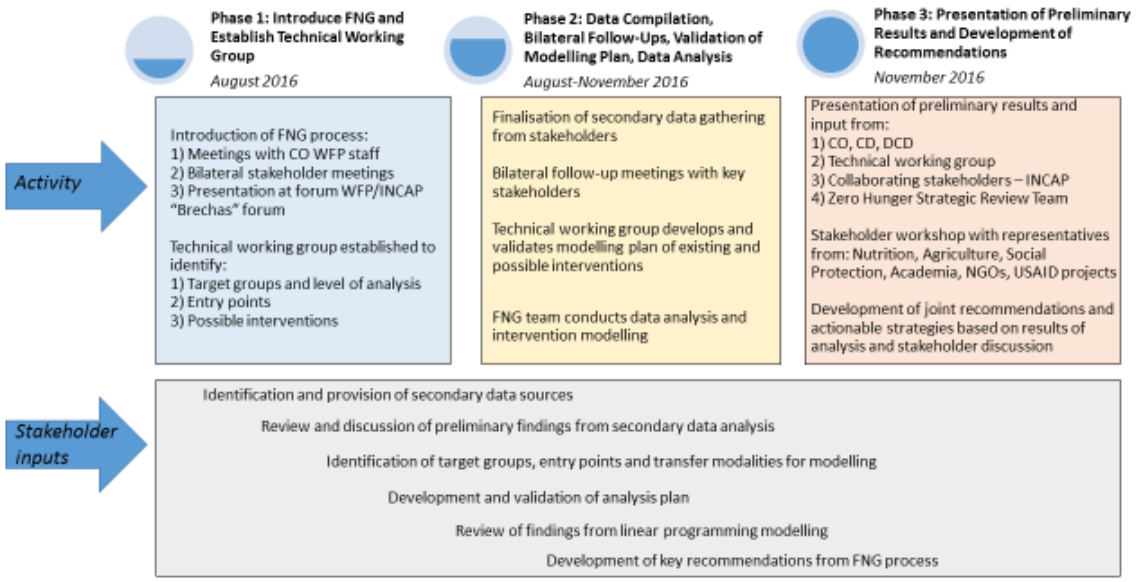

Figure 3. Timeline and overview of the FNG process in Guatemala

Introduction

This report seeks to understand the different drivers of the nutrition situation in Guatemala, particularly for the most vulnerable groups, in relation to nutrient access and intake during the first 1000 days of life. It then moves to identify strategies and intervention packages tailored to the context to improve nutrient intake in key target groups with a focus on children 6-23 months as well as pregnant and lactating women (PLW).

It is widely recognised that ensuring adequate complementary feeding is very challenging and stretches beyond what type of foods are fed to ensuring that infants and young children are fed at the right time, in the right place and in the right way (Pelto & Armar-Klemesu 2011). Given the heavy time and financial constraints placed on many caretakers, particularly the poorest, and the high nutrient density required in complementary foods, it is not always feasible to meet nutrient needs using only local unfortified and plant-source based foods. For this reason the report explores options related to fortified foods as well as non-fortified foods, to identify the most suitable strategies for improving nutrient intake within the local context, giving consideration to the constraints faced by vulnerable target groups. In the section on Cost Optimization and Modelling a range of different intervention options are modelled to demonstrate their effect on affordability of diets that meet nutrient needs (this includes Specialised Nutritious Foods, Fortified Foods, Cash Transfers and vouchers for local nutrient-rich foods).

Guatemala is the largest and most populous country in Central America with a population of 16.34 million people, more than two million of whom are less than five years old (The World Bank 2016; Bermudez et al. 2010). As per the 2001 census, approximately 40% of the national population is indigenous and this percentage is as high as 97% in some Western Highlands departments. Indigenous Guatemalans have historically suffered from greater discrimination, poverty and relative geographic isolation (INE 2013).

The Guatemalan economy has been one of the strongest performers in Latin America with GDP growth of nearly 5% in 2015 (The World Bank 2016). This growth has not been shared by all and Guatemala is one of the most unequal countries in the world with a GINI coefficient of 52 in 2011 (ranked 130 out of 145 countries) (The World Bank 2016) and a Human Development index ranking of 128 out of 188 countries (UNDP 2016). Guatemala is one of the few countries in the region where the population living in poverty, as defined by national country-specific poverty lines, has increased in recent years from 51% in 2006 to 59.3% in 2014 (The World Bank 2016). Poverty is concentrated in rural and remote parts of the country, areas that are predominately populated by indigenous Guatemalans (The World Bank 2016). In the last decade, extended drought and the effects of the global economic crisis on remittances, exports, foreign investment, tourism and access to credit have led to an economic and food security crisis throughout Guatemala (WFP 2016a).

Malnutrition Characteristics

The malnutrition situation in Guatemala is characterised by high levels of chronic malnutrition and low levels of acute malnutrition (MSPAS 2015), indicating inadequate dietary quality, i.e. too low intake of essential nutrients, or nutrient gaps, over extended periods of time. Stunting (defined by height-for-age Z score of <-2 SDs based on comparisons of child's height (cm) for age

(months) to WHO standard) affects almost half (47%) of all children under five in Guatemala (Figure 4) (MSPAS 2015). Guatemala has the highest prevalence of chronic malnutrition in Latin America and is ranked 127 out of 132 countries with the highest prevalence of stunting in the '2016 Global Nutrition Report' (IFPRI 2016). Although there has been some progress in the past 30 years the country remains 'off course' to meet SDG global nutrition target 2.2 of reducing stunting by 40% by 2025 (IFPRI 2016). Wasting prevalence –an indicator of acute malnutrition -- is low in Guatemala (0.7%) (MSPAS 2015). The combination of high stunting prevalence and low wasting prevalence is suggestive of adequate energy intake, but inadequate intake of essential nutrients (e.g. vitamins, minerals, essential amino acids etc) among young children.

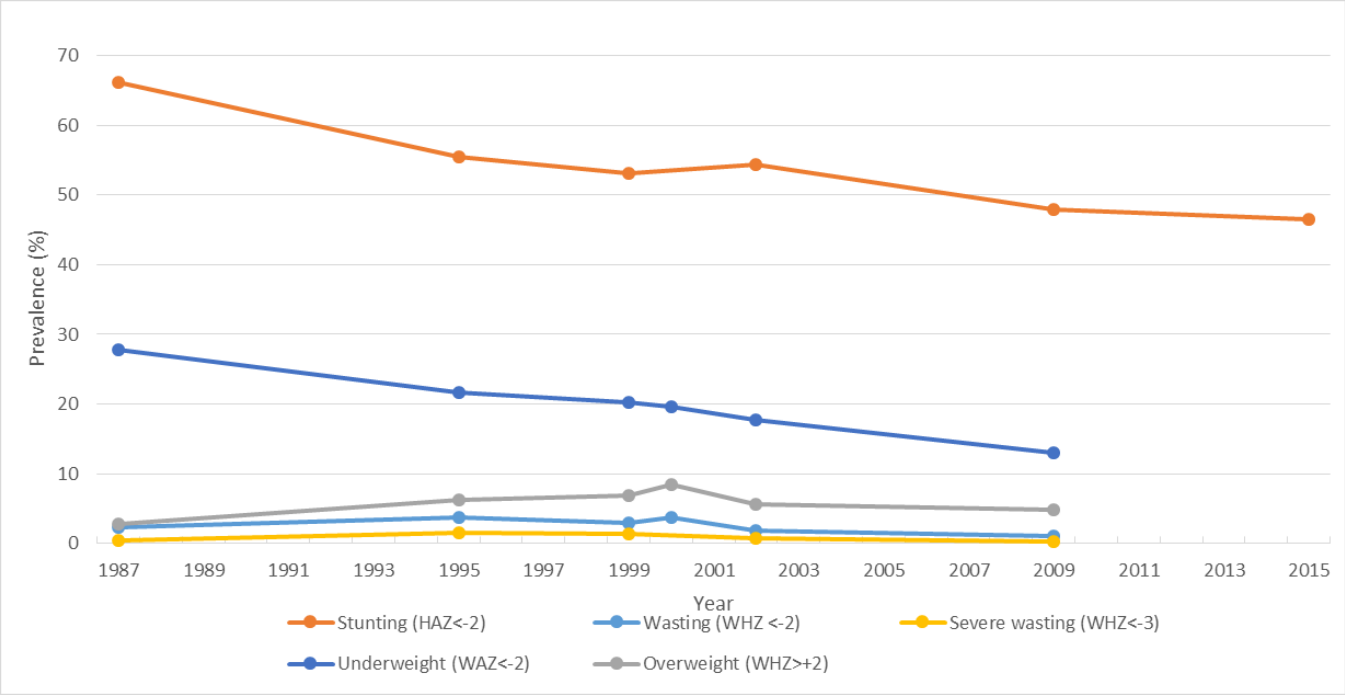

Figure 4: Trends in Key Nutrition Indicators 1987-2015 for children under 5 years[1][2] (The World Bank 2016)

Stunting prevalence can be classified as high or very high in 18 out of 22 departments (Figure 5). Prevalence is higher in rural areas (53% compared to 35% in urban areas) (MSPAS 2015). There is a strong correlation between poverty levels and stunting prevalence by department (Figure 6) and children from wealthier households and children who have more educated mothers are less likely to be stunted (MSPAS 2015).

[1]HAZ = Height for age z score, WAZ = Weight for age z score, WHZ = Weight for height z score
[2] Nutrition status defined using WHO cut-offs for child growth http://www.who.int/childgrowth/en/

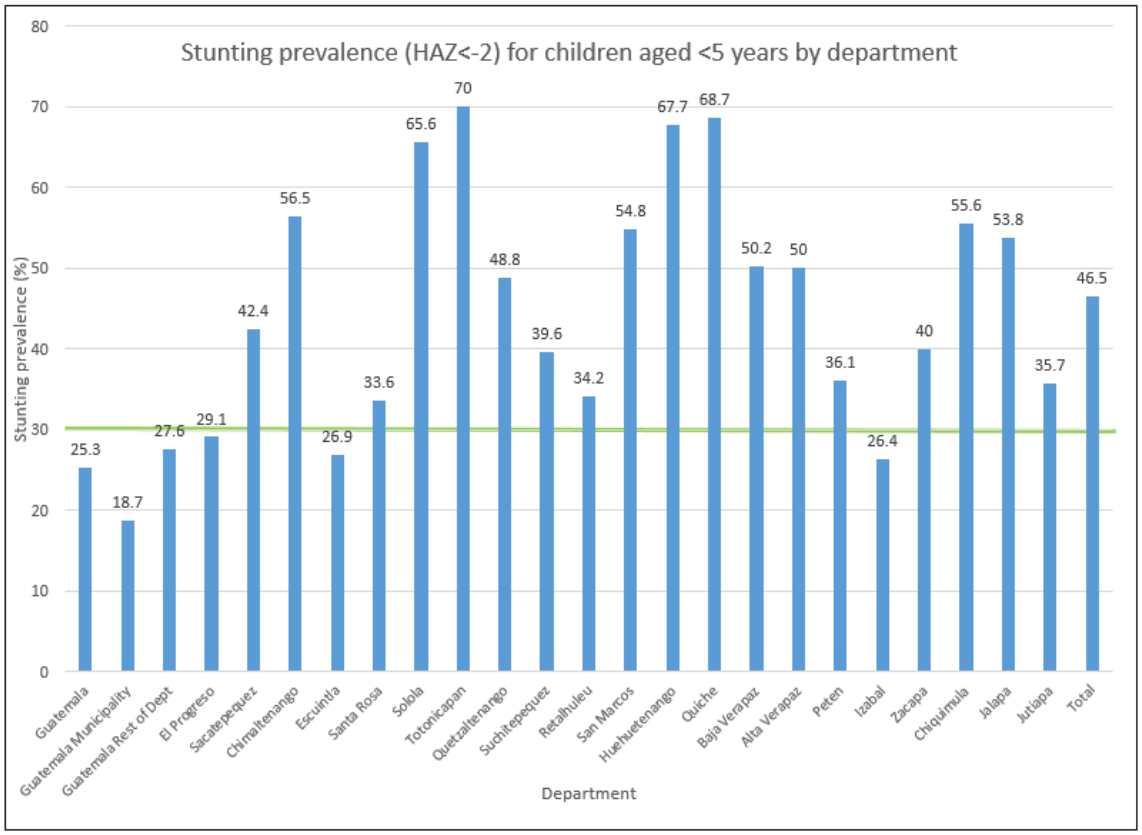

Figure 5: Stunting prevalence (HAZ<-2) by department (MSPAS, 2015)

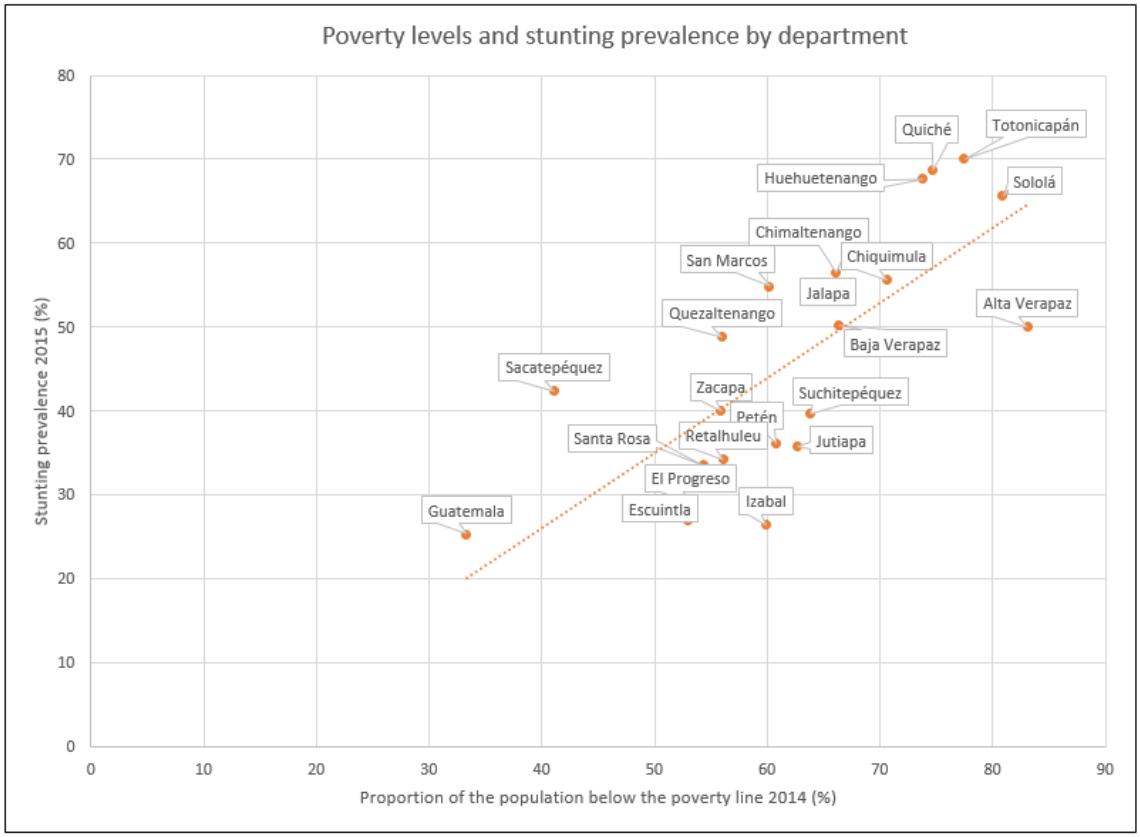

Figure 6: Poverty and stunting by department (INE 2015; MSPAS 2015)

Indigenous Guatemalans have disproportionately high rates of malnutrition with a stunting prevalence of 58% compared to 34% among the non-indigenous population and a severe stunting prevalence of 23% compared to 10% among the non-indigenous population (MSPAS 2015).

Among children less than six months old, who should receive all necessary nutrients from body stores present at birth and breast milk, stunting prevalence is high (30%) (Figure 7). This indicates limited gestational growth due to nutritional deficiencies in mothers related to young age (i.e. adolescent pregnancies), poor dietary intake and poor nutritional status in women in the period prior to pregnancy, during pregnancy and while lactating (MSPAS 2015). Among children 12-17 months and 18-23 months stunting prevalence increases to 47% and 55% respectively. High stunting prevalence throughout the first two years of life highlights a need to improve maternal nutrition, breastfeeding practices and complementary feeding (SESAN & INE 2014; MSPAS 2015).

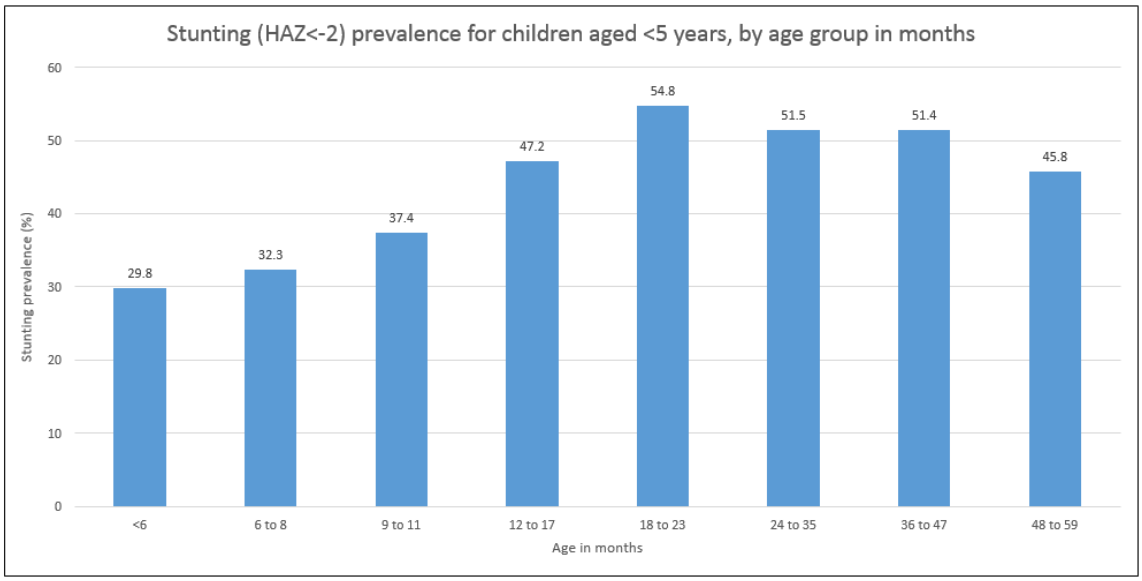

Figure 7: Stunting by age in months (INCAP and WFP 2016)

Previous estimates of anaemia (defined as haemoglobin of 11g/dL or less) in past DHS surveys report alarming rates of anaemia among children under 5, however the latest Guatemalan DHS survey estimates with altitude adjusted haemoglobin levels measured with HemoCue are considerably lower (MSPAS 2015). Although some improvement could be expected due to national programs mandating fortification of sugar with vitamin A and providing specifications for voluntary fortification of wheat with iron (ferric trisglycinate at 8 mg/kg) and the distribution of micronutrient powders (Chispitas) among children aged less than 5 years this reduction is likely due to methodological issues and unlikely to reflect real changes in prevalence.

Among children under five anaemia prevalence is moderate (25%) (Figure 8) (MSPAS 2015). Anaemia prevalence is higher for indigenous children (27% compared to 24% for non-indigenous children) and rural populations (27% compared to 21% for urban), although the differences are not as large compared with stunting (61.2% for indigenous compared to 34.5% for non-indigenous and 53.0% rural compared to 34.6% urban) (MSPAS 2015).

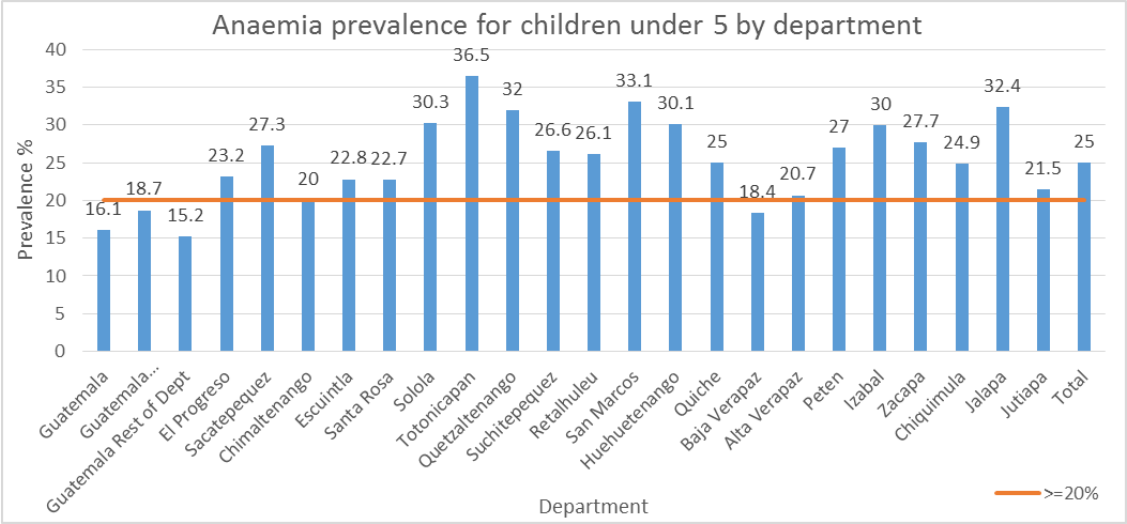

Figure 8: Prevalence of anaemia in children under 5 by department. Orange line indicates a moderate public health problem (>=20% prevalence)((MSPAS 2015)

National anaemia prevalence for WRA is lower than for children at 11%, with the vast majority (8%) suffering 'mild' anaemia (MSPAS 2015). Anaemia prevalence for WRA is slightly higher in rural areas than urban areas (11% compared to 10%) and higher for indigenous WRA (12% compared to 10%) (MSPAS 2015). For adolescent girls (15-19 years) anaemia prevalence is 9% nationally (MSPAS 2015).

The reported percentage of children born at low weight (<2500 grams) is 11%, as per the National Health Survey in 2008-2009 (MSPAS 2010). The incidence of low birthweight is slightly higher in urban areas (13% of urban births compared to 11% of rural births) (MSPAS 2010). However, only 65% of births occur in a health centre and birthweight is not always measured and recorded (MSPAS 2010). It is very likely that actual low birthweight incidence is higher.

Evidence of frequent infections among young children, inadequate WASH practices and poor sanitation facilities and water access, especially in rural areas, point to a complex malnutrition-infection relationship. Poor nutrition and frequent infection create a vicious cycle in which poor nutritional status increases susceptibility to infection through decreased immune response and epithelial function, while infection affects nutritional status through reduced appetite, impaired intestinal absorption, increased catabolism and direction of nutrients away from growth and towards immune response (Brown 2003; Solomons 2007; Stewart et al. 2013). Based on the 2008 DHS one in four (25%) children aged <5 years reported symptoms of diarrhoea in the two weeks prior to data collection (MSPAS 2010). Of those children with symptoms of diarrhoea, medical care was sought for less than half (44%) (MSPAS 2010).

With respect to conditions contributing to a high prevalence of diarrhoea among young children, 93% of households in Guatemala had access to drinking water from an improved source[3] in 2015, an increase from 77% in 1990 (WHO/UNICEF 2015). Almost all (97%) urban households had piped water on premises compared to 71% of rural households having piped water, 16%

[3] An improved drinking water source is one that, by the nature of its construction, adequately protects the source, from outside contamination, particularly faecal matter (WHO/UNICEF 2015)

obtained water from other improved sources and 13% did not have access to an improved water source (WHO/UNICEF 2015). Nationally 64% of households were using improved sanitation facilities[4] in 2015. This was an improvement from 47% in 1990, but access remains lower in rural areas (49%) compared to urban areas (78%) (WHO/UNICEF 2015). No information was found on food hygiene and storage practices, which can also be an important cause of diarrhoea.

The prevalence of overweight and obesity in Guatemala has increased steadily over the last two decades to alarming levels (Figure 9). Half (50%) of all women of reproductive age[5] (WRA) are overweight[6] (35%) or obese[7] (15%) (MSPAS 2010). BMI increases with age and almost a third of adolescent girls[8] (29%) are overweight or obese. The increase in the prevalence of obesity and overweight by age was documented in the INCAP/WFP study *Determination of Nutrient Gaps in Children 6-23 Months and Their Mothers,* a descriptive survey across five zones prioritized by the government due to high levels of stunting (Figure 10). More than 1 in 5 (21%) of non-pregnant WRA 15-19 years old across the five zones surveyed were overweight or obese and 88% of non-pregnant WRA 45-49 years old were overweight or obese, suggesting the need for interventions addressing overweight and obesity during adolescence, before overweight and obesity rates increase (INCAP and WFP 2016).

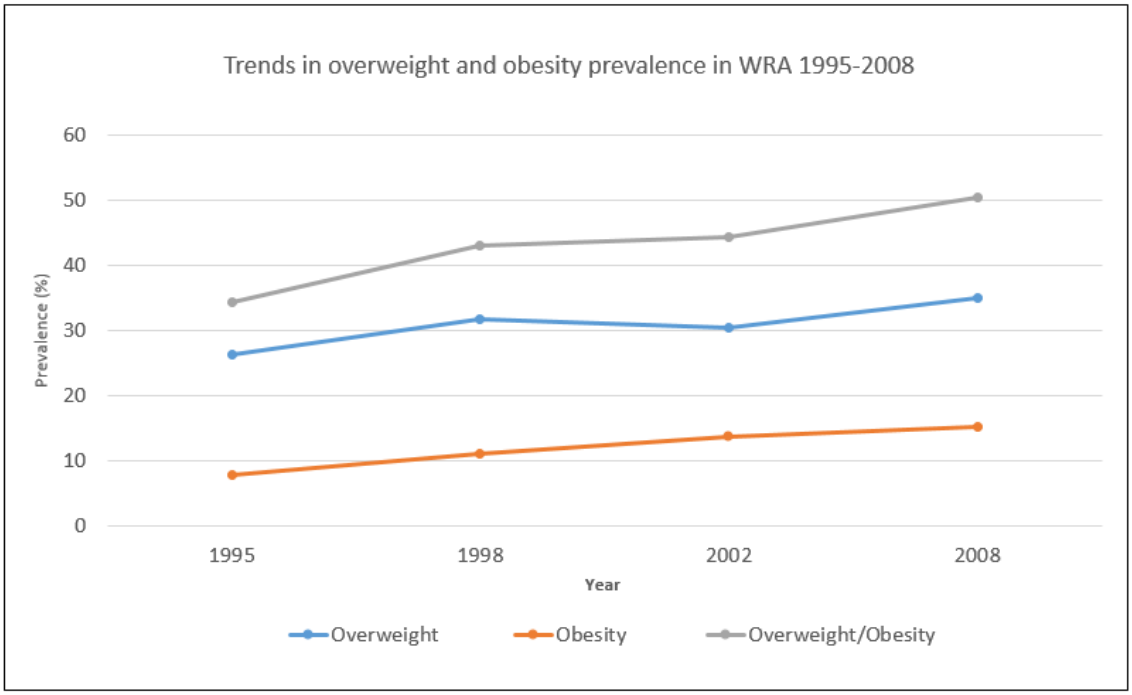

Figure 9: Trends in WRA overweight and obesity 1995-2008 (MSPAS 2010)

[4] An improved sanitation facility is one that hygienically separates human excreta from human contact. Sanitation facilities shared with other households are not considered to be improved (WHO/UNICEF, 2015).
[5] Defined as non-pregnant women 15-49 years old.
[6] Defined as having a Body Mass Index (BMI) of 25-29.9 (MSPAS, 2010)
[7] Defined as having a BMI of 30 or more (MSPAS, 2010)
[8] Adolescent girls defined as girls aged 15-19 years

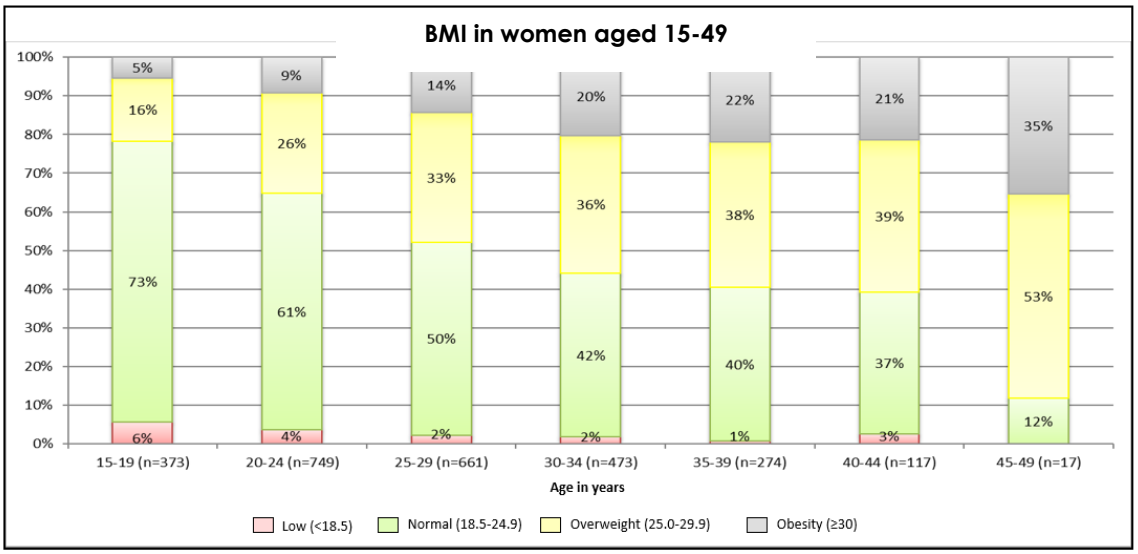

Figure 10: BMI classification by age group of women aged 15-49 (not currently pregnant), surveyed in the Determination of Nutrient Gaps in Children 6-23 Months and Their Mothers in five zones prioritized by the government for having high levels of stunting (INCAP & WFP 2016).

