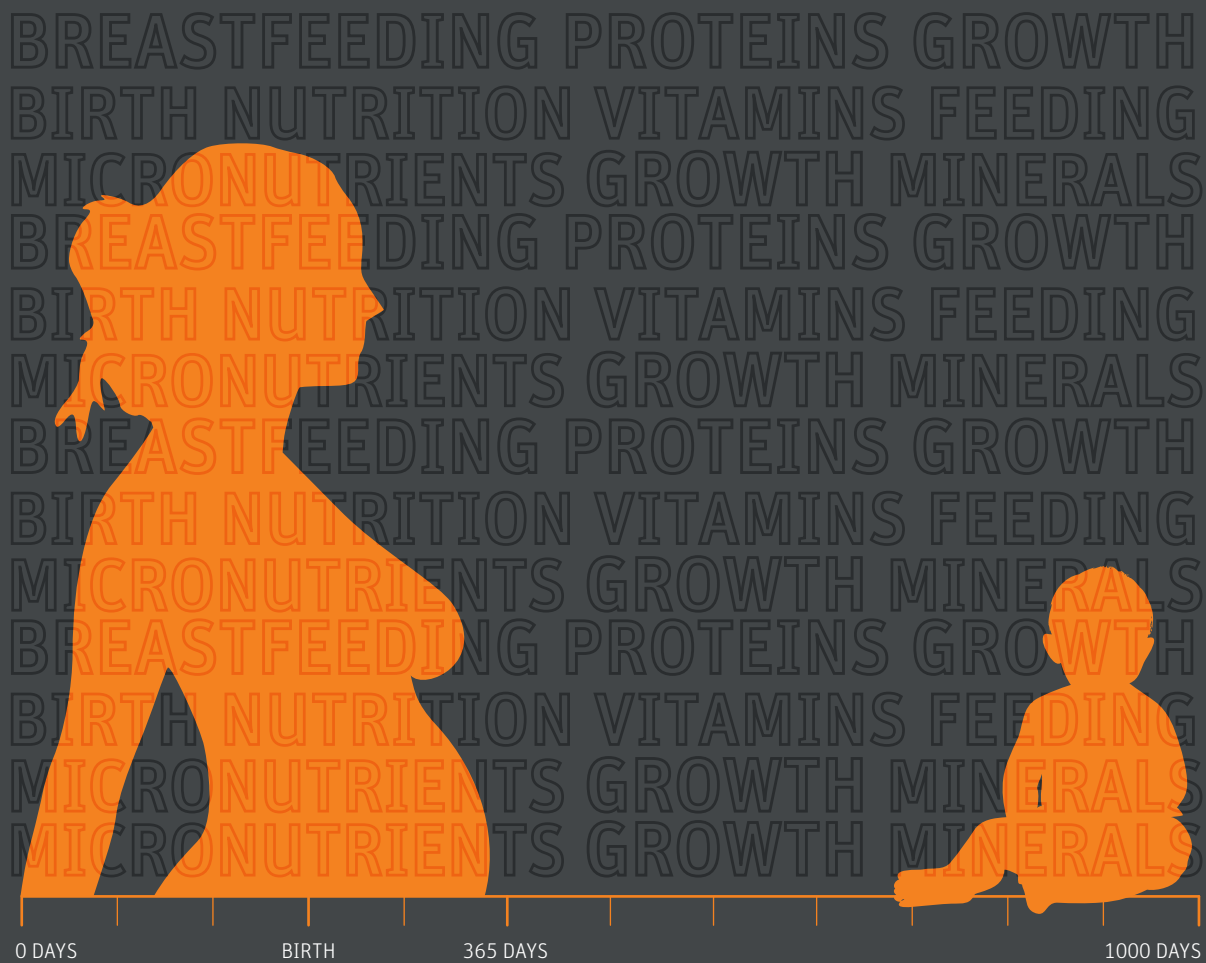


INTERVENTIONS AND POLICY OPTIONS

— FOR COMBATING MALNUTRITION —

IN GUATEMALA



Country Department
Belice, Central America, Mexico,
Panama and Dominican Republic



Social Protection
and Health Division

INTERVENTIONS AND POLICY OPTIONS FOR COMBATING MALNUTRITION IN GUATEMALA

Reynaldo Martorell



Inter-American Development Bank

© Inter-American Development Bank, 2012. All rights reserved.
1300 New York Ave., N.W.
Washington, D.C. 20577
www.iadb.org

JEL code: I10
IDB publication code: IDB-MG-125

The author is the Robert W. Woodruff Professor of international nutrition in the Hubert Department of Global Health, Rollins School of Public Health, Emory University (Atlanta, Georgia, United States of America).

The opinions expressed in this publication are those of the authors and do not necessarily reflect the views of the Inter-American Development Bank, its board of directors or the governments of the IDB member countries.

CONTENTS

Prologue	v
Executive Summary	vii
Introduction	xi
1 Objective and sources of information	1
2 Guatemala's nutrition problems	3
Chronic malnutrition, acute malnutrition and overweight in children under age 5	3
The Guatemalan mother: short in stature and obese	5
Anemia in mothers and children	6
Vitamin A and other micronutrients	7
3 The causes of malnutrition	9
4 Evolution of nutrition problems in Guatemala	13
Mortality in children under age 5	13
Chronic malnutrition	13
Acute malnutrition	14
Maternal size	14
Anemia	14
Overweight and obesity in women	15
Summary of the changes	15
5 Experiences in other countries	19
Mexico	19
Brazil	20
Bolivia	21
6 Strengths and weaknesses of the government's strategies and interventions for preventing and treating acute and chronic malnutrition	23
Institutions charged with nutrition programs and policies	23
Ministry of Public Health and Social Services	24
Inequalities in food distribution	25

Acute malnutrition 26

The Mi Familia Progresa (MIFAPRO) program 27

Monitoring and evaluation 27

7 Recommendations 29

 Nutrition problems in Guatemalan children under age 5 and women of reproductive age 29

 Proposed interventions 29

 The intervention “package” 33

 Change theory 34

 Specific recommendations 34

8 Nutrition and Guatemala’s future 39

Bibliography 41

Annexes 47

PROLOGUE

Guatemala is facing a health paradox. On the one hand, chronic child malnutrition rates are worse than those in Africa, and are quadruple the average rates for Latin America. On the other hand, obesity and overweight affect half of the country's women, and anemia has also increased at an alarming rate.

While some health indicators have improved over the past few decades, little progress has been made in the fight against chronic malnutrition. In fact, half the children under age five show evidence of stunted growth, and the rate of anemia is worsening in this population. This situation will have serious consequences for child development, affecting intellectual development, school performance and, ultimately, the development of capacities necessary for succeeding in the labor market.

This is why the work done by Dr. Reynaldo Martorell, an internationally recognized leader in the field of nutrition

science and an expert in the countries of the Mesoamerican isthmus, is so important. In this new report, Dr. Martorell addresses the topic of malnutrition in an innovative and pragmatic way and provides key recommendations for implementing much-needed nutrition interventions in Guatemala.

Dietary deficiencies and low breastfeeding rates are limiting children's developmental potential in Guatemala and negatively affecting quality of life and opportunities for the country's population.

We hope that this study will help generate an in-depth discussion on this topic and secure the place of chronic malnutrition—which is the country's most urgent development problem—on the national agenda, so that action will be taken to solve this central human development problem in Guatemala.

Gina Montiel

Manager, Country Department for Belize, Central America, the Dominican Republic, Mexico and Panama

Ferdinando Regalia

Chief, Social Protection and Health Division

EXECUTIVE SUMMARY

The objective of this study is to identify the causes of malnutrition in Guatemala, and discuss the consequences for children under age two and pregnant women. The study also makes specific recommendations for public policy and potential interventions.

The main nutrition problem in the country is chronic malnutrition leading to short stature, defined as height more than 2 standard deviations (SD) below the median height of children of the same age, according to the World Health Organization (WHO). According to the 2008–2009 National Survey of Maternal and Child Health, the prevalence of chronic malnutrition among children ages 3 and 59 months was 49.8% in Guatemala, which exceeds the average in Africa, Asia and Latin America and the Caribbean.

Chronic malnutrition has serious short, medium and long-term implications. In the short term, it lowers resistance to infection and increases the risk of mortality. In the medium and long term, it negatively affects the development of human capital, lowers income generation capacity and increases the risk for chronic diseases. In Guatemala and in other poor countries, short stature generally manifests in a child's first 1,000 days of life (from pregnancy until age two). If we want to prevent chronic malnutrition and its consequences, we must intervene during the window of opportunity found in those first 1,000 days of life, not later.

UNICEF's conceptual framework identifies immediate, underlying and basic causes of chronic malnutrition. The combination of a poor diet, either in quantity or quality, and infection is an immediate factor that limits the availability of nutrients at the cellular level and interferes with linear growth. In Guatemala, extremely poor breastfeeding and complementary feeding practices, combined with high rates of diarrhea, set the stage for short stature. The

underlying causes include food insecurity, inadequate maternal and child healthcare, insufficient access to water and sanitation services, as well as a lack of high quality health services. The basic causes reflect the social, economic and political context, and include poverty, limited education and marginalization, which limits access to both services and opportunities for improving living conditions

Acute malnutrition, defined as weighing less than 2 SD less than the median weight according to size, is not a public health problem. WHO data show that statistically speaking, about 2.3% of the population can be expected to under age five in Guatemala is 1.1%, which is lower than expected for a normal population.

Data from the 2008–2009 survey indicate that the prevalence of anemia is 21.4% in women who are not pregnant, and 29.1% in pregnant women. The consequences of maternal anemia include low iron stores in the newborn, increased morbidity and neonatal, infant and maternal mortality, and increased risks of preterm birth and low birthweight, among others. The prevalence of anemia in children ages 6 to 59 months is 47.7%, and the youngest children have the highest rates. Infants depend on iron stores in the liver, which are deposited during gestation, since breast milk is low in this nutrient. Anemia in children negatively affects learning, cognitive development and behavior, and its effects may be irreversible.

Guatemala has also seen an increase in chronic diseases. Alarmingly, half of Guatemalan women are overweight or obese. Maternal obesity or overweight exposes the fetus to altered metabolism due to high levels of blood glucose, which increase the risk of gestational diabetes, and lead to increased deposition of adipose tissue (i.e. fat). With an overweight mother who herself is of short stature, the baby is also likely to be overweight and of limited

stature. Obesity and its health consequences can bankrupt a country, due to their substantial adverse impact on life expectancy and economic productivity, combined with exorbitant treatment costs.

The survey showed mixed results regarding nutritional status in the country. The encouraging news is that chronic malnutrition declined between 2002 and 2008–2009, with the greatest declines seen among the indigenous population (from 74.8% to 65.9% in the indigenous population, compared with a decline from 40.9% to 36.2% in the non-indigenous population). However, if change continues at the same rate (about 1 percentage point per year), it will take more than four decades to eradicate chronic malnutrition in Guatemala.

On the other hand, there has been an alarming increase in the prevalence of anemia in children ages 6 to 59 months, from 39.7% in 2002, to 47.7% in 2008–2009. This increase seems to have occurred across the board, affecting all social groups and regions. Increased prevalence has also been observed in the case of women, particularly pregnant women. Among non-pregnant women, the change was minor (from 20.2% to 21.4%), but in pregnant women, the increase was more dramatic, from 22.1% to 29.1%.

Also alarming is the rapid increase in overweight and obesity among women, especially indigenous women. Between 1995 and 2008–2009, a 13 or 14 year period, overweight and obesity increased from 28% to 47% in indigenous women, and from 38% to 53% in non-indigenous women.

Obesity and anemia may be attributable to a decline in the quality of the diet, but this cannot be confirmed due to a lack of evidence. The Guatemalan diet is excessively high in energy, particularly in sugar and other simple carbohydrates; in addition, consumption of fats and oils has increased. Evidence shows an association between consumption of a high-energy, low-nutrient diet and prevalence of anemia and obesity.

It is important to consider the distribution of nutrition problems across social and ethnic groups. Chronic malnutrition and short stature in women is strongly associated with poverty and ethnicity. In addition, there is

also a less pronounced relationship between poverty and ethnicity and anemia in mothers and children (which is higher among poor and indigenous people) as well as overweight (which is lower among poor and indigenous people). However, anemia and obesity affect both the rich and the poor, while acute malnutrition, child overweight and maternal underweight have nothing to do with poverty or ethnicity.

Comments on the institutional framework for nutrition programs and policies

- The way in which nutrition issues are addressed within the framework of the Food and Nutrition Security policy (Seguridad Alimentaria y Nutricional or SAN) has hindered intersectoral coordination and has favored distributing food as a strategy for preventing chronic malnutrition. These programs are generally not effective because the food they provide is often unsuitable for children ages 6 to 24 months. In addition, they usually do not include an educational component to ensure that the food that is donated will be suitable for young children.
- Within the SAN, the Ministry of Public Health and Social Assistance (MSPAS, according to its Spanish acronym) is charged with implementing most of the nutrition support activities for mothers and children under age two. Unfortunately, MSPAS is a weak ministry that lacks technical and financial resources. As such, its programs have low coverage and are of poor quality. In addition, the SAN fails to emphasize the need to focus on the first 1,000 days of life.
- The publicity in 2009 around the potential for cases of severe malnutrition in the dry corridor of Guatemala distorted the magnitude of the “acute malnutrition problem” and diverted attention away from more serious problems, such as chronic malnutrition and anemia. Such distorted perceptions persist and, since news stories about cases of severe malnutrition may arise again in the future, potential cases should be investigated carefully using appropriate methodology and any response should be in line with the magnitude of the situation.
- Guatemala lacks a culture of monitoring and evaluation (M&E); and thus, it lacks evidence needed to inform and revise policies and programs. A high-quality

surveillance system should be implemented to monitor nutrition issues and programs, and to detect potential cases of acute malnutrition.

- ▶ Guatemala has not recognized the magnitude of the consequences stemming from the nutrition problem known as “the double burden.” The country still has not solved “yesterday’s” problems of chronic malnutrition and micronutrient deficiencies. Yet, new problems affecting societies in nutrition transitions have surfaced, including obesity and chronic diseases related to diet and lifestyle. These relatively new issues need to be included in policies and programs.

Recommendations for future programs

Chronic Malnutrition. To have an impact during the window of opportunity in the first 1,000 days of life, programs need to target pregnant and breastfeeding women and children under age two. The interventions should be provided to everyone in that target group, regardless of social status. They should include: i) activities to promote good breastfeeding (i.e. exclusive breastfeeding in the first six months, and supplemental breastfeeding until two years of age) and complementary feeding practices; ii) water, sanitation and hygiene interventions; iii) the administration of prenatal iron and folic acid supplements to the mother; iv) immunizations; and v) the use of zinc and oral rehydration to treat diarrhea. In addition to improving the quality and availability of health services, it is also important to implement strategies that increase demand and promote their use. Chronic malnutrition is highly related to poverty and ethnicity; as such, additional measures should be taken to reach the most vulnerable groups. Ideally, conditional cash transfers (such as the Mi Familia Progresiva [MIFAPRO] program) should link behaviors affecting health and nutrition, with the provision of fortified complementary foods such as Vitacereal. Such programs should provide counseling and education to encourage families to use the funds and fortified complementary foods in ways that will optimize their good health and nutritional status.