There is no difference in overweight prevalence between non-indigenous (35%) and indigenous (35%) WRA. However, obesity prevalence is higher for non-indigenous WRA (18% compared to 12% for indigenous WRA) (MSPAS 2010). All 22 departments in Guatemala have high or very high levels of overweight/obesity, including the 18 departments with high or very high levels of stunting (Figure 11). Thus, the double burden of malnutrition is widespread.

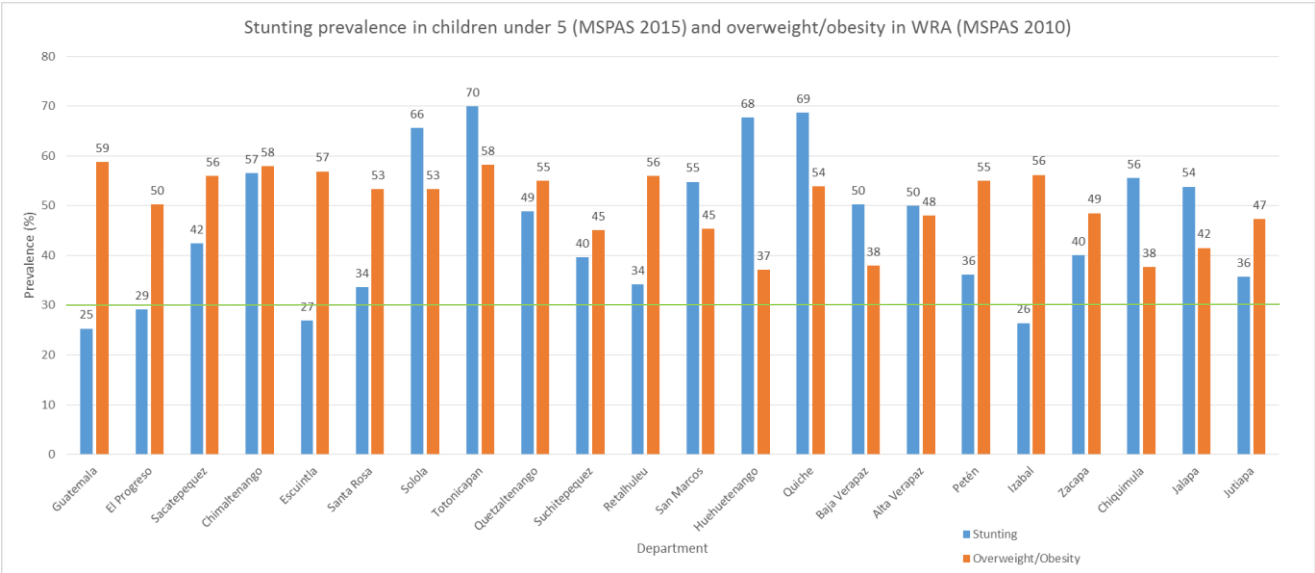

Figure 11: Double-burden of malnutrition: stunting (MSPAS 2015); WRA overweight/obesity (MSPAS 2010)

Latin America is undergoing a rapid demographic and nutritional transition. Diets have shifted toward more energy-dense, less nutrient-rich foods and away from whole grains, legumes and

fresh fruits and vegetables, as Guatemala continues to industrialize and more and more people have a predominantly sedentary lifestyles. These transitions can explain some of the rise in overweight and obesity prevalence and the rise in diet-related non-communicable diseases (Uauy et al. 2001). Guatemala faces increasing metabolic risk factors; 36% of the adult population has raised blood pressure and/or raised blood cholesterol (28%), 13% have raised blood glucose and 11% of adults have diabetes (IFPRI 2016).

There is growing recognition of the 'double burden' of malnutrition with under- and over-nutrition occurring simultaneously among different population groups, within households and among individuals who are both stunted and overweight. As the prevalence of obesity increases in Guatemala the double burden of malnutrition has become a public health problem, particularly in Mayan communities where stunting prevalence is alarmingly high (Lee et al. 2010; Lee et al. 2012). The percentage of households with a stunted child and an overweight or obese mother (double burden of malnutrition at household level) was estimated at 20% in 2008 based on DHS data (Palmieri Santisteban et al. 2015; MSPAS 2010) and at 18% in 2011 in a sample of women in the highlands (Doak et al. 2016). The stunted child and overweight mother pattern was more likely to occur in households that were rural, indigenous and low/middle income (Ramirez-zea et al. 2014; Lee et al. 2012).

The 2016 Global Nutrition Report identified Guatemala as one of twenty countries with overlapping under-5 stunting, anaemia in WRA, and adult overweight/obesity all at a level of public health concern (Table 1) (IFPRI 2016). WRA underweight prevalence is low at 1.6% (MSPAS 2010), although anaemia prevalence indicates micronutrient deficiencies are still a concern. Evidence is accumulating that undernutrition in utero and early childhood may predispose individuals to being overweight, with the risk of elevated blood pressure, glucose, and serum lipids in adulthood (Schroeder et al. 1999; Stein et al. 2005). Early nutritional influences on chronic disease risk in later life in developing countries contribute to the acceleration of the overall worldwide epidemic of obesity and non-communicable diseases.

Table 1: Key indicators of malnutrition in Guatemala*

	Prevalence (%)	Ranking	Number of countries	Progress towards 2025 global nutrition targets
Under-5 stunting (chronic malnutrition)	48	127	132	Off course, some progress
Wasting (acute malnutrition)	1.1	10	130	On course
Under-5 overweight prevalence	4.9	48	126	On course, good progress
Anaemia in women of reproductive age	25.7	98	185	Off course
Exclusive breastfeeding rate	53.2	33	141	Off course, some progress
Adult overweight and obesity	52.0	82	190	Off course
Adult obesity	18.6	83	190	Off course
Adult diabetes	10.5	124	190	Off course

* Adapted from the '2016 Global Nutrition Report' (IFPRI 2016)

One in five adolescent girls aged 15-19 (21%) has a child or is pregnant (MSPAS 2015). This figure is higher for rural populations (24%) (MSPAS 2015). The percentage of adolescent girls who are mothers or pregnant is highest in the Western Highlands (Zone 1), central Guatemala (Zone 5) and the Dry Corridor (Zone 4), as well as in the departments of Santa Rosa and Izabal (Figure 15). A child born to an adolescent mother faces an increased risk of malnutrition, in the form of low birthweight, stunting and micronutrient deficiencies. High rates of adolescent pregnancy is a key component to the nutrition situation in Guatemala.

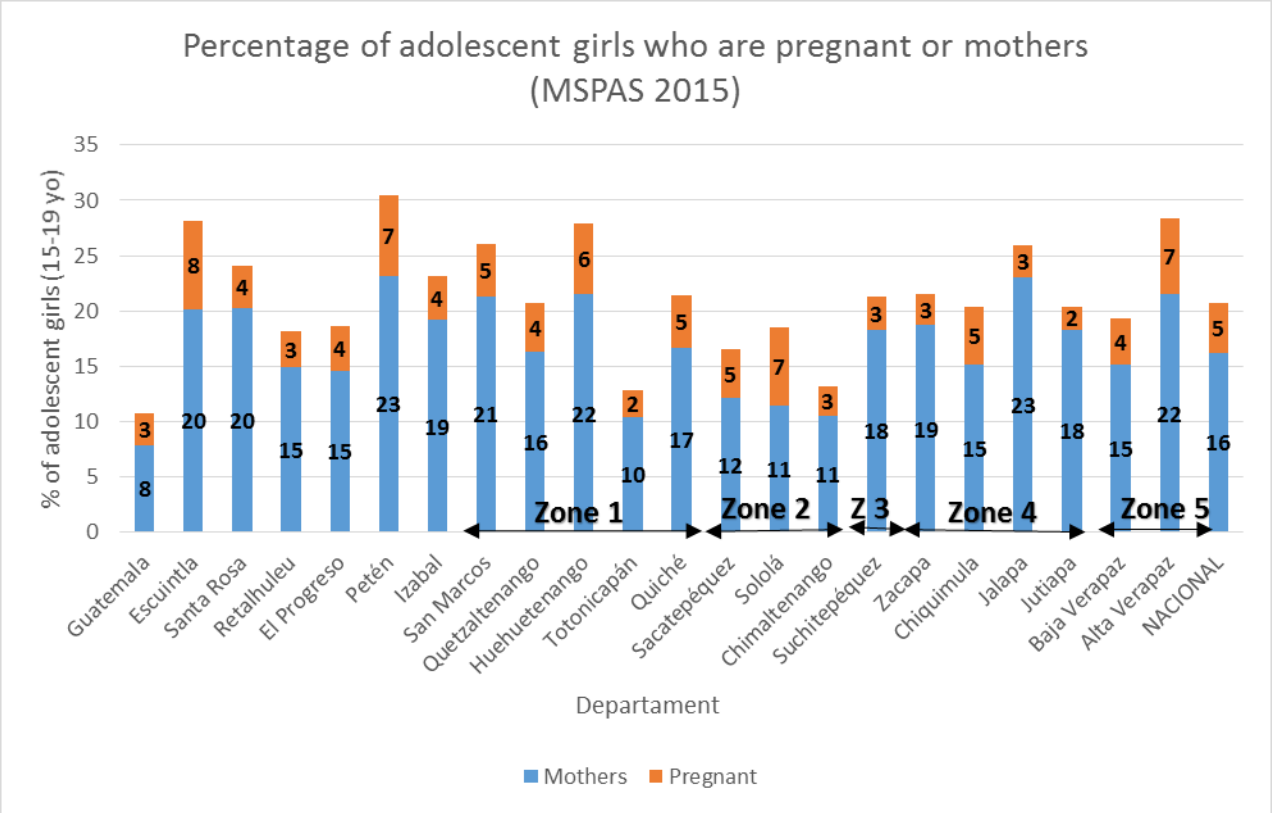

Figure 12: Adolescent girls (15-19) who are pregnant or mothers (MSPAS 2015).

Policies and Programmes

The 2005 *Act on the National System for Food Security and Nutrition* (SINASAN) and the establishment of the *National Council on Food Security and Nutrition (CONASAN)* provide a political and institutional framework for the *National Strategy for Reduction of Chronic Undernutrition (ENRDC)* and the *Strategic Plan for Food Security and Nutrition (PESAN 2012-2016)* (SUN 2015; National Council on Nutrition and Food Security (CONASAN) 2011).

Plan Pacto Hambre Cero (PPH0) was developed through PESAN 2012-2016 to be Guatemala's technical and operational instrument to eradicate hunger and address malnutrition with cooperation from the private sector, civil society and partners/donors (SUN 2015). PPH0 was developed in 2012 with four principal objectives: 1) reduce stunting by 10% by 2015; 2) prevent seasonal hunger and reduce infant mortality from severe acute malnutrition (SAM); 3) promote

food security and nutrition; and 4) prevent and address food security emergencies related to climate change and natural disasters (Government of Guatemala 2012). PPH0 was implemented in 166 municipalities in which stunting prevalence was above the national median of 42.8% (based on a 2008 national classroom survey of children 6-9 years old) (Government of Guatemala 2012).

To achieve these priorities PPH0 aimed to promote and support breastfeeding; improve complementary feeding practices through public health campaigns and classroom education; improve hygiene practices; deliver vitamin A supplementation; treat diarrhoea with therapeutic zinc supplements; deliver micronutrient powders, deworming pills and vaccinations to children; deliver iron and folic acid supplementation to pregnant women; prevent iodine deficiency with iodized salt; support homestead family agriculture; prevent and treat acute malnutrition with ready-to-use foods (RUF) and ready-to-use therapeutic foods (RUTF); and provide social protection against seasonal hunger with temporary work programs, conditional cash transfers and humanitarian assistance, such as food assistance (Food and Nutrition Security Platform 2016). PPH0 called on 24 institutions to deliver these priorities including: SESAN, MIDES, Ministry of Agriculture (MAGA), ministries of public health, labour, social work, public finance and education, representatives of civil society and representatives of the private sector.

An evaluation of PPH0[9] found the program was not on-track to reduce stunting by the intended 10%. In the first round of surveying (November-December 2012) stunting prevalence was 59.9% and during the second round (December 2013–February 2014) stunting prevalence was 58.2% (SESAN & INE 2014). High stunting among 6 month and 12 month old children indicated the need to emphasize the importance of good nutrition during the gestational period, maternal nutrition and good complementary feeding practices for children 6-12 months in nutrition policy (SESAN & INE 2014). As per the PPH0 evaluation, anaemia prevalence decreased from 34% to 30% for children and did not decrease for WRA (SESAN & INE 2014). This suggests that although multiple micronutrient supplements can be effective in reducing the anaemia status of children with only two visits per year reducing the anaemia status of WRA would require more prolonged interventions (SESAN & INE 2014).

The PPH0 evaluation identified disparities in nutritional status between rural and urban populations and concluded that future nutrition policy should establish more permanent contact with remote and difficult to reach populations to promote exclusive breastfeeding, best practices for complementary feeding and good hygiene behaviour in homes and the environment to prevent infections (SESAN & INE 2014).

Guatemala underwent a change in government in January, 2016. The Secretary of Food and Nutrition Security (SESAN) and the Presidential Commissioner have pledged to reduce stunting prevalence by 10% by 2021 (FANTA n.d.). Specific policies to achieve this goal are currently under development.

Fortification of salt with iodine and fluorine has been mandatory by law since 2004 and fortification of sugar with vitamin A has been mandatory by law since 2000 (CONAFOR 2010).

[9] The PPH0 evaluation surveyed 4735 households in 294 primary sample areas randomly selected across the 166 municipalities targeted in PPH0.

Guidelines are available for voluntary fortification of wheat flour with iron, thiamine, riboflavin, niacin and folic acid (CONAFOR 2010). Costs of fortification are covered by producers and MSPAS is responsible for monitoring fortification compliance.

The PPH0 evaluation found that 37.7% of households consumed non-fortified salt, 51.6% consumed salt fortified with iodine within the requirement range and 10.7% consumed salt with more iodine than the requirement range (SESAN & INE 2014). These figures reveal that despite the law mandating salt fortification a considerable number of households are consuming non-fortified salt. The majority of households where non-fortified salt was being consumed were located in the Western Highlands and in the North, where non-fortified salt is imported from Mexico, in parts of the following departments: Quetzaltenango, Totonicapán, Sololá, Quiché, Alta Verapaz and Baja Verapaz (Figure 13) (SESAN & INE 2014).

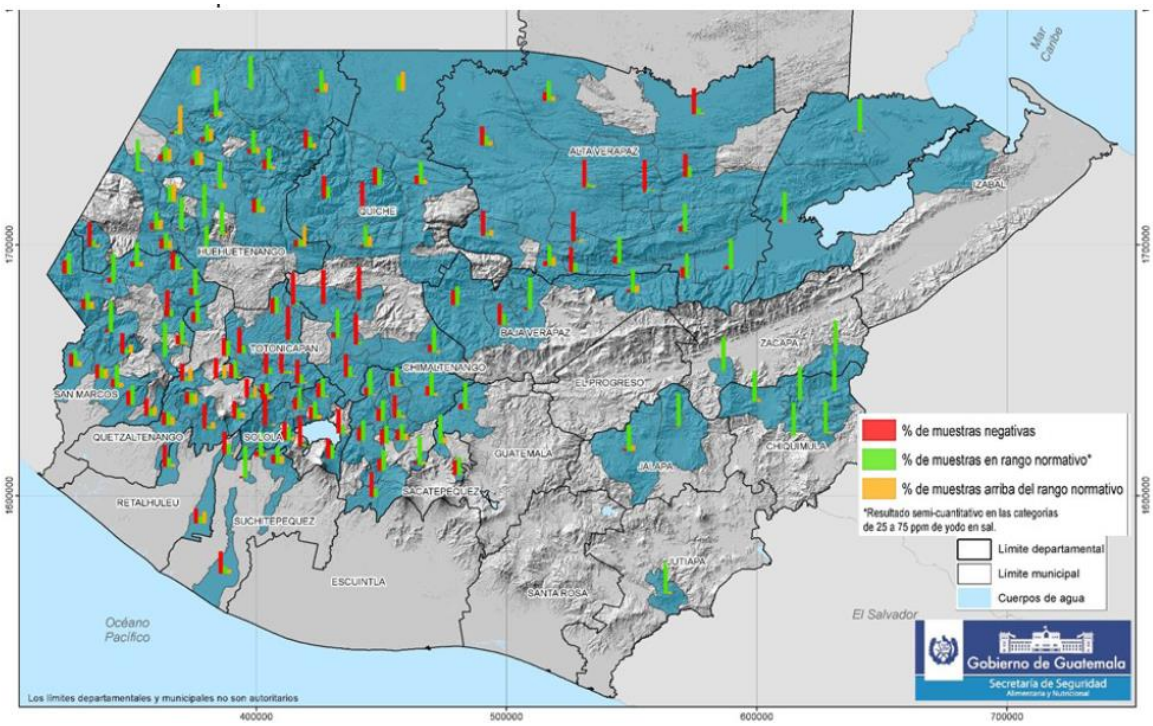

Figure 13: Salt iodization adequacy in PPH0 prioritized municipalities (SESAN & INE 2014).

A study on the potential impact of wheat flour fortification with iron and folic acid found, based on observed dietary practices, that the poorest, rural, indigenous populations suffering the highest burden of nutritional deficiencies would likely benefit least from wheat flour fortification due to low wheat consumption among this population group and low levels of iron in fortification (Imhoff-Kunsch et al. 2007).

Social Protection

The Ministry of Social Development (MIDES) delivered *Mi Bolsa Segura*, a food basket valued at 150 Q (USD 20)/month to 243,000 vulnerable households around Guatemala City in 2015 (MIDES 2016). *Mi Bono Seguro Salud* is a cash transfer of 150 Q/month delivered to 191,000 households with children 0-5 in 2015, conditional on children and PLW visiting health centres for medical check-ups (MIDES 2016). *Mi Bono Seguro Educación* is a cash transfer of 150 Q/month delivered to 432,000 households with children 6-15 in 2015, conditional on children having

>90% school attendance (MIDES 2016). A household receiving both *Mi Bono Seguro Salud* and *Mi Bono Seguro Educación* could receive up to 300Q/month. However, key informants reported that transfers have not been delivered regularly.

School Feeding

Guatemala has a rights-based approach that states by law that all children have the right to receive food in schools (World Food Programme 2013). The government school feeding programme provides universal funding to schools for communities to deliver meals worth approximately 4 Q (USD 0.5) per meal per student in 83 priority municipalities, 2.4 Q (USD 0.3) per meal per student in other rural areas and 1.7Q (USD 0.2) per meal per student in urban areas. Estimated coverage among all primary school pupils in the country was 94% in 2013 (WFP 2013). Funding is provided by the national government. In 2012 the national government planned to spend US$82.9M on purchasing food for school feeding programmes and spent US$52.2M (FAO 2013).

Alliance for Nutrition

The Alliance for Nutrition is composed of 23 organizations from business and civil society that coordinate interventions targeting the 1000-day window at the municipal level. The partnership includes several NGOs, foundations and private sector institutions such as agricultural exporters, coffee producers and sugar producers. The Alliance for Nutrition works in three main focus areas: 1) public policy, 2) direct action (field work and identifying best practices) and 3) communication (Alianza por la Nutricion 2013).

Community Health Services

Many health and nutrition interventions have been dependent on the service delivery network of the *Programa de Extensión de Cobertura* (PEC), a government initiative to contract NGOs and community volunteers to deliver primary health care in rural and remote communities. PEC suffered severe gaps in funding and service provision and ceased to exist at the end of 2014 (Rodriguez 2016; Avila et al. 2016).

PEC was launched after the signing of the 1996 peace accord. The program was a response to figures showing that 46% of the population – largely indigenous communities –did not have access to basic health care (Avila et al. 2016). Contracts were developed between MSPAS and multiple NGOs to provide basic health services (primarily maternal and child health and vaccinations) to these identified, unserved communities.

PEC grew rapidly and by 1999 was providing basic health services to 3.5 million people, approximately 77% of the previously unserved population (Avila et al. 2016). However, there was increasing dissatisfaction with the services provided to indigenous communities and accusations of inefficiency and a lack of transparency in contracting. This led to legislation in 2013 that prohibited the subcontracting of NGOs to provide health services and the cancellation of the majority of contracts by the end of 2014. As a consequence, primary health care services to the majority of rural populations in Guatemala were suspended, without any plans to replace or substitute these services in the short term. Following the appointment of a new Minister, the Ministry of Public Health and Social Assistance are undergoing a process to define programmatic direction for the coming years.

Policy Analysis

An enabling policy environment provides entry points for nutrition interventions (both specific and sensitive) and their implementation. In Guatemala the existing key policies and programmes by entry point are:

National Policy and Legal Framework

- Law of the National System of Food and Nutritional Security (SINASAN) passed in 2005.
- Strategic Plan for Food Security and Nutrition (PESAN 2012-2016). Follow up plan (PESAN 2016-2020) is currently under review.
- Plan Pacto Hambre Cero (PPH0) developed through PESAN as Guatemala's technical and operational instrument to eradicate hunger and address malnutrition finished in 2015. Specific follow-up policies are under development.
- Scaling Up Nutrition movement: joined in 2010
- Mandatory fortification: sugar (vitamin A) and salt (iodine and fluorine). Salt fortification compliance is a concern in PPH0 prioritized municipalities.

Social Protection

- Mi Bolsa Segura: food basket valued at 250Q/month distributed to 243,000 vulnerable households around Guatemala City in 2015.
- Mi Bono Seguro Salud: conditional cash transfer of 150Q/month for children 0-5 yrs distributed to 191,000 households in 2015. The cash transfer is conditional on children and PLW visiting health centres for medical check-ups.
- Mi Bono Seguro Educación: conditional cash transfer of 150Q/month for children 6-15 yrs distributed to 432,000 households in 2015. The cash transfer is conditional on children having >90% attendance.

Health and Nutrition Services

- Programa de Extensión de Cobertura (PEC) was launched in 1996 to provide basic care to communities without access to health services. After dissatisfaction with services provided the majority of contracts were cancelled in 2014.

School Feeding

- By law, all students in Guatemala have the right to receive food in school. A government-funded universal school feeding program provides meals with a daily value of 4Q per student in 83 priority municipalities; 2.4Q in other rural areas and 1.7Q in urban areas. Estimated coverage was 94% in 2013.

Availability

Especially in rural, indigenous communities the availability of nutritionally diverse foods is poor and as a result diets are deficient in animal source foods, such as dairy, meat and eggs and vitamin A-rich foods (Webb et al. 2016). The food groups that sustain the population in terms of energy and food quantity are cereals (mostly maize), sugar and legumes (black beans) (FAO 2010). Many rural settings provide infrequent access to fresh produce markets and food purchases are dominated by low-cost, low-quality processed snack foods (Webb et al. 2016).

A qualitative study[10] in Totonicapán, the department with the highest stunting prevalence, found that almost all families surveyed produced maize and legumes but few were self-sufficient (FAO 2012a). The production of gourds (pumpkin and squash) has diminished due to plagues and frosts, but also due to cultural practices and decreases in the size of available farm plots (FAO 2012). Few families have fruit trees and those who do only produce fruits in small quantities. The most common fruits produced were peaches, apples, avocados, bananas and citrus (oranges, lemons and limes) (FAO 2012a). In each of the 16 communities surveyed raising chickens was common, but in small numbers, with families generally consuming at most one chicken every two weeks (FAO 2012a). The production of eggs was increasing but not yet sufficient to provide for regular consumption by all family members. Some families raised cattle, pigs, rabbits and sheep, but in small numbers, producing only enough milk and cheese from cattle and sheep for the family itself (FAO 2012a). Pigs were raised primarily for sale, except when eaten by families around Christmas time. Cheap, easy to prepare foods, such as instant noodles, have been increasingly incorporated into rural diets in recent years. Within communities that had no retail presence ten years ago, it is now common to find five or six small shops selling packaged foods, soft drinks, chips, candies, instant chicken soup and, sometimes, fruit and vegetables (FAO 2012a).

The country has fertile soil, farming practices spanning generations and the climate is amenable for growing maize, wheat, legumes and many other crops. Maize and black beans are produced across the country, however production deficits are common in the Central and Western Highlands, the Dry Corridor and some areas of northern Guatemala (FAO/WFP 2010).

The expansion of non-traditional agricultural exports (NTAE) has reduced food availability by displacing subsistence crops (Webb et al. 2016). A study[11] in one indigenous village in the Western Highlands department of Chimaltenango found that only 10% of households in the community devoted most of their agricultural efforts to growing food for domestic consumption, intercropping beans and maize to sell and consume and producing coffee, green

[10] The study included interviews with 8 key informants (community leaders, agriculture producers, community elders and mothers), 26 focus groups with on average 12 women to discuss dietary habits and food availability, 25 focus groups with on average 6 agricultural producers, 10 focus groups with community nutrition and food security promoters from ENRDC, 29 semi-structured interviews with cooks, 18 interviews with owners of popular eateries, 8 group discussions with third grade students and a survey of sixth grade students (n=147). The study spanned 16 communities in 8 municipalities in Totonicapán (FAO 2012a).

[11] The study included interviews with 8 key informants (community leaders, agriculture producers, community elders and mothers), 26 focus groups with on average 12 women to discuss dietary habits and food availability, 25 focus groups with on average 6 agricultural producers, 10 focus groups with community nutrition and food security promoters from ENRDC, 29 semi-structured interviews with cooks, 18 interviews with owners of popular eateries, 8 group discussions with third grade students and a survey of sixth grade students.

beans, snow peas, broccoli and blackberries for export (Webb et al. 2016). Early adopters of NTAEs in Guatemala saw significant profits, triggering a shift away from subsistence agriculture, but recent longitudinal analyses have shown that late adopters have not experienced any significant improvement in welfare or return on investment, taking on significant debt and increased financial risk (Webb et al. 2016). Despite high rates of land ownership and food production, in this village there was a high prevalence of child undernutrition, food insecurity and increasing processed snack food consumption (Webb et al. 2016).

In other communities the lack of access to financial services hinders production and a baseline study conducted by USAID in beneficiary communities targeted for food assistance interventions in the Western Highlands found that only 16% of farmers reported using any form of savings, credit or insurance in the last 12 months, leading to a lack of resources to invest in products that would increase yield, such as fertilizer, insecticides and seed (USAID 2014).

If fertile regions of the Western Highlands continue to suffer from poor nutrition, the situation is equally alarming in less fertile regions, such as the Dry Corridor where soils are shallow and stony and producers own small parcels of land making it difficult to take advantage of economies of scale for input purchases and sales of surpluses (FAO/WFP 2010).

Guatemala has two main agricultural seasons: *Primera* with planting from April-May and harvesting beginning in August-September and *Postrera* with planting in August-September and harvesting beginning in November (Figure 14) (FAO/WFP 2010). The lean season is generally from March-August (Figure 15).

In Totonicapán, in the Western Highlands, during the rainy season gardens are more bountiful and a variety of vegetables, including green leafy vegetables, are available. In contrast, during the dry season, only basic grains and one or two types of green leafy vegetables are commonly available (FAO 2012). There is no tradition or knowledge of food preservation to enable consumption at other times of the year (FAO 2012).The only foods stored are basic grains and post-harvest losses vary by community (FAO 2012).

In Chiquimula, in the Dry Corridor, Oxfam conducted a market analysis to harmonize emergency relief programming with long-term support for agricultural producers. Oxfam found that the average family produces only enough maize, sorghum and beans to meet their needs for four months, relying on the market to meet basic food needs the rest of the year (Brady 2014). An increase in the production of sorghum as an alternative to maize is a common coping strategy applied in the Dry Corridor (MFEWS 2009). Sorghum has a lower nutritional value than maize, but is more resistant to dry conditions and could be sold to generate income to buy maize and beans (MFEWS 2009). Despite this, Sorghum production is considered by many to be undesirable as production and consumption are associated with poverty and hardship.

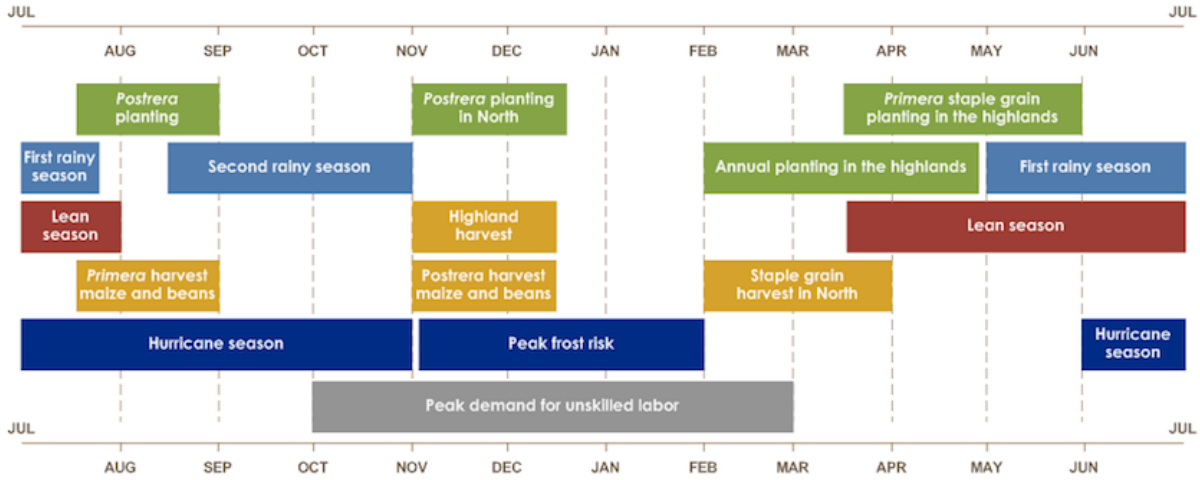

Figure 14: Seasonal agricultural calendar for Guatemala (FEWS NET n.d.)

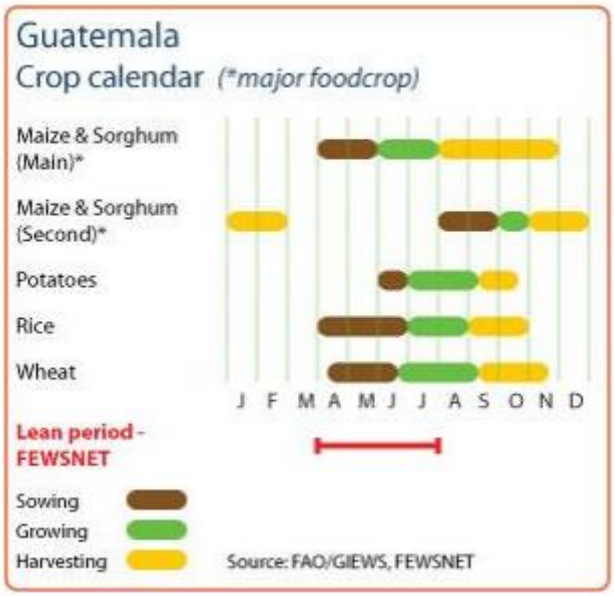

Figure 15: Guatemala crop calendar and lean period (FAO 2016)

The 2015/2016 El Niño phenomenon led to one of the worst droughts in Central America in 35 years. During the *Primera* growing season in 2015 the most-affected subsistence farming households, particularly in the Dry Corridor regions of the Western Highlands and Eastern Guatemala, suffered a 75-100% reduction in crop production (FEWS NET 2016b). Crop losses of 50-100% of maize and beans alone in 2015 in the Dry Corridor were valued at an estimated $82.6 million (WFP 2015).

For the end of 2016 and beginning of 2017 predicted rainfall suggests an average *Postrera* or 'second' harvest can be expected. If this holds, agricultural households should be able to build 3-4 months of bean and staple reserves and generate income from sales (FEWS NET 2016b). However, an increased likelihood of strong La Niña rainfall could lead to crop and post-harvest losses (FEWS NET 2016a).

A range of fortified complementary foods are available either through markets and/or through social programmes in Guatemala.

Incaparina, a low-cost, high-protein food, was highly publicised internationally when introduced by the Institute of Nutrition of Central America and Panama (INCAP) in Guatemala in 1961 (Wise 1980). The initial formula was based entirely on local ingredients; lime-treated maize flour (50%), sesame meal (35%), cottonseed meal (9%), torula yeast (3%) and powdered kikuyu leaf (3%). Later, when it was recognised that it would be cheaper and more practical to supply vitamin A in synthetic form from a foreign source, the formula was updated (Scrimshaw 1980). Incaparina in its current formula, made from maize and soy flour (without milk products) and fortified with iron and zinc, is widely available in supermarkets, markets and small community stores throughout Guatemala. The product continues to be produced and distributed by Alimentos S.A. in Guatemala, El Salvador and Honduras.

In 2015 The Government of Guatemala and WFP introduced a locally produced Supercereal Plus, locally known as 'Mi Comidita', a fortified complementary food for young children, with support from the Government of Canada. The composition of Mi Comidita is based on a Maize-Soy blend with milk powder, soybean oil and sugar as well as a micronutrient mix. Mi Comidita, initially piloted for distribution to 3,000 pregnant and lactating mothers and their children in Totonicapan (WFP 2014), was then expanded beyond Totonicapan, to 19 municipalities of Solola department, and 16 municipalities of Chimaltenango department (WFP 2016).

Vitacereal is a fortified, maize-soy blend with added iron, zinc, folic acid and vitamin A. Vitacereal was developed for PLW and children aged 6-35 months and, until late 2015, distributed by the Government of Guatemala in municipalities with stunting prevalence of 65% or higher (WFP n.d.) The Vitacereal formula was developed by the Government of Guatemala, WFP, other UN agencies and NGOs and produced within Guatemala, using local ingredients. For young children, it has now been replaced by Mi Comidita.

Access

Guatemala has the poorest road infrastructure in Central America (Figure 16) (World Bank 2009). Poor roads limit access to markets for consumers and vendors, lead to greater damage to transported goods and increase final costs to the consumer as a result of elevated logistical and inventory costs.

In a study of dietary practices in Totonicapán, in the Western Highlands, the markets in municipal centres were found to be the best option for food purchases as diversity was greatest and prices lowest. Given the distance needed to travel to these markets however, most respondents from rural communities would only visit once or twice per month to buy or sell food (FAO 2012).

As a result of limited access to markets, in one rural, Western Highlands community in Chimaltenango, market vendors reported offloading spoiled food that had not been sold earlier in the week in other markets (Webb et al. 2016). Local stores sold non-perishable snack items such as candy and chips (Webb et al. 2016). The availability of dairy, fresh meat, eggs and vitamin-A rich foods was low in these stores, mirroring the observed deficiencies in children's diets (Webb et al. 2016b).

In Chiquimula, in the Dry Corridor, market analysis found that local municipal markets were well serviced by regional and international supply chains, however transport was costly and local people would need to travel for up to 4 hours on foot (round trip) to their closest market (Brady 2014).

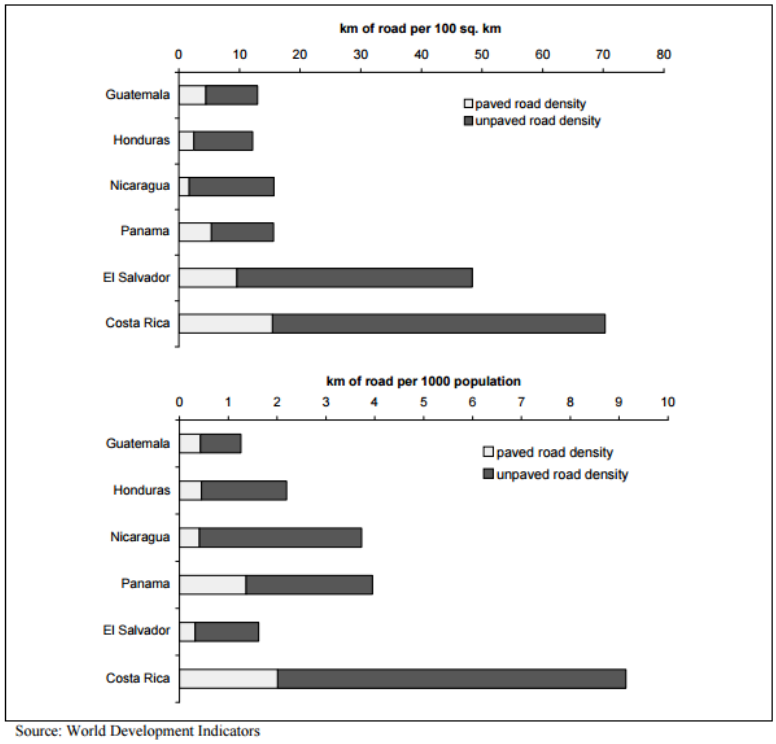

Figure 16: Road infrastructure in Guatemala compared with other Central American countries (World Bank 2009)

More than half (61%) of staple grain producers in Guatemala are indigenous people from the Highlands, earning an average of USD$92 per month (FAO & ACF 2012). A study of dietary practices in Totonicapán, in the Western Highlands, found that although many rural communities had small markets, a significant portion of the population living in poverty did not have continual access to the foods sold (FAO 2012b). A qualitative study of the sociocultural factors associated with malnutrition in 12 communities throughout Guatemala found that respondents (n=96 households) were aware of the nutritional benefits of eating meat but said it was not possible to consume meat frequently due to the high cost (SESAN & UNICEF 2014).

Several recent reports have described the devastating effects of rising food prices on diet quality and micronutrient intake in rural indigenous communities in Guatemala (Webb et al. 2016). Food prices have risen steadily over the last 14 years in Guatemala, mirroring increases in poverty levels. The price of maize, Guatemala's staple crop, has more than tripled from 2.2Q per pound in 2001 to 7.4Q per pound in 2014 (Figure 17) and the price of black beans has nearly doubled from 3.4Q per pound in 2001 to 6.6Q per pound in 2014 (Figure 18) (WFP 2016b).

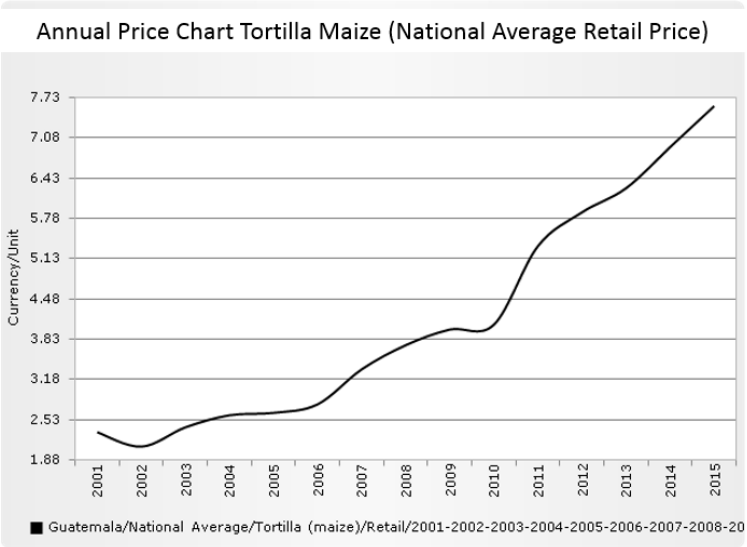

Figure 17: Increase in average tortilla prices from 2001-2015 (WFP 2016)

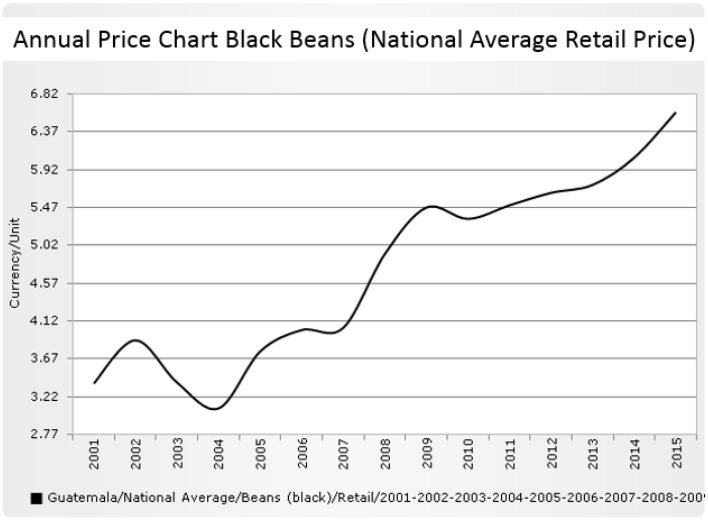

Figure 18: Increase in average tortilla prices from 2001-2015 (WFP 2016)

Oxfam's Market Analysis in the Dry Corridor department of Chiquimula found that most household income comes from unskilled labour on coffee plantations (Brady 2014). Seasonal hunger corresponds with periods of low demand for labour on these plantations as well as spikes in maize prices that are linked to seasonal falls in supplies and low local grain storage capacity (Figure 21) (Brady 2014).

FEWS NET predicted that in 2016 demand for agricultural labour would remain low until October, with only sporadic, short-term opportunities at low rates for day labourers in maize and bean production and maintenance work (FEWS NET 2016a). This was said to likely result in high unemployment and leave many households affected by the previous year's drought unable to access income needed to purchase food. This, in turn, would heighten competition for available jobs and weaken the bargaining power of day labourers in wage negotiations (FEWS

NET 2016a). Damage to coffee crops from drought and coffee rust, in addition to low coffee prices were expected to reduce the coffee harvest, the number of day labourers hired and the final amount payable to coffee harvesters (FEWS NET 2016a).

This lack of labour opportunities, combined with a poor harvest poses severe food security risks across Guatemala. In 2015, during the lean season (March-August), work availability declined, shortages in basic grains were reported and maize production started late (SESAN & MAGA 2015). In recent years, 2012-2015, bean prices have increased from June through September, with the timing and duration of price spikes varying each year (Figure 19) (WFP 2016b).

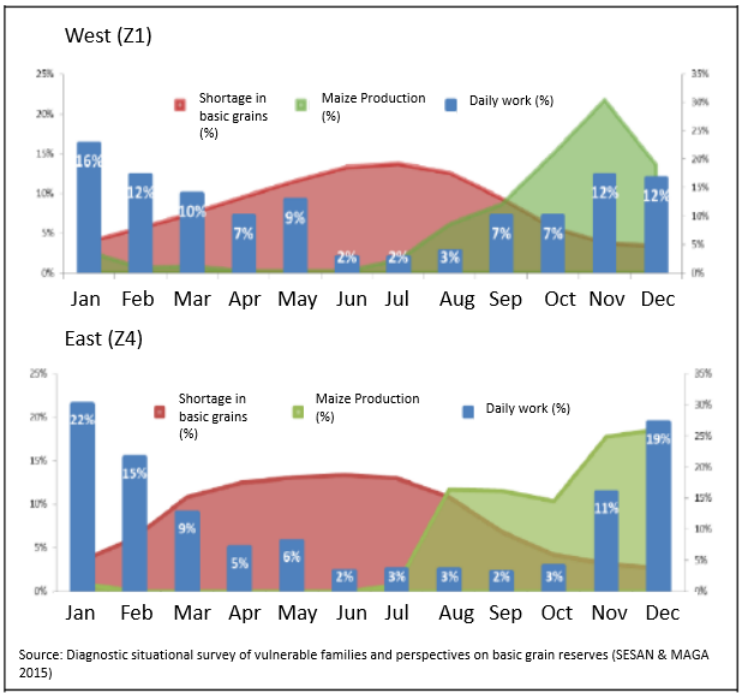

Figure 19: During the lean season demand for work decreases when Guatemala experiences shortages in basic grains in western and eastern Guatemala (Brady 2014).

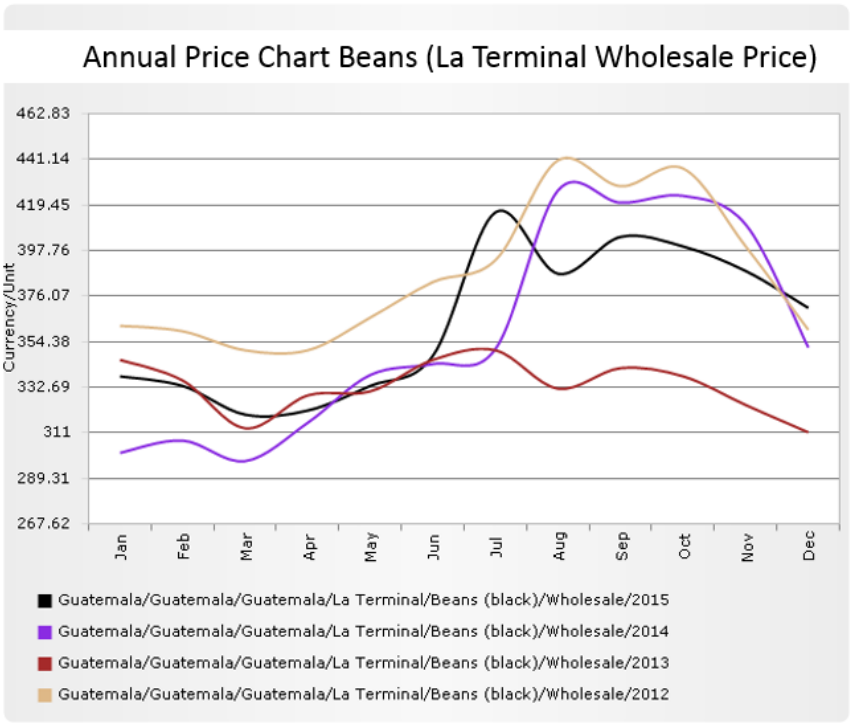

Figure 20: Seasonal fluctuations in bean prices 2012-2015 (Q/45 kg) (WFP 2016)

Food insecurity in Guatemala is concentrated in the Western Highlands and the Dry Corridor. The social groups most affected by limited access to nutritious food are landless families, subsistence farmers and traditional fishing communities (International Development Research Centre 2016). El Niño and recent low rainfall have led to lost labour opportunities and reduced household incomes, exacerbating food insecurity among vulnerable households throughout Guatemala (USAID 2016).

To measure household food security in five geographic areas selected for high risk of drought and coffee rust, WFP calculated food consumption scores (FCS) based on the number of food groups household members consumed over the previous 7 days (Figure 21). Surveys (n=1,065) were conducted during the last phase of the first harvest cycle, a time of year when food shortages are not commonly experienced (WFP Guatemala 2016). The region most affected was the Coffee Region (Alta Verapaz, Izabal, Quiché) where 55% of households had limited diets and 18% had poor diets (WFP Guatemala 2016). The second-most affected region was the West (Chimaltenango, Huehuetenango, Quetzaltenango, Quiché, Sacatepéquez and Totonicapán) where 41% of households had limited diets and 5% had poor diets (WFP Guatemala 2016).

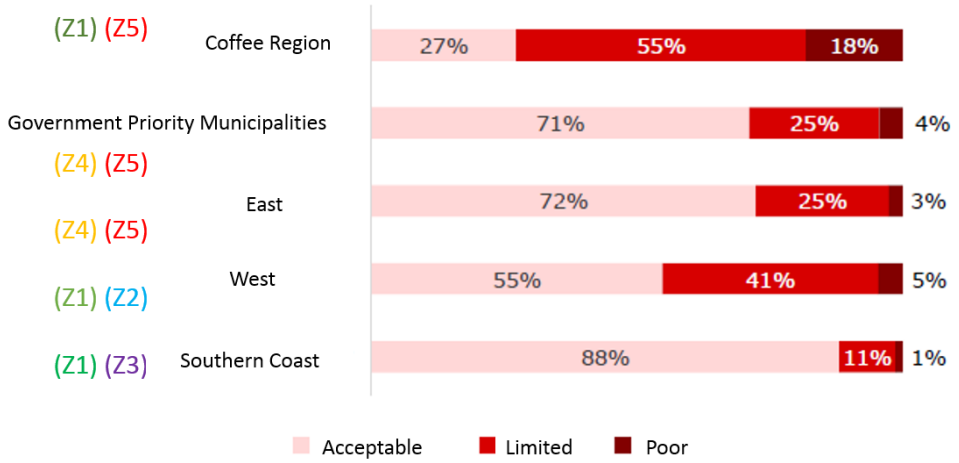

Figure 21: Food consumption results by region evaluated by WFP VAM Guatemala (WFP Guatemala 2016)

As a result of the 2015/2016 El Niño households in the Dry Corridor are experiencing a food security crisis in Guatemala (FEWS NET 2016b). The populations of greatest concern for food security are poor households in the temperate Western Highlands and very poor households in the East (Figure 22) (FEWS NET 2016b). As of November 2016 *Postrera* harvests had begun with lower yields for beans in the eastern part of the Dry Corridor due to irregular rainfall in October and high temperatures (FEWS NET 2016c). In the Dry Corridor of the Western Highlands poor households will be stressed through January 2017, with the situation likely deteriorating to crisis levels from February through May 2017 as labour availability and household reserves decline seasonally (FEWS NET 2016c).

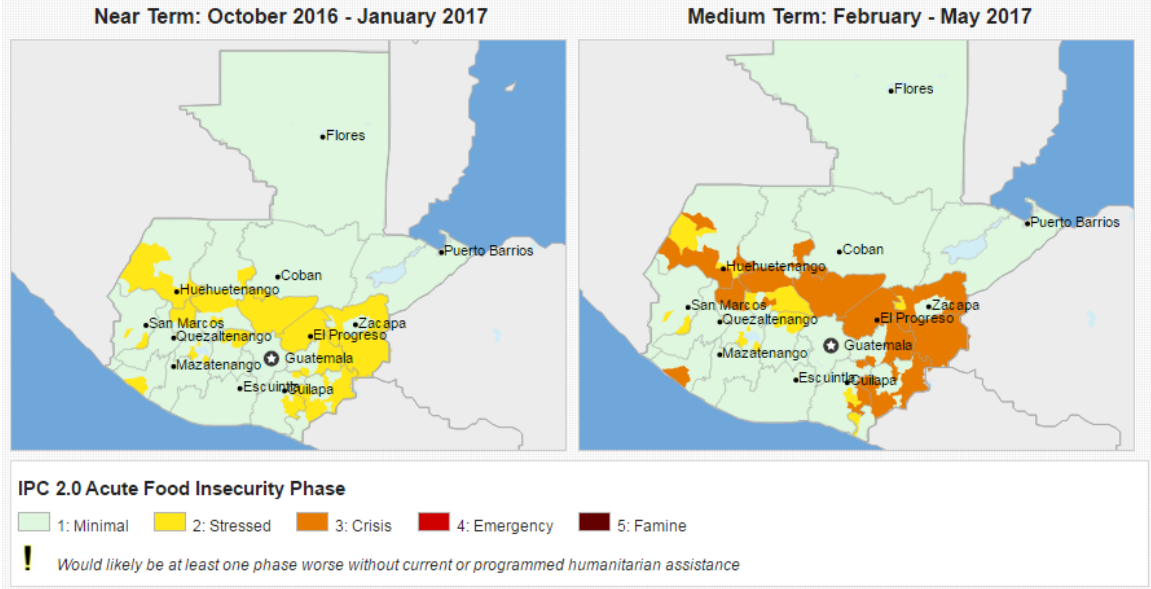

Figure 22: Near term and medium term food insecurity in Guatemala forecast for 2016/2017 (FEWS NET 2016d)

Analysis of Nutrient Availability and Access

A wide range of nutritious foods is available in Guatemala. Maize, tomatoes, onions, beans, eggs and potatoes are commonly available in departments with poor nutritional indicators.

Guatemala is highly vulnerable to natural disasters, such as droughts, floods, hurricanes, earthquakes and frosts, all impacting the quantities of food produced, food prices and access.

59% of the national population is classified as living below Guatemala's poverty line of $3.68/day. Nutrition outcomes in rural areas, among indigenous communities, are especially poor partially due to reduced market access in remote areas.

Availability

- Maize (tortillas) are the main staple.
- 76% of the farms in Guatemala are small-scale (<2 hectares).
- The 2015/2016 El Niño phenomenon led to one of the worst droughts in Central America in 35 years.
- The most-affected subsistence farming households, particularly in the Dry Corridor regions of the Western Highlands and Eastern Guatemala, suffered a 75-100% reduction in crop production in 2015; maize and bean losses in the Dry Corridor were valued at an estimated $82.6 million (WFP 2015a).
- Expected food crisis in Jan-May 2017.

Access

- Food prices have increased steadily and the price of maize has more than tripled since 2001.
- Prices of maize, beans and potatoes have risen seasonally during the lean months of June-October.
- Increasing poverty levels over the last decade, combined with high food prices and inflation make nutritious diets inaccessible for large parts of the population.
- In rural, indigenous communities, particularly in the Western Highlands and the Dry Corridor, many households lack physical access to markets without walking up to four hours. As a result, diets are deficient in animal source foods, such as dairy, meat and eggs and vitamin A-rich food and most food purchases are for low-quality, low-cost processed

Nutrient Intake

The proportion of the population with insufficient dietary energy consumption to meet metabolic needs has increased slightly in the last 25 years. In 2015 15.6% of the population was classified as being below the minimum level of dietary energy compared to 14.9% in 1991 (World Bank 2016). A qualitative study[12] in Totonicapán, the department with the highest

[12] The study included interviews with 8 key informants (community leaders, agriculture producers, community elders and mothers), 26 focus groups with on average 12 women to discuss dietary habits and food availability, 25 focus groups with on average 6

stunting prevalence, found that there has been an increase in consumption of animal source foods, such as meat and eggs, but not yet at sufficient quantities for target groups to meet nutrient requirements (FAO 2012a). Actions to improve roads, increase the number of small markets and promote home garden food production have added more onions, tomatoes, potatoes, carrots, cucumbers, melons and watermelon to local diets (FAO 2012a). These foods are typically consumed around once a week in stews and soups.

In a survey of children aged 6-23 months (n=2790) across a representative sample of SESAN prioritised PPH0 municipalities nearly half (47%) were found to be consuming minimum acceptable diets (MAD) (INCAP and WFP 2016). Half of children surveyed (52%) were found to be consuming diets with minimum diversity of food groups (MDD); most (85%) were consuming meals with the minimum frequency (MMF) (INCAP and WFP 2016). The difference between observed MDD and MMF suggests that most children are being fed frequently, but not from a wide variety of food groups. MAD was higher in urban areas, 50%, compared to rural areas, 45% (INCAP and WFP 2016).

MAD findings in PPH0 municipalities were similar to a representative survey of all of Guatemala that found MAD for children 6-23 months was 51% (MSPAS 2015). In a 2012 UNICEF bottlenecks study of Western Highlands departments, MAD was 45.2% of children (37.6-52.9) aged 6-23 months (UNICEF 2012). In the 2014 Guatemalan DHS, half (51%) of IYC aged 6 to 23 months met MAD however the figure was only 1 in 3 (33%) for 6-8 month olds, suggesting the need to improve dietary diversity during the initiation of complementary feeding (Figure 25) (MSPAS 2015).