Anemia. Anemia is a national problem and solving it will require multiple interventions. Pregnant women need to receive iron and folic acid supplementation. Other interventions include delayed clamping of the umbilical cord

after childbirth and deworming in children and mothers. Children not receiving fortified complementary foods should use micronutrient powder. In addition, the food fortification program should be expanded and strengthened by adding other micronutrients, such as zinc and vitamin B12, as well as expanding the types of foods that are fortified to include semolina, cornmeal and rice.

Vitamin A deficiency. Recent media reports suggest that vitamin A deficiency is no longer considered a public health problem in children. A recent survey shows very few cases of children with low levels of serum retinol. There may also be some cases with levels that are too high. Fortification levels of sugar should be reviewed and possibly revised; and public education programs should be launched to reduce sugar consumption. Obtaining data periodically on dietary intake would also greatly facilitate this analysis. An assessment should also be undertaken by an expert task force to determine if it is necessary to continue vitamin A supplementation programs, which currently provide massive doses to children

Iodine-fortified salt. The program should continue forward. However like many fortification programs, a better monitoring system is necessary.

Obesity. While this epidemic began in rich countries four decades ago, preventive efforts are still getting underway and the empirical basis to sustain these interventions is limited, although it is increasing. Based on the available evidence and quantitative models, experts recommend the following strategies for improving the diet, increasing physical activity and fighting obesity: informing the public and effectively communicating the benefits of a healthy diet and lifestyle; using financial incentives to increase the cost of unhealthy foods and reduce the price of foods rich in fiber; creating regulations to improve nutrition labels; and restricting companies from advertising or marketing sugary drinks and junk food to children. Within the context of the first 1,000 days, which was the focus of this study, nutrition and diet counseling should be offered to pregnant and nursing mothers. This counseling should incorporate information aimed at reducing the nutrition double burden, such as teaching families that poor quality diets lead to micronutrient deficiencies as well as overweight and obesity. The Guatemalan diet includes large portions of junk food and sugary

drinks, even among young children. Food aid programs should take the nutrition double burden into account, as well, and improve the quality of food baskets. In the case of school children, nutritious lunches and snacks should be provided and the school curriculum should teach children about healthy diets and lifestyles.

Periodic surveys. Periodic national nutrition and health surveys should continue to be done in Guatemala. In addition, specific questions should be included about participation in nutrition programs, in order to document their coverage and areas of intervention. Similarly, indicators of micronutrient deficiencies should be included, such as anemia prevalence and low levels of vitamin A, and information should be collected about diet, physical activity and sedentary lifestyles. Dietary information

is very useful for examining consumption patterns and nutrient deficiencies. Along with information on physical activity, this data is essential for developing policies and programs to address the nutrition double burden.

Final comment. Given the nutrition problems among its citizens, Guatemala faces an uncertain future. On one hand, problems associated with under-nutrition, such as chronic malnutrition and micronutrient deficiencies and anemia, continue to exist. Simultaneously, “modern” nutrition issues such as obesity and chronic diseases are emerging. The challenge for Guatemala is to find an effective, integrated solution to the dual burden that will enable its youngest citizens to grow at a healthy rate, and improve their stature without falling into the obesity trap.

INTRODUCTION

The 2008 series in *The Lancet* on maternal and child malnutrition (containing five articles) is the product of a systematic effort on the part of the world's nutrition science community to underscore the importance of this topic. It identifies effective interventions for prevention and highlights strategies for accelerating national and global actions (Black et al., 2008). The series gives a high priority to opportunities that can be leveraged during a child's first 1,000 days of life (from pregnancy until age two) and identifies short stature for age (chronic malnutrition) and low weight for height (acute malnutrition) as the main indicators of malnutrition (Table 1 contains a description of these indicators). The first 1,000 days are a risky time in a child's life, characterized by high nutritional requirements, rapid physical growth and brain development, increased susceptibility to infections, and high needs for physical and emotional care.

Each year, 13 million babies are born with poor intrauterine growth and 178 million children suffer from chronic malnutrition, accounting for nearly a third of the world's children (Black et al., 2008). Approximately 19 million children suffer from acute malnutrition, and 28% of child mortality in the under age five category is attributed to nutrition problems (poor intrauterine growth, chronic and acute malnutrition, and vitamin A, zinc and other micronutrient deficiencies), equating to 2,800,000 deaths. In addition, another 1.4 million deaths each year are attributed to inadequate breastfeeding practices (primarily, a lack of exclusive breastfeeding during the first six months of life). According to the first study of its kind in terms of experimental design (Kramer et al., 2008), breastfeeding is important not only for survival, but also for cognitive development. A randomized clinical trial was carried out in Belarus using a sample of some 17,000 children. It assessed the impact of UNICEF's Baby-friendly hospital initiative

(UNICEF, 2100a) on breastfeeding practices, and found that exclusive breastfeeding improved significantly. At three months, 43% of mothers in the experimental group continued to practice exclusive breastfeeding, compared to just 6% in the control group. A follow-up study carried out seven years later compared children in the experimental group with children in the control group, regardless of whether they had been exclusively breastfed. The study found a six point improvement in IQ, confirming the positive findings attributed to breastfeeding in numerous observational studies. Although observational studies control for confounding factors, experimental studies provide stronger evidence and are capable of identifying causal relationships.

“Disability-Adjusted Life Years” (DALYs) is an indicator that measures disease burden and reflects the total number of healthy years of life lost due to premature mortality and disability. Nutrition-related causes are responsible for 150 million DALYs in children under age five and represent 27% of the disease burden in children, as well as 8.5% of disease burden in the overall population (Black et al., 2008). However, DALYs do not reflect the long-term effects of malnutrition on human capital; thus, this indicator underestimates the importance of maternal and child malnutrition (Victora et al., 2008).

Poor health experienced at an early age leads to permanent disabilities that increase the risks of short stature in adulthood and having small babies, in addition to having adverse effects on cognitive development, academic performance and educational achievements. Poor intrauterine growth or subsequent growth during the first two years of life reduces economic productivity in adulthood. For this reason, size for age in children is the best indicator of future human capital. Maternal and child malnutrition is also related to the risk of chronic diseases in adulthood.

Children with poor growth during the first 1,000 days of life, who later experience rapid weight gain, have a greater risk of developing high blood pressure, diabetes, and metabolic and cardiovascular diseases in adulthood (Victora et al., 2008). There is no evidence showing that an increase in size and weight during the first two years of life (which can be achieved through effective programs) increases the risk of chronic diseases. Rather, it is likely that interventions that promote growth and nutrition in early life can reduce the incidence of these diseases (Victora et al., 2008).

The Lancet series on maternal and child malnutrition included a systematic analysis of the efficacy/effectiveness of 45 interventions that may address this type of malnutrition. Depending on the evidence, interventions were classified as appropriate for implementation in all countries, appropriate for implementation only in specific situations, having inconclusive or incomplete data, or lacking data or ineffective (Bhutta et al., 2008). The most promising interventions for reducing both the number of deaths and the disease burden were: promoting breastfeeding and appropriate complementary feeding practices; supplementing with vitamin A and zinc; managing acute malnutrition; and improving nutritional intake of the mother during pregnancy. Simulation exercises were conducted to calculate the short-term effects (over 4–5 years) of implementing the recommended nutrition interventions. Assuming universal coverage and analyzing data from the 36 countries that are home to 90% of the world's children of short stature, the study found that these interventions would reduce: mortality in children under age three by 25%; nutrition-related DALYs by 25%; and chronic malnutrition by 36%.

Many important challenges must be addressed at the national level in order to successfully implement programs with good quality and coverage (Bryce et al., 2008). Among them are identifying nutrition as a national priority; implementing evidence-based policies and interventions; scaling up program activities; reaching those in need; implementing good monitoring and evaluation systems; making decisions based on reliable and timely information; and strengthening strategic and operational capacity. The challenges at the national and/or regional level for nutrition experts include reviewing existing programs and strategies to ensure that interventions aimed

at reducing malnutrition in pregnant mothers and children under age two are assigned high priority, developing feasible strategies to promote public demand for such interventions; and implementing effective interventions that provide universal coverage. The needs of the public should be considered when addressing all these challenges, and interventions may vary, depending on local needs (Bryce et al., 2008).

The longitudinal study carried out by the Institute of Nutrition of Central America and Panama (INCAP) from 1969 to 1977, in four villages in Eastern Guatemala, and related follow-up studies have contributed to the global consensus on the short- and long-term importance of nutrition during the first 1,000 days of life, both for individuals and for society (Martorell et al., 2010). In this study, two villages received a nutritional supplement called 'Atole,' containing Incaparina (a dry mix of corn and soy flours), milk and sugar; the other two villages received a control drink called 'Fresco,' containing a small amount of sugar and flavoring. Both beverages contained several micronutrients, such as iron, vitamin A and some of the B complex vitamins. All four villages benefited from free medical services.

The results showed that compared with Fresco, consumption of Atole increased intakes of protein, calories, and several micronutrients, and significantly reduced chronic malnutrition. The effect over three years amounted to 3 cm in height, but the majority of this growth was achieved within 24 months. The study also showed that Atole did not have affect size after three years. It's worth noting that the increase in calories (~100 Kcal) and protein intake (~9 grams) is similar to that generally achieved by public health programs, either through supplementation or educational counseling.

In 1988–1989, when the subjects were between 11 and 26 years old, the first follow-up study was conducted on the group of subjects, whether they still lived in the original villages or had migrated to other villages or the capital. It found that the young people who had received Atole were taller and had more lean muscle mass; and the men had a greater capacity to work. The study also found that teens who had received Atole performed better on math, reading comprehension and vocabulary tests, and had more all-around knowledge, compared to the controls.

In 2002–2004, another follow-up study was done when the subjects were between 26 and 41 years old. Atole's effects on human capital were very robust, compared with Fresco, and included: an increase in schooling of 1.2 years; improved school attendance and a greater likelihood of completing primary school; and reduced grade-level repetition among women. Also, both men and women improved their reading performance by 17%, and IQs increased by 8% (Maluccio et al., 2009). The most important findings of the study relate to income in men; it found that men exposed to Atole within the first 24 months of life earned hourly wages 46% higher than those who had had Fresco, amounting to an annualized increase of US\$ 914. This effect was not observed in women, probably because very few were employed in the labor market (Hoddinott et al., 2008). Generational effects were also observed. The children of women who were exposed to Atole during childhood (compared to Fresco) grew better: weighed more at birth, and had greater length and head circumference sizes (Behrman et al., 2009). Finally, the nutrition intervention provided a small, but measurable, degree of protection against the risk factors for cardiovascular diseases, in particular with regard to glucose levels (Stein et al., 2006).

The so-called 'natural experiments' also point to the importance of nutrition in early life. In 1959–1961,

China was ravaged by a famine, associated with the policies of Mao's Great Leap Forward campaign, which killed somewhere between 30 to 60 million people. Studies comparing the survivors who were exposed to the famine during the window of opportunity in the first 1,000 days of life, with those who were older when the famine struck, or who were born after the famine, revealed very similar, although opposite, effects, compared to the INCAP follow-up studies: a reduction of 3 cm in adult size, and a reduction of annual per capita income of around 33% (Chen and Zhou, 2007). Another study shows that exposure to the famine during early life increased the risk of obesity and hypertension (Huang et al., 2010).

Maternal and child malnutrition has serious consequences in the short, medium and long term. In the short term, it lowers resistance to infection and increases the mortality risk. In the medium and long term, it reduces human capital development, lowers incomes and leads to higher risks for chronic diseases. The cost of maternal and child malnutrition is difficult to calculate in Guatemala, but the Economic Commission for Latin America and the Caribbean (ECLAC) and the World Food Programme (WFP), have tried (Martinez and Fernandez, 2007). In 2004, malnutrition cost the country US\$ 3.1 billion, equivalent to 11.4% of GDP, and 185% of social spending.

BREASTFEEDING PROTEINS GRO BIRTH NUTRITION VITAMINS FEEI 1 MICRONUTRIENTS GROWTH MINERALS BREASTFEEDING PROTEINS GROWTH BIRTH NUTRITION VITAMINS FEEDING

OBJECTIVE & SOURCES OF INFORMATION

The aim of this study is to identify the causes of malnutrition in Guatemala and discuss recent changes in this regard in comparison with other similar countries. It focuses on nutrition problems affecting children under age two and pregnant women. It also contains specific recommendations for public policy and interventions necessary to set the stage for a policy dialogue on improving the nutritional and health status of the Guatemalan population.

The study is based on: i) interviews conducted in Guatemala, Panama and Washington of government officials, specialists from bilateral and multilateral agencies, staff

from non-governmental organizations (NGOs), researchers and academics, and experts from the Inter-American Development Bank (IDB); ii) articles from scientific journals as well as government documents and other grey literature; and iii) data from the Guatemalan National Survey of Maternal and Child Health (ENSMI, according to its Spanish acronym). Statistical tests were not performed on the national survey data. Since the sample size is so large, p (probability) values would have been significant in most cases. Thus, performing statistical analyses would not have been useful. Rather, levels of importance and differences between values should be assessed from a general public health standpoint.

BREASTFEEDING PROTEINS GRO BIRTH NUTRITION VITAMINS FEE 2 MICRONUTRIENTS GROWTH MINERALS BREASTFEEDING PROTEINS GROWTH BIRTH NUTRITION VITAMINS FEEDING

THE STATE OF NUTRITION IN GUATEMALA

This chapter describes the current state of nutrition in Guatemala and outlines the main nutrition problems found in the most recent national survey (the 2008/2009 ENSMI).

Chronic Malnutrition, acute malnutrition and overweight in children under age 5

Recent WHO standards were used to assess growth patterns (WHO, 2006a). The WHO standards were developed following an ambitious and rigorous multi-national study in six countries: India, Oman, Ghana, Norway, Brazil and the United States. Rather than using representative samples from these countries, which would have included malnourished and/or obese children, the study focused on measuring optimal growth in order to produce a standard that would more accurately reflect the nutrition status of individuals and populations. Researchers used a prescriptive approach, selecting families with healthy lifestyles and good economic prospects. The study only included families that followed WHO recommendations with regard to breastfeeding and complementary feeding. It also sought households that were smoke-free, had good access to water and sanitation, and where the children had received optimal healthcare, including all recommended vaccines. Only families who met all these conditions throughout the duration of the study were included in the final sample.