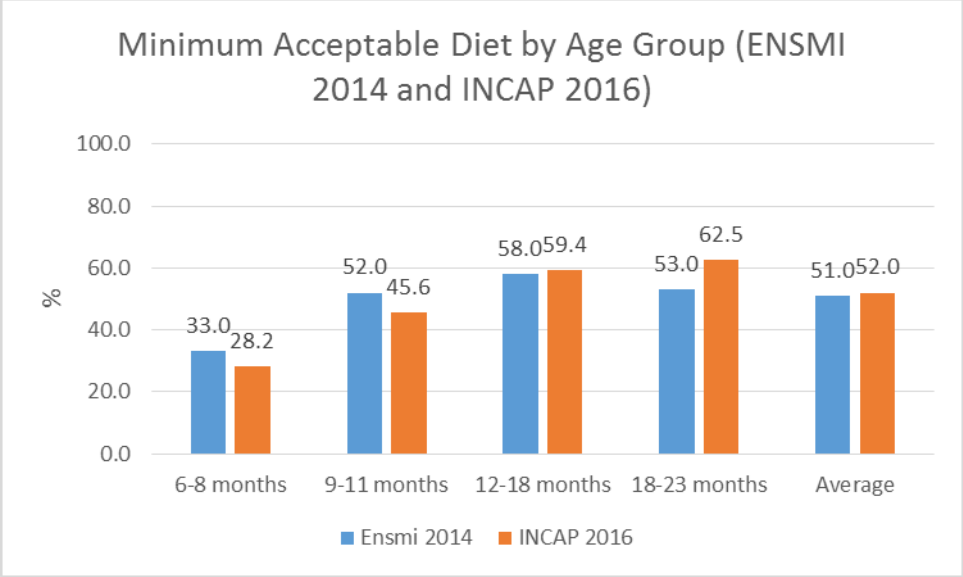

Figure 23: Percentage of Infants and Young Children (IYC) with a Minimum Acceptable Diet[13] by age group (MSPAS 2015)

agricultural producers, 10 focus groups with community nutrition and food security promoters from ENRDC, 29 semi-structured interviews with cooks, 18 interviews with owners of popular eateries, 8 group discussions with third grade students and a survey of sixth grade students (n=147). The study spanned 16 communities in 8 municipalities in Totonicapán (FAO 2012a).

[13] Minimum acceptable diet is defined as the percentage of breastfed children aged 6-23 months who had at least the minimum dietary diversity (received foods from at least four food groups) and minimum meal frequency during the previous day (WHO et al. 2008)

Dietary diversity indicators are lower in rural indigenous communities and a study in an indigenous farming village in the Western Highlands department of Chimaltenango found that less than 3% of IYC aged 6-23 months met WHO standards for dietary diversity and meal frequency (Table 2) (Brown et al. 2016).

Table 2: Estimates of 'minimum acceptable diet' consumed by children in a Mayan highland community in Chimaltenango (based on a survey of 52 caregivers) and a lowland, coastal (*Bocacosta*) community in Suchitepéquez (based on a survey of 50 caregivers) (Chary et al. 2013).

	Highlands[1]	Bocacosta[2]
Minimum Dietary Diversity	6%	37.5%
Minimum Meal Frequency	12.5%	35%
Minimum Acceptable Diet	2.5%	20.6%

[1]Many households own and cultivate their own land and 45% of households live on less than $2 USD per day
[2]Most residents work as seasonal agricultural day labourers or in construction; only 28% of households own land and 28% of households live on less than $2 USD per day

A WFP survey of households (n=946) in five geographic areas selected for high risk of drought and coffee rust estimated micronutrient deficiencies at the household level based on 7-day household recall of food groups consumed. The study found that 90% of households were consuming vitamin A-rich foods daily and 71% were consuming good quality protein sources daily however only 1% of households were consuming iron-rich foods daily (Figures 23-25) (WFP Guatemala 2016).

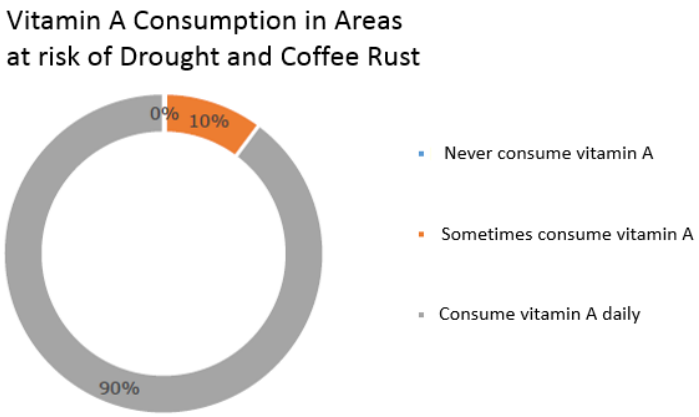

Figure 23: Household vitamin A consumption across five geographic areas selected for high risk of drought and coffee rust (WFP Guatemala 2016)

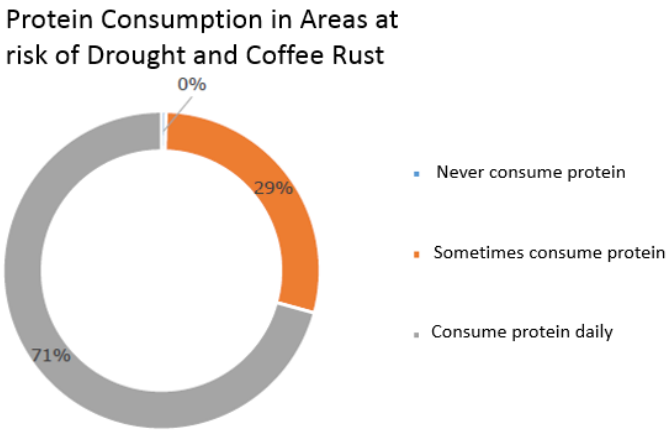

Figure 24: Household protein consumption (good quality protein from animal source foods, not counting protein from staple foods) across five geographic areas selected for high risk of drought and coffee rust (WFP Guatemala 2016)

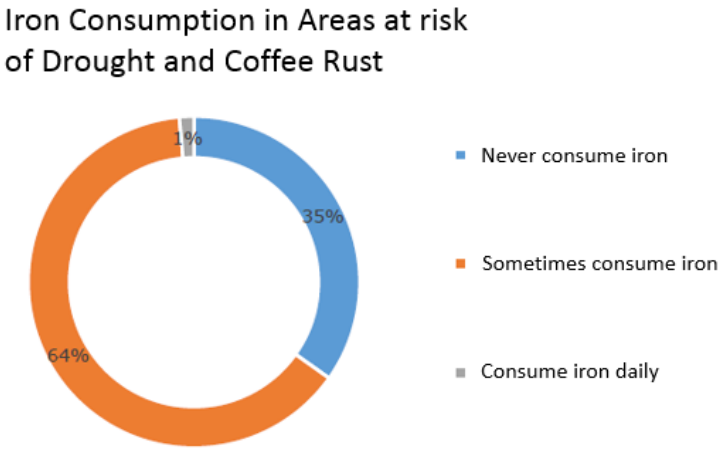

Figure 25: Household iron consumption across five geographic areas selected for high risk of drought and coffee rust (WFP Guatemala 2016)

The 2016 study "*Determination of Nutrient Gaps in Children 6-23 Months and Their Mothers*" conducted 24-hour dietary recall surveys to assess likely nutrient gaps in diets of IYC and PLW in in SESAN prioritised municipalities. The findings revealed that diets of surveyed 6-23mo children and their mothers were limited in variety and do not satisfy micronutrient requirements (INCAP and WFP 2016). Dietary intakes are below required levels of key (micro)nutrients such as protein, folate, zinc, calcium and iron for breastfeeding children aged 6-23mo (Figures 26-28), mothers (Figure 29) and pregnant women (Figure 30) (INCAP and WFP 2016).

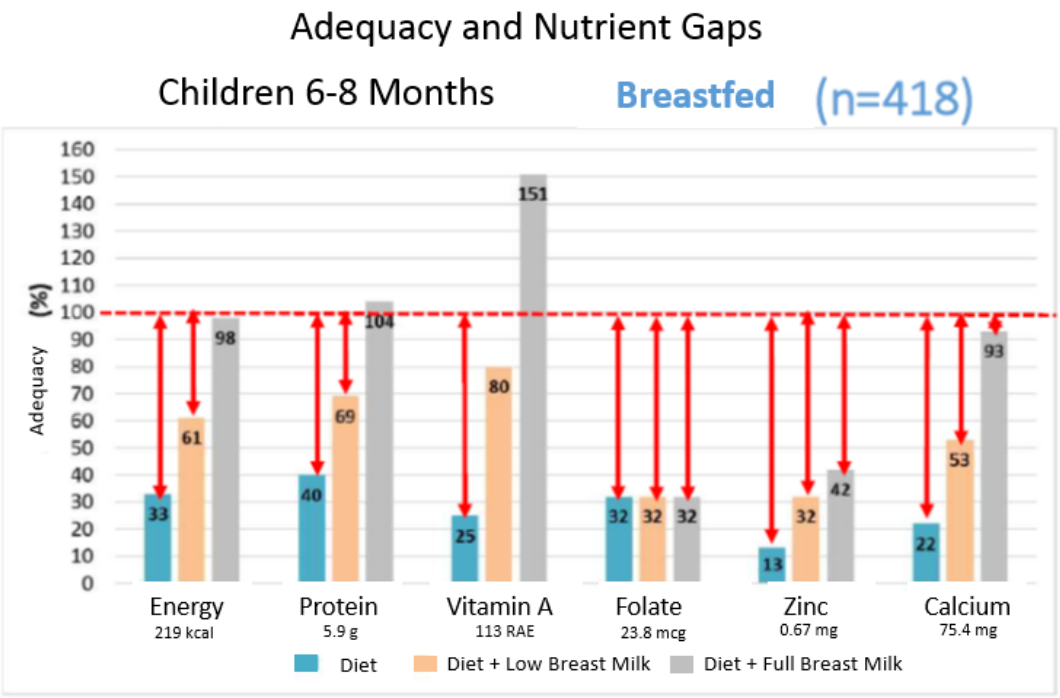

Figure 26: Nutrient gaps for children 6-8 months in SESAN prioritised municipalities with diet alone, assumed low breast milk intake (389 ml/day) and assumed high breast milk intake (889ml/day)

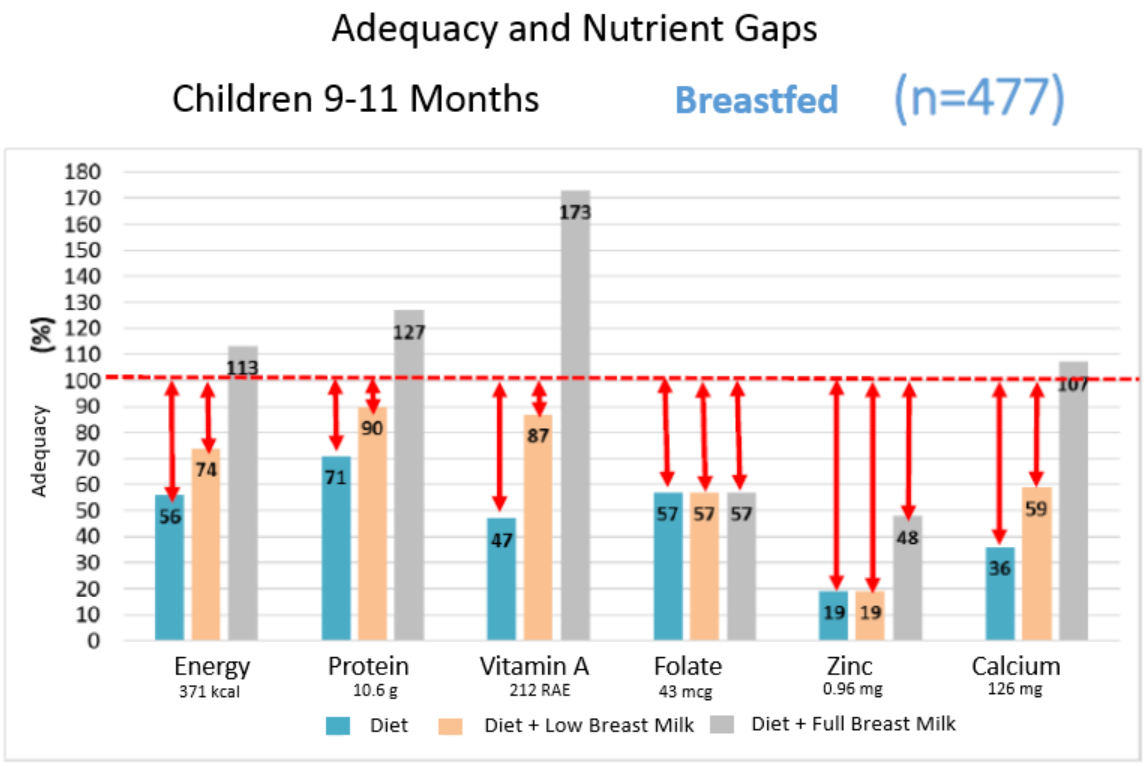

Figure 27: Nutrient gaps for children 9-11 months in SESAN prioritised municipalities with diet alone, assumed low breast milk intake (285 ml/day) and assumed high breast milk intake (889 ml/day)

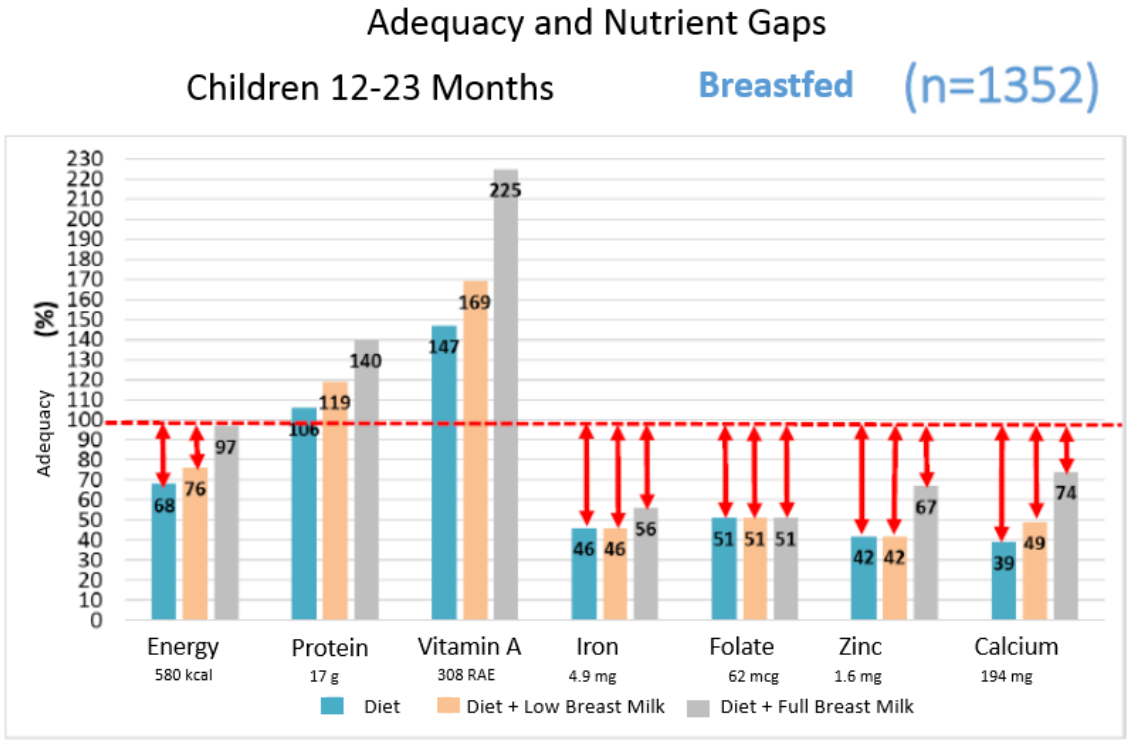

Figure 28: Nutrient gaps for children 12-23 months in SESAN prioritised municipalities with diet alone, assumed low breast milk intake (152 ml/day) and assumed high breast milk intake (550 ml/day)

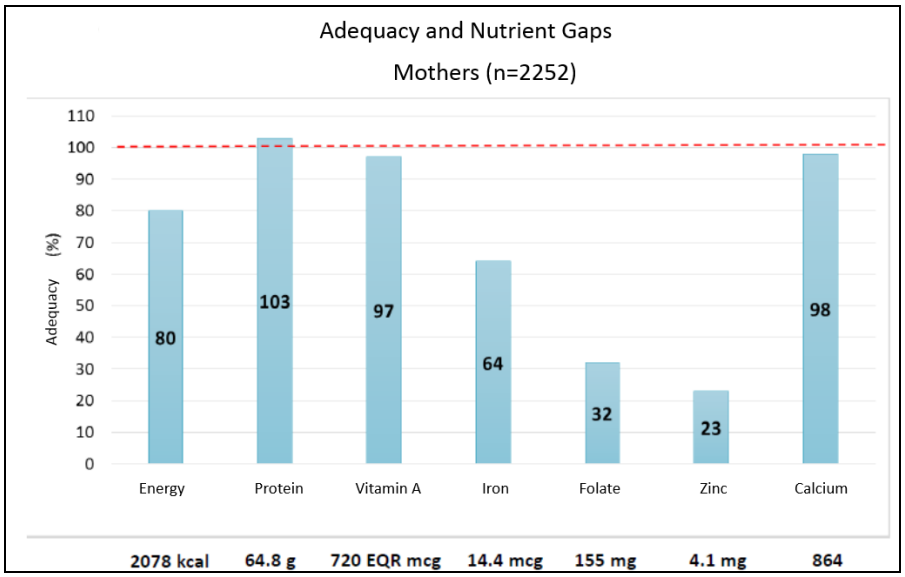

Figure 29: Nutrient gaps for mothers in SESAN prioritised municipalities

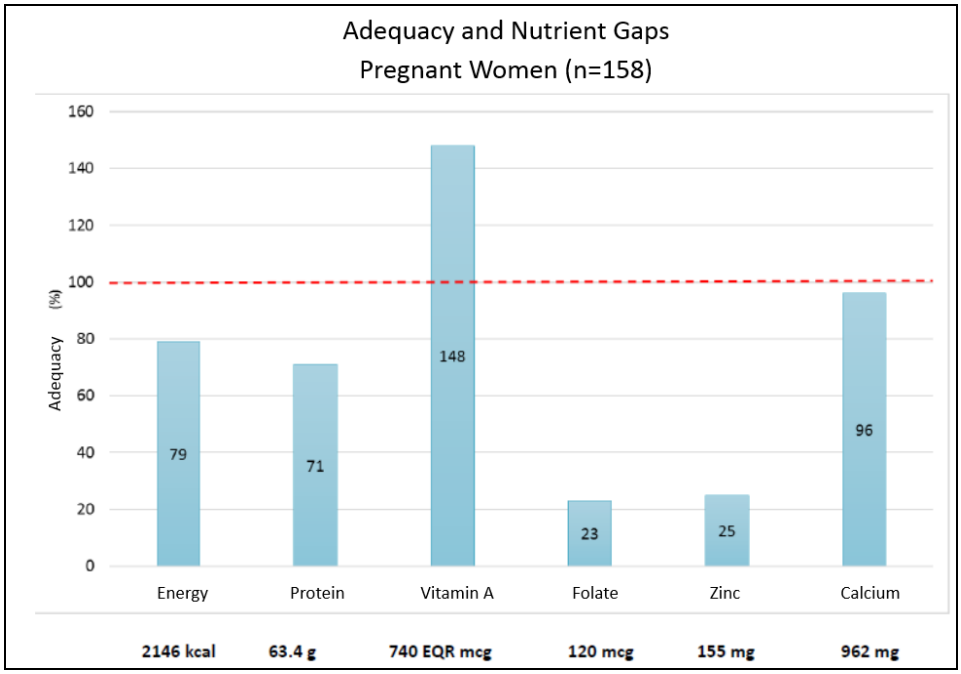

Figure 30: Nutrient gaps for pregnant women in SESAN prioritised municipalities.

The 24hr recall data from the study was used to derive inputs for a linear optimisation analysis using Optifood. This analysis investigated the extent to which nutrient requirements could be met for 6-8, 9-11 and 12-23 mo children, lactating adult women and lactating adolescent women using diets based on local foods and within observed dietary patterns across five study zones (Figure 31). Zone 1 covered Huehuetenango, Quetzaltenango, Quiche, San Marcos and Totonicapán. Zone 2 covered Chimaltenango, Sacatepéquez and Sololá. Zone 3 covered Suchitepéquez. Zone 4 covered Chiquimula, Jalapa, Jutiapa and Zacapa. Zone 5 covered Alta Verapaz and Baja Verapaz.

The analysis revealed that even if the most optimal combination of local foods were modelled, within quantities deemed 'realistic' it was not possible to meet nutrient adequacy for any of the five target groups. Identified problem nutrients for IYC were iron and zinc for all age groups, calcium for 6-8mo and 9-11mo and 12-23mo target groups in most zones and vitamin C for most child target groups. Niacin was a problem nutrient for children 6-8 mo in zones 2 and 4. Vitamin B12 was a problem nutrient for 6-8 mo in zone 3 and 12-23 mo in zone 5.

For adult and adolescent lactating women, vitamin B12 and zinc were problem nutrients across all zones and iron and vitamin C for many zones. Calcium and riboflavin were problem nutrients for lactating women based on local foods and dietary patterns in some zones. The problem nutrients for all study zones and target groups are presented in Tables 3&4.

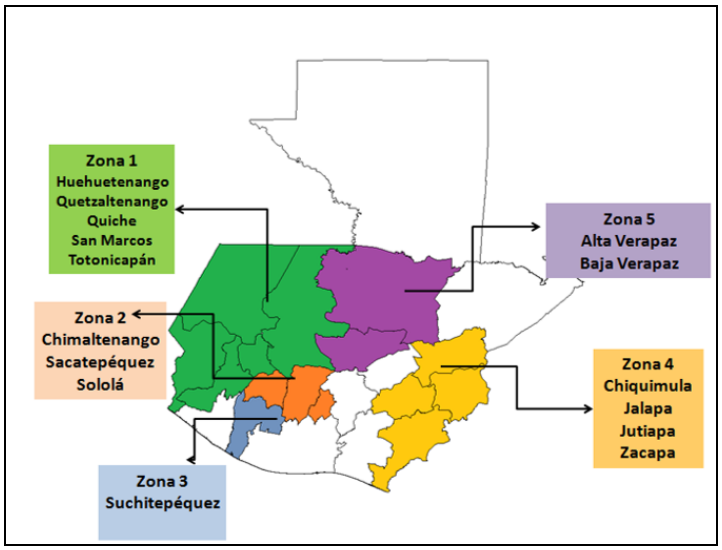

Figure 31: Five study zones in SESAN prioritised municipalities (INCAP & WFP 2016)

Table 3: Absolute problem nutrients (red)[1] and partial problem nutrients (orange)[2] identified in children 6-23 months using Optifood

Nutrient	**6-8mo children**					**9-11mo children**					**12-23mo children**				
Zones	***Z1***	***Z2***	***Z3***	***Z4***	***Z5***	***Z1***	***Z2***	***Z3***	***Z4***	***Z5***	***Z1***	***Z2***	***Z3***	***Z4***	***Z5***
Calcium															
Vit C															
Niacin															
Vit B12															
Iron															
Zinc															
No. Problem Nutrients	**3**	**5**	**6**	**6**	**4**	**4**	**3**	**2**	**3**	**4**	**2**	**3**	**3**	**2**	**4**

[1]Absolute problem nutrients marked in red refer to nutrients for which requirements could not be met even in optimised diets based on local foods, within 'realistic' quantities as per observed dietary patterns.
[2]Partial problem nutrients, marked in yellow, are nutrients for which requirements could be met using local foods, but to the detriment of the intake of other nutrients.

Table 4: Absolute problem nutrients (red)[1] and partial problem nutrients (orange)[2] identified in lactating adolescent girls and lactating adult women using Optifood

Nutrient	**Lactating adolescent girls**					**Lactating adult women**				
Zones	*Z1*	*Z2*	*Z3*	*Z4*	*Z5*	*Z1*	*Z2*	*Z3*	*Z4*	*Z5*
Calcium					*Partial*					
Vitamin C										
Riboflavin							*Partial*		*Partial*	
Vitamin B12										
Iron										
Zinc										
No. Problem nutrients	**2**	**6**	**6**	**4**	**6**	**3**	**3**	**4**	**3**	**5**

[1]Absolute problem nutrients marked in red refer to nutrients for which requirements could not be met even in optimised diets based on local foods, within 'realistic' quantities as per observed dietary patterns.
[2] Partial problem nutrients, marked in yellow, are nutrients for which requirements could be met using local foods, but to the detriment of the intake of other nutrients.

Diets observed through 24hr recall surveys for the "*Determination of Nutrient Gaps in Children 6-23 Months and Their Mothers*" tended to be monotonous; based on energy-dense, micronutrient-poor staples and other foods. The least diverse diets were those of the youngest

age group, 6-8mo children. The complementary diets of 6-8 month olds consisted mainly of salt and sugar (>75% of children) as well as maize tortillas, tomatoes, coffee and onion (50-74% of children) and for some children (20-49%), eggs, oil, potatoes, consommé or stock and bread (INCAP and WFP 2016). Children in the 9-11mo and 12-23mo age groups were more likely to consume maize tortillas and consume a more diverse diet, including foods such as beans, banana, chayote, Incaparina and egg (INCAP and WFP 2016). For children 6-23mo, the majority of energy in observed diets (was derived from maize tortillas (22-27% of energy), sugar (14%), potato (2-4%) and bread (4-6%) (INCAP and WFP 2016).

At the time of data collection, >75% of surveyed mothers were consuming diets based around maize tortillas, salt, sugar, coffee and tomatoes, 50-74% were also consuming onions, oil, beans and eggs and 25-49% were also consuming powdered chicken stock, bread, instant noodles, cilantro and potatoes (INCAP and WFP 2016). Within the diets of surveyed mothers 49% of energy was provided by tortillas, 10% from sugar, 5% from bread and 4% from beans (INCAP and WFP 2016). The low micronutrient content in these foods underlies much of the moderate levels of anaemia seen throughout Guatemala.

Local practices

Dietary Practices

A qualitative study of dietary practices in the Western Highlands department of Totonicapán found that local diets were based on maize, beans, gourds and herbs with limited portions of fruits and vegetables (FAO 2012a). Dietary diversity, especially in terms of the variety and quantity of vegetables being included in traditional sauce and soup-based dishes, has improved in recent years, however at the same time there is a growing consumption of commercial, sugary beverages and an increased use of fat, especially lard, in cooking (FAO 2012a). There has been an increase in the consumption of refined carbohydrates (instant noodles, white bread and cookies) and industrial snacks (chips and candies). The study found an increasing preference for and practice of using industrial soup bases, consommé and powdered soup products of little to no nutritional value for preparation of soups and stews (FAO 2012a). This practice has been reported across the Western Highlands and other areas of Guatemala in a number of recent studies (FANTA 2014; FANTA 2015; INCAP and WFP 2016). Such products are becoming increasingly available in regional markets and remote community stores. Although they are not considered expensive, their purchase may replace the use of family resources to purchase more nutrient-rich foods.

The increasing availability of and preference for industrial foods reflects the first stages of the nutrition transition: a term used to describe the transition from traditional high-fibre, cereal and plant-based diets in developing countries to a more Western diet, high in sugar, fat, processed foods and animal-source foods. The arrival of and taste for new foods has led to a view of traditional foods, such as GLV and beans as ‘old’, and industrial foods as modern and in-style (FAO 2012a). Across the country many farmers who produce crops such as carrots, onions, strawberries and squash prefer to sell their produce than consume it, often without understanding the nutritional value of the crops they sell (USAID 2011).

During FNG technical working group meetings stakeholders from FANTA, INCAP and WFP discussed concerns over the apparent decreasing preference for and consumption of traditional

black beans in rural areas of Guatemala, stating that consumers are favouring the purchase of pre-prepared beans or other easier to prepare foods rather than soaking and cooking their own beans. Lower than expected bean consumption by PLW and IYC has been reported in 24hr recall surveys carried out by INCAP and FANTA in the Western Highlands over recent years (FANTA 2014; INCAP and WFP 2016).

In contrast, a *Sociocultural Factors* study related to malnutrition surveyed 96 families from 12 communities across the country[14] with high stunting rates and found that tortillas and, to a lesser extent, beans, were the only foods consistently present in the local diet (SESAN & UNICEF 2014). The study reported that families found it "inconceivable" not to eat maize and beans, however beans were considered a 'secondary' food to maize, eaten less often and in lower quantities, as determined by cost and availability (SESAN & UNICEF 2014). Dietary intake surveys and qualitative surveys conducted by INCAP and FANTA reported that bean consumption in Huehuetenango and Quiché tended to occur 1-3 days per week, partially due to the high cost of beans but also due to the time, effort and fuel required to cook beans (FANTA 2014; FANTA 2015).