The study found only minor differences in physical growth among countries. Therefore, the study data was combined to create the current standards. The WHO study contributes to the scientific evidence showing that preschool-age children have similar growth potential, regardless of ethnicity. In the case of Guatemala, where indigenous and mixed-race populations form the majority, it is worth

noting that Mexican children under age five living in the United States, who are ethnically similar to Guatemalans, do not differ from American children of European origin in terms of physical growth patterns and height (Martorell et al., 1989).

Low height for age (stunting) is the indicator commonly used to evaluate chronic malnutrition in preschool-age children (see Table 1). About half of Guatemalan children under age five are of short stature or suffer from chronic malnutrition, a figure exceeded by very few countries: Afghanistan, Yemen, East Timor, Malawi, Ethiopia, Rwanda, and Madagascar (UNICEF, 2011b).

According to the 2008/2009 National Survey of Child and Maternal Health, 49.8% of Guatemalans are chronically malnourished, exceeding the national averages found in Africa, Asia and Latin America and the Caribbean (see Figure 1). Guatemala is among the countries with the highest prevalence of chronic malnutrition in the world; and it has the highest prevalence of any country in the Americas, including Haiti.

The pattern seen with stunted growth in the first 1,000 days of life (from pregnancy until age two) is the same in many poor countries, not just Guatemala (Victoria et al., 2010). Figure 2 shows the similarities between Guatemala and India (panel A). The greater than 20% prevalence of stunting in the first six months of life is largely a function of intrauterine growth delays. Later, stunting prevalence increases sharply through two years of age. After year two, prevalence stabilizes or declines slightly. Cohort studies show that the first 1,000 days of life account for the only period of delayed growth in developing country populations. After that period, children in these countries partially catch up to their counterparts in other countries, in part due to

the delayed onset of puberty and a prolonged period of growth (Stein et al., 2010). However, short stature seen in adults in poor countries, such as among the indigenous peoples of Guatemala, stems from growth delays in the first 1,000 days of life. Interventions aimed at preventing chronic malnutrition and its consequences must occur during the first 1,000 day window of opportunity, not later.

The prevalence of chronic malnutrition among children ages 0 to 59 months is the same in India and Guatemala, 48% (Figure 2, panels A and B). However, there are differences with regard to acute malnutrition (Figure 2, panels A and B). Wasting is the indicator that is commonly used to describe acute malnutrition (Table 1). Guatemala has very low prevalence of wasting (1.1%) while India's prevalence is very high at 19.8%. Children age 12–17 months have the highest prevalence in Guatemala (3.7%), while in India, the highest prevalence is among children under 6 months of age (about 30%). This is reflected in the physical appearance of children in these countries. In Guatemala, children are small but well-proportioned; while in India, they are very thin. The clinical signs of acute malnutrition—characteristics of marasmus

and kwashiorkors—are very common in the India, but very rare in Guatemala.

By definition, 2.3% of the reference population falls below the cut-off point at -2 standard deviations (below the mean). Similarly, 2.3% of the reference population also surpasses the threshold for $+2$ standard deviations above the mean. This does not imply that 2.3% of the children in the WHO study suffered from chronic or acute malnutrition; rather, it just indicates that the data observed in Guatemala and India are not usually found in countries with a normal distribution. If rates of chronic or acute malnutrition of 2.3% were reported in a healthy population, such as in the Nordic countries, it would not be a concern. The logical conclusion would be that such cases are probably false positives, although the recommendation would be to investigate further to verify their normality. However, the finding that 48% of children in Guatemala and India are chronically malnourished clearly indicates the existence of a major public health problem. The fact that India has an almost 20% rate of acute malnutrition is also alarming, while Guatemala's acute malnutrition rate of 1% is lower than expected for all age groups other than children ages 12 to 17 month,

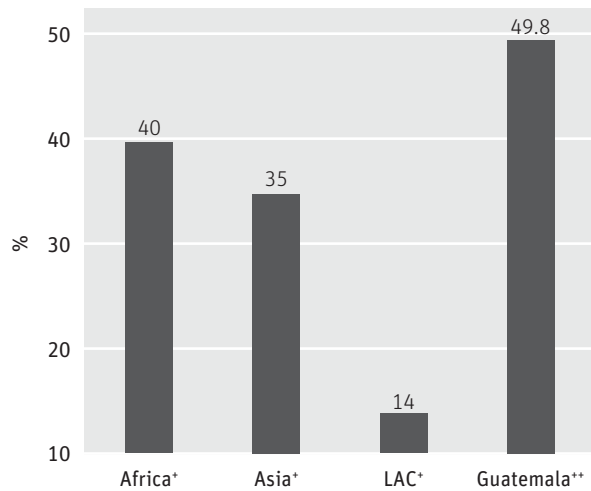
TABLE 1. Definitions of anthropometric indicators in children and women

Indicator	Measures	Definition
Stunting (low height for age) in children < age 5	Chronic malnutrition, growth delays	Height for age < -2 standard deviations (SD) of the WHO Child Growth Standards median
Wasting (low weight for height) in children < age 5	Acute malnutrition	Weight for height < -2 SD of the WHO Child Growth Standards median
Underweight (low weight for age) in children < age 5	Overall malnutrition	Weight for age < -2 standard deviations (SD) of the WHO Child Growth Standards median
Low birthweight	Poor intrauterine growth	<2500 g
Overweight in children < age 5	Overweight, obesity	Weight for height > $+2$ SD of the WHO Child Growth Standards median
Short stature in women	Chronic malnutrition in childhood, risk for complications during pregnancy	<145 cm
Underweight in mothers	Wasting	BMI <18.5
Overweight	Overweight	BMI 25.0–29.9
Obesity	Obesity	BMI ≥ 30

SD = Standard deviation
 BMI = Body mass index (Weight in kg divided by height in cm, squared; Kg/cm²)

FIGURE 1

Stunting (chronic malnutrition) in children < age 5, by region and in Guatemala (%)



* Source. The State of the World's Children 2011. UNICEF.
 ** Official data from the MSPAS, based on the 2008 National Survey of Maternal and Child Health (ENSMI-2008/09). This data was compiled for children ages 3–59 months. Including infants ages 0–2 months lowers the figure slightly to 47.9%.

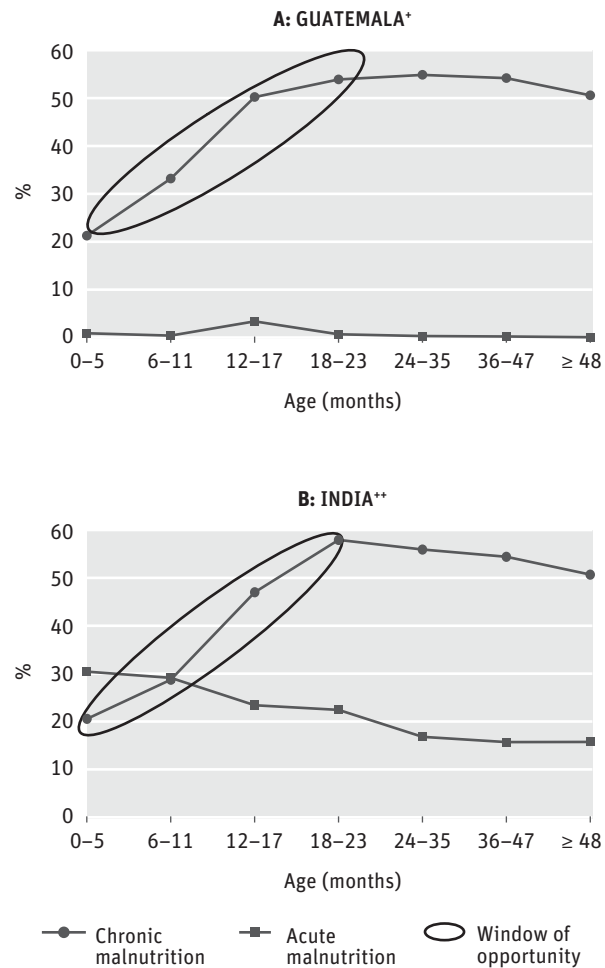
which slightly exceeds expectations (Figure 3). On the other hand, equally concerning is that the percentage of overweight children exceeds expectations, particularly at 0–5 months, when it is as high as 16.5% (Figure 3). Thus, chronic malnutrition is a serious public health problem in Guatemala, while acute malnutrition is not. More information is needed on the body composition of newborns in Guatemala, as well as its determinants and functional consequences, in order to determine whether overweight in infants represents a public health problem. As mentioned in the introduction, overweight in children over age two is a known public health problem, particularly in the context of the high prevalence of stunting in the first 1,000 days of life.

The Guatemalan mother: short and obese

The nutrition situation of Guatemalan children reflects the environment, including the characteristics of their mothers. Guatemalan mothers (ages 15–49) are of short

FIGURE 2

Chronic malnutrition in Guatemala (Panel A, ENSMI 2008/09) and India (Panel B, FHW-2005/06)

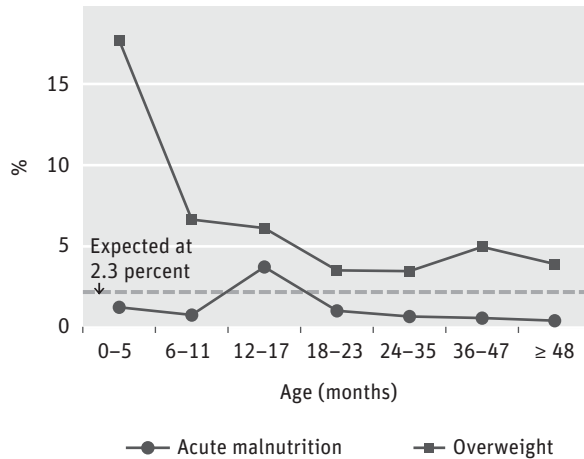


* MSPAS, 2008 National Survey of Maternal and Child Health (ENSMI-2008/09). Ministry of Public Health and Social Assistance (MSPAS)/National Institute of Statistics (INE)/Centers for Disease Control and Prevention (CDC). Guatemala (2010).
 ** Analysis of the 2005-2006 India National Survey (National Family Health Survey).

stature, obese and anemic (see section 2). Their height averages 148 cm, and 31% are shorter than 145 cm, and are therefore at increased risk for complications during childbirth; this stems from their being chronically malnourished as children. Among other things, having a mother of short stature limits intrauterine growth in infants and is a risk factor for low birthweight (UNICEF/WHO, 2004). Similarly, children's height during first

FIGURE 3

Acute malnutrition and overweight in children under age 5 in Guatemala (ENSMI–2008/09). By definition, 2.3% of the reference population falls above and below the cut-off point for ± 2 standard deviations from the mean, according to the WHO standard.*



* MSPAS, 2008 National Survey of Maternal and Child Health (ENSMI–2008/09). Ministry of Public Health and Social Assistance (MSPAS)/National Institute of Statistics (INE)/Centers for Disease Control and Prevention (CDC). Guatemala (2010).

grade indicates whether they were chronically malnourished in early life and thus, has been used to identify municipalities where chronic malnutrition was common (Delgado, 2010a).

Overweight and obesity affect half of Guatemalan women (Figure 4). While this figure is alarming, it can be compared with the 64% of women over age 20 in the United States, and 76% of the Latina population who are overweight or obese (Flegal et al., 2010). The indicator for acute malnutrition in adults is underweight, defined as having a body mass index lower than 18.5 (Table 1). In Guatemala, 1.6% of women are underweight, (Figure 4), compared with 40.3% in India (2005/2006 data). It's not surprising that children in India and Guatemala mirror the characteristics seen in their mothers: chronically malnourished yet overweight in Guatemala; and both chronically and acutely malnourished in India. Maternal obesity and overweight exposes the fetus to altered metabolism and high blood glucose levels, which increases the risk

for gestational diabetes and lead to increased body fat deposits (Dabelea et al., 2005; Herring and Oken, 2011). However, when this occurs in mothers with short stature, linear growth is reduced and instead, babies become overweight.

Anemia in mothers and children

The Guatemalan diet is excessively high in energy (calories); particularly in terms of consumption of sugar and other simple carbohydrates; fat and oil consumption is also on the rise (Hidalgo and García, 2008). One of the myths surrounding the hunger problem in Guatemala is that people need to eat more. It is not a question of eating more, but rather, eating better. The problem with the diet is its quality, measured by the density of nutrients in relation to energy. This means that Guatemalans meet or exceed their energy needs, but not their needs for many nutrients, such as iron, zinc, and vitamins A, D, C, folate and B12. In one of the few studies that examines the nutrition transition problem in Guatemala in detail, Hidalgo and García (2008) underscore how people in rural areas consume pasta or noodles in place of beans, which have become scarce and expensive. The authors also say that the rural diet:

Includes frequent consumption of junk food, fried foods and sweets, with high chemical contents—to preserve color, odor, taste and consistency and to provide a longer shelf-life—but questionable nutritional value. On the other hand, qualitative studies on the diversity of the diet in rural areas in the Eastern part of the country, have found that the only food that is consistently present in the diet is corn. The second most commonly eat foods are fats and sugars, while beans and junk food tied for third place (Hidalgo and García, 2008, p.30).

Anemia is defined as a low concentration of hemoglobin in the blood; and although its causes include both nutritional deficiencies and parasitic infections, in general it reflects diet quality. Anemia prevalence in the ENSMI survey was determined from capillary blood samples taken using the Hemocue method in children ages 6 to 59 months (infants under 6 months were excluded) and in women ages 15 to 49 (MSPAS, 2010). Criteria from the

US Centers for Disease Control and Prevention (CDC) were used, after adjusting for altitude (CDC, 1998), which varied according to physiological status in women and age in children. Data from the 2008/2009 ENSMI indicate that anemia prevalence in non-pregnant and pregnant women is 21.4% and 29.1%, respectively. The consequences of maternal anemia include low iron stores in the newborn, increased morbidity and mortality in newborns and mothers, and increased risk of preterm delivery and low birthweight, among others (Stoltzfus, 2011; Dibley et al., 2012; Zeng et al., 2008; Imbad and Bhutta, in press). Anemia prevalence in children ages 6 to 59 months is 47.7%, and the highest values were observed in the youngest children (Figure 5). Infants depend on iron stores deposited in the liver during the intrauterine period, as breast milk is physiologically low in this nutrient (Stoltzfus, 2011). Anemia in children interferes with learning, cognitive development and behavior, and its effects may be irreversible (Walker et al., 2011).

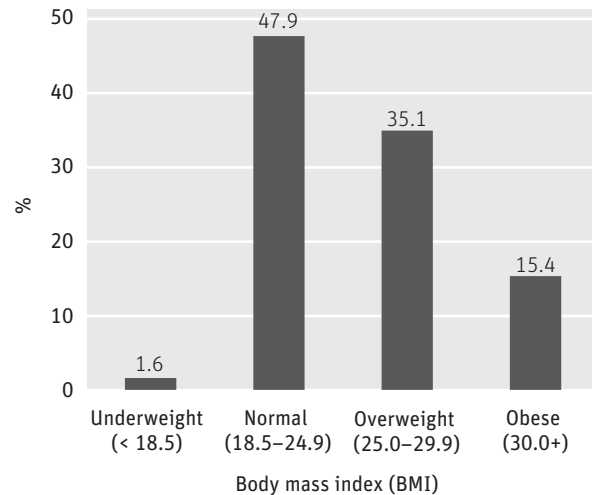
Vitamin A and other micronutrients

The 2008/2009 ENSMI did not measure serum retinol to calculate vitamin A deficiency levels. Historically, vitamin A deficiency was a problem in Guatemala, which INCAP addressed through the fortification of sugar with vitamin A. Data and results from the 2009/2010 micronutrient survey are not yet available. A recent press release (Vásquez, 2011) provided the following information: “vitamin A deficiency in children under age five has declined to 1.3%, meaning it has been virtually eradicated in Guatemala, said Victor Mayén during the unveiling of the 2009/2010 National Micronutrient Survey (Enmicron).” This is good news, but the possibility of excess consumption also exists and must be assessed. Serum retinol levels should be measured and assessed to determine clinical evidence indicates excess consumption. The vitamin A sugar fortification program should be reviewed, since fortification levels may need to be reduced due to the substantial increase in sugar consumption in recent years (Fiedler and Helleranta, 2010). At the same time, the ongoing practice of giving children under age 5, massive doses of vitamin A should be re-examined.¹

¹ The 2009/2010 Enmicron Survey also contains valuable information on other micronutrients, such as iron, folate and vitamin B12.

FIGURE 4

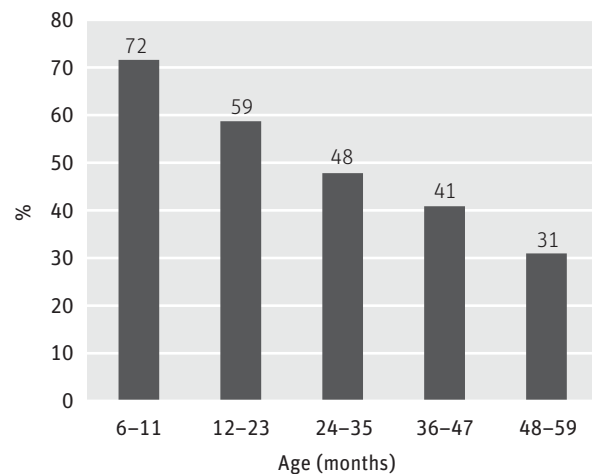
Distribution of body mass index in non-pregnant Guatemalan women, ages 15–49 (ENSMI–2008/09)*



* MSPAS, 2008 National Survey of Maternal and Child Health (ENSMI–2008/09). Ministry of Public Health and Social Assistance (MSPAS)/National Institute of Statistics (INE)/Centers for Disease Control and Prevention (CDC). Guatemala (2010).

FIGURE 5

Anemia in children ages 6 to 59 months in Guatemala (ENSMI–2008/09)*



* MSPAS, 2008 National Survey of Maternal and Child Health (ENSMI–2008/09). Ministry of Public Health and Social Assistance (MSPAS)/National Institute of Statistics (INE)/Centers for Disease Control and Prevention (CDC). Guatemala (2010).

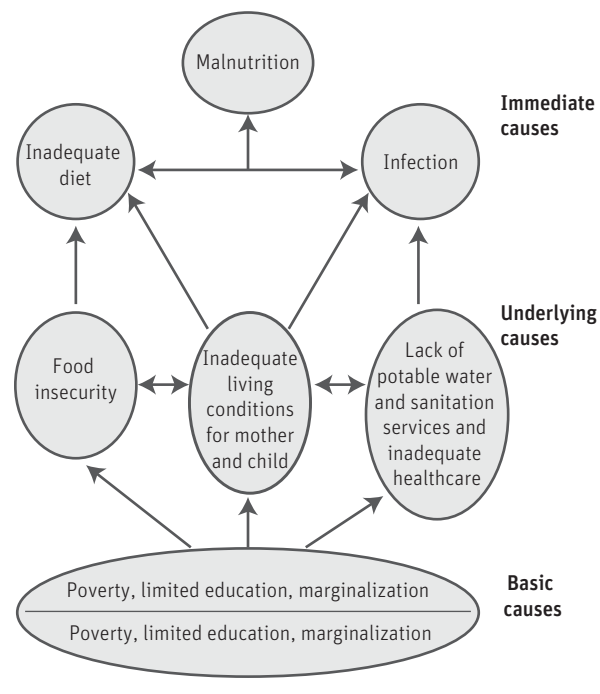
THE CAUSES OF MALNUTRITION

The conceptual framework developed by UNICEF identifies immediate, underlying and basic causes of malnutrition (Figure 6). The interaction between a poor diet, whether due to food quantity or quality, and infection, is an immediate factor which limits nutrient availability at the cellular level and interferes with growth (Black et al., 2008, Martorell et al., 1975). Infections have a high nutritional cost; the immune response required to fight them has a substantial metabolic cost, and diarrhea decreases nutrient absorption. Even asymptomatic infections reduce appetite (Martorell et al., 1980). As such, infections and diarrhea, in particular, are a major cause of chronic malnutrition. In Guatemala, studies have shown that the negative effect of diarrhea on growth was eliminated in children who received Atole, a nutritional supplement containing Incaparina (a dry mix of corn and soy flours) and milk, but not in those who did not receive the supplement. (Martorell et al., 1990).

According to the 2008 / 2009 ENSMI, 22.5% of mothers or caregivers of children under age five reported that the children had had diarrhea in the two weeks prior to the survey; surprisingly, this proportion varied little between urban and rural areas, and between indigenous and non-indigenous groups. However, there were important differences according to age, socio-economic quintile and maternal education. Among children under 6 months of age, 19.1% suffered from diarrhea, while among children ages 6 to 11 months, and ages 12 to 23 months, the respective proportions were 32.2% and 34.9%. Diarrhea prevalence was only lower in mothers with high levels of education (Figure 7). A similar trend was observed in the relationship between diarrhea and socio-economic quintile: the highest quintile

FIGURE 6

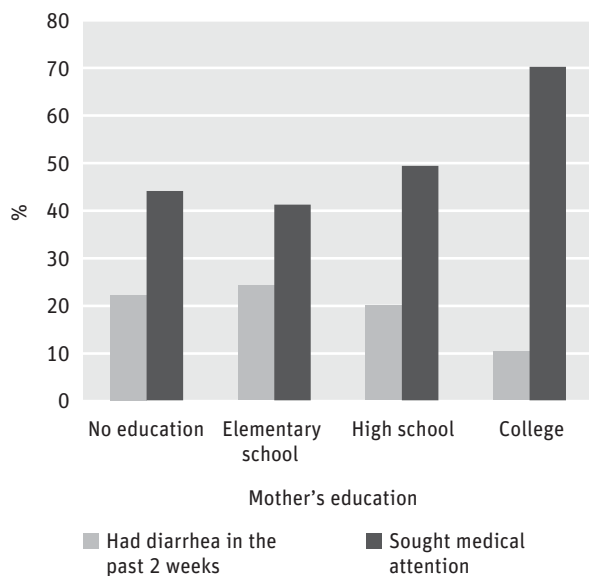
The causes of malnutrition (adapted from UNICEF's conceptual framework)



was considerably healthier than the bottom four quintiles (MSPAS, 2010). Nationwide, families sought medical care for 44% of diarrhea cases. Maternal education, particularly at the college level, influenced the demand for healthcare services. While children from families with the most highly educated mothers represented only 10% of diarrhea cases, 70% of those consulted healthcare professionals (Figure 7).

FIGURE 7

Percentage of children under age 5 who had experienced diarrhea in the past 2 weeks, by education level of the mother*



* MSPAS, 2008 National Survey of Maternal and Child Health (ENSMI-2008/09). Ministry of Public Health and Social Assistance (MSPAS)/National Institute of Statistics (INE)/Centers for Disease Control and Prevention (CDC). Guatemala (2010).

International agencies report that most of the population has access to water and sanitation services, which does not explain the diarrhea rates reported above. In 2008, UNICEF (2011b) reported that 94% of the population had access to an improved water supply, including 98% in urban areas and 90% in rural areas; while 81% had access to improved sanitation services, including 89% in urban areas and 73% in rural areas. However, those definitions are very broad. An “improved” water supply may range from having domestic or community connections, to access to protected wells or rainwater collection facilities; while “improved” sanitation may be anything from having simple latrines to flushable toilets. The ENSMI used stricter definitions and reported that 57% of the population had access to “a piped drinking water supply” in 2008 / 2009. Surprisingly, a smaller percentage of urban residents had access to such services as compared to rural residents, comprising a respective 53% and 61%. On the other hand, only 40% of the overall population had access to a toilet connected to the sewer system, including

73% of respondents in urban areas and only 11% in rural areas (MSPAS, 2010). Even this “enhanced” infrastructure does not guarantee that fecal contamination will not occur in water or food preparation. Infrastructure investments must be complemented by education on hygiene and hand washing, which is associated with higher levels of income and education. A study in Guatemala found that the positive effect of water and sanitation infrastructure on growth and height is dependent on the level of maternal education and household income (Poder and He, 2011).

Extremely poor breastfeeding and complementary feeding practices represent a serious and little-recognized problem, worldwide. Recent research has called attention to the lack of available information on the coverage and quality of interventions aimed at improving such practices (Lutter et al., 2011). The situation in Guatemala is as alarming as it is elsewhere. Despite the fact that 96% of children breastfeed at some point in their lives, only 56% started breastfeeding within one hour after birth, and only 79% began on the first day of life. Only 55% of children ages 0 to 3 months breastfeed exclusively, and among children ages 4 to 6 months, the rate is just 8.5% (Table 2). This explains the high prevalence of diarrhea in children under 6 months of age.

The underlying causes include food insecurity, inadequate living conditions of mother and child, and a lack of water and sanitation services, as well as good quality health services. The basic causes are a reflection of the social, economic and political context, and include low education levels, poverty and marginalization, in regard to both a lack of access to services, as well as a lack of opportunities for improving living conditions. Complementary foods in Guatemala are insufficient for meeting the nutritional needs of young children; they are also likely to have come into contact with microbiological contaminants. It is not a coincidence that diarrhea is most common in children ages 6 to 23 months.

Table 3 shows the prevalence of nutrition-related health concerns among children and mothers, by socio-economic quintile and ethnicity. Chronic malnutrition and short stature in mothers is very closely related with socio-economic quintile. For example, more than 70% of children in the poorest quintile are chronically malnourished,

TABLE 2. Breastfeeding in children under age 2 ^{+,**}

Age in months	Do not breastfeed	Breastfeed exclusively	Receive breast milk and complementary foods and/or fluids				Total
			Water	Other fluids	Milk formulas	Complementary Foods ^{***}	
Age group							
0–3	4.2	55.6	6.0	14.9	15.8	3.5	100.0
4–6	8.5	33.0	6.1	8.8	6.1	37.5	100.0
7–8	13.2	6.7	1.2	2.6	0.7	75.6	100.0

+ Percent of surviving sons and daughters under age 2, by breastfeeding status in the 24 hours prior to the survey, according to selected characteristics. ENSMI-2008/2009.

** MSPAS, 2008 National Survey of Maternal and Child Health (ENSMI-2008/09). Ministry of Public Health and Social Assistance (MSPAS)/National Institute of Statistics (INE)/Centers for Disease Control and Prevention (CDC). Guatemala (2010).

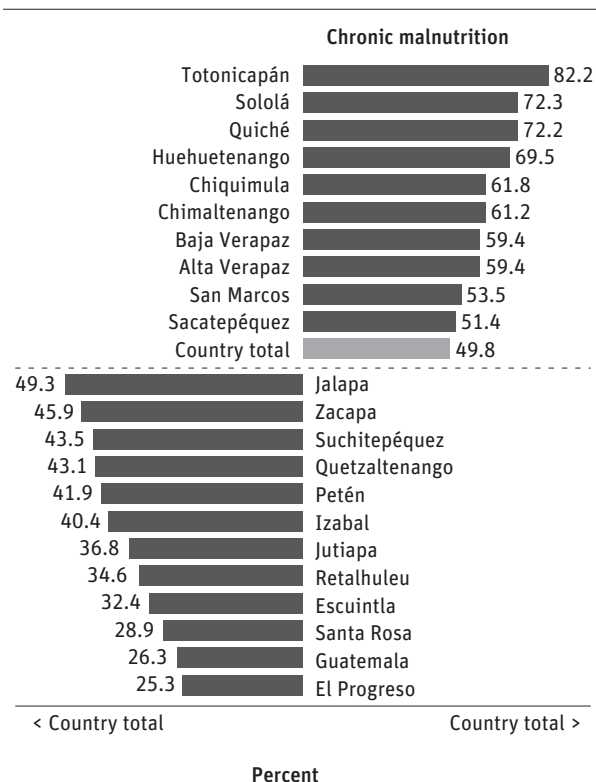
*** Including foods such as cereals, fruits/vegetables, eggs, meat, beans, tortillas, bread.

compared with just 14% in the richest quintile; and 66% of indigenous children suffer from chronic malnutrition, compared with 36% of non-indigenous children. The Departments in Guatemala's indigenous highlands have the highest prevalence of chronic malnutrition (Figure 8). In the Northwestern region, prevalence of chronic malnutrition is 70.8%, while at the other end of the country, prevalence in the metropolitan region is 26.3%. Acute malnutrition is lower than expected according to WHO standards in all socio-economic quintiles. Quintile 3 has the highest prevalence, at 1.9%; while the lowest prevalence of 0.7% is observed in Quintile 5 (Table 3). In mothers, underweight (BMI<18.5) is not related to poverty; curiously, the highest rate (3.0%) is in the richest quintile. There is slightly more acute malnutrition in non-indigenous mothers (1.5%) than in indigenous mothers (1.3%). Overweight in children has little relationship to poverty and is slightly higher among indigenous children. In women, the prevalence of overweight and obesity is very high in all income quintiles, but is highest in the richest quintile. Anemia in women and children, and obesity in women, are widespread, although lower levels occur in the richest quintile. Anemia prevalence in indigenous children of 49.5% is slightly higher than prevalence in non-indigenous children (46.3%). In women, anemia prevalence is also a little higher in the indigenous population.