In the *Sociocultural Factors* study all families interviewed had a positive opinion of fruits and vegetables for their high vitamin content and saw *comida chatarra* (junk food) negatively (SESAN & UNICEF 2014). Processed foods such as pasta, instant soups and cookies were well regarded because they were considered affordable and filling (SESAN & UNICEF 2014). The study found that respondents in 10 out of 12 surveyed communities regarded foods to be either "hot" or "cold" based on a traditional, Mayan belief system (SESAN & UNICEF 2014). Foods classified as "hot" were thought to benefit the body and regulate temperature while foods classified as "cold" were thought to cause negative changes in body temperature, stomach pain and diarrhoea. Many mothers would not eat "cold" foods while pregnant or lactating and avoided giving "cold" foods to children (SESAN & UNICEF 2014). Many fruit and vegetables were considered "cold" including squash, banana, avocado and herbs such as amaranth (SESAN & UNICEF 2014). Classifications were inconsistent across families —the classification belief systems tended to be passed down through generations but some households considered tomato a "hot" food while others considered it "cold". The majority of people interviewed could not explain the reasons for classifying a particular food as being hot or cold (SESAN & UNICEF 2014).

Time of breastfeeding initiation as well as frequency and duration can be influenced by traditional beliefs around 'temperature' of food and the human body. The concept of 'heat' and 'cold' in the traditional Mayan belief structures is described in detail in anthropological literature (Maffi 1999). This classification can apply to illnesses, foods and medicinal plants, implying that balance is required in the body to maintain 'heat' in the body as the sign of health and life and avoid 'cooling' or imbalance, which brings about sickness (FAO 2012a; Maffi 1999). The notion of foods as warm or cold refers not to their actual temperature but to a traditional classification system (Maffi 1999; FAO 2012a).

Most people interviewed as part of the *Sociocultural Factors* study considered symptoms of malnutrition in children as a normal occurrence and not something especially deserving of

[14] The 12 study communities were located in Huehuetenango, Totonicapán, Quiché and Sololá in the Western Highlands, Chimaltenango, Guatemala and Sacatepéquez in the centre of the country, Suchitepéquez near the coast, Alta Verapaz in the central highlands and Jalapa and Chiquimula in the Dry Corridor (SESAN & UNICEF 2014)

priority by the household or community (SESAN & UNICEF 2014). Some respondents were familiar with symptoms of IYC malnutrition, such as low weight, short stature, skinniness and even extended stomachs and discolouration of hair, but few mothers knew the current nutritional status of their own children or could name common causes of malnutrition (SESAN & UNICEF 2014). Poor purchasing power, specifically the relationship between the cost of foods and available income, was the principal reason given for not following good dietary practices (SESAN & UNICEF 2014). Many families were aware of which foods were especially nutritious and good for their children – however they preferred to sell nutritious foods they produced in their households (such as eggs) and use the money to purchase more filling staples (SESAN & UNICEF 2014).

Breastfeeding Practices

While it was reported in the most recent DHS that 96% of IYC are breastfed at some point, breastfeeding practices are generally inadequate in Guatemala (MSPAS 2015). Nationally only half of all infants (55%) were breastfed within an hour of birth according to the 2008 DHS (MSPAS 2010) and a third of infants (30.8%) were fed liquids other than breast milk in the first month of life according to the most recent DHS (Table 5) (MSPAS 2015). Rates of exclusive breastfeeding for infants under 6 months of age has only improved marginally in recent years: from 50.6% in 2002 to 53.2% in 2014 (MSPAS 2015). Rates of exclusive breastfeeding at 0 to 3 months are almost twice as high for indigenous (71.7%) compared to non-indigenous infants (41.3%), and median duration of breastfeeding is longer: 22.6 months for indigenous IYC compared to 17.9 months for non-indigenous IYC (MSPAS 2010).

Table 5: Guatemalan estimates for key indicators of breastfeeding and complementary feeding practices

	DHS, 2008[1]	DHS, 2014-2015[2]
Percentage of infants breastfed within one hour of birth	55.5%	x
% 0-5 month-olds exclusively breastfed in the last 24 hours	49.6%	53.2%
Median duration of breastfeeding	18 months	x
Percentage of breastfed infants 4-5 and 6-7 mo old receiving liquids other than breast milk from bottles or complementary foods	29.6% (at 4-5 mo) 39.4% (at 6-7 mo)	36.1% (at 4-5 mo) xxxx (at 6-7 mo)
Percentage of breastfed infants receiving complementary foods at 6-8 mo of age	71.0%(at 6-8 mo) 80.6% (at 9-11 mo)	73.1% (at 6-8 mo) 85.4% (at 9-11 mo)

[1] ((MSPAS 2010)
[2] (MSPAS 2015)

Independent of initiation, duration or exclusivity, breastfeeding is practically universally in Guatemala. It holds significant cultural value and is intimately related with concepts of motherhood and child rearing. Breast milk is commonly known to be rich in nutrients and the most appropriate food for infants (Saenz De Tejada 2013a). In some indigenous cultures in

Guatemala, breastfeeding is symbolically associated with the vital force connected to mother earth and the maize harvest (Saenz De Tejada 2013a).

In Guatemala, early initiation of breastfeeding (within the first hour after delivery) is determined by place of delivery, type of delivery (caesarean compared to vaginal birth), perceptions of the benefits of colostrum and perceived breast milk supply.

A survey of mothers (n=777) in peri-urban areas of Guatemala city found that early initiation is lower among infants born in hospitals and that place of delivery was the primary determinant of early breastfeeding (Dearden et al. 2002). A Western Highlands study of infant-mother dyads (n=190) concluded that indigenous Mam-Mayan women who gave birth at the homes of traditional midwives were more likely (OR = 2.5) to initiate breastfeeding within 1 hour postpartum (Wren et al. 2015).

In contrast to national figures, a recent study in the largely indigenous, central highlands department of Alta Verapaz, observed that almost all infants (94%) received breast milk as the first liquid and the majority of children were breastfed within the first few hours of birth (Olney et al. 2012). A small qualitative study of the IYCF practices of 52 mothers of 0-12 month old children in Chiquimula (Dry Corridor) and Totonicapán (Western Highlands) found that most mothers reported offering their child the breast soon after birth "*because they start to cry, it's because they want to breastfeed"* (Haeussler 2010). In contrast, mothers in one of the Totonicapán study communities reportedly gave a bottle with cooled, boiled water or formula for the first few hours or days after birth (Haeussler 2010). The common elements between mothers reporting this practice were illiteracy, use of the services of the same local midwife and caesarean birth (Haeussler 2010).

UNICEF's bottleneck study in the 8 municipalities with the highest prevalence of chronic malnutrition found that only half (56%) of pregnant women (n=274) knew that they should breastfeed their newborn within the first hour (UNICEF 2012). Perceptions of the benefits of giving colostrum to newborns vary and there is little current data available. Mothers have reported that the 'first milk', or the 'yellow milk', is beneficial to the child as it cleans the stomach, preparing it for the breast milk (Saenz De Tejada 2013a; Haeussler 2010). It has been reported that in Mam communities (an indigenous people living predominately in parts of Quetzaltenango, Huehuetenango and San Marcos departments of the Western Highlands), colostrum is sometimes considered as "the first vaccination" for an infant (Saenz De Tejada 2013a). Despite this, there are anecdotal reports that colostrum is considered harmful in some communities and that it is expressed and discarded instead of being given to infants (Saenz De Tejada 2013a). This information may be out of date however; a recent study in Alta Verapaz found that most mothers and fathers encouraged the feeding of colostrum but that two out of 10 grandmothers surveyed thought that colostrum should be discarded (Olney et al. 2012).

In Totonicapán and Chiquimula, the majority of mothers said they breastfed soon after birth because it was recommended by the '*comadrona' or* traditional midwife (Haeussler 2010). Women listed talks at the local health centre, education given in the hospital by doctors or nurses and their mothers or mothers-in-law as sources of information on early breastfeeding initiation and colostrum (Haeussler 2010).

A 1995 study documented mothers waiting for up to three days for breast milk to 'come down' or 'mature' before initiating breastfeeding (Ruel 1995). There has been historical documentation of the use of wet nurses until a mother could establish breastfeeding however there is little mention of this in recent literature (Saenz De Tejada 2013a). In a small study in the largely indigenous San Marcos department of the Western Highlands, one-third of mothers reported not producing any milk after birth and relying on wet-nurses and/or water-based herbal infusions to feed their child until the milk descended (Saenz De Tejada 2013a). Waiting for milk to 'drop' or shortage of milk was also a reason for not breastfeeding within the first few hours after birth cited in the Alta Verapaz study (Olney et al. 2012). Another finding was that when some mothers do initiate breastfeeding early it is because they have no other food available in the household to give to their infant (Saenz De Tejada 2013a). This suggests that some mothers who initiate early breastfeeding may not be doing it for the right reasons. It has also been reported that some mothers wait for signs or signals from their infant to start breastfeeding (Olney et al. 2012).

There are some reports that prelacteal feeds (non-breast milk liquids given to neonates before the initiation of breast feeding) are common in Guatemala and are an important factor in delaying the initiation of breast feeding (Saenz De Tejada 2013a). However, a recent yet small survey conducted in Quetzaltenango noted that prelacteal feeds do not appear to be common (Doak et al. 2013).

Only half of Guatemalan infants aged 0-6 months are exclusively breastfed (MSPAS 2015). The UNICEF Bottlenecks study found that in three surveyed Western Highlands departments, less than 1% of adolescent, pregnant and lactating women had 'good[15]' knowledge of breastfeeding practices (UNICEF 2012). Very few mothers were able to report when breastfeeding should be initiated, the period of time infants should be exclusively breastfed, and the health benefits of exclusive breastfeeding (UNICEF 2012). Some mothers reportedly believed that breast milk is a good food for their child but that water should also be given to quench thirst (UNICEF 2012). Likewise a study in Totonicapán (Western Highlands) and Chiquimula (Dry Corridor) noted that mothers generally do not understand the concept of exclusive breastfeeding (Haeussler 2010).

Other liquids (aguitas) such as sugar water and herbal infusions are commonly given to infants during the exclusive breast feeding period to complement colostrum, provide extra nourishment or treat colic and indigestion (Saenz De Tejada 2013a). Anise tea, castor and olive oil are also sometimes given as laxatives to 'clean' a new-born's stomach (Saenz De Tejada 2013a). In Chiquimula over half of mothers interviewed were feeding their infants aged <6 months liquids other than breast milk as supposed remedies for a variety of symptoms including excessive crying and stomach-ache (Haeussler 2010).

Warm, grain-based gruel, called *atole* is also commonly given to infants before six months of age across Guatemala. *Atoles* are generally offered to small children in a bottle up to 2 times per day. The most common preparations are highly diluted mixtures based on masa (maize), maicena, Incaparina, Vitacereal and fortified oats (Quaker brand or similar (Chary et al. 2013; Saenz De Tejada 2013a; Haeussler 2010). Due to the preference for thin, diluted *atoles, preparations* tend to have low energy and nutrient density (FANTA 2014; Saenz De Tejada

[15] Knowledge of breastfeeding was determined by as asking survey participants if they knew when to give breast milk to a new born for the first time, for how long they should exclusively breastfeed, the elements that guarantee a good quality diet for children aged <6 months and the benefits of breastfeeding for children <6 months of age (UNICEF 2012)

2013a). Reasons for giving *atole* could be that mothers feel their breast milk production is insufficient as the child grows and that *atole* is needed for the infant's appetite to be satisfied and for growth to occur (Saenz De Tejada 2013a; Haeussler 2010). In many areas it is believed that *atole* helps strengthen and prepare the stomach for more solid foods that will be given in the future. It is important to note that *atole* is generally prepared in large quantities for consumption by the whole family, as such intra-household distribution of fortified blended flour may affect the amount of in-kind or discounted FBF available for consumption by intended recipients (IYC or PLW) (Chary et al. 2013; FANTA 2014).

Stemming from this is the belief that certain activities or emotions in the mother can alter the quantity, quality or character of breast milk that she produces (Saenz De Tejada 2013a). Milk can 'cool' if the mother consumes 'cold' foods, which can in turn cause vomiting, stomach pains and diarrhoea for her infant. Milk that becomes 'warm' can make the child ill with conditions such as fever. Strong emotions in the mother such as fright '*sustos*' or anger/temper '*cóleras*' are believed to alter breast milk (Saenz De Tejada 2013a). As such, indigenous mothers may take measures to protect their milk, which is thought to be especially vulnerable during the early stages of lactation (Saenz De Tejada 2013a). Particular herbs or preparations may be used to balance the body's 'temperature', as well as use of traditional '*temascal*' saunas (Saenz De Tejada 2013a; Wren et al. 2015).

An example of these beliefs in practice is found in a survey of Mam-Mayan mothers in the Western Highlands; women who indicated they believed that emotions could have negative effects on breast milk were more likely (OR=2.4) to initiate breastfeeding within 1 hour after birth (Wren et al. 2015). Further, higher breastfeeding frequency was observed among mothers who spent more time in a '*temascal*', which is believed to promote breast milk production and counteract cold influences (Wren et al. 2015).

Beliefs regarding hot/cold can also effect breastfeeding duration in indigenous communities; as it is believed that a mother's activities, emotions or diet can affect breast milk, it is not unusual for weaning to occur soon after a 'shock' (Saenz De Tejada 2013a). This could apply for example to situations of violence or trauma in the household or the community.

The 2015 DHS found that over half (56.8%) of infants were still being breastfed at the two year mark[16] an increase from 46.2% in the 2008 DHS (MSPAS 2015; MSPAS 2010). In the 2008 DHS the median breastfeeding duration was 18 months (MSPAS 2010). In the 2008 DHS, half (50%) of infants in rural areas were still breastfed at two years of age compared with 39.9% of urban infants (MSPAS 2010). The most common reason for weaning in rural areas of Guatemala was new pregnancy. Some mothers believed their milk no longer 'belonged' to the infant and they should reduce breastfeeding as it could make them ill (Saenz De Tejada 2013a). Other cultural reasons for weaning were a belief that as a child ages, breast milk becomes old or watery and was no longer nourishing (Saenz De Tejada 2013a). Other mothers reportedly continued breastfeeding until the final stages of the new pregnancy because they didn't want to deprive their older child of nutrients (Saenz De Tejada 2013a). If a mother is trying to initiate weaning she may put lemon or chilli on her nipples or send the baby to live with other family members for a few days (Saenz De Tejada 2013a).

[16] Indicator measured at 20-23 months, as per WHO classification

Complementary Feeding Practices

Complementary foods are generally introduced from the age of 6-9 months in a casual, non-systematic way (Saenz De Tejada 2013a; FANTA 2015; UNICEF 2012). A number of qualitative studies from the 1990s have discussed beliefs that the stomach is an 'intelligent organ' that knows what it needs for the body to grow and develop (Saenz De Tejada 2013a). This belief has been echoed during interviews with traditional birth attendants who say there is no pre-determined age for starting to give children foods other than breast milk (Saenz De Tejada 2013b). In general, late introduction of complementary foods (after six months of age) tended to be related to beliefs that children's stomachs were not ready to digest solid foods and giving complementary foods before they were ready would lead to illness in the child (Saenz De Tejada 2013a). As opposed to waiting for particular ages or stages of development, mothers generally wait for infants to 'indicate' they are ready to eat solid or family foods (Saenz De Tejada 2013a; Olney et al. 2012). It has been suggested that the preponderance of health messages promoting breastfeeding has led to a view of breast milk as a 'super food', that meets all of a baby's needs during the first year of life (Saenz De Tejada 2009; Saenz De Tejada 2013a). This view perpetuates the idea that a child or a child's stomach can decide when is the right time to start eating solid foods. Based on this, some mothers have reported feeling powerless to change the preferences or eating habits of their children (Saenz De Tejada 2013a).

In other studies, a family's economic situation or mother's access to resources have been identified as key factors, outside of a mother's control, that may determine which complementary foods are given or delay the introduction of complementary foods. Income, as well as intra-household distribution of resources and food can impact the timing, quantity and type of complementary feeding given. A small qualitative study from two rural indigenous communities in Chimaltenango and Suchitepéquez in the Guatemalan Piedemont found that mothers' ability to begin complementary feeding and their selection of complementary foods was often dependent on whether husbands had given money to purchase food for children (Chary et al. 2011). Children in the case studies were often breastfed exclusively past 6 months of age and experienced severe growth faltering when there was no money to purchase solid food (Chary et al. 2011).

Many studies conducted in Guatemala found that energy consumption from complementary feeding is inadequate (Campos et al. 2011; Enneman et al. 2009; Solomons & Vossenaar 2013; INCAP and WFP 2016; FANTA 2014). *Atoles* commonly given to IYC are thin and lacking in nutrient density and when meat, bean or vegetable soups or broths are commonly prepared IYC are generally only given the liquid part of the meal, which is believed to be nutritious as it was 'cooked' with nutritious foods (FANTA 2014; FANTA 2015). In some areas it is believed that children should not be given beans or GLV as they can stick to the stomach and cause sickness/diarrhoea or choking (FANTA 2015). Mothers prefer liquid, thin and soft foods for children and start giving more substantial food only when children have teeth (FANTA 2015). Soft foods are prioritised so children can swallow them easily.

Mothers rarely prepare separate food to give to IYC. Children are given a small portion of the family meal, at times with the texture changed (liquid only/mashed/blended). Even if meat is present in the family pot the child is generally given broth only for fear that the food will choke the child as they can't chew well yet (FANTA 2015). Tortillas may not be given before 9 months or will be soaked and mashed for fear this food will stick to the stomach. The most common first

foods are broths with GLV, beans or vegetables, rice and tortillas (sometimes soaked and mashed) (Saenz De Tejada 2013a). Some mothers prepare purees with soft foods, such as potato, rice, squash and chayote.

In Suchitepéquez, a qualitative study based on structured household-level surveys (n=102) on IYCF practices found that first complementary foods were often inadequate in terms of consistency and nutrient density and liquids (*atole*, coffee and sugar water) were usually given much earlier than solid foods (Chary et al. 2013). A common first food is thin bean broth, based mainly on cooking liquid (Chary et al. 2013). Some fortified blended flours were given to infants as first foods (Incaparina, Bienastarina), but they were generally prepared as thin *atole*, after many unsuccessful attempts to promote thick porridge preparations by community health workers (Chary et al. 2013).

There is an increasing amount of evidence suggesting mothers with limited access to nutritious food use the small amount of money they have to purchase *Comida Chatarra* or Junk Food - sweets, chips and soft drinks - instead of purchasing fruit or other nutritious foods (Saenz De Tejada 2013a). When mothers do purchase nutritious foods they usually try to give eggs to their children as much as possible and meat is more restricted. Many families only consume chicken once per week. In Totonicapán an FAO study reported that once per week families will buy 1 kilo of beef meat with bone (bone can be up to 50%) to make *caldo de res* for the family, giving small portions for each individual person (FAO 2012a).

A survey of mothers (n=120) in five communities in Alta Verapaz found that lack of money and economic access to nutrient-rich foods were the most commonly stated barriers to following best practices for PLW and children under 2 consuming good quantities of quality food (Olney et al. 2012). Mothers in the survey knew that animal source foods, fruits and vegetables were beneficial, but lacked the economic means to purchase nutritious foods (Olney et al. 2012). It was noted that increasing family-level consumption of animal source foods did not necessarily translate to increased consumption for infants. Many mothers believed small children could feed themselves and did not need to be forced to eat certain foods or be fed; mothers simply offered foods and left children to eat them. Foods were offered when or if children asked for them and there was little stimulation or encouragement for children to finish uneaten food (Olney et al. 2012). Mothers feared that forcing or pressuring a child to finish food could make them sick. Further, some mothers said they couldn't tell how much a child actually eats because in many cases mothers fed them from their own plates (Olney et al. 2012).

Health services

The percentage of births attended by a doctor in Guatemala was 61.4% in 2014, an increase from 47% in 2008 (MSPAS 2015; MSPAS 2010). The percentage of births attended by a traditional midwife decreased from 42.4% in 2008 to 29.1% in 2014 (Figure 35) (MSPAS 2010; MSPAS 2015). The percentage of births attended by trained birth attendants, family, someone else or not attended at all remained higher in rural areas and Zones 1 and 5 and Zone 4 had the highest percentage of unattended births (Figure 36) (MSPAS 2015).

In a number of studies, traditional midwives or *comadronas* have been identified as an important influence on birth outcomes and IYCF practices (Haeussler 2010; Saenz De Tejada 2013b; Saenz De Tejada 2013a; Chary et al. 2013). Interestingly, the qualitative study in

Chimaltenango and Suchitepéquez found that *comadronas* were not mentioned as a source of health information (Chary et al. 2013).

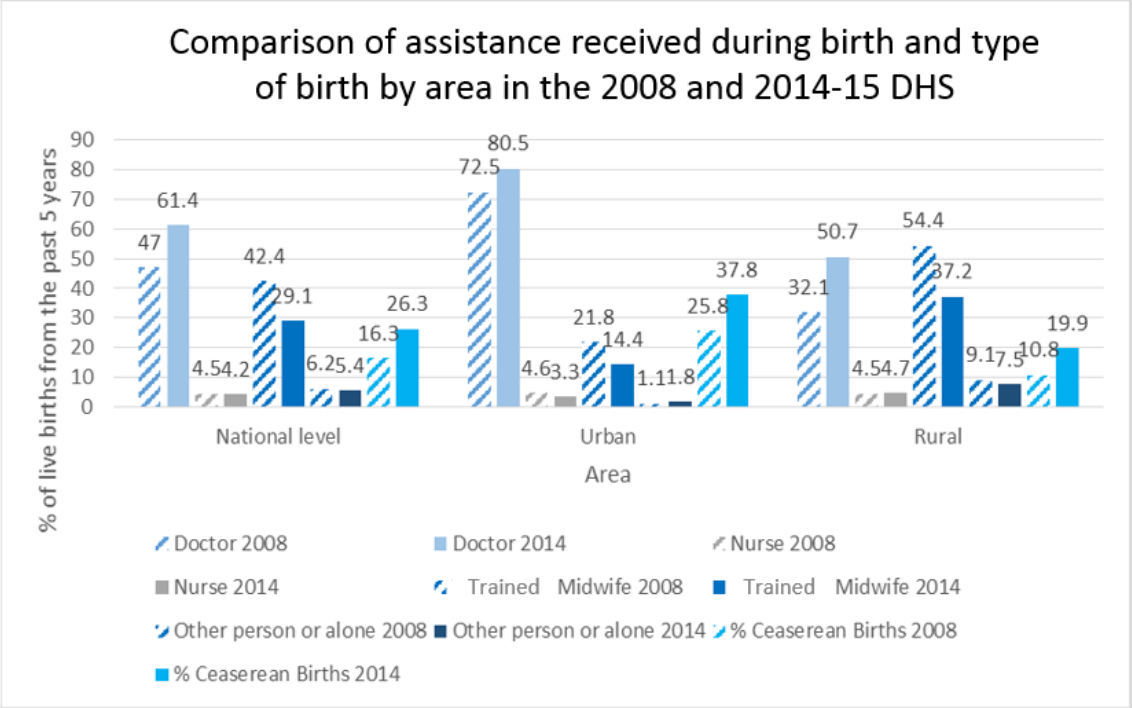

Figure 32: Comparison of birth assistance received and type of birth by area from 2008-2014 (MSPAS 2010; MSPAS 2015)

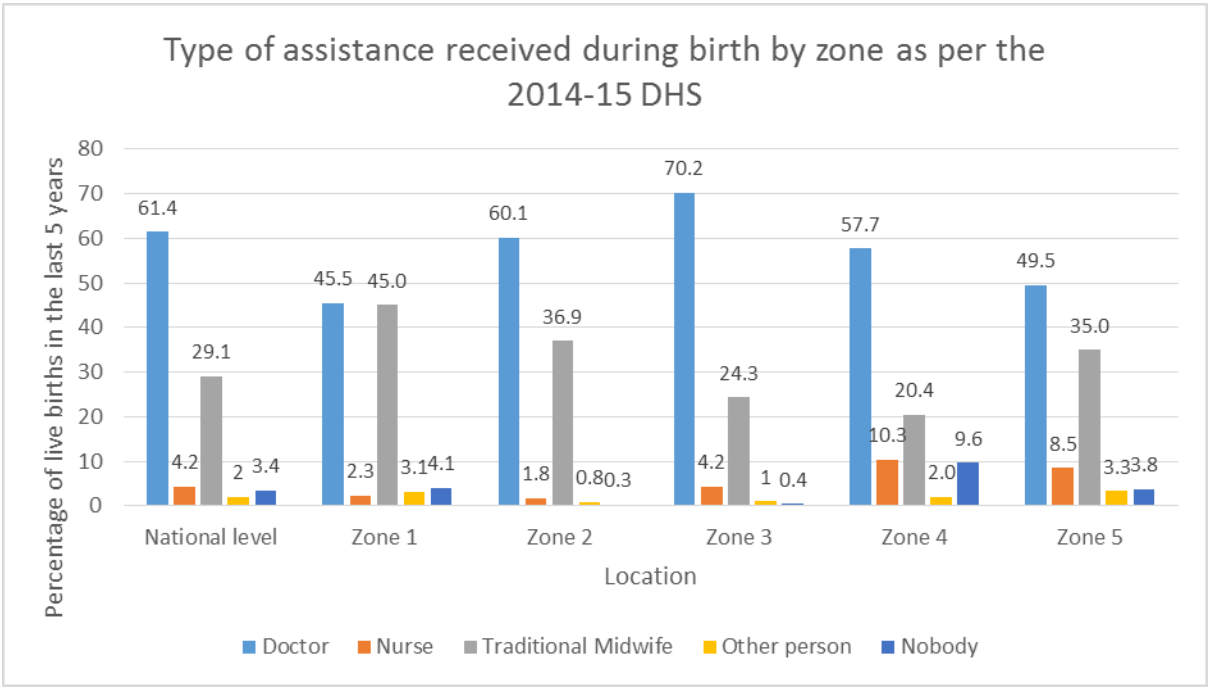

Figure 33: Type of assistance received during births occurring in the past 5 years by zone (MSPAS 2015; MSPAS 2010)

In the Chary study about a third of respondents in both Suchitepequez and Chimaltenango (30% and 38% respectively) listed health projects or health posts as a source of information on IYCF (Chary et al. 2013). The UNICEF Bottleneck study found there was limited availability of education and counselling materials and poor quality of health messaging and counselling in the eight municipalities with the highest prevalence of chronic malnutrition (UNICEF 2012). Of pregnant women surveyed (n=274) 63.7% reported attending a prenatal care visit in the first 12 weeks of pregnancy (UNICEF 2012). In exit interviews with mothers leaving health posts, health centres and hospitals (n=213) only 16% said they had spoken about diet during the first six months after birth and only 15% had been oriented on breastfeeding after birth (UNICEF 2012). Only 3.7% of pregnant women that had received counselling messages could remember three or more messages on recognizing the signs and signals of danger during pregnancy, good dietary practices during pregnancy, the importance of prenatal visits and the importance of supplementation with iron and folic acid (UNICEF 2012). Of pregnant women surveyed (n=274) only 3.9% were satisfied with prenatal care received, which tended to include messaging, counselling and delivery of iron and folic acid (UNICEF 2012). The biggest areas of concern were messaging and counselling; often messages were not delivered in mothers' native language for indigenous populations, mothers did not understand messages and mothers did not find the messages to be helpful (UNICEF 2012). Of pregnant women surveyed (n=274), 28.8% reported taking iron and folic acid during the first trimester of pregnancy (UNICEF 2012). The figure was lower for mothers of children under 12 months (n=408): 15.3% (UNICEF 2012). The most common reasons for pregnant women not taking supplements were: supplies not being available and women not knowing they needed it (UNICEF 2012).

Sources of information and influence

Health service providers, traditional local midwives and female family members are key sources of information and influencers on IYCF practices in Guatemala. Indirectly, through their tendency to have control over resources, male family members (fathers and grandfathers) are also key influencers on IYCF. The influence of male family members has been raised by health staff as a barrier to the adoption of BCC recommendations (Chary et al. 2013). Health staff in Suchitepéquez and Chimaltenango have explained that even if promoted messages are accepted by mothers, putting recommended behaviours into practice is dependent on support from the male household members controlling family resources, usually the mother's husband or father-in-law (Chary et al. 2011).

In the Chary study, more than two thirds of caregivers (70%) in coastal Suchitepéquez received health information from family members, usually their mother or mother-in-law, compared to only about a third (29%) of those living in the highlands areas of Chimaltenango (Chary et al. 2013). It has also been noted that, especially in the case of younger women, mothers-in-law have significant control over decision-making regarding feeding practices and food purchasing (Chary et al. 2013). This highlights the need for inclusive behaviour change education targeting households as a whole, as opposed to mothers only (Chary et al. 2013).