In short, chronic malnutrition and short stature in women are closely related with poverty and ethnicity. There is also a relationship, although of lower magnitude, between

FIGURE 8

Chronically malnourished (stunted) children ages 3–59 months, by Department (percent)⁺



⁺ MSPAS, 2008 National Survey of Maternal and Child Health (ENSMI-2008/09). Ministry of Public Health and Social Assistance (MSPAS)/National Institute of Statistics (INE)/Centers for Disease Control and Prevention (CDC). Guatemala (2010).

TABLE 3. Nutrition-related health conditions in children ages 3 to 59 months and women ages 15 to 49, by socioeconomic quintile and ethnicity (ENSMI, 2008/2009)

Socioeconomic Quintile	Children (3–59 months)+				Women (ages 15–49)				
	Chronic malnutrition	Acute malnutrition	Overweight	Anemia	Height <145 cm	BMI <18.5	Overweight and obesity (BMI ≥25)	Anemia Not Preg	Anemia Preg
1 (poorest)	70.2	1.4	3.4	50.7	46.9	1.4	36.7	27.9	29.9
2	59.7	1.4	3.8	51.4	36.3	1.4	48.0	25.1	37.8
3	43.8	1.9	3.8	46.2	29.8	1.4	54.7	16.7	28.1
4	25.5	1.2	5.0	43.2	18.6	1.4	60.8	17.6	20.6
5 (richest)	14.1	0.7	6.1	39.8	10.2	3.0	61.0	14.7	20.2
Ethnicity									
Indigenous	65.9	1.3	5.1	49.5	48.3	0.7	46.8	24.9	32.2
Non-indigenous	36.2	1.5	4.9	46.3	19.0	2.2	53.2	19.0	26.6

+ Only children ages 3–59 months were included
 BMI = Body mass index
 Not Preg = not pregnant
 Preg = Pregnant

poverty and ethnicity, and anemia in mothers and children (more so in poor and indigenous people), as well as overweight and obesity in women (less so in poor and indigenous people). Acute malnutrition, overweight in children, and underweight in mothers, are unrelated to poverty or ethnicity.

The appendices show the relationships between nutritional status and a variety of factors: urban and rural residence, region, department, ethnicity, level of education, socio-economic quintile, age, gender, birth order, and time elapsed between pregnancies (Tables A1 to A10). Chronic malnutrition is slightly more common in children (50.5% vs. 49.0%); and it is higher than 60% in children with birth orders of four and higher. Time intervals of fewer than 48 months between pregnancies are an equally important risk factor.

The relationship among poverty, education, and early sexual activity is complex. The median age for first intercourse in 2008/2009 was 19.4 years, which is older than the age observed in 1987, 18.6 years. The median age of first sexual contact was 18.3 years in 2008/2009, compared to 18.4 years in 1987. The median age for having one’s first child was 20.5 years in 2008/2009, although non-indigenous women were slightly younger

than indigenous women when their first child was born: 20.0 versus 20.8. However, the median age for having one’s first child was significantly higher in women with higher education (27.1 years) and in the highest socio-economic quintile (23.2 years). In 2008/2009, 6% of women reported dropping out of school to get married or have a relationship, and 2.8% reported doing so due to pregnancy. The corresponding numbers for women who reported dropping out of college were considerably higher: 11.2% and 5.4%, respectively. The percentage of women reporting having their first child before age 18 was 23.5%. Having a child before age 18 increases the risk of having a low birthweight baby (UNICEF/WHO, 2004). In addition, mothers who were themselves born with a low birthweight are at higher risk for having low birthweight children (Farina et al., 2010; Klebanoff et al., 1997). Research shows that the risk of chronic malnutrition is between 25% and 50% higher in the children under age three whose mothers were under age 20 at the time of the ENSMI survey (whether they participated in 1987, 1995, or 1988/1989), compared to those whose mothers were between 20 to 35 years of age (Martorell et al., 2002). These findings showcase the need to include a family planning component in maternal and child health programs aimed at eradicating chronic malnutrition.

BREASTFEEDING PROTEINS GRO BIRTH NUTRITION VITAMINS FEE 4 MICRONUTRIENTS GROWTH MINERALS BREASTFEEDING PROTEINS GROWTH BIRTH NUTRITION VITAMINS FEEDING

EVOLUTION OF NUTRITION CONCERNS IN GUATEMALA

Mortality in children under age 5

In 1970, the mortality rate in Guatemala for children under age five was very high: 165 deaths per 1,000 live births (UNICEF, 2011b). Since then, mortality has continuously declined. Twenty years later, in the years 1990, 2000 and 2009, the respective numbers were 76, 48 and 40 per 1,000. However, every other country in Central American had a lower rate than Guatemala in 2009: Costa Rica, 11; El Salvador, 17; Panama, 23; Nicaragua, 26; and Honduras, 30. These figures reflect the coverage and quality of health services, immunization and disease control programs, as well as the level of malnutrition in each country.

Chronic malnutrition

Fortunately, frequent national surveys in Guatemala provide information showing how chronic and acute malnutrition have evolved over time. In 2009, a group of researchers published a monograph on the Central American Regional Program for Nutrition and Food Security (PRESANCA, according to its Spanish acronym), which uses a uniform methodology to assess all available surveys (Palmieri et al., 2009). The monograph followed WHO standards and included all children ages 0–59 months, except in 1987, when the survey only measured children under 36 months (Table 4). The PRESANCA study did not include the 2008/2009 ENSMI

TABLE 4. Evolution of chronic and acute malnutrition in Guatemala (data from 1966 to 2002, Palmieri et al., 2009)

Survey	Chronic malnutrition ⁺			Acute malnutrition ^{**}		
	Indigenous	Non-indigenous	Total	Indigenous	Non-indigenous	Total
1966	–	–	63.5	–	–	3.6
1987 ⁺⁺⁺	76.0	52.5	62.2	1.9	2.8	2.4
1995	72.3	42.8	55.5	3.7	3.9	3.8
1998	72.8	41.1	52.8	2.4	3.2	2.9
2000 ^{****}	65.2	38.8	51.1	3.5	3.1	3.3
2002	74.8	40.9	54.5	1.8	1.9	1.8
2008/2009	65.9	36.2	47.9	1.0	1.1	1.1

+ Stunting < –2 SD

++ Wasting < –2 SD

+++ 1987 ENSMI survey included only children ages 0–36 months. Surveys in all other years include children ages 0–59 months.

**** ENCOVI Survey.

data, which we have since added to the database. The 1966 Regional Food and Nutrition survey showed that 63.5% per cent of children under age five suffered from chronic malnutrition. Unfortunately, ethnicity was not included in this survey. In 1987, 62.2% of Guatemalan children suffered from chronic malnutrition, including 76.0% of indigenous children and 52.5% of non-indigenous children. Since children ages three to five years were not included in the 1987, unlike in all the subsequent surveys, prevalence of chronic malnutrition was underestimated in that year. However, data from 1966 and 1987 suggest that in the 1970–1990 period, while mortality in children under age five declined to less than half the 1970 rate, prevalence of chronic malnutrition remained very high. Differences in prevalence between the surveys done in 1987 and 1995, suggest major progress was achieved during those 8 years in the non-indigenous population (–9.7 percentage points [pp] in the non-indigenous group, compared to –3.7 in the indigenous group, or a respective –1.2 and –0.5 pp/year). Since the 1987 figures were underestimated, progress was likely even greater.

How the evolution of chronic malnutrition since 1995 is interpreted depends on how much emphasis is given to the 2000 Living Conditions Survey (ENCOVI, according to its Spanish acronym), which used a different methodology than the ENSMI. Other analyses have found that the 2000 ENCOVI contains lower quality anthropometric data: one standard deviation higher for the z-scores for height, a lower percentage of cases with available anthropometric information, and differences in the characteristics of cases that had or did not have anthropometric data. Due to these shortcomings, we decided to discard the 2000 ENCOVI data; and we only used the ENSMI surveys to assess chronic malnutrition trends (Martorell et al., 2002). In addition, the changes reported in these years (1998, 2000 and 2002) were pronounced, particularly in the case of the indigenous group, and unlikely to have occurred in such a short timeframe. Further, the most erratic data seems to be that reported in 2000. Discarding the ENCOVI 2000 survey, it can be said that there was a period of stagnation between 1995 and 2002; and that improvements were observed between 2002 and 2008/2009, particularly in the indigenous population. In the latter period, the country as a whole improved from 6.6 to 1.0

pp/year. In the indigenous group, the absolute change was from –8.9 to –1.4 pp/year; while in the non-indigenous group, it was from –4.7 to –0.7 pp/year. In other words, the gap in chronic malnutrition between ethnic groups began to diminish in 2002, but there is still much work to do. While in 2002, the difference in prevalence favored non-indigenous groups by 33.9 pp, it was only slightly reduced—to 29.7 pp—in 2008–2009.

Acute malnutrition

Acute malnutrition has always been very low in Guatemala, and similar between the indigenous and non-indigenous groups. Using WHO standards, acute malnutrition declined from 1.8% to 1.1%, between 2002 and 2008 / 2009 (Table 4).

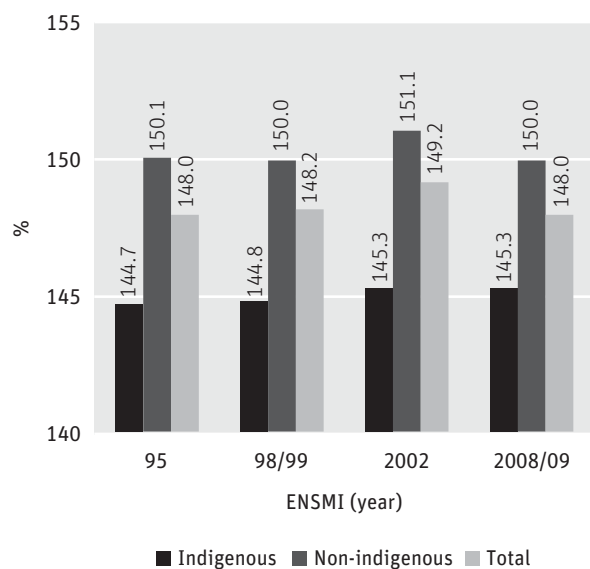
Mothers' height

Height in adulthood reflects nutrition status (including chronic malnutrition) in childhood, decades earlier. Considering the age range (15–45) used in the survey, the fact that mothers' height is very short and did not change between 1995 and 2008/2009, tells us that the determinants for chronic malnutrition remained static for decades (Figure 9). In addition, no improvements were observed in the gap of just over 5 cm between ethnic groups.

Anemia

ENSMI data on anemia from 2002 and 2008/2009 show an alarming increase in prevalence in children ages 6–59 months, from 39.7% to 47.7% (Table 5). This decline seems to have occurred in all social groups and regions. For example, prevalence in urban areas increased from 35.2% to 46.2%; while rural areas saw an increase from 41.8% to 48.6%. A less pronounced change in anemia status occurred in women, with an improvement seen in non-pregnant women (Table 6). In pregnant women, there was a mild increase in anemia, from 20.2% to 21.4%; however, in non-pregnant women, the change was more dramatic, declining from 22.1% to 9.1%.

FIGURE 9

Evolution of Guatemalan mothers' height (cm)**Overweight and obesity in women**

Overweight and obesity are rapidly increasing among women, especially indigenous women (Figure 10). Between 1995 and 2008/2009 (some 13 to 14 years), overweight and obesity increased from 28% to 47% in indigenous women, and from 38% to 53% in non-indigenous women. Like anemia in women and children, obesity is already a widespread problem in Guatemala; anemia and obesity are a problem for everyone, regardless of socioeconomic status.

Summary

With regard to nutrition, change in Guatemala has been mixed. It is encouraging that chronic malnutrition decreased from 2002 to 2008/2009, particularly in the indigenous population; nevertheless, the current rate in Guatemala—48% of children ages 0 to 59 months—is

TABLE 5. Anemia in children ages 6 to 59 months (2002–2008)^{+,**}

Selected characteristics	Anemia in children	
	2002 ENSMI	2008/2009 ENSMI
Area		
Urban	35.2	46.2
Rural	41.8	48.6
Region		
Metropolitan	32.8	40.7
North	36.1	46.8
Northeast	46.3	52.2
Southeast	37.1	48.3
Central	34.7	51.9
Southwest	45.5	49.0
Northwest	47.4	47.5
Petén	37.9	48.5
Ethnicity		
Indigenous	41.9	49.5
Non-indigenous	38.2	46.3
Level of Education		
No formal education	41.4	48.3
Primary	41.3	49.2
Secondary or higher	28.9	42.9
Total	39.7	47.7

+ Percentage (*) of children ages 6–59 months with anemia, according to selected characteristics. Guatemala, 2002–2008. ENSMI–2008/2009.

** MSPAS, 2008 National Survey of Maternal and Child Health (ENSMI–2008/09). Ministry of Public Health and Social Assistance (MSPAS)/National Institute of Statistics (INE)/Centers for Disease Control and Prevention (CDC). Guatemala (2010).

TABLE 6. Anemia in non-pregnant and pregnant women ages 15–49 (2002–2008)^{+,**}

Selected characteristics	Anemia in non-pregnant women		Anemia in pregnant women	
	2002 ENSMI	2008/2009 ENSMI	2002 ENSMI	2008/2009 ENSMI
Area				
Urban	16.5	19.1	18.0	27.5
Rural	22.3	23.1	24.1	30.0
Region				
Metropolitan	13.1	16.6	13.1	30.1
North	23.9	21.7	27.4	33.1
Northeast	25.9	27.4	21.7	32.1
Southeast	23.5	13.8	20.9	17.8
Central	18.4	21.2	20.7	26.4
Southwest	22.1	25.3	34.7	33.8
Northeast	19.9	22.9	16.1	23.9
Petén	32.0	21.3	34.3	34.1
Ethnicity				
Indigenous	24.4	24.9	23.6	32.2
Non-indigenous	17.8	19.0	21.2	26.6
Education level				
No formal education	24.7	27.8	21.8	33.0
Primary	20.5	20.8	24.8	28.8
Secondary or higher	11.2	16.2	14.4	25.7
Total	20.2	21.4	22.1	29.1

+ Percentage (*) of non-pregnant women ages 15–49 with anemia who had a child within 5 years of the survey, and percentage (*) of pregnant women age 15–49 with anemia, according to selected characteristics. Guatemala, 2002–2008. ENSMI-2008/2009.

** MSPAS, 2008 National Survey of Maternal and Child Health (ENSMI-2008/09). Ministry of Public Health and Social Assistance (MSPAS)/National Institute of Statistics (INE)/Centers for Disease Control and Prevention (CDC). Guatemala (2010).

among the highest in the world. At the current rate of change in the country—1.0 pp per year—it will take more than four decades to eradicate chronic malnutrition in Guatemala.