In the same study, many NGO staff stressed that when health messages are reinforced by health promoters, community elders, and midwives, in addition to NGO programs, local people are more likely to be accepting of new information (Chary et al. 2013). Other suggestions from key informants for improving health education delivery included: assuring that nutritious complementary foods are available in local stores; disseminating information with a positive

deviance model that identifies community members with outstanding health and nutrition outcomes despite not having extra resources or information and shares their behaviours; performing individualized needs assessments for families; and providing joint education to men and women (Chary et al. 2013).

It has been noted that for women with many children in Guatemala, changing established IYCF practices as well as household-level food purchasing and preparation behaviours may be more difficult (Chary et al. 2013). Associations have been drawn between receptiveness to health messages and level of educational attainment, suggesting that behaviour change may be more difficult to influence in less-educated communities (Chary et al. 2013).

Service providers have stressed the need for key health and IYCF messages to be delivered in local indigenous languages, through various channels (consultations, meetings, promotional material, radio etc.) that allow the opportunity for questions and discussion in the local language (Chary et al. 2013; Saenz De Tejada 2013a; Olney et al. 2012). It has been suggested that messages reiterated by local health volunteers, community leaders and *comadronas,* will have a higher likelihood of being remembered and accepted by mothers (Chary et al. 2013). A whole-of-family and indeed a whole-of-community approach to SBCC concerning PLW and IYC diets has strongly been recommended through formative research and not only pregnant women and mothers, but also fathers, grandmothers, health staff and community leaders should all be target populations for SBCC strategies (Olney et al. 2012; Chary et al. 2013). These populations have been said to be eager to receive more training on these topics (Olney et al. 2012).

Cost Optimization and Modelling

Two different linear programming software packages have been used as part of the FNG in Guatemala to gain a greater understanding of the role played by cost and affordability of nutritious diets for different vulnerable groups of interest: Optifood and Cost of the Diet. The complementary use of the two software packages is better explained in the paragraphs below.

Cost of the Diet software was then used to model different types of interventions, both nutrition-specific and sensitive, to reduce cost and improve affordability of nutritious diets within this context, which can be implemented by different sectors and through various delivery platforms.

Optifood Analysis

Optifood is a software tool that supports interventions to improve population-level nutrient intake, including the development of food-based approaches that are grounded in evidence and appropriate for the local context (Daelmans et al. 2013). The tool is used to estimate gaps in nutrient intakes from diets based on observed dietary patterns and locally available and commonly consumed foods; identify optimal combinations of local foods to fill or come as close as possible to filling these nutrient gaps; estimate the relative cost of optimal diets; test the potential impact of introducing fortified foods or other products to the diet and use results to elaborate realistic and cost-effective food-based recommendations (FBRs) for individual target groups that can then be supported by nutrition programs. These results can further be used to inform a range of nutrition-specific and nutrition-sensitive interventions, including fortification, supplementation, social assistance and agriculture.

As part of the Fill the Nutrient Gap process in Guatemala an Optifood analysis was carried out in 2016 using dietary intake and market survey data from the INCAP Nutrient Gap Study (INCAP and WFP 2016). The objectives of this analysis were to identify problem nutrients and best local food sources of nutrients and to provide evidence for interventions to fill nutrient gaps within the existing dietary pattern. The analysis investigated the extent to which optimised diets based on existing food availability and dietary patterns could meet the nutrient requirements of each target group, to help identify products - local pulses and vegetables, fortified foods, micronutrient supplements, animal-source foods, bio-fortified crops, etc. - that could be added to the local diet to fill nutrient gaps and achieve dietary adequacy. The tool was used to test the potential impact of different interventions based on the addition of identified nutritious foods to local diets, in varying combinations and quantities for each target group in each zone.

Optifood allows analysis of target-group specific diets and location-specific food availability. The ability to analyse different target groups is dependent on dietary intake data for target groups from an adequate sample size[17]. The Guatemalan FNG working group identified children under the age of 2 years, PLW and adolescent girls as key target groups for the FNG study and decided to set the level of analysis as 'zonal', based on the 5 zones used in the WFP and INCAP study *Determination of Nutrient Gaps in Children 6-23 Months and Their Mothers* (Figure 37) (INCAP and WFP 2016).

Key target groups for analysis were identified in collaboration with technical working group members and other stakeholders based on a consideration of the most recently available data on malnutrition characteristics across Guatemala. The working group decided to position FNG as a follow-up to the joint SESAN, INCAP, WFP, USAID, CRS and UNICEF study *Determination of Nutrient Gaps in Children 6-23 Months and Their Mothers* using data collected across five zones in Guatemala (Figure 34):

Zone 1: Totonicapán, Huehuetenango, San Marcos, Quezaltenango, Quiché;
Zone 2: Sololá, Chimaltenango, Sacatepéquez;
Zone 3: Suchitepéquez;
Zone 4: Jalapa, Jutiapa, Zacapa;
Zone 5: Alta Verapaz, Baja Verapaz

[17] In a number of other Optifood studies, sample sizes of at least 50 individuals per target groups have been determined to be adequate (Skau et al. 2013; Hlaing et al. 2015; Vossenaar et al. 2016; Ferguson et al. 2015; Santika et al. 2009)

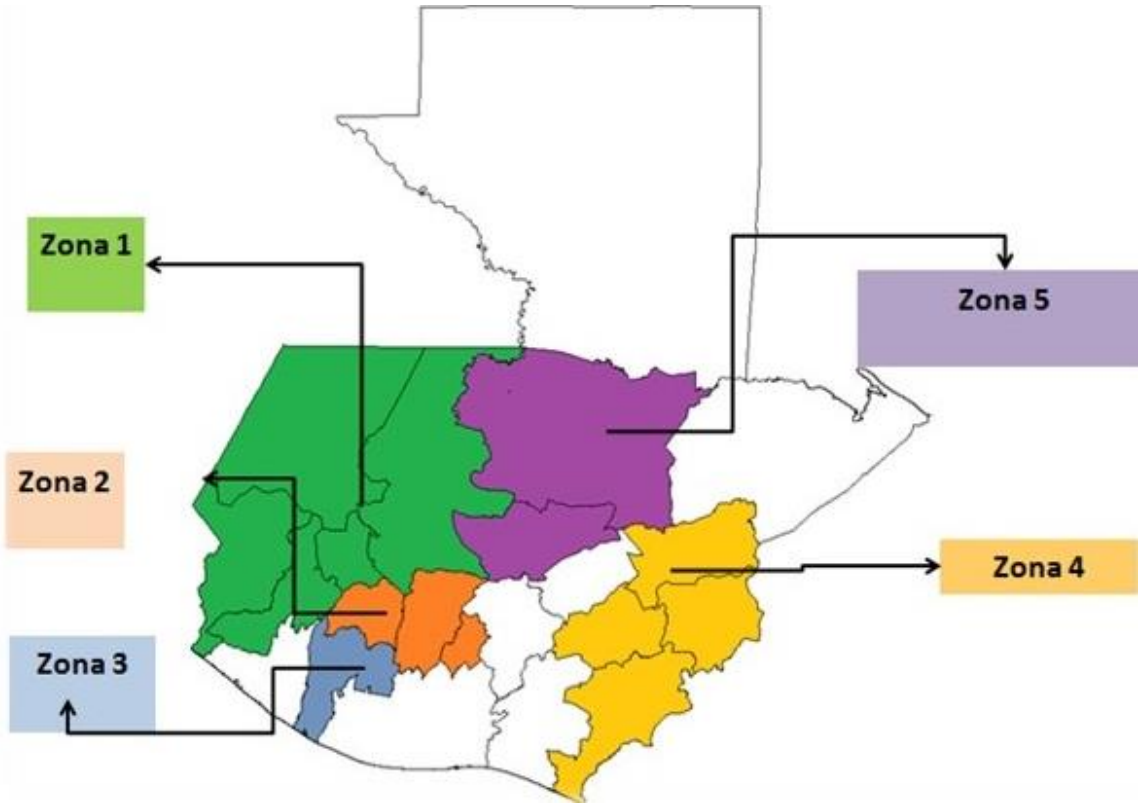

Figure 34: The 5 ethno-geographic zones selected for the Determination of Nutrient Gaps in Children 6-23 Months and Their Mothers study.

The target groups included in the zone-level Optifood analysis were as follows:

- 6-8 month old breastfeeding children
- 9-11 month-old breastfeeding children
- 12-23 month-old breastfeeding children
- Adolescent breastfeeding mothers (aged 15-19 years)
- Adult breastfeeding mothers (aged >19 years)

As target groups were analysed separately for each zone, a total of **25 target groups** were analysed. Data from surveyed pregnant women and non-pregnant, non-lactating women were not used for the Optifood analysis as the sample size was too small to develop target group inputs.

Table 6: Final sample size available in the Determination of Nutrient Gaps in Children 6-23 Months and Their Mothers 24hr recall dataset, by zone and target group for rural areas only.

Sample size by zone and target group from the *Determination of Nutrient Gaps in Children 6-23 Months and Their Mothers* 24hr recall dataset **Target group samples sizes determined to be insufficient for an Optifood analysis marked in grey**						
Target Group	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**	**Zone 5**	**TOTAL**
Children aged 6-23 months	***400***	***358***	***339***	***345***	***361***	***1803***
6-8mo children	73	76	70	75	74	**368**
9-11mo children	81	53	54	71	62	**321**
12-23mo	246	229	215	199	225	**1114**
Pregnant Women (PW)	***15***	***9***	***20***	***12***	***8***	***64***
Adolescent PW (15-19 years)	1	1	4	1	1	**8**
Adult PW (>19 years)	14	8	16	8	7	**53**
Lactating women (LW)	***303***	***276***	***271***	***269***	***291***	***1410***
Adolescent LW (15-19 years)	116	94	110	107	114	**541**
Adult LW (>19 years)	187	182	161	162	177	**869**
Non pregnant, non-lactating mothers (NPNL)	***62***	***42***	***27***	***40***	***35***	***206***
Adolescent NPNL (15-19 years)	27	18	8	12	14	**79**
Adult NPNL (>19 years)	35	24	19	28	21	**127**

The analysis in Optifood is based on observed dietary patterns from 24hr recall data, reference values for recommended nutrient intakes (RNIs) for each target group, food composition data, and cost information for each food. The data necessary for Optifood and sources of the data used in this activity are summarised in Table 7.

Table 7: Data requirements for Optifood analysis, per target group

Data Requirement	**Source of data used in this activity**
List of foods routinely consumed by the target group	24Hr recall from INCAP Brechas study (INCAP and WFP 2016)
For each individual food: • Median serving size (g/meal) • Maximum frequency (serves/week) of consumption	
• Cost per 100g edible portion	Market survey from INCAP Brechas study (INCAP and WFP 2016)
Food group and food sub group dietary patterns (low, average and high number of serves per week from each food group modelled)	24Hr recall from INCAP Brechas study (INCAP and WFP 2016)
Recommended Nutrient Intakes (RNI) for target group	INCAP dietary recommendations (Menchu et al. 2012)
Nutritional composition of all foods	INCAP Food Composition table (INCAP 2007)

As shown in Table 8, between 116 and 308 individual foods were reportedly consumed by each target group. After removal of food items consumed by <5% of the population, within the 24 hour recall, and foods with little/no nutritional value (such as tea and water) the final food list featured between 37-67 food items for each target group.

In general, the variety of foods consumed increased with age. Greater numbers of food items were reported in Zones 1 and 2 and lower numbers of individual foods were reportedly consumed in Zones 4 and 5.

Table 8: Number of individual foods reportedly consumed in 24hr recall data per target group and number of individual foods included in final food list per target group

	Z1: Huehuetenango, Quetzaltenango, Quiché, San Marcos, Totonicapán					**Z2: Chimaltenango, Sacatepéquez & Sololá**					**Z3. Suchitepequez**				
Target Group:	6-8mo	9-11mo	12-23mo	LW <20y	LW >19y	6-8mo	9-11mo	12-23mo	LW <20y	LW >19y	6-8mo	9-11mo	12-23mo	LW <20y	LW >19y
Number of individual foods consumed[1]	163	163	268	213	248	150	159	308	187	251	142	125	233	177	212
No. of individual foods in final food list[2]	54	47	47	57	45	43	43	67	60	65	42	47	60	49	55

	Z4. Chiquimula, Jalapa, Jutiapa, Zacapa					**Z.5 Alta Verapaz, Baja Verapaz**				
Target Group:	6-8mo	9-11mo	12-23mo	LW <20y	LW >19y	6-8mo	9-11mo	12-23mo	LW <20y	LW >19y
Number of individual foods consumed[18]	133	116	205	150	180	141	116	225	173	199
No. of individual foods in final food list[19]	39	43	55	37	42	46	40	58	45	44

The serving size for each item in a food list represents the median reported portion consumed by children or women in the specified target group and refers to the amount of a food normally eaten during one meal (g/meal). To reduce the likelihood of modelling unrealistic food portions, serving sizes were carefully scrutinized across target groups and similar food types.

The estimated energy intake from breast milk and corresponding amount of breast milk consumption per day is shown in Table 9. The energy content of breast milk used in these calculations was 0.66 kcal/g (Brown et al. 1998).

[18] *Individual foods reportedly consumed by at least one child/mother in the target group, as per the 24 hour recall data* (INCAP and WFP 2016)

[19] Inclusive of food items consumed by >5% of target group, foods consumed by <5% of the target group and foods of no nutritional value removed

Table 9: Estimated breast milk intakes for 6-23mo children in the 5 study zones

TARGET GROUP	Energy Requirement	Calculation of Energy Requirement that takes breastfeeding into account (=B - C)			Estimated quantity (g) of breast milk consumption *(assuming 66kcal/100g)*
	A. Energy Requirement for target group[1]	B. Recommended percent of energy from breast milk (% of requirements) [2]	C. Recommended energy from breast milk (A*B)	D. Recommended energy from complementary food	
6-8 mo	660	67%	442.2	217.8	**670**
9-11mo BF	660	55%	363	297	**550**
12-23mo BF	850	39%	331.5	518.5	**502**

[1] (Menchu et al. 2012)

[2] (Brown et al. 1998)

The best diet possible – a diet that achieves the highest level of nutrient adequacy using local foods outside of observed average dietary patterns but within observed minimum and maximum consumption constraints – was generated to identify problem nutrients, identify key food sources of nutrients and test possible interventions. The best diet possible is based on the assumption that some behaviour change would be needed.

Problem nutrients are nutrients for which 100% RNI could not be achieved using diets based on local foods within 'realistic' dietary patterns, from foods that were reportedly consumed by >5% of respondents. Most problem nutrients identified, including iron and zinc for all 6-8 month old children and most 9-23 month old children and mothers, calcium for most child target groups, vitamin B12 for all mothers, vitamin C for most 6-8 month old children and many mother target groups and niacin for 6-8 month old children in Zones 2 and 4 were absolute problem nutrients[20], meaning that requirements could not be met using local foods within the set model parameters. Calcium for 6-8 month old children in Zone 1, 9-11 month old children in Zone 4 and lactating adolescents in zone 5, iron for Z5 lactating adolescents, riboflavin for lactating adult women in Zones 2 and 4 and niacin for lactating adolescents in Zone 4 were partial problem nutrients[21], meaning that adequacy was attainable using local foods in some combination, but that this would compromise the intake of other nutrients. Results (Tables 10&11) suggest that nutrient adequacy for target groups, especially 6-8 month old children and lactating adolescent girls, would be difficult to meet without addressing local food access. A combination of interventions providing access to natural, nutrient-dense foods, fortified staples, special fortified foods or micronutrient supplementation would be required.

[20] An **absolute** problem nutrient is defined as a nutrient for which the requirement (i.e., 100% of the RNI) is impossible to meet using local foods within the model constraints for frequency and portion size. A **partial** problem nutrient is defined as a nutrient for which the requirement (i.e., 100% of the RNI) can be met, but would be detrimental for other nutrients given local food patterns because foods with other nutrients would need to be replaced by those providing the problem nutrient.

[21] A **partial** problem nutrient is defined as a nutrient for which the requirement (i.e., 100% of the RNI) can be met, but would be detrimental for other nutrients given local food patterns because foods with other nutrients would need to be replaced by those providing the problem nutrient.

Table 10: Absolute Problem Nutrients (APN) in red and Partial Problem Nutrients (PPN) in yellow for 6-8, 9-11 and 12-23 month child target groups in the five study zones and highest % RNI achievable in optimised diets based on local foods and observed minimum and maximum dietary constraints.

Nutrient	**6-8 mo children**					**9-11 mo children**					**12-23 mo children**				
Zones	*Z1*	*Z2*	*Z3*	*Z4*	*Z5*	*Z1*	*Z2*	*Z3*	*Z4*	*Z5*	*1*	*Z2*	*Z3*	*Z4*	*Z5*
Calcium	PPN 84.3 %	APN 73.6 %	APN 71.8 %	APN 81.8 %	APN 85.7 %	APN 88.5 %	APN 91.90%		PPN 99.41%	APN 96.24%		APN 82.50%	APN 89.20%		APN 80.53%
Vitamin C		APN 85.0 %	APN 95.7 %	APN 85.3 %	APN 82.4 %	APN 90.2 %				APN 72.30%					
Niacin		APN 86.6 %		APN 75.3 %											
Vitamin B12			APN 98.5 %												APN 80.74%
Iron	APN 45,8 %	APN 34.5 %	APN 28.3 %	APN 53.7 %	APN 36.7 %	APN 47.1 %	APN 67.80%	APN 54.30%	APN 40.63%	APN 41.70%	APN 87.00%	APN 70.20%	APN 39.90%		APN 53.80%
Zinc	APN 43.2 %	APN 34.5 %	APN 36.2 %	APN 32.4 %	APN 43.6 %	APN 46.30%	APN 46.70%	APN 40.50%	APN 56.28%	APN 46.50%		APN 89.00%	APN 82.10%	APN 94.08%	APN 79.80%
No. Problem Nutrients	**3**	**5**	**6**	**6**	**4**	**4**	**3**	**2**	**2**	**4**	**1**	**3**	**3**	**1**	**4**

Table 11: Absolute Problem Nutrients (APN) in red and Partial Problem Nutrients (PPN) in yellow for lactating adolescent girls and lactating adult women, key target groups, in the five study zones and highest % RNI achievable in optimised diets based on local foods and observed minimum and maximum dietary constraints.

Nutrient	**Lactating Adolescent Girls**					**Lactating Adult Women**				
Zones	*Z1*	*Z2*	*Z3*	*Z4*	*Z5*	*Z1*	*Z2*	*Z3*	*Z4*	*Z5*
Calcium		APN 92.15%	APN 81.70%		PPN 94.8%					
Vitamin C		APN 71.54%	APN 65.90%		APN 50.2%			APN 72.89%		APN 59.70%
Riboflavin		APN 77.50%	APN 90.10%	APN 75.37%	APN 78%		PPN 98.60%		PPN 96.55%	APN 82.04%
Vitamin B12	APN 60.40%	APN 42.40%	APN 34.49%	37.45%	APN 29.16%	APN 52.50%	APN 68.40%	APN 45.89%	APN 47.43%	APN 32.50%
Iron		APN 78.30%	APN 71.20%	APN 50.3%	APN 82.7%			APN 72.07%		APN 92.40%
Zinc	APN 74.80%	APN 56.30%	APN 56.20%	APN 53.10%	APN 58.17%	APN 65.20%	APN 64.00%	APN 47.96%	APN 57.06%	APN 58.10%
No. Problem Nutrients	**3**	**7**	**7**	**6**	**7**	**3**	**4**	**5**	**4**	**6**

Key nutrient sources[22] in local diets and food supply were identified for each target group in the optimised diet (See Annex Tables 17 and 18) and compared across zones. For breastfeeding children across all zones, breast milk was a key source of all modelled micronutrients, except iron. For all target groups enriched/fortified grains, a food sub group (FSG) which consisted of Incaparina and fortified oats was a key source of iron, vitamin A, zinc, thiamine, riboflavin and niacin for most zones. Whole grain products (lime-treated maize tortillas), refined grain products, refined grain bread and starchy plant foods were key nutrient sources due to the large quantities in which they were consumed in local diets as staple foods. Maize and other foods in the whole grains sub group were key sources of iron, calcium, thiamine, niacin, zinc, vitamin B6 and folate. The refined grain bread and products sub groups were key sources of thiamine, riboflavin, niacin and folate as well as zinc and iron in some zones. Other nutrient-rich FSGs that were key sources of three or more modelled micronutrients were green leafy vegetables (vitamin C, folate, vitamin A and iron), milk (calcium, riboflavin and vitamin B12) and cheese (calcium, B12 and zinc).

Other FSGs were not necessarily key sources of multiple micronutrients but an important source of individual problem nutrients. Vitamin B12 was identified as a problem nutrient for all mother target groups and two child target groups and vitamin C was identified as a problem nutrient for a number of mother and child target groups. FSGs that included chicken, eggs, red meat and liver were shown to be good local food sources of vitamin B12, a vitamin that is predominantly found in animal source foods, and could be tested as food-based recommendations to fill this nutrient gap through modelled interventions in Cost of the Diet analysis. Four fruit and vegetable FSGs were identified as good sources of vitamin C (See Annex Tables 17 and 18).

Cost of the Diet Methodology and Results of Affordability Analysis

Cost of the Diet (CotD) linear optimization software, developed by Save the Children UK, was used to estimate minimum cost nutritious diets at the regional level. CotD models the cheapest possible diet that meets individual Recommended Nutrient Intakes (RNI) with realistic portion sizes for each member of a model household based on locally available foods. Initial models were based on market price data collected by INCAP from July 2015 to January 2016 in five zones as part of the *Determination of Nutrient Gaps in Children 6-23 Months and Their Mothers* study (INCAP & WFP 2016). Prices were collected in local markets for each food reportedly consumed, recording food weight, unit of measure and total price (INCAP & WFP 2016). When foods were not available in local markets, surveyors asked household survey respondents for the purchase price. If household respondents did not know the price, surveyors estimated prices using those from other zones or from similar foods in the same zone (INCAP & WFP 2016). Once prices were collected from different sites within a zone, an average price per 100 grams was calculated for each product in each zone (INCAP & WFP 2016).

Household composition for modelling was based on data from the 2014 National Living Conditions Survey (ENCOVI) data (INE 2015). Based on the average household size in Guatemala (5.3 family members), five person households were modelled (INE 2015). Each model household included a 9-11mo child, a 6-7 year old child, a 14-15 year old adolescent girl, a 30-59 year lactating woman (lactation period of 7-12 months) and a 30-59 year old adult man.

[22] A key nutrient source was defined as a food or food-sub group that contributed to 5% or more of the total amount of a nutrient in the optimised diet that was modelled outside of food patterns but within upper and lower constraints.

CotD modelled cost-optimized diets to meet the recommended intakes for energy, protein, fat and 13 micronutrients for each individual household member. A staple-adjusted nutritious diet (SNUT) was used. The SNUT must meet nutrient requirements and represent minimum consumption (at least one portion per day) of locally-consumed staple foods for all household members except the child 12-23 months. The key staple included in diets for all zones was maize that had been soaked in an alkaline solution of mineral lime and prepared as tortillas.

Modelled diets ranged in price from 52.67 Q per day in Zone 2 to 80.43 Q per day in Zone 4. In four out of five zones the diets of adolescent girls were the most expensive among the household members, accounting for 35.88 Q per day and 48% of the daily cost of the household's diet in Zone 5. In Zone 1 the lactating woman's diet was the most expensive (Figure 38).

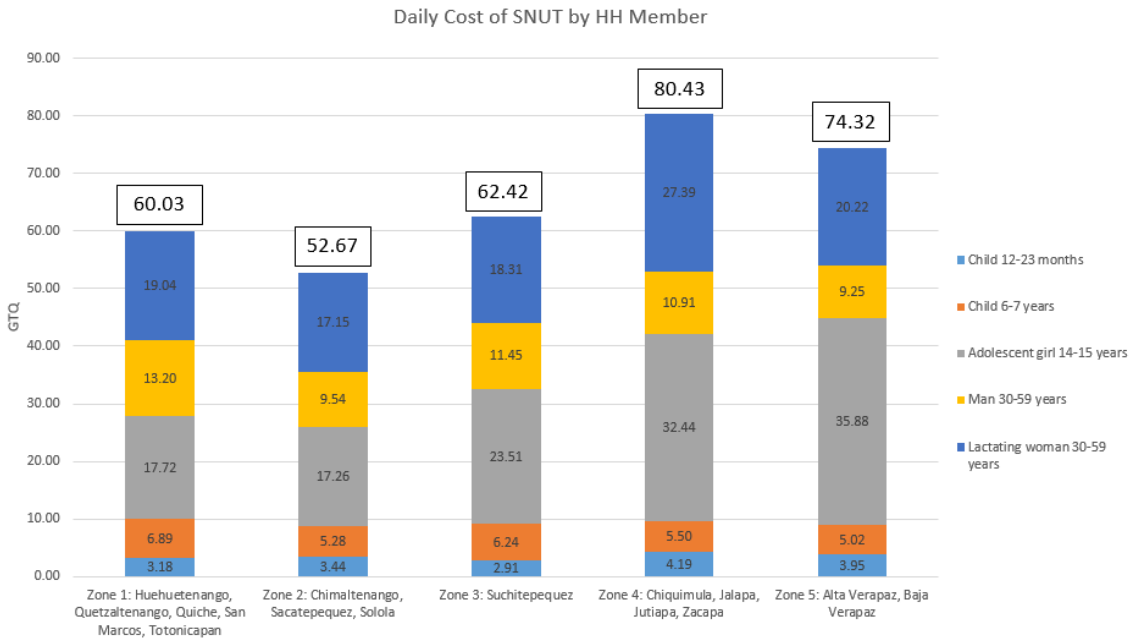

Figure 35: Cost of the Diet by household member in five ethno-geographic zones

In four of the five zones assessed it was possible to meet nutrient requirements using the SNUT diet for all household members. In Zone 4 it was not possible to meet the iron requirement of adolescent girls using locally available foods.

Affordability was calculated based on zone-specific expenditure data from the 2014 ENCOVI and the assumption that 48.3%[23] of all household expenditure was on food (INE 2015). This percentage was based on the average amount of household expenditure spent on food by five person households in the five zones. In all zones except Zone 2 the majority of households could

[23] In the 2014 National Living Conditions Survey 5 person households spent on average 50% of total expenditure on food in Zone 1, 44.4% in Zone 2, 50.8% in Zone 3, 47.0% in Zone 4 and 53.7% in Zone 5. The range of the percentage of total expenditure spent on food in the five zones by five person households was from 10% to 84%.

not afford the SNUT diet. The percentage of households that could not afford the SNUT diet ranged from 32 in Zone 2 to 71% in Zone 5 (Figure 36).

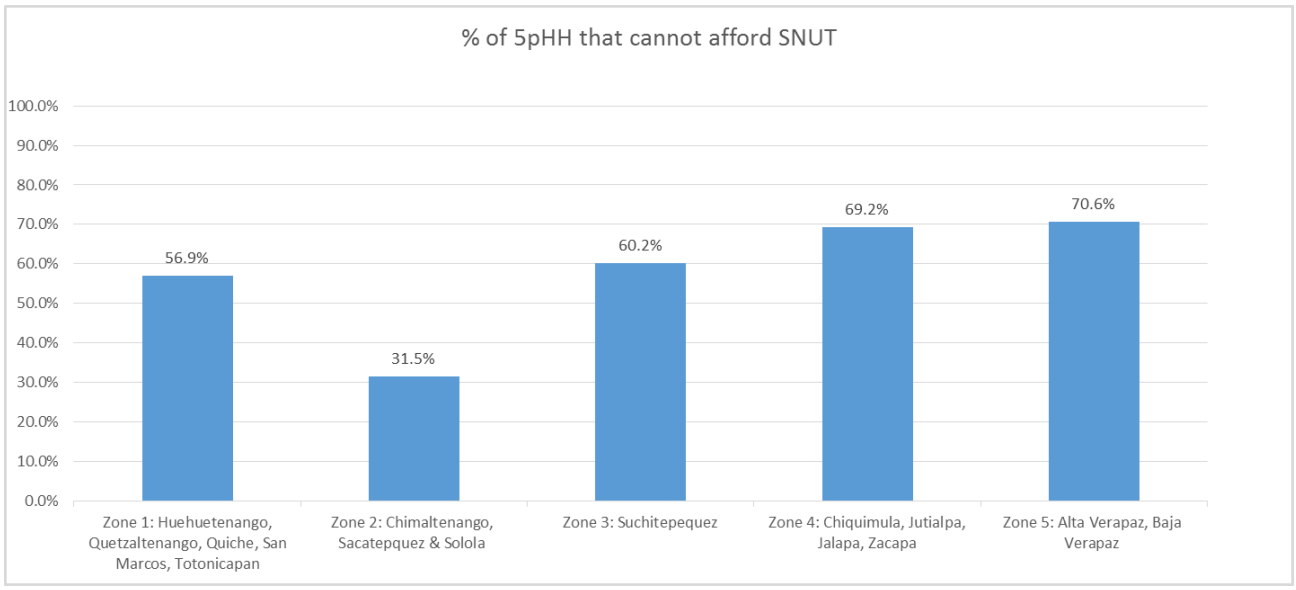

Figure 36: The percentage of households unable to afford SNUT diets in the five ethno-geographic zones

Limiting nutrients in the CotD analysis are defined as nutrients for which requirements would be difficult to meet for all or some household members using locally available foods without exceeding the energy threshold. Limiting nutrients for each HH member were identified using CotD for all five zones (Table 12). Nutrients for which adequacy was met by a small margin (100-102% of RNI met) were classified as limiting nutrients; further provision of these nutrients was not possible in optimised diets without negatively affecting the intake of other nutrients. The most common limiting nutrients for vulnerable groups (IYC, lactating women and adolescent girls) were calcium, iron, vitamin B12 and pantothenic acid (vitamin B5) for all groups and zinc for children 12-23 months old (Table 13).

Table 12: Limiting nutrients [a] found for lactating women, children aged 9-11 months and adolescent girls in 6 regions

Nutrient	Child 9-11 months					Adolescent Girl 14-15 Years Old					Lactating Woman				
	Z1	*Z2*	*Z3*	*Z4*	*Z5*	*Z1*	*Z2*	*Z3*	*Z4*	*Z5*	*Z1*	*Z2*	*Z3*	*Z4*	*Z5*
Calcium	X	X	X		X	X	X	X			X	X	X		
Vit A							X					X			
Vit C			X					X					X		
Vit B12	X	X	X	X	X	X	X	X	X		X	X	X	X	X
Iron				X	X		X		X	X				X	X
Zinc		X		X	X										
Pantothenic Acid	X	X	X			X	X	X	X		X	X	X		
Number of limiting nutrients	3	4	4	3	4	3	5	4	3	1	3	4	4	2	2

[a] *X indicates nutrients for which 100% RNI was met but not exceeded.*

In Zone 1, shown as an example, CotD identified breast milk, fortified blended flours (Incaparina and fortified oats), maize and other grain products (pasta and rice) as key sources of most nutrients (Table 13). Green leafy vegetables, fortified blended flour and grain products were identified as key sources of iron. Milk was identified as a key source of calcium, riboflavin and vitamin B12. Cheese, eggs and red meat were identified as key sources of vitamin B12. Chicken was not identified as a key nutrient source and other foods, either less expensive or more nutrient-dense, were selected in optimised diets. Fresh vegetables and fruit were identified as key sources of vitamin A, vitamin C and folate.

Table 13: CotD identified key food sources for nutrients in Zone 1

	Breast Milk	Cheese	Milk	Beans	Eggs	Red Meat	Other Fruit	Vit C Fruit	Vit C Veg	Herbs	Vit A Veg	Other Veg	Soups	Fortified Sugar	Potatoes	Bread	Rice, Pasta	FBF[1]	Maize
Calcium	X		X										X				X	X	X
Vit C	X						X	X	X	X		X							
Thiamine	X															X	X	X	X
Riboflavin	X		X		X											X	X	X	
Niacin	X															X	X	X	X
Zinc	X																X	X	X
Vit B6	X														X		X		X
Folate	X			X						X							X	X	X
Vit B12	X	X	X		X	X												X	
Vit A	X									X	X			X				X	
Iron										X			X				X	X	X

[1]*FBF= Fortified, blended flour*

CotD Modelling Plan

Based on the insights derived from the secondary data analysis and stakeholder consultations, the following interventions were considered to increase nutrient affordability:

- Targeting specific groups with high needs (PLW, Children Under 2, Adolescent Girls) with nutrition specific interventions such as supplementation and in-kind provision of special fortified foods
- Improving household or individual access to nutritious fresh foods, processed foods and/or fortified foods
- Improving market availability of bio-fortified foods such as beans and wheat and promoting home gardening to increase access to GLV and fruit identified as good nutrient sources
- Supporting market-based, in-kind (through social safety nets) or combined approaches

Specifically, the following food based interventions were considered based on current and/or potential availability of these products in the local market or through public/internationally supported programmes (please see previous sections on availability of SNF and fortified food in local markets): multi micronutrient tablets (MMT), multiple micronutrient powder (MNP), Vitacereal, Mi Comidita, fortified oats, Incaparina, Nutributter, Mani+, amaranth leaves, and vouchers for nutritious local foods such as powdered milk, bananas, eggs, chicken meat, amaranth leaves, squash, cabbage, beans and fresh cheese (Table 14).

CotD Modelling Results

Interventions were modelled through different modalities (in-kind transfer, voucher, cash transfer) with the aim of reducing the daily cost of the SNUT diet in each zone, and subsequently improving the affordability of nutritious diets at household level.

For 12-23mo children the most effective intervention among the various locally available fortified complementary food options identified was the in-kind provision of daily portions of Mi Comidita (60g/day) (Figure 37). In Zone 1 (Western Highlands departments of Huehuetenango, Quetzaltenango, Quiché, San Marcos, Totonicapán) in-kind provision of daily portions of Mi Comidita (60g/day) could reduce the daily cost of the SNUT diet for children 12-23 months old by 70% (from 3.2 Q/day to 0.7 Q/day), due to its higher nutrient density compared to other fortified commodities. Of natural food interventions modelled, a voucher for a daily portion of local green-leafy vegetables (Amaranth) was the most effective, reducing the daily cost of the SNUT diet from 3.2 Q/day to 2.4 Q/day (Figure 38).

Table 14: Intervention modelling for CotD by intervention, target group and entry point

	Target Group					Entry Point								
						Public and Private	Social Protection			Education	Health		Agriculture	
	Household	Children 12-23 months	Children 6-7 years	Lactating Women	Adolescent Girls	Market	In-Kind	Cash Transfer	Voucher	Schools	Health Services	Community and Volunteers	Extension Services	Specific Programs
Complementary foods and specialized nutritious foods: Mi Comidita, Vitacereal, Fortified Oats, Incaparina, NutriButter, Mani+, in-kind, voucher, market access	x	x		x			x				x	x	x	
Improved access to fortified wheat and beans	x					x							x	x
Traditional foods with high nutrient content (milk, banana, egg, chicken, amaranth, squash, cabbage, beans, cheese)		x		x	x				x				x	x
Supplements (MMT, MNT)			x	x	x					x	x	x		
Conditional Cash Transfer	x							x						
School Feeding	x		x				x			x	x			

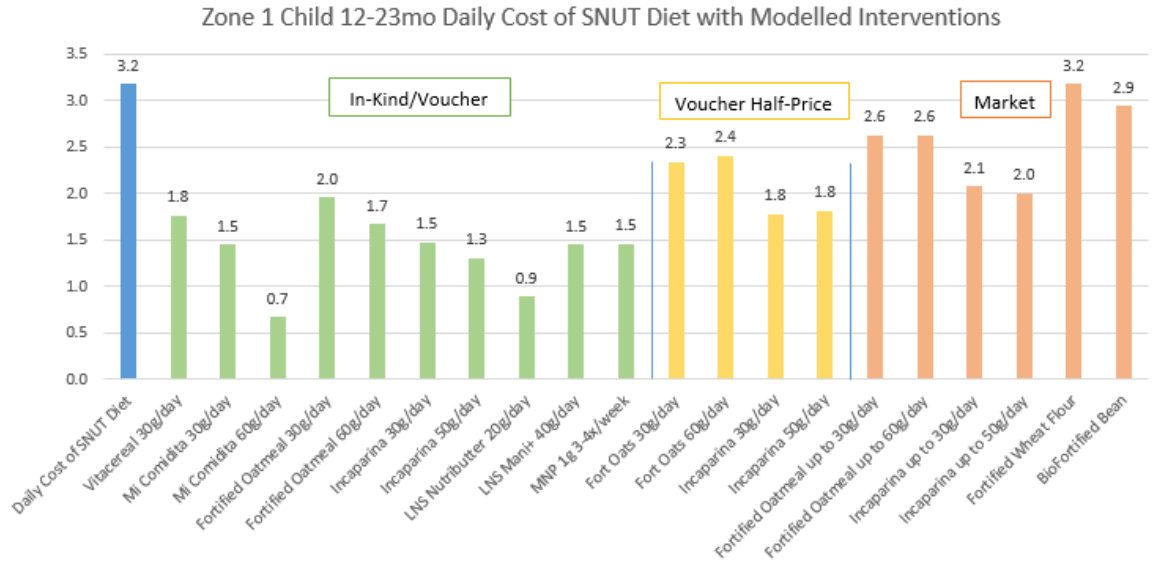

Figure 37: The daily cost of the SNUT diet for a 12-23mo child in Zone 1 with modelled interventions.

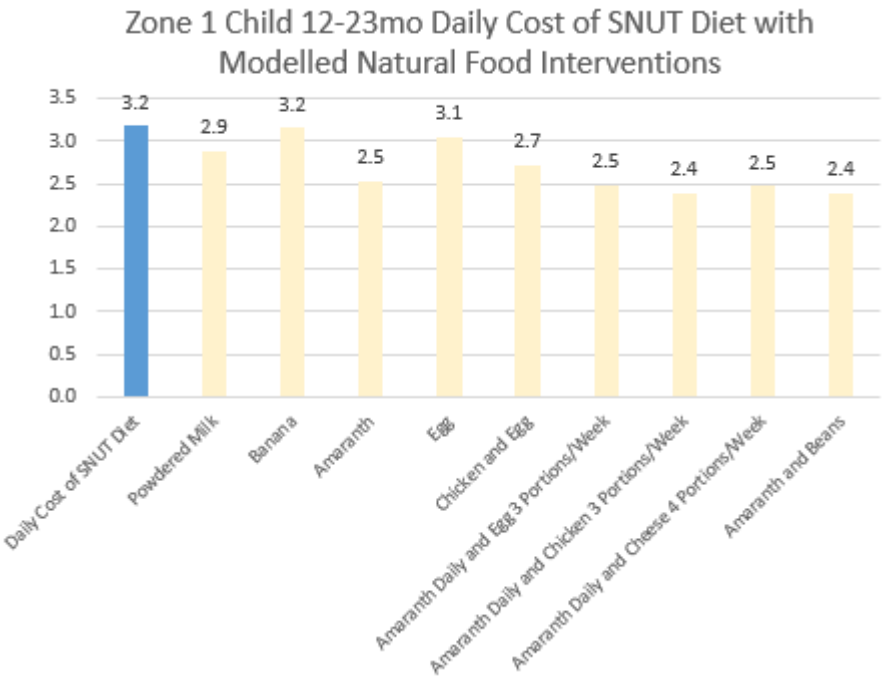

Figure 38: The daily cost of the SNUT diet for a 12-23 month child in Zone 1 with modelled natural food interventions (no cost to consumer) (daily portions unless otherwise mentioned).

For adolescent girls the most effective interventions were in-kind provision of a daily MMT and vouchers for daily portions of fortified oatmeal (60g/day). In Zone 1 (Huehuetenango, Quetzaltenango, Quiché, San Marcos, Totonicapán) a daily MMT could reduce the daily cost of the SNUT diet for adolescent girls by 58% (from 17.7 Q/day to 7.5 Q/day) (Figure 39). The most effective natural foods combination for adolescent girls in Zone 1 was a daily portion of amaranth and three portions of chicken per week, reducing the daily cost of the diet by 12% (from 17.7 Q/day to 15.6 Q/day) (Figure 40).

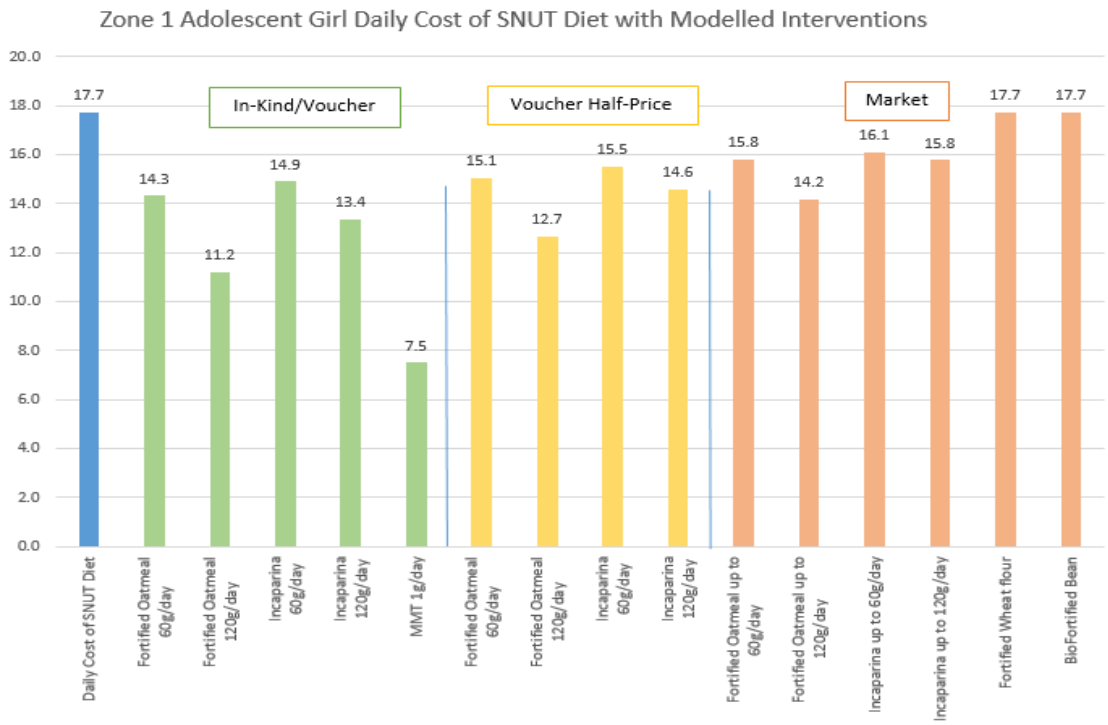

Figure 39: The daily cost of the SNUT diet for an adolescent girl in Zone 1 with modelled interventions.

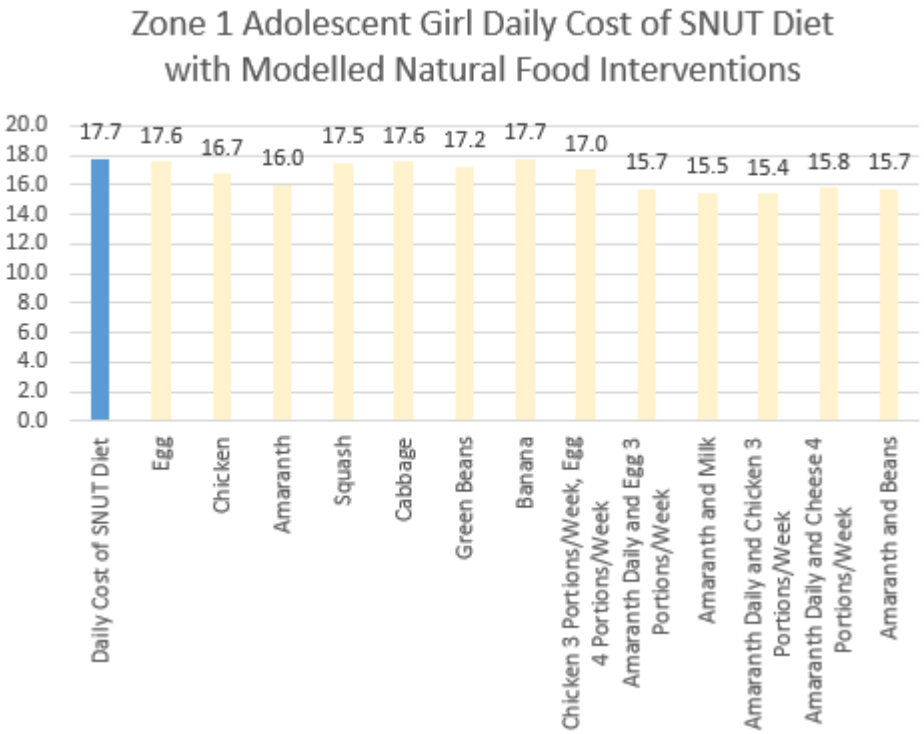

Figure 40: The daily cost of the SNUT diet for an adolescent girl in Zone 1 with modelled natural food interventions (no cost to consumer) (daily portions unless otherwise mentioned).

For lactating women across all five zones the most effective intervention was in-kind provision of a daily MMT. In Zone 1, daily MMT provision reduced the daily cost of the SNUT diet by 60 per cent (from 19.0 Q/day to 7.7 Q/day) (Figure 41). The most effective natural foods

combination for lactating women in Zone 1 was vouchers for a daily portion of local green leafy vegetable (amaranth) reducing the daily cost of the SNUT diet by 15% (from 19.0 Q/day to 16.2 Q/day) (Figure 42).

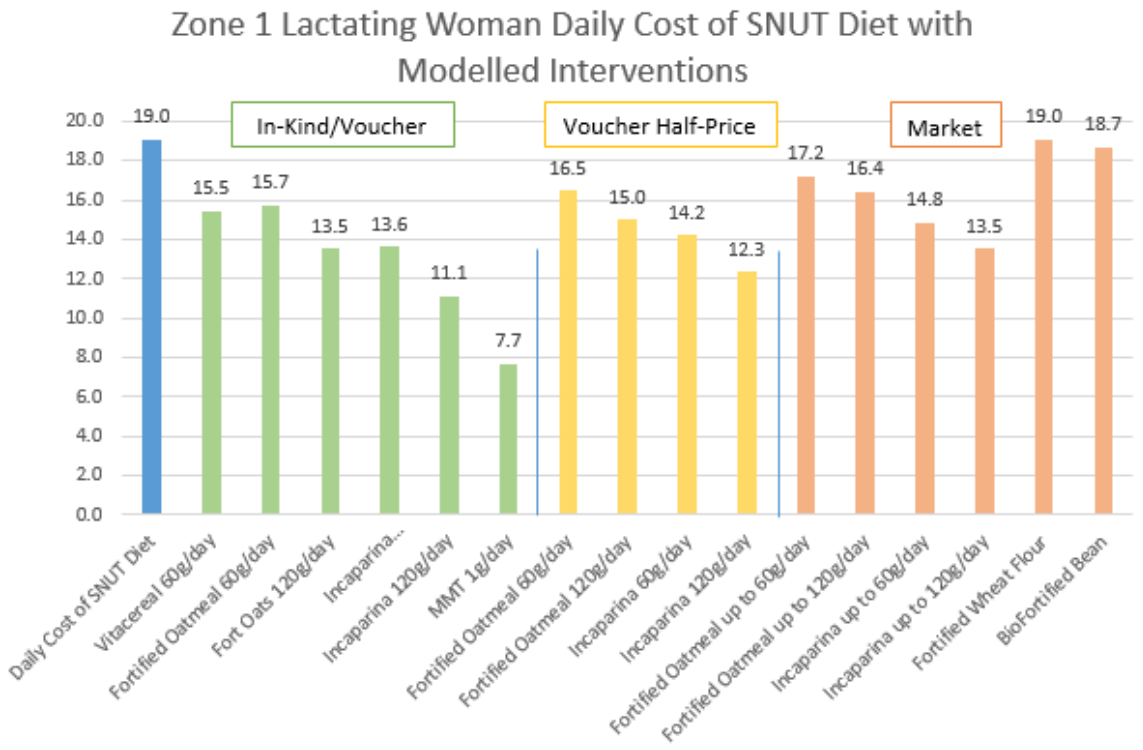

Figure 41: The daily cost of the SNUT diet for a lactating woman in Zone 1 with modelled interventions.

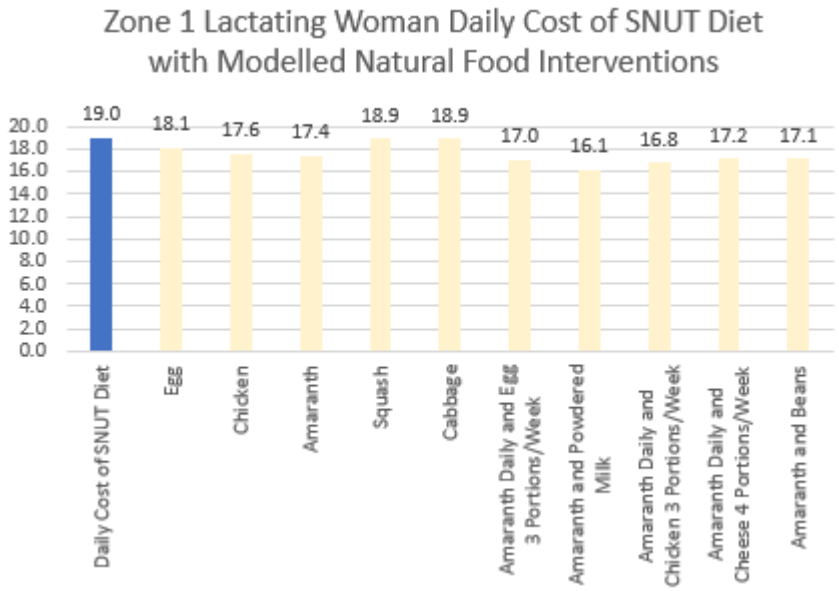

Figure 42: The daily cost of the SNUT diet for a lactating woman in Zone 1 with modelled natural food interventions (no cost to consumer) (daily portions unless otherwise mentioned).

Based on the results of intervention modelling for individual target groups, zone-specific household intervention packages were identified to reflect food availability and local practices in each zone. In Zone 1 (Table 15) the first household package included in-kind provision of Mi Comidita (60 g) for 12-23mo children and MMTs for adolescent girls and lactating women, most likely delivered through health services; package 2 included the provision of in-kind Incaparina through existing markets, health services or other services; package 3 included home production of vegetables along with FBFs; package 4 included vouchers for natural nutritious foods and in-kind provision of FBFs; package 5 included improved market access to Mi Comidita, fortified oatmeal as a fortified blended food and bio fortified beans; package 6 included home production and consumption of natural nutritious foods and MMTs for adolescent girls and lactating women. Of the household packages modelled (Figures 43 & 44) package 6 was most effective, reducing the monthly cost of the SNUT diet from 1826 to 918 and reducing the number of households that could not afford the SNUT diet from 57% to 8%.

Table 15: Intervention packages modelled in Zone 1.

	Package 1	Package 2	Package 3	Package 4	Package 5	Package 6
Child 12-23 months	Mi Comidita in-kind 60 g/day	Incaparina in-kind 50 g/day	Mi Comidita in-kind 60g/day and voucher for: orange daily portion and amaranth daily portion	Mi Comidita in-kind 60g/day, voucher for: orange daily portion, amaranth daily portion, egg 4 portions/week	Mi Comidita up to 60 g/day available for sale in local markets and biofortified beans available for sale in local markets (217 g of Mi Comidita and 438 g of biofortified beans selected by the CotD software, for 8.9 Q weekly cost at market prices)	Mi Comidita in-kind 60 g/day, voucher for orange daily portion, amaranth daily portion and egg 4 portions/week

Adolescent Girl	MMT in-kind daily	Incaparina in-kind 120g/day	Incaparina in-kind 60 g/day and voucher for amaranth daily portion	Incaparina in-kind 120 g/day, voucher for: daily portion of amaranth, red meat 4 portions/week, egg 4 portions/week, orange daily portion	Fortified oatmeal up to 60g available for sale in local markets and biofortified bean available for sale in local markets (935 g of fortified oats for 23.2 Q weekly cost at market prices. SNUT did not include biofortified beans)	Incaparina in-kind 120 g/day, voucher for: daily portion of amaranth, red meat 4 portions/week, egg 4 portions/week, orange daily portion, MMT in-kind daily
Lactating Woman	MMT in-kind daily	Incaparina in-kind 120g/day	Incaparina in-kind 60 g/day and voucher for amaranth daily portion	Incaparina in-kind 120 g/day, voucher for: daily portion of amaranth, red meat 4 portions/week, egg 4 portions/week, orange daily portion	Fortified oatmeal up to 60g available for sale in local markets and biofortified bean available for sale in local markets (SNUT did not include either of these foods)	Incaparina in-kind 120 g/day, voucher for: daily portion of amaranth, red meat 4 portions/week, egg 4 portions/week, orange daily portion, MMT in-kind daily

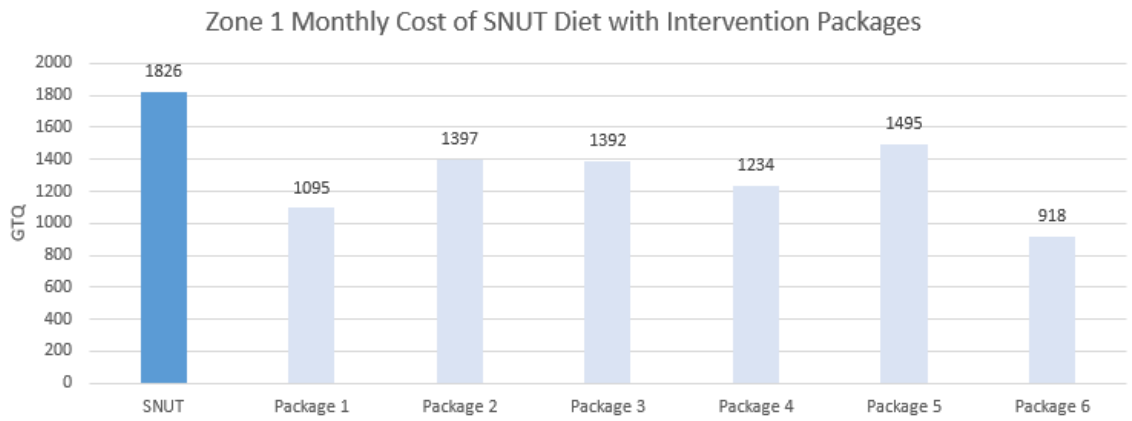

Figure 43: Monthly cost of SNUT Diet in Zone 1 with six intervention packages.

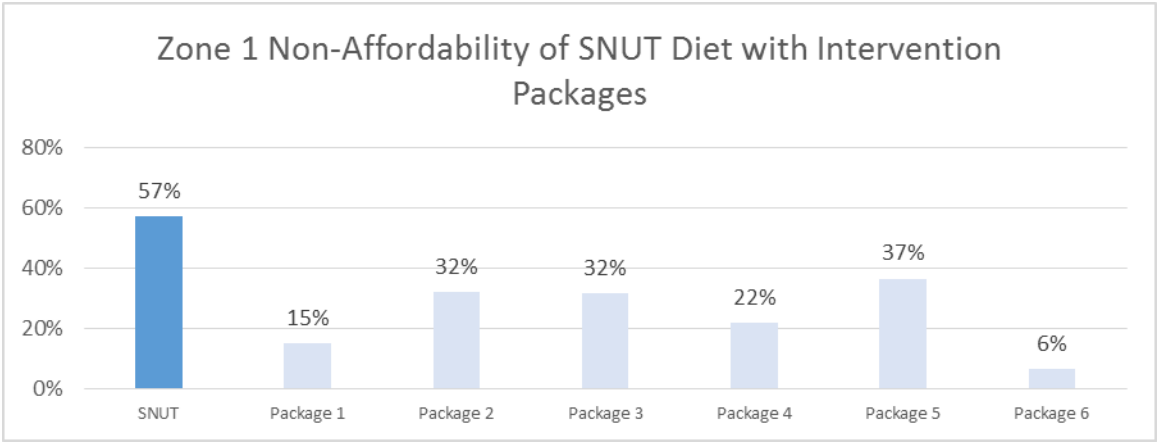

Figure 46: Non-affordability of SNUT Diet in Zone 1 with six intervention packages.

A monthly cash transfer of 300Q or 600Q per household in addition to the modelled household intervention packages further decreased the percentage of households in Zone 1 that could not afford the SNUT diet. A cash transfer of 600Q per month with no other intervention could reduce the number of households unable to afford the SNUT diet from 57% to 24%. Combined with Intervention package 1 a cash transfer of 600Q per month could reduce the percentage of households unable to afford the SNUT diet to 0%, meaning virtually every household in zone 1 would be able to afford a staple-adjusted nutritious diet (Figure 45). These calculations are based on the following assumptions: cash transfers and interventions were delivered reliably, the full amount of the cash transfer was spent on nutritious foods and foods were shared equitably within the household.