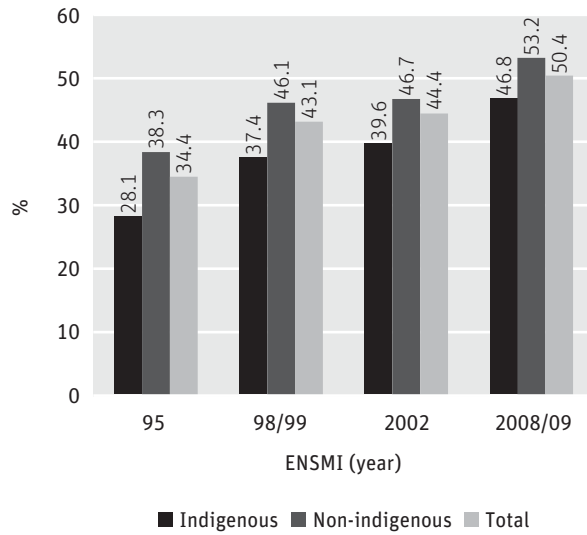
Other changes, namely the rise in obesity among women and the increase in anemia among women and children, are causes for concern and seem to contradict the positive changes seen in regard to chronic malnutrition. It is likely that obesity and anemia can be attributed to the lower quality diet commonly consumed in the country today. Various studies in the United States have identified a relationship between anemia and obesity in women and children (Brotanek et al., 2007). The authors of one study of American children indicate that consuming a high calorie, low micronutrient diet is a common risk factor for overweight and anemia, particularly a diet characterized by overconsumption of whole milk (prolonged bottlefeeding), and frequent consumption of juices, sugary drinks, and other junk foods (Brotanek et al., 2007).

Chronic malnutrition has many causes, but a lack of iron does not appear to be among them. A meta-analysis of non-randomized clinical trials found that iron supplementation did not improve growth in children in developing countries (Ramakrishnan et al., 2004). In addition, micronutrient survey data in Honduras do not indicate the existence of a relationship between anemia and chronic malnutrition in children (Albalak et al., 2000). In other words, have one condition did not significantly increase the risk of having the other. Finally, the fact that the relationship between poverty and chronic nutrition is strong, while the relationship between poverty and anemia is weak, indicates that they have different causes.

Unfortunately, the Guatemalan national survey does not include dietary intake; as such, it is not possible to track changes in food and nutrient consumption patterns. This makes it difficult to identify the specific causes of the

FIGURE 10

Guatemala's overweight and obesity epidemic (BMI > 25), by ethnicity



growth increases observed in children under age 2. For example, we know that there have been improvements in maternal education levels and access to water and sanitation services, and that poverty has declined. Each of these factors is known to be related to chronic malnutrition prevalence; yet without more information, it is difficult to ascertain the significance of those relationships.

BREASTFEEDING PROTEINS GRO BIRTH NUTRITION VITAMINS FEE 5 MICRONUTRIENTS GROWTH MINERALS BREASTFEEDING PROTEINS GROWTH BIRTH NUTRITION VITAMINS FEEDING EXPERIENCES IN OTHER COUNTRIES

Mexico

The experiences and lessons learned in Mexico's efforts to eradicate chronic malnutrition are very valuable to Guatemala for several reasons. First, a large percentage of the population in both countries is indigenous and both face similar situations in regard to marginalization, poverty and malnutrition. Second, Mexico has been a pioneer in designing and implementing innovative programs within a "culture of evaluation." The State has collaborated with the academic and research community, especially Mexico's National Institute of Public Health, to design science-based programs, establish monitoring and evaluation systems, and apply operational research in social programs. These lessons, both positive and negative, have been widely disseminated and are available in international journals.

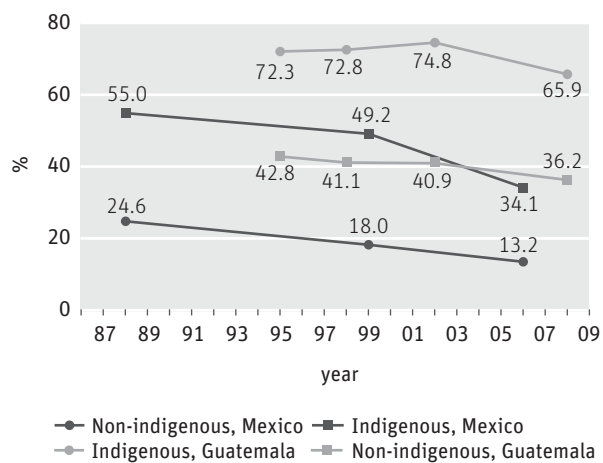
Mexico has done three national nutrition surveys (1988, 1999 and 2006); and one more is planned for 2012 (Rivera et al., in press). The prevalence of chronic malnutrition in each survey was a respective 26.9%, 21.5% and 15.5%. A comparison of the surveys found that the greatest change occurred in the period between 1999 and 2006. In the 1988–1999 period, the decrease was –0.49 pp/year, compared to –0.86 pp/year in 1999–2006. In addition, the gap between social groups didn't decline in the first period, and the gap between the indigenous and non-indigenous groups increased. However, in the second period, both gaps decreased, signaling a more equitable distribution of the malnutrition burden among the social groups, although to a lesser degree among ethnicities. Figure 11 divides the populations of Guatemala and Mexico by ethnic group and presents the trends in each group. Prevalence of chronic malnutrition declined faster among indigenous populations in Mexico

in 1999–2006 (–2.2 pp/year), compared to Guatemala in 2002–2008/2009 (–1.4 pp/year). The rate of decline was slower among the non-indigenous populations and identical in both countries: –0.7 pp/year

How did Mexico lower the chronic malnutrition rate, and how did it speed up this decline and reduce the gaps between social groups? An analysis of survey carried out in 1988 found that at the time, Mexico did not target its programs at the neediest populations; i.e. the most vulnerable families, people in the Southern region, rural populations, indigenous peoples, people living in abject poverty, or families with children under age two were less likely to benefit. Another finding was that the programs in Mexico focused almost exclusively on food

FIGURE 11

Evolution in chronic malnutrition by ethnic group in Guatemala (ENSMI surveys, children ages 0–59 months) and Mexico (children ages 0–59 months)



distribution; and not on coordinating efforts with other programs, such as those that provided water, sanitation or health services. The foods that were distributed or subsidized were typically not suitable for children ages 6 to 24 months, and the educational components were generally weak. This analysis prompted the country to design innovative, science-based strategies for combating chronic malnutrition, namely the Food and Health Education Program (Progresa, according to its Spanish acronym), which continues operating today under its new name, Oportunidades. A key to Progresa's success, confirmed in an analysis of the 1999 survey, was the decision to target low-income households for benefits. The Progresa/Oportunidades program provides conditional cash transfers, complementary foods that have been fortified with micronutrients at levels appropriate for young children, a more substantial educational component, among many other components. Oportunidades is a large program that benefits 6 million households. The program has a monitoring and evaluation mechanism that has served to provide feedback for improving the program; and its redesign took into account the latest research. For example, after studies found that fortified baby formula was not as effective as expected in reducing anemia, the type of iron added to the formula was changed. Subsequent research showed that the new formulation was both more bioavailable and well tolerated. Evaluations have made it possible to gauge the impact of the program through rigorously designed studies, and to publish the results in prestigious international journals.

The impact of the Oportunidades program could be better. While conditional cash transfers have improved the frequency with which beneficiaries seek healthcare services, the quality of such services is lacking. Education has been neglected and the program has had little impact on breastfeeding and complementary feeding practices. Although it has been well accepted, consumption of fortified baby food (Nutrisano) among children ages 6 to 24 months is lower than was hoped for several reasons: dilution during its preparation at home, limited availability in stores, and the lack of an effective education and communication component to promote its proper use. Much remains to be done to increase the program's effectiveness, but the will and mechanisms for doing this do exist. Oportunidades has been correlated with improved economic growth and poverty reduction. Likewise, obesity

and chronic diseases are very important problems that are already being addressed in government policies and programs.

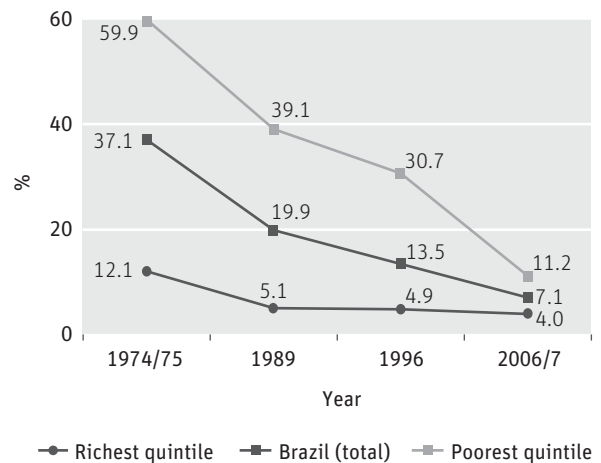
Brazil

Brazil has done four national surveys over a 33 year-period. Chronic malnutrition prevalence was 37.1% in 1974–1975, and highly correlated with socioeconomic status (Figure 12). Since then, prevalence has been rapidly reduced and the socioeconomic gaps have declined dramatically, not only in terms of chronic malnutrition, but also the gaps associated with morbidity and mortality; access to healthcare (prenatal visits and the use of modern contraceptive methods), water, sanitation, and education; and family purchasing power, among others (Monteiro et al., 2010; Barros et al., 2010). While gaps between the richest and poorest segments of the population still exist, Figure 12 shows how they have narrowed over time.

Acute malnutrition in children has not been a public health problem in recent decades—the respective figures in the 1989, 1996 and 2006–2007 surveys were 2.2%, 2.5%, and 1.6%. Overweight in children has varied

FIGURE 12

Socioeconomic inequity and chronic nutrition in Brazil, 1974–2007 (Monteiro et al., 2009)



between 7% and 8%. As in Mexico, obesity in adults is a very serious problem.

What led to the remarkable decline in chronic malnutrition? Several authors have attributed it to economic growth, combined with public policies to combat poverty and inequality (Santos et al., 2011; Victora et al., 2011; de Barros et al., 2010; Monteiro et al., 2010). Investments in infrastructure (water, sanitation, and schools) have also played a significant role, but many gaps remain (Monteiro et al., 2010).

The program that is considered to have had the most impact is the Sistema Único de Saúde, or Consolidated Health System. Since 1989, this system has provided free medical care to all Brazilians. Funded through taxes and social insurance contributions, it is the only national consolidated health system of its kind in Latin America. The system puts a lot of emphasis on community participation, education and promoting health through the mass media (Victora et al., 2010). Brazil also pioneered the conditional cash transfer programs, which are tied to participation in specific health and education activities. The nation-wide Bolsa Família program focuses mostly on the families most in need. It benefits 12.9 million families—nearly 52 million people, accounting for about 25% of the Brazilian population (Santos et al., 2011). Rather than distributing complementary fortified foods, it focuses on education for families with children ages 6 to 24 months. Much research indicates that beneficiary families spend more on food, particularly those who are food-insecure. The amount of the cash transfer has increased; each beneficiary family now receives around US \$300. Since 2001, the Bolsa Família program has contributed to poverty reduction and to lowering the country's Gini coefficient (Santos et al., 2011). Monteiro et al. (2010) conclude:

The Brazilian experience is an example of the huge impact that policies aimed at income redistribution and universal access to education, health, water and sanitation, can have on child malnutrition. These policies should be among the highest priorities of any government that is genuinely committed to reducing malnutrition and improving the quality of life for future generations. (Monteiro et al., 2010, p.309).

Bolivia

Like Guatemala, Bolivia has a large indigenous population. Some 28.5% of children under age five suffer from chronic malnutrition, according to the country's 2008 survey (WHO, 2011). Chronic malnutrition is 2.6 times higher in rural areas, largely populated by indigenous people, than in urban areas (Morales et al., 2010). In mid-2007, the Desnutrición Cero (Zero Malnutrition) program was launched with the goal of reducing chronic malnutrition in children under age two by 50% by 2011. The multisectoral program started operations in 52 municipalities, which were given priority due to their high levels of poverty and food insecurity. The second phase includes expansion to 166 municipalities, or about half the total (Ministry of Health and Sports, 2008). By the end of 2011, the plan is to provide services to 2.5 million mothers and children under age five; but measuring actual coverage is difficult. The program is similar to the programs in Mexico and Brazil. It includes improvements in the health system and in breastfeeding and complementary feeding practices, use of a fortified food (Nutribebe) and powdered micronutrient supplements (known as “chispitas,” or “sparks”), and conditional cash transfers for attending prenatal and well-child visits, among other conditions. It also promotes the dignity and self-esteem of indigenous peoples and takes into account their values, customs and traditions, including traditional medicine. Although in theory it is a multisectoral program, the Ministry of Health and Sports has been the main implementing agency.

The program has had problems with implementation and quality control (Morales et al., 2010) and its expansion has been slower than expected. An independent evaluation (date not specified, but it appears to have been done in 2010) recounted many problems related to its multisectoral approach, management and financing; monitoring and evaluation mechanism; service quality; communication activities and micronutrients (Ministry of Health and Sports, 2010). One challenge the program faces with its expansion is the “particular political context, characterized by a high level of polarization between the majority central government and some of the departmental and local governments” (Morales et al., 2010, p.6). Bolivian President Evo Morales was recently reelected for a second term (2010–2015), and so the program continues. Pelletier and Hoey (2011) suggest that the program

underestimated the challenge of securing and maintaining political support at all levels (high, medium and local). In particular, they note that support from the President has been lacking since the program's launch. Both the independent evaluation team and Pelletier and Hoey draw attention to the fact that the President has not attended a meeting of CONAN (the National Council on Food and Nutrition), which he himself heads and which is comprised of relevant ministers, to coordinate intersectoral efforts.

It is too early to say whether or not Desnutrición Cero will be successful. If it fails, it will not be due to its lackluster implementation. Its monitoring and evaluation component needs to be strengthened, as this has been very important in the success of the programs in Mexico and Brazil. The sustainability of the programs in those two countries is due in part to the evidence reported regarding their positive impact on the nutrition and health of the target groups.

STRENGTHS AND WEAKNESSES OF THE GOVERNMENT’S STRATEGIES AND INTERVENTIONS FOR PREVENTING AND TREATING ACUTE AND CHRONIC MALNUTRITION

Institutionalizing nutrition policies and programs

The National Council for Nutrition and Food Security (CONASAN) was created over two decades ago. The concept of nutrition and food security (SAN) is very broad and involves four pillars: availability of food, access to food, food consumption, and biological utilization (Delgado, 2010b). Pursuant to a Congressional decree, the National Food Security System (SINASAN) was established and the Department of Nutrition and Food Security (SESAN) was created in 2005 (Palmieri and Delgado, 2011). SAN has been institutionalized on three levels: CONASAN handles decision-making and policy management; SESAN is charged with technical coordination and planning; and the member institutions of SINASAN implement all SAN activities (Palmieri and Delgado 2011). The list of SINASAN members is extensive and includes: i) the Office of the Vice President; ii) eight ministries, including the ministries of agriculture, livestock and food (MAGA), the environment and natural resources (MARN), communications, infrastructure and housing (MICIVI), the economy, education (MINEDUC), public finance (MINFIN), public health and social assistance (MSPAS), and labor; iii) two secretariats, namely the Executive Coordination Secretariat of the Presidency (SCEP), and the Secretariat of Public Works of the First Lady (SOSEP); and iv) representatives of the private sector and civil society (Palmieri y Delgado, 2011).