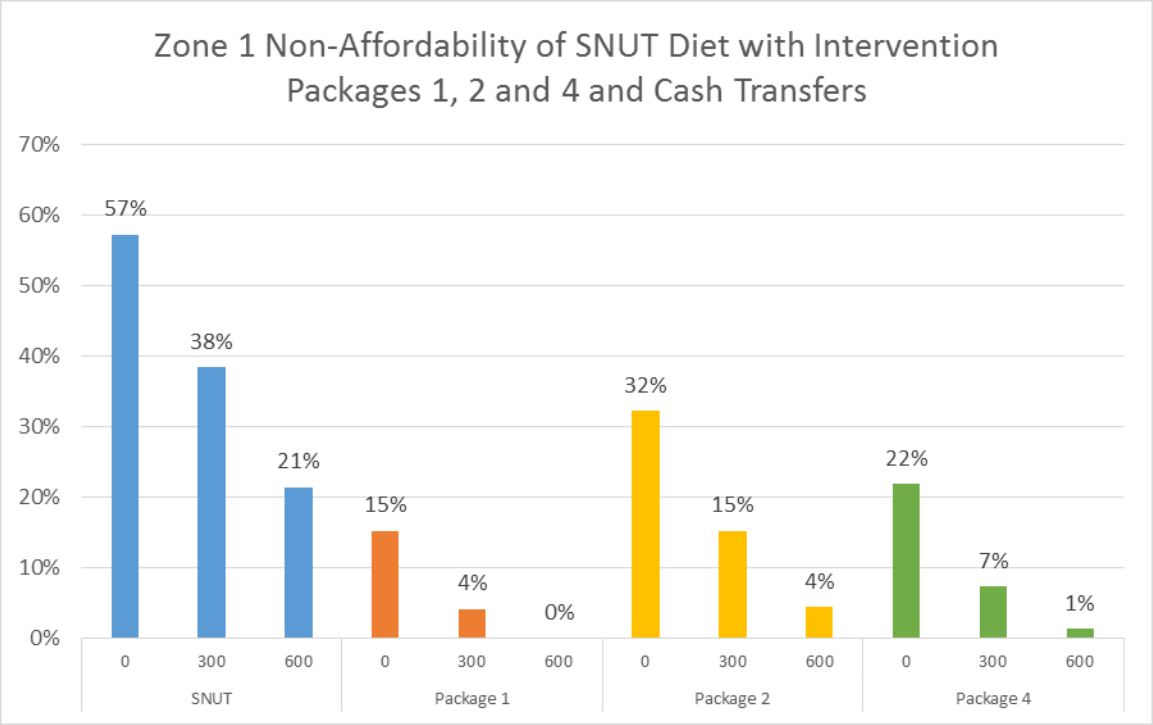

Figure 45: Household non-affordability in Zone 1 with three intervention packages and cash transfers.

These findings show the possibility of improving economic access to nutrients through food-based interventions provided by the public sector, in combination with local markets. However, the design of these interventions would require analysis of programme feasibility and cost-effectiveness. Model diets are theoretical and behaviour change communication would be required to encourage dietary practices necessary to meet nutrient requirements.

Across all five zones Package 1 (Mi Comidita in-kind 60g/day for child 12-23 months; in-kind daily MMT for adolescent girls; in-kind daily MMT for lactating women) could reduce the percentage of households unable to afford a nutritious diet by at least 25 percentage points in each zone and by as much as 62 percentage points in zone 4. Including a cash transfer of 300Q per month could reduce the percentage of households unable to afford a nutritious diet to below 5% in all five zones (Figure 46).

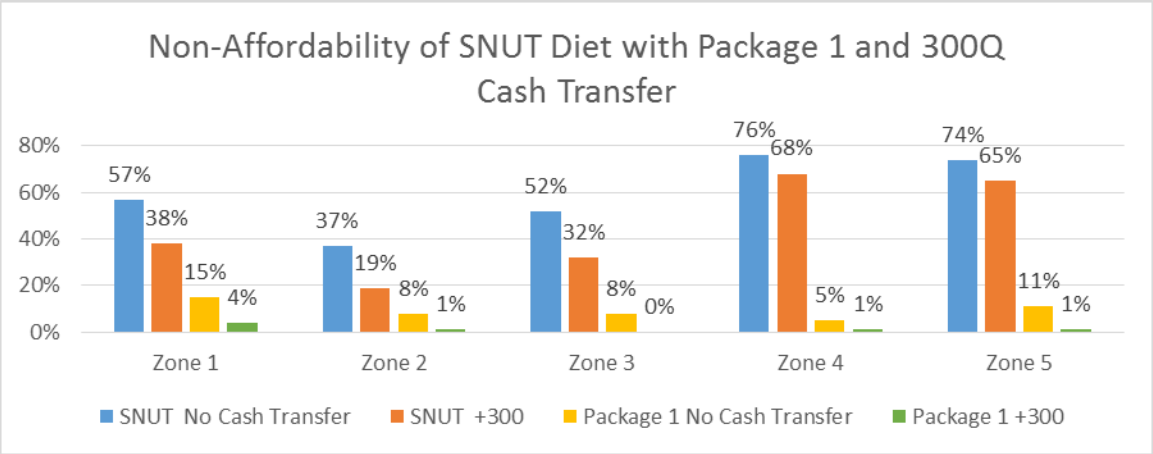

Figure 46: Percentage of households that would not be able to afford the SNUT diet after the introduction of an optimal package of targeted interventions (in-kind Mi Comidita and MMTs, i.e. package 1) and a cash transfer of 300Q per month per household.

Across all five zones Package 4 (Mi Comidita in-kind 60g/day for child 12-23 months; voucher for fortified oatmeal or Incaparina for adolescent girls 120g/day; voucher for fortified oatmeal or Incaparina for lactating women 120g/day combined with vouchers for the three target groups for natural nutritious foods such as amaranth, red meat, eggs, oranges, chicken, milk or beans) could reduce the percentage of households unable to afford a nutritious diet by at least 28 percentage points in each zone and by as much as 67 percentage points in zone 4 (Figure 47). Package 1 could reduce the percentage of households unable to afford a nutritious diet by at least 30 percentage points in each zone and by more than 50 percentage points in zones 3, 4 and 5. Including a cash transfer of 300Q per month could reduce the percentage of households unable to afford a nutritious diet to below 10% in all five zones and below 3% in zones 2, 3, 4 and 5 (Figure 46). Vouchers for specific natural foods in Package 4 were based on Optifood food based recommendations determined for each zone by nutrient needs and local availability (see Annex).

Package 1 and package 4 are both very effective at reducing the percentage of households unable to afford a nutritious diet. The intervention packages are much more effective than the provision of only a cash transfer. Package 1 and package 4 are fairly similar in their potential impact and package 4 would be considerably more expensive to implement, due to the cost of natural foods provided in vouchers.

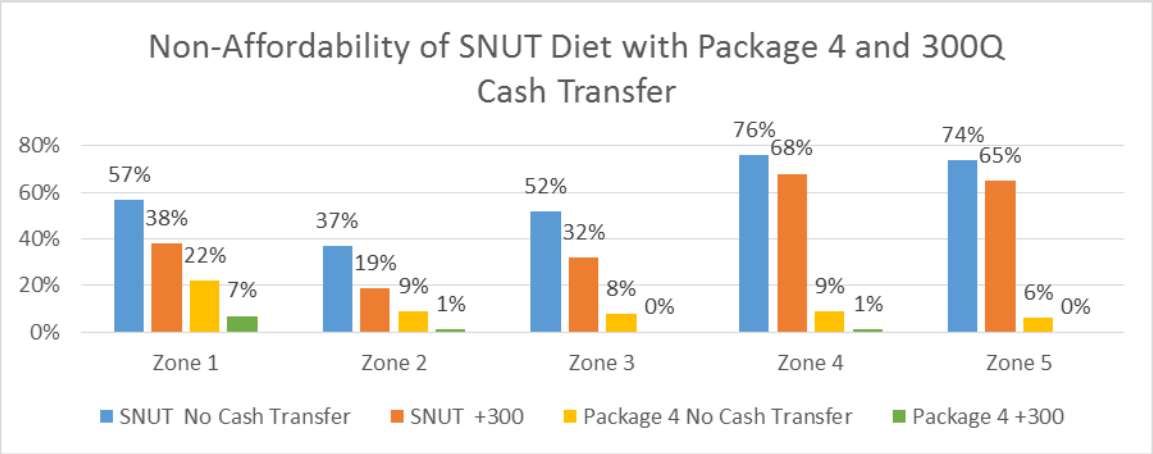

Figure 47: Percentage of households unable to afford a nutritious diet after the introduction of an optimal package of interventions (in-kind Mi Comidita for children 6-23 months, vouchers for Incaparina and fortified oatmeal for adolescent girls and lactating women, combined with vouchers for natural foods,) with and without a cash transfer of 300Q per month per household.

Recommendations to Improve Nutrient Access

Recommendations to fill nutrient gaps for target groups with evidence-based interventions and strategies were developed in a workshop in Guatemala with representative stakeholders from a wide-array of sectors, held in November 2016. Contributing participants included:

- Ministry of Social Development (MIDES)
- Ministry of Agriculture (MAGA)
- FANTA
- ASIES/INCAP
- CRS
- WFP CO, RB, HQ

* Two contributing stakeholders, SESAN and the INCAP team that conducted the study *Determination of Nutrient Gaps in Children 6-23 Months and Their Mothers*, were unable to attend the workshop but provided input during an earlier meeting with the FNG team.

General recommendations to close nutrient gaps in target groups

The stakeholder group agreed that findings should be shared with key sectors: health, development and social protection, agriculture and finance. Stakeholders identified three key themes that emerged from FNG analysis:

1) Address the double-burden of malnutrition

2) Improve behaviour and practices related to nutrient intake through behaviour change communication (BCC)

3) Mitigate the effect of seasonality on access to nutritious diets

1) Address the double-burden of malnutrition

Policy and programmes to create an enabling environment

- Advocate for the prevention of malnutrition and overweight and obesity by promoting healthy lifestyles. The main focus should remain chronic malnutrition due to the high prevalence in Guatemala; an increasing emphasis should be put on overweight and obesity.
- Improve food labels on the nutritional content of snacks, such as junk food, to highlight sodium and sugar content. Address the marketing of snacks and other processed foods.
- Existing opportunities: Proposed law on nutritional branding and proposed law on school feeding could be incorporated into a broader package of laws with a focus on healthier diets.

Adolescent girls

- Conduct further analysis of adolescent girls' (pregnant and not) dietary intake based on the sample from the study *Determination of Nutrient Gaps in Children 6-23 Months and Their Mothers,* to better understand the barriers to nutrient intake for this target group.

Promising entry points identified to strengthen engagement with adolescent girls and improve their dietary intake

- Health: Increase the coverage of iron and folic acid as part of the health sector's ongoing services.
- Existing programs: Healthy Adolescents, Healthy Schools and Friend Spaces are existing programs operating on a small scale.
- Sexual and Reproductive Health: Incorporate interventions designed to improve nutrient intake in adolescents, such as supplementation, education campaigns and BCC, into health sector activities promoting sexual and reproductive health and the prevention of adolescent pregnancy.
- Education: Reach adolescent girls with positive messages through schools and other professional development activities.
- Social Protection: Incorporate workshops with adolescent girls into MIDES plans.
- Agriculture: Incorporate messaging into extension workers healthy households programs.
- Community Platforms: Work with churches, youth groups and other platforms on initiatives to improve access and consumption of affordable, nutritious foods.
- Municipalities: Work with municipal offices for children and youth.

First 1000 days: PLW and children under two

Policy and programmes to create an enabling environment

- Opportunity: Bill on IYCF is under discussion in Parliament, focusing on promotion of exclusive breastfeeding, continued breastfeeding and complementary feeding. Once it is

approved, efforts need to be placed on ensuring implementation of specific actions at decentralized level.

- Strengthen the monitoring of the application of the Law related to the Marketing of commercial breastmilk substitutes
- The Social Development Cabinet – under the President of the Republic - provides an opportunity for multi-sectoral collaboration focused on the prevention of malnutrition.

Entry Points identified

- Health: A fundamental platform that must be complemented by other sectors, to avoid overburdening one sector.
- Social Protection: Work with social protection platforms to include nutrition-specific interventions. Connect social protection programs with markets – using vouchers and coupons for specific target groups covering the first 1000 days.
- Adapt nutrition-specific interventions for PLW that address micronutrient deficiencies, such as anaemia, and overweight and obesity by increasing access to good sources of micronutrients through markets and social protection without contributing to an excessive caloric intake.
- Connect government transfers (cash, vouchers, in-kind) with BCC and the promotion of healthy lifestyles.

2) Improve behaviour and practices related to nutrient intake through behaviour change communication (BCC)

- BCC strategies must be complemented by initiatives to improve availability, access and affordability of safe, nutritious foods for key target groups, in order to be really effective.
- FNG analysis highlights the challenges and barriers to exclusive breastfeeding practices (50% of children are not exclusively breastfed in the first six months). Interventions should promote exclusive breastfeeding for the first six months and highlight the importance of colostrum. Messaging should be clear, adapted to the local context, transmitted in the local language and include visual aids explaining exclusive breastfeeding.
- Generate a better understanding of the barriers to exclusive breastfeeding, especially for working mothers in urban zones. Develop messaging and strategies specifically to address these barriers, such as using safe and adequate breastmilk substitutes as a last option.
- FNG analysis identified barriers and challenges in the introduction of complementary foods, in particular in dietary diversity and in the consistency of atoles. Messaging and strategies on BCC should address these issues.
- BCC should also target in-laws, grandparents and fathers as key influencers.
- Networks of midwives should be trained on key messages.
- Community leaders should be trained on key nutrition themes related to improving nutrient intake for specific target groups.

- Generate a better understanding of the role of health sector staff at the community level and best practices for communicating messages to mothers, caretakers and communities to reinforce the quality and effectiveness of on-going BCC efforts.
- Conduct BCC to influence household purchasing patterns and choices, particularly in households with young children. This is a fundamental component of BCC, especially for households receiving cash transfers and vouchers.
- Promote healthy lifestyles and prevent overweight and obesity by limiting consumption of sugar, sodium and trans-fat.
- Conduct formative research on new BCC programs, particularly for adolescents, to better understand consumption patterns and barriers to eating nutritious diets.
- All BCC messages should be in the local language.

Entry Points identified for BCC

- Health: A multi-sectoral focus is needed to change practices. The health sector should strengthen trainings on nutrition for networks of midwives.
- Agriculture: Extension workers and woman educators in the home.
- Social Protection: Facilitators should focus on BCC for nutrition-sensitive interventions.
- Education: An important platform to raise awareness on the importance of healthy lifestyles and diets to prevent rising overweight and obesity and promote dietary diversity.
- Markets: The private sector has a responsibility to promote and create demand for products associated with healthy lifestyles and to offer healthy and nutritious foods in the market.

3) Mitigate the effects of seasonality on access to nutritious diets

Entry Points identified

- Agriculture: Promote interventions that protect watersheds at the community level; invest in low-cost irrigation and water harvesting; conserve soil in zones affected by frost; increase the cultivation of sorghum and other species more resistant to drought. Extension workers can spread messages on the importance of exclusive breastfeeding and complementary feeding, to reduce the reliance on negative coping strategies during seasonal shocks.
- Municipalities and Local Governments should play a stronger role in supporting these initiatives.

Annex

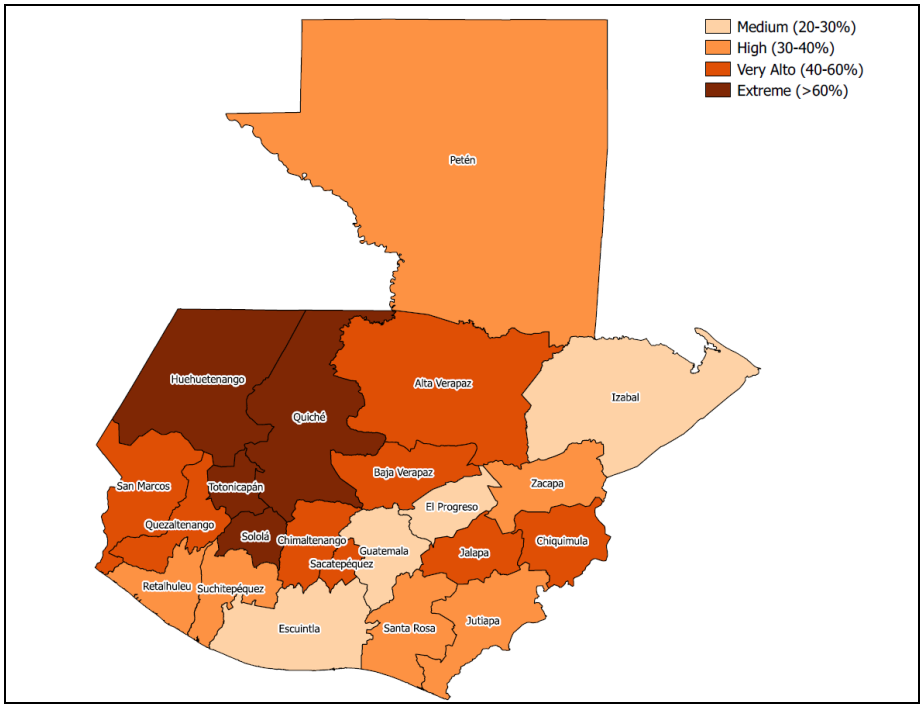

Figure 50: Stunting prevalence by department (MSPAS, 2015).

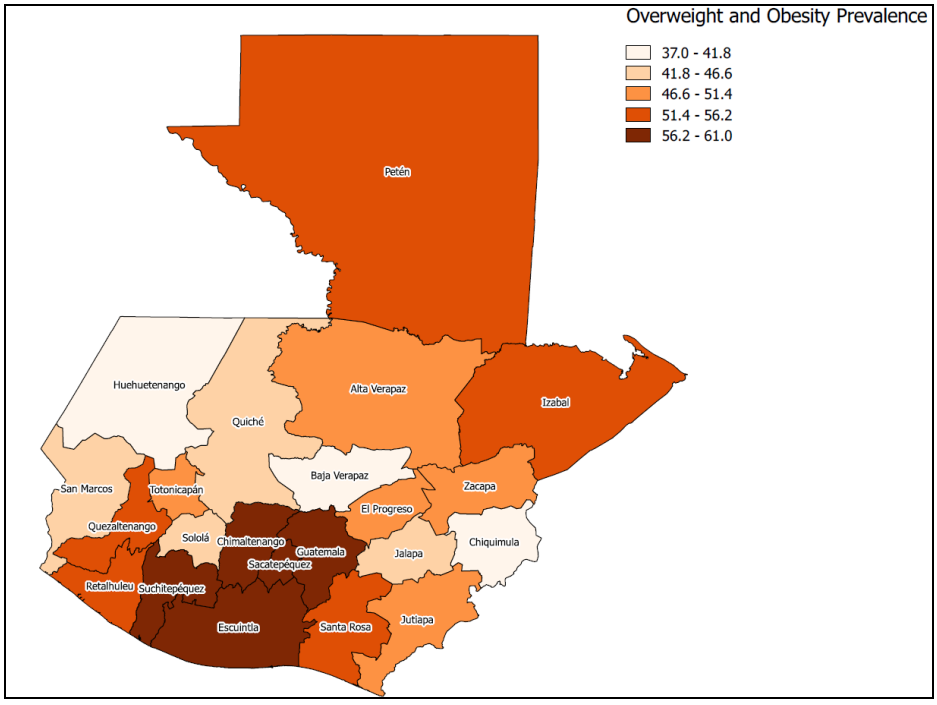

Figure 51: WRA overweight and obesity by department (MSPAS 2010).

Table 1: Best food-based recommendations identified for Zone 1 (Huehuetenango, Quetzaltenango, Quiche, San Marcos and Totonicapán) based on identified nutrient-rich foods within the existing food supply and dietary patterns – Optifood analyses:

		Zone 1: Huehuetenango, Quetzaltenango, Quiche, San Marcos, Totonicapán																			
		1.A Z1 6-8m				1.B Z1 9-11m				1.C Z1 12-23m				1.D Z1 Adolescent LW				1.E Z1 Adult LW			
		Servings/week	Av. Portion size	Total g/week	Cost/day	Servings/week	Av. Portion size	Total g/week	Cost/day	Servings/week	Av. Portion size	Total g/week	Cost/day	Servings/week	Av. Portion size	Total g/week	Cost/day	Servings/week	Av. Portion size	Total g/week	C a
Recommendation	**Enriched/ fortified grains**	6	13.3	80.0	0.4	5	11.3	56.7	0.7	10	11.3	113.3	1.3	14	22.5	315.0	8.6	7	18.3	127.8	
	Whole grains and products	7	10.0	70.0	0.4	10	16.3	163.3	0.7	14	16.3	228.7	1.2	21	130.5	2740.5	7.3	21	129.3	2714.3	
	Bread					5	16.0	80.0	0.7												
	Powdered milk	5	4	20.0	0.6	7	6.0	42.0	0.9	7	6.0	42.0	1.6								
	Meat, Poultry or Eggs													7	50.3	352.3	7.9	7	63.3	443.3	
	Vitamin A source other vegetables	4	10.0	40.0	0.4																
	Green leafy veg	2	15.0	30.0	0.4	3	17.0	51.0	0.7	7	17.0	119.0	1.3	7	49.3	344.8	7.4	7	58.0	406.0	
	Other veg	7	35.7	249.7	0.4									7	161.0	1127.0	7.4	7	103.0	721.0	
	Fruit (FG)													8	55.0	440.0	7.3	7	60.0	420.0	
	Vitamin C-rich fruit					3	52.5	157.5	0.7												
	Other Fruit	7	52.5	367.5	0.5	4	73.5	294.0	0.7	5	73.5	367.5	1.3								
Cost/day of putting all FBRs in place in context of an energy-replete diet		GTQ 1				GTQ 1.2				GTQ 2				GTQ 10.8				GTQ 10.1			
Total grams recommended food per week		857.2				844.5				870.5				5319.6				4832.3			
Microutrients for which at least 65% RNI in a min diet was not achieved		Iron 22.6% Zinc 33.9%				Iron 23.8% Zinc 32.2%				Iron (42.6%)				Vitamin B12 (35.9%) Zinc (55.2%)				Vitamin B12 (34.6%) Zinc (47.8%)			
Macronutrients for which at least 65% of requirement not met														Fat (23.4%)				Fat (29.4%)			

Table 18: Best food-based recommendations identified for Zone 2 (Chimaltenango, Sacatepquez & Sololá) based on identified nutrient-rich foods within the existing food supply and dietary patterns – Optifood analyses:

		Zone 2: Chimaltenango, Sacatepéquez & Sololá																			
		2.A Z2 6-8m																2.B Z2 9-11m			
		Servings/week	Av. Portion size	Total g/week	Cost/day	Servings/week	Av. Portion size	Total g/week	Cost/day	Servings/week	Av. Portion size	Total g/week	Cost/day	Servings/week	Av. Portion size	Total g/week	Cost/day	Servings/week	Av. Portion size	Total g/week	C a
Recommendation	**Enriched/fortified grains and products**	7	6.8	47.3	0.4	6	6.0	36.0	0.9	7	7.1	49.6	2.0	10	16.0	160.0	7.6	7	41.0	287.0	
	Refined grains and products																				
	Whole grains and products	7	8.7	60.7	0.4	7	12.0	84.0	0.8	10	12.6	126.0	2.0	24	150.0	3600.0	7.1	14	110.0	1540.0	
	Bread	7	13.3	92.8	0.5									7	100.0	700.0	7.2	7	35.0	245.0	
	DAIRY									7	9.5	66.5	2.3	4	6.0	24.0	7.4				
	Fluid or powdered milk	2	5	10.0	0.5	4	4.0	16.0	1.0												
	Meat, Poultry or Eggs																	5	65.0	325.0	
	Eggs	3	12.0	36.0	0.5									4	29.0	116.0	7.2				
	Chicken					1	15.0	15.0	0.8					2	50.0	100.0	7.2				
	Vitamin A source other vegetables	4	15.0	60.0	0.4					1	17.8	17.8	2.0								
	Green leafy vegetables					4	20.8	83.3	0.9	3	18.0	54.0	2.0	5	46.0	230.0	7.2	7	63.5	444.5	
	Other vegetables	7	20.0	140.0	0.4					11	68.0	748.0	2.2								
	Starchy Plant Foods									7	30.0	210.0	2.0					7	96.7	676.7	
	Cooked beans, lentils, peas	4	13.0	52.0	0.4									7	65.3	457.3	7.9	7	61.0	427.0	
	Fruit (FG)	7	30.0	210.0	0.4									7	64.8	453.6	7.2				
	Vitamin C-rich fruit																				
	Other Fruit					4	62.5	250.0	0.9												
Cost/day of putting all FBRs in place in context of an energy-replete diet		GTQ 1				GTQ 1.2				GTQ 2.6				GTQ 9.4				GTQ 10			
Total grams recommended food per week		708.7				484.3				1271.8				5840.9				3945.2			
		9				9				10				8				9			

Microutrients for which at least 65% RNI in a min diet was not achieved	Iron (25.2%) Zinc (31.1%	Iron (29.6.%) Zinc (33.4%)	Iron (31.7%)	Vitamin C 23.3% Vitamin B12 25.7% Zinc 48.6%	Vitamin B12 (23.9%) Zinc (47.2%)
Macronutrients for which at least 65% of requirement not met				Fat 19.5%	Fat (24%)

Tables 19-24: Package 4 intervention details for zones 1-5

Package 4 Zone 1

Target Group	Product	Modality
Child 12-23mo	Mi Comidita 60g/day, fruit daily portion, green leafy vegetable daily portion, egg 4 portions/week	In kind and voucher
Adolescent Girl	Incaparina 120g/day, green leafy vegetable daily portion, chayote daily portion, red meat 4 portions/week, egg 4 portions/week, fruit daily portion	Voucher
Lactating Woman	Incaparina 120g/day, green leafy vegetable daily portion, chayote daily portion, red meat 4 portions/week, egg daily portion, fruit daily portion	Voucher

Package 4 Zone 2

Target Group	Product	Modality
Child 12-23mo	Mi Comidita 60g/day, green leafy vegetable daily portion, egg 4 portions/week	In kind and voucher
Adolescent Girl	Fortified oatmeal 120g/day, green leafy vegetable daily portion, egg 5 portions/week, beans daily portion	Voucher
Lactating Woman	Fortified oatmeal 120g/day, green leafy vegetable daily portion, egg 5 portions/week, beans daily portion	Voucher

Package 4 Zone 3

Target Group	Product	Modality
Child 12-23mo	Mi Comidita 60g/day, milk 4 portions/week, beans daily portion, green leafy vegetable daily portion, chicken 4 portions/week, carrot 3 portions/week	In kind and voucher
Adolescent Girl	Fortified oatmeal 120 g/day, milk 4 portions/week, green leafy vegetable daily portion, carrots 4 portions/week, beans daily portion, chicken 4 portions/week	Voucher
Lactating Woman	Fortified oatmeal 120 g/day, green leafy vegetable daily portion, beans daily portion, egg 4 portions/week, chicken 3 portions/week, chayote 4 portions/week	Voucher

Package 4 Zone 4

Target Group	Product	Modality
Child 12-23mo	Mi Comidita 60g/day, cheese 4 portions/week, beans daily portion, green leafy vegetable daily portion, egg 4 portions/week	In kind and voucher
Adolescent Girl	Fortified oatmeal 120g/day, cheese 4 portions/week, green leafy vegetable daily portion, beans daily portion, egg 4 portions/week, chicken 3 portions/week	Voucher
Lactating Woman	Fortified oatmeal 120 g/day, cheese 4 portions/week, green leafy vegetable daily portion, beans daily portion, egg 4 portions/week, chicken3 3 portions/week	Voucher

Package 4 Zone 5

Target Group	Product	Modality
Child 12-23mo	Mi Comidita 60g/day, green leafy vegetable daily portion, egg 4 portions/week, milk 3 portions/week, beans daily portion	In kind and voucher
Adolescent Girl	Fortified oatmeal 120 g/day, green leafy vegetable daily portion, eggs 4 portions/week, milk 3 portions/week, beans daily portion	Voucher
Lactating Woman	Fortified oatmeal 120 g/day, green leafy vegetable daily portion, egg 5 portions/week, milk 3 portions/week, beans daily portion	Voucher

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