The Central American Institute of Fiscal Studies (ICEFI) and UNICEF carried out a detailed analysis of the federal

budget and the budget of the Institute for Municipal Promotion (INFOM) in order to estimate government expenditures on food and nutritional security (GPSAN) in 2008–2011 (ICEFI/UNICEF, 2011). Expenditures increased each year during this period; in 2008, 2009, 2010, and 2011, the respective GPSAN was 2,265.5 million quetzales, 3,508.6 million quetzales, 4,507.9 million quetzales and 4,753.7 million quetzales. With regard to GDP, GPSAN represented 0.76% of GDP in 2008, and close to 1.30% in 2010 and 2011. Annual expenditure per capita increased from 165.33 quetzales in 2008, to 323.07 quetzales in 2011. The Mi Familia Progres program (MIFAPRO) accounts for most of the increase; and the largest percentage (37.7%) of GPSAN expenditures funds social protection programs. Water supply and sanitation programs and housing represent a respective 17.0% and 12.7% of GPSAN expenditures. The proportion of the GPSAN invested in preventive, maternal and child health was 12% (UNDP, 2011).

The SESAN has the very difficult tasks of planning and coordinating efforts and technical support for the large number of governmental agencies that are charged with carrying out the various SAN activities (Delgado, 2010b). As in the case of Bolivia, past and present global experiences involving intersectoral coordination of nutrition and other SAN activities have not always been successful (Pelletier and Hoey, 2011). The new government of Guatemala has created a Ministry of Social Development for the purpose of centralizing implementation of the SAN

policies and programs, which heretofore, have been scattered among various ministries and departments. This seem to have some advantages, such as improving intersectoral coordination and support for social development, increasing fiscal transparency and accountability, and reducing duplication of efforts. The SESAN will continue to exist, but it is still not clear how it will interact with the new ministry.

Ministry of Public Health and Social Assistance

Social spending increased 43% from 2007–2010; in 2007, it totaled 18,915 million quetzales, compared to 26,978 million quetzales in 2010 (SEGEPLAN, 2011). Health spending also increased by 43%, from 3,009 million quetzales in 2007, to 4,291 million quetzales in 2010. Health spending represented 16% of total social spending in 2010. MSPAS' budget increased by 80% in this period, from 1,656 million quetzales in 2007, to 2,988 million quetzales in 2010. This increase was meant to extend coverage and access to free services, but in the view of many, it has not been enough to «fully strengthen the country's public health system» (SEGEPLAN, 2011, p.12).

MSPAS plays a very important role in implementing SAN activities; it is in charge of improving consumption patterns and biological utilization via disease prevention. However, it is a weak ministry that lacks technical and financial resources. As such, its programs are low-quality and have limited coverage (Delgado, 2010b). One study blames the high malnutrition rates in Guatemala on the «low coverage and scant cultural relevance of health services» (ICEFI/UNICEF, 2011, p.4). The 2012–2016 PESAN, which was prepared by CONASAN, alludes to the same study and references the same comment.

MSPAS' programs are generally well-designed. The National Program to Reduce Chronic Malnutrition (PRDC) aims to halve the rate of chronic malnutrition reported in 2009 (CONASAN, 2100a). This ambitious program has direct components relating to health and nutrition (basic health services, food and nutrition education, breastfeeding and complementary feeding support), as well as indirect components (water and sanitation services, economic improvements, and community organization). Initially,

the program was directed toward 83 priority municipalities. In 2009, plans were made to expand it to other municipalities that were also found to be at high risk for chronic malnutrition (Palmieri and Delgado, 2011). Priority was assigned based on the Nutrition and Food Insecurity Vulnerability Index (IVISAN), which is composed of three sub-indices: the nutrition and food insecurity index, environmental threats, and ability to respond (CONASAN, 2011b). The Nutrition and Food Insecurity Vulnerability Index was assigned a weight of 0.67. It incorporates indicators of food availability (lack of basic grains), food access (extreme poverty, precarious employment), consumption (illiteracy in women) and biological utilization of food (sanitation). Carried out on a municipal level, it reported a correlation of 0.77 between the IVISAN and the percentage of stunting reported in first graders in the Third National Census of Stature, conducted in 2008–2009. The majority of the most vulnerable municipalities are in the «altiplano» and in the Western and Central regions. They include: Quiché, Huehuetenango, San Marcos, Quetzaltenango, Alta Verapaz, Baja Verapaz, Totonicapán, Sololá, Chimaltenango and Sacatepéquez.

Guatemala's Plan to Prevent and Care for Malnourished Children emphasizes both chronic and acute malnutrition, which it calls a «latent» problem (MSPAS, 2009). Documents on nutrition say that children under age five are the priority, and when referring to Vitacereal, the priority age group mentioned is children under age 3. It does not stress the need to focus on the first 1,000 days of life, corresponding to pregnancy and the first two years of life, and this lack of emphasis is plainly visible in programs operating in rural areas (Delgado, 2010b). Although growth monitoring is advised for children under age five, growth delays only occur in the first two years of life. The adoption of the WHO standard (WHO, 2006a), which replaces the flawed table on minimum weight gain, has been a positive development.

Given the high cost of fortified complementary foods such as Vitacereal, coverage could be increased by restricting the program only to high-risk families with children ages 6 and 24 months. Counseling aimed at improving breastfeeding and complementary feeding practices, regardless of whether or not Vitacereal is provided, is very important. However, MSPAS does not have the capacity to carry out that activity efficiently on the necessary scale,

despite having a well-designed model to provide Comprehensive Care to Children and Women at the Community Level (AINM-C). To date, there are no studies documenting the effectiveness of Vitacereal, which is made from corn, flour, soybeans and micronutrients such as iron, zinc, folic acid and vitamin A. Studies conducted by the International Research Institute on Food Policy (IFPRI) in Haiti, using a similar product that contains wheat instead of corn, suggest that such products are effective for improving growth when provided during the window of opportunity existing at between 6 and 24 months; and they are even more effective when accompanied by a high quality education and promotion component (Ruel et al., 2008). IFPRI is carrying out a similar study using a fortified product similar to Vitacereal that is used in the community level Maternal-child Food Diversification Program (PROCOMIDA), which is being implemented by Mercy Corps in the Department of Alta Verapaz.

Trend toward food distribution

Interventions that use food distribution to combat chronic malnutrition have been criticized as costly, ineffective and not focused on the poorest families (Rivera et al., in press; Musgrove, 1993; Mason et al., 2006). As the case of Mexico illustrates, food distribution programs have a high opportunity cost because they require extensive investments of resources and effort; they often provide foods that are unsuitable for children ages 6 to 24 months; and they do not have effective educational components to inform beneficiaries about the benefits of complementary feeding and including donated food in the family's diet (Rivera et al., in press).

The 2012–2016 Strategic Plan for Nutrition and Food Security in the West, or PLANOCC, (SESAN, 2011) and the 2012–2016 Strategic Plan for Nutrition and Food Security, or PESAN, (CONASAN, 2011a) discuss strategies for transforming production, as well as the need to foster conditions favorable to creating sustainable livelihoods, in addition to promoting good food and nutrition practices. However, their programs emphasize direct food distribution to families and vulnerable communities (the Bolsa Solidaria program, for example). This tendency to favor food distribution stems from the poverty that still persists in Guatemala, which leads people to appreciate

and demand this type of aid. However, such “aid” only perpetuates misconceptions about Guatemala's hunger and malnutrition problem, such as the myth that the problem will be solved if the number of available calories per person is increased. MSPAS' 2009 plan for preventing and addressing child malnutrition in Guatemala says: “Inadequate energy intake and recurrent infections, which are products of food and nutrition insecurity, are reflected in the 49.3% rate of chronic malnutrition...” (MSPAS, 2009, p.9). The PESAN (CONASAN, 2011a) contains specific indicators and goals for increasing per person calorie intake. This data, which is derived from balance sheets, would increase calorie intake from the baseline of 3,223 kCal in 2011, to 3,705 kCal in 2016, representing an almost 500 calorie increase! Balance sheet estimates of food production and available calories per capita may be useful for guiding food and agriculture policy, but they do not represent actual consumption and are generally unreliable (Hawkesworth et al., 2010). Based on balance sheet data and the presumption of variability in available calories per capita, FAO estimates that 850 million people worldwide are “hungry”, meaning they consume fewer calories than they need to meet their minimum energy requirements. According to FAO criteria, 22% of Guatemalans were “hungry” in 2006–2008, and the per capita deficit was about 250 kilocalories (FAO, 2011). FAO data shows an increasing prevalence of hunger in Guatemala since 1990–1992, when the rate was 15%. Guatemala does not do surveys of food consumption, so this assertion cannot be verified; however, the high prevalence of obesity and anemia in the country suggests that the problem is one of food quality, and not quantity or caloric intake.

School meals also represent a large investment; expenditures totaled 431 million quetzales in 2010. Palmieri and Delgado (2010) reviewed the history of Guatemala's school meals program, including provision of fortified, nutritious cookies and milk. Since 2008, the funds for the Vaso de Leche (glass of milk) program are directed to local school boards, who provide school children “nutritious, safe meals that take local preferences into account,” as well as the menu guidance provided by the Ministry of Education and SESA (Palmieri and Delgado, 2010). Providing meals in school can encourage attendance and correct micronutrient deficiencies, depending on the foods that are provided. However, they cannot correct the

stunting that occurs in the first 1,000 days of life. Other, more cost effective ways to support school attendance and correct micronutrient deficiencies should be considered. Although the ENSMI survey does not include school-children, other studies in Guatemala (Groeneveld et al., 2007) indicate that obesity is a growing problem in this age group. Thus, school meals should be reviewed from the standpoint of improving diet quality. Schools provide an opportunity to foster good eating habits, not only in children (by including nutrition in the school curriculum), but also in parents (through school activities that involve the community).

In short, programs need to clarify what is being achieved by distributing basic foodstuffs to poor families. In general, food distribution is not effective in tackling chronic malnutrition, due to the reasons outlined above. School meals cannot correct nutritional damage that has occurred in the first 1,000 days of life. Likewise, there is no justification for increasing caloric intakes in school children and adults, including through food distribution. However, food distribution may be justified, or even essential, for preventing or mitigating disasters. In addition, food distribution may be a justifiable way to combat poverty; however, the cost of such interventions should be compared with other, potentially more effective alternatives, such as conditional cash transfers. Finally, if a decision is made to distribute food, the nutritional quality of the food basket should be assessed, as well as its potential to circumvent anemia and obesity.

Acute malnutrition

According to national surveys, acute malnutrition is not a public health problem, meaning it doesn't affect large segments of the population. Nevertheless, due to very low crop yields caused by drought in Guatemala's so-called 'dry corridor,' which includes several municipalities in the departments of Alta Verapaz, Baja Verapaz, El Progreso, Zacapa, Chiquimula, Jutiapa, Santa Rosa, Jalapa and El Quiché, 2009 brought many alarming reports of severe malnutrition and deaths from starvation (Delgado, 2010a). This prompted the Humanitarian Network, a coalition of UN agencies and non-governmental organizations, to visit the affected area (which also included parts of Honduras and Nicaragua) and to

conduct surveys to examine the effects on 1,455 children under age five and females ages 10–54 (Humanitarian Network, 2009; Action Against Hunger, 2010). Using the standard of a brachial perimeter <11.5 cm, the coalition found that 4.9% of children ages 6 to 59 months suffered from acute malnutrition. Among women, 13.9 % were acutely malnourished, using the standard of a brachial perimeter <23.0 cm (Humanitarian Network, 2009). No cases of acute malnutrition were reported in Honduras and Nicaragua (Action Against Hunger, 2010). In 2010, the Ministry of Public Health and Social Assistance produced an "Integrated strategy to address acute malnutrition in children," but apparently, it was never implemented. That strategy proposed visits to every household in the country to identify acutely malnourished children and to implement "nutritional-medical recovery" efforts (MSPAS, 2011). The criterion of a brachial perimeter <11.5 cm was proposed to identify potential cases, which would later be confirmed in health posts using weight for size measures. The most severe cases would be taken to recovery care centers, while less severe cases would be provided with Therapeutic Ready to Eat Food (TREF).

Catastrophic events, such as droughts and crop losses, may cause acute malnutrition. However, using the brachial perimeter to assess nutritional status is controversial. First, its use in children is problematic, since brachial perimeter increases with age and tends to overestimate the problem in children. Second, the margin of measurement error is very high. The Humanitarian Network report did not discuss how staff was trained, nor did it present reproducible data (Humanitarian Network, 2009). The cases that were diagnosed using the brachial perimeter measure were not validated using weight for height measures. WHO and UNICEF published a very ambiguous report (WHO, 2009) that recommends using brachial perimeter (<11.5 cm) and weight for height (<-3 SD) as criteria for identifying acutely malnourished children for treatment and recovery efforts. However, it favors the use of weight for height, although it warns that this measurement may not be reliable if edema is present. It also notes that although the two indicators identify approximately the same percentage of children, only 40% met both criteria!

It is difficult to understand the extent of the acute malnutrition problem in the dry corridor or to tell whether

MSPAS's proposed plan to "nutritionally sweep the nation" is justified, without more information. Given current staff shortages and the plan's high costs, implementing it would divert attention from other important, but neglected problems. However, what is clear is that the proposal "medicalizes" the nutritional problem, exaggerates the need to allocate resources to a problem of unclear magnitude, and ignores the need to prevent chronic malnutrition as well as to address its complex causes. What's missing is an agile, effective surveillance system that should be used to direct resources and efforts to affected geographical areas when justified. Finally, in light of the data on overweight and obesity in women, it is hard to believe that so many women are malnourished to the extent typically seen in times of famine.

Mi Familia Progresa (MIFAPRO)

The Council of Social Cohesion consists of several government entities and is charged with implementing social policy interventions. Each entity uses part of its budget to fund various programs, of which MIFAPRO is the largest. The Ministry of Education was responsible for implementing this cash transfer program previously, as well as administering the program's budget, which has grown from 117 million quetzales in 2008, to 1,139 million quetzales in 2010 (2011 SEGEPLAN). Under the new government, the Ministry of Social Development will be charged with administering MIFAPRO beginning in 2012. This will strengthen it on an institutional level, and it is expected to have a budget sufficient to cover both its operational costs as well as its commitments to its beneficiaries.

MIFAPRO provides two cash transfers, each for 150 quetzales: one for education (children age 0 to 15), and the other for nutrition and health (children under age six). The amount of the transfer is low, compared to other programs; it is fixed (i.e. not adjusted for inflation), and does not take family composition into account. The program had a quick initial launch and rapid expansion; in just two years, it managed to cover 862,000 families, equivalent to 23% of the population in 302 municipalities (UNDP, 2011). This level of coverage is similar to that attained in Mexico and Brazil. Its rapid expansion has caused several problems. For example, lack of funds

delayed timely payments on six occasions in 2010. In addition, there were cases where families were either erroneously included or excluded from the program (UNDP, 2011). Other problems surfaced related to the conditions that were imposed, including the poor quality of education and health services, which led to low coverage in the case of health. However, the program has posted some achievements, namely in terms of education indicators (Gutierrez, 2011), and its operations have improved (IDIES, 2009, 2010). MIFAPRO is currently entering a phase of consolidation and improvement. The United Nations Development Program has recommended including a monitoring and evaluation system to continually assess the program's processes and impact (UNDP, 2011). Evaluations conducted both externally and by the government would provide a way to measure the program's effectiveness, monitor achievements, identify problems and make systematic improvements for the benefit of the population.

The World Food Program did a study of social protection networks in Central America and Panama to examine ways of improving their impact on nutrition status (WFP, 2010). In regard to conditional transfer programs, whether cash or in kind, it recommends "including specific goals aimed at improving the nutritional status of families, particularly small children and women, from day one" (WFP, 2010, p.XV). Among the specific measures that should be included to improve the nutrition impact of MIFAPRO are an educational component to teach healthy eating, as well as to instruct parents why and how to incorporate fortified complementary foods in the diets of children ages 6 and 24 months, and a program to promote their use.

Monitoring and evaluation: the missing element

Guatemala does not currently have a culture of monitoring and evaluation, which makes it difficult to gather the evidence needed to guide and improve its policies and programs.

The absence of a high quality, well-designed surveillance system for monitoring nutrition-related issues and programs has hindered the country's ability to improve the nutritional status of its population. The CDC, United

States Agency for International Development (USAID) and other partners have designed an Integrated Malnutrition Surveillance System (SIVIM), which may be launched in Guatemala as early as 2012 (CDC/USAID, 2011). The SIVIM will support planning, cross-sectoral programs, monitoring and evaluation efforts for large-scale programs such as MIFRAPRO. It will also identify pressing problems (such as acute malnutrition) and emerging issues (such as obesity in women), and it will help translate the data to inform decision-making and find solutions to existing problems. It will measure a range of indicators, including height and weight in children ages 3 to 59 months, anemia and vitamin A status, complementary

feeding practices, consumption of fortified foods, family diets, food purchases and availability, access to clean water, household characteristics, agricultural productivity, poverty, and several others. In addition, it will collect salt and sugar samples to monitor fortification levels. The SIVIM is based on ongoing cross-sectional surveys in representative homes in five departments (Quetzaltenango, San Marcos, Totonicapán, Huehuetenango and Quiché), as well as nationwide surveys, to be done every two years using a methodology similar to the ENSMI. A pilot will be done to determine the sample size. Institutionalizing the SIVIM would improve its ability to monitor and assess programs.

BREASTFEEDING PROTEINS GROWTH BIRTH NUTRITION VITAMINS FEEDING 7 MICRONUTRIENTS GROWTH MINERALS BREASTFEEDING PROTEINS GROWTH BIRTH NUTRITION VITAMINS FEEDING RECOMMENDATIONS

Nutrition concerns in children under age 5 and women of childbearing age in Guatemala

Table 7 outlines the main nutrition concerns affecting children and mothers, provides a qualitative assessment of their relative importance, identifies the most affected groups, and presents recommended interventions. These are discussed in greater detail in the next section. In our view, chronic malnutrition, which manifests as delayed growth, both intrauterine and in the first two years of life, is the most pressing problem facing Guatemala, based on its magnitude and effects on morbidity and mortality, height and ability to work in adulthood, intellectual performance, educational attainment, and ability to generate income. Chronic malnutrition accurately reflects inequality; it is most common among the poorest families, those living in rural areas, and among the indigenous population.

Despite the high level of poverty in Guatemala, the prevalence of acute malnutrition is lower than expected, based on WHO standards, and is not associated with poverty or ethnicity. Therefore, we believe that acute malnutrition is not a significant public health problem in Guatemala, despite news reports to the contrary. However, these reports should be investigated and verified.

Anemia in mothers and children is a serious concern due to its high incidence and serious consequences. It is a nationwide problem that affects all social stratas. The increase in anemia is alarming because it speaks to the deterioration in the quality of the Guatemalan diet, which also probably contributes to obesity.

Obesity in females (women and girls) is also an important concern because it is so common and it is increasing in

prevalence. Future costs to treat the disease burden (diabetes, hypertension, cardiovascular diseases, and others) as well as related to reduced productivity, as well as public expenditures and private costs associated with curative services, are expected to be enormous.

Likewise, obesity in children under age five is worrisome. Research is needed to determine the consequences of the high level of obesity in infants under six months of age. In addition, it is important to have a better understanding of body composition in newborns, and to determine whether the incidence of gestational diabetes has increased. The government needs to take measures to address and prevent the growing overweight and obesity problem in schoolchildren.

Proposed interventions

Table 7 outlines scientifically sound interventions, based on the available research, beginning with the series on maternal-child malnutrition published in *The Lancet* (Bhutta et al., 2008), as well as more recent studies.

Chronic malnutrition

Delayed growth starts during the intrauterine period; therefore, better nutrition during pregnancy improves the nutritional status of the newborn. Evidence shows that nutrition education and counseling during pregnancy improves the baby's weight at birth (Webb Girard and Olude, in press). There is even stronger evidence that demonstrates the positive impact of taking protein-energy supplements during pregnancy on weight at birth (Bhutta et al., 2008). These supplements should be fortified with micronutrients. The consumption of iron during pregnancy reduces the risk for preterm birth and

TABLE 7. Major nutrition concerns in children under age 5 and women of childbearing age (15–49) in Guatemala.

Problem	Importance*	Affected groups	Solutions
Chronic malnutrition	++++	Higher among the poor and in indigenous populations	Improve maternal nutrition, breastfeeding and complementary feeding practices, fortified complementary foods (6–24 months), water and sanitation; health services; conditional cash transfers.
Acute malnutrition	+	Not associated with poverty or ethnicity. Associated with emergencies in specific areas	Surveillance system to identify emergency situations and provide curative and preventive assistance.
Anemia in children	+++	Children under age 5; affects entire population	Iron and folic acid during gestation, delaying detachment from the umbilical cord. Fortified complementary foods (6–24 months), micronutrient powders, fortifying foods, deworming.
Anemia in mothers and women of childbearing age	+++	Pregnant and non-pregnant women; affects entire population	Iron and folic acid during pregnancy, fortifying foods, micronutrient powders or supplements for women of childbearing age, deworming.
Obesity in children under age 5	++	Affects entire population	Nursing, complementary foods, eating a healthy diet, more physical activity, less sedentary activities.
Obesity in women	+++	Affects entire population	Better lifestyles, healthy diet, physical activity, less sedentary lifestyle.

* “Importance” relative to the magnitude of the problem and its consequences for the country.

+ = Little importance

++ = some

+++ = important

++++ = highly important

increases the weight of the newborn (Stoltzfus, 2011; Imdad and Bhutta, in press). In addition, the consumption of folic acid during pregnancy effectively prevents neural tube defects (De-Regil et al., 2010). As mentioned previously, reproductive health interventions can also improve weight at birth (preventing pregnancies in adolescents, appropriate spacing between children, having fewer children, etc.). Tobacco use is a major factor associated with low birth weight, as is wood smoke from poorly ventilated indoor kitchens. (Bhutta et al., 2008).

Improving breastfeeding and complementary feeding practices is essential for circumventing chronic malnutrition. Education has also been shown to be effective if the family does not suffer from food insecurity, even if it is not accompanied by complementary fortified food supplements (Bhutta et al., 2008). However, using fortified complementary foods along with education has a greater impact than education alone (Bhutta et al., 2008). It is worth mentioning the positive Haitian experience with a product similar to Vitacereal (Ruel et al., 2008); as is

the Mexican experience using a similar product that contains milk, which is highly recommended, but also more expensive. Follow-up research to the INCAP longitudinal study, which was based on the use of Incaparina, milk and sugar, reported very important short- and long-term effects. Although they contain zinc, which has been shown in some studies to have had a positive impact on growth when taken daily, micronutrient powders have not been shown to be effective for combating chronic malnutrition.

Diseases, particularly diarrhea, are a determining factor for chronic malnutrition. As such, measures taken to improve living conditions, such as access to quality health services, and improvements in water, sanitation and hygiene, will ultimately help to reduce the chronic malnutrition. In addition, taking zinc reduces the duration and severity of diarrhea episodes (Bhutta et al., 2008).

Poverty is closely linked to chronic malnutrition for many reasons. Conditional cash transfers are a good way to

combat poverty and increase human capital, as evidenced by the experiences in Brazil and Mexico. Although it is impossible to isolate the specific contribution of the transfers, their implementation in both countries coincides with decreases in chronic malnutrition.

Acute malnutrition

Pockets or isolated cases of acute malnutrition and confirmed cases of clinical malnutrition should be treated using the curative measures recommended in WHO protocols; such measures have already been adopted by MSPAS.

Anemia in mothers and children

Iron deficiency is a common problem throughout the world, even in rich countries. No public health strategy can solve the problem alone; joint strategies are needed to achieve better results.

Iron status in pregnant women is an important determinant of iron stores in the newborn and of anemia in children (Stoltzfus, 2011). Iron requirements during pregnancy are so high that it is difficult for a mother who is anemic at the start of her pregnancy to satisfy both her own and the baby's needs. It is for this reason that taking weekly or intermittent iron and folic acid supplements, or consuming micronutrient powders or fortified foods, are recommended prior to pregnancy (Stoltzfus, 2011; Peña-Rosas and Viteri, 2009).

Many studies have confirmed that taking daily iron and folic acid supplements during pregnancy is a very effective way to improve iron status in pregnant women (Stoltzfus, 2011; Peña-Rosas and Viteri, 2009). However, many programs are not effective due to low coverage of prenatal services, late first consultations, an insufficient supply of supplements in clinics, and lack of support and counseling, since taking supplements can cause nausea and discomfort in some women.

Fortifying wheat flour with iron and folic acid, which is already being done in Guatemala, is a way to address the problems of anemia and neural tube defects. This is an ideal intervention to help mothers increase their iron reserves prior to pregnancy as well as to provide folic acid near conception, when women often have not yet realized that they are pregnant. The disadvantage is

that consumption of wheat flour is higher in non-indigenous populations and urban areas, since the main foodstuff of indigenous peoples is corn. In addition, even those who eat foods made with wheat flour tend to consume modest amounts, compared to countries like Chile (Imhoff-Kunsch et al., 2007). Since nationwide anemia rates are so high, wheat flour should continue to be fortified, despite the fact that doing so may increase inequalities. A recent study that examined food shopping data by quintile of poverty and ethnicity—based on the latest data from the ENCOVI—suggests increasing the number of foods that are fortified in order to improve coverage in high-risk groups. Some of the foods that have been proposed include corn flour, pasta and rice (Imhoff-Kunsch and Martorell, 2011). The study also suggests increasing the number of micronutrients that are added (to include, for example, vitamin B12 and zinc).

Fortifying staple foods such as wheat or corn flour is not ideal for children under age two because they tend to consume very little of these foods, due to their small size. It is more effective to use fortified complementary foods or fortified milk to combat iron deficiency and anemia; micronutrient powders are also effective (Rivera et al., 2011; Stoltzfus, 2011; WHO, 2011c).

Iron supplements (usually drops) are another option. However, human cannot excrete iron, which makes it risky to provide children with daily supplements, given the risk for excess consumption. Excess iron supplementation for in children with adequate reserves can have severe adverse effects, particularly in the context of malaria (Stoltzfus, 2011), although a recent review of the literature concludes that this has not occurred (Okebe et al., 2011). In any case, safety dictates that daily iron supplements should only be given to children with severe anemia and only by trained health personnel. Stoltzfus (2011) says that countries with poor infrastructure may not achieve adequate coverage or ensure correct dosing, and recommends administering iron supplements through foods, including fortified complementary foods (for children ages 6 to 24 months) or micronutrient powders (WHO, 2011c).

What about children under six months who should only receive breast milk? The easiest and simplest intervention recommended by the authors in the series in The

Lancet and other studies is delayed clamping of the umbilical cord (Bhutta et al., 2008; Stoltzfus, 2011). The newborn infants with the highest risk for developing anemia are those with low birthweights. A recently published double-blind randomized clinical trial done in hospitals at the Universities of Umeå and Karolinska, which compare Swedish low birthweight newborns who received daily iron supplements from the ages of 6 weeks to 6 months, with a control group that received a placebo (Berglund et al., 2010). Both the group with very low birthweights (<2 kg) and the group with moderately low birthweights (2.0–2.5 kg)—which is a little studied group—received daily iron supplements; and both had a lower risk of iron deficiency anemia. No adverse effects were reported in this study. Although WHO recommends iron supplementation for children with low birthweights (WHO, 2011a), and studies such as this one show that supplements are effective, the question still remains as to whether it is feasible to do provide newborns with supplements on the necessary scale in Guatemala, without putting their health at risk?

In addition, intestinal parasitic diseases are very common in Guatemala and are an important cause of anemia, particularly those caused by hookworms (*Necator americanus*) (Sorensen et al., 2011). Studies suggest that of the total population of 14 million people, nearly 8 million have hookworms, 8.6 million have ascaris, and 7.9 million have trichuris (Sorensen et al., 2011). WHO recommends using albendazole or mebendazole to deworm children (WHO, 2006b; WHO, 2011b) and mothers (WHO, 2006c) in endemic areas.

Other deficiencies

Iodine fortification in salt is one of INCAP's great successes; it has kept iodine deficiency at bay. Another of INCAP's successes is the fortification of sugar with vitamin A, although as mentioned earlier, that program and the necessity of administering vitamin A supplements to children need to be reviewed.

Obesity

The prestigious journal *The Lancet* has published several articles on the subject of obesity and diet- and lifestyle-related chronic diseases, sounding the alarm about what may be a global epidemic (Cecchini et al., 2010; Swinburn et al., 2011; Gortmaker et al., 2011). Obesity

is caused by energy intakes that exceed energy expenditures via physical activity. When average daily intake exceeds expenditure over a period of years, even by a very small amount, the excess will be converted into kilos of fat. The causes of obesity are very complex and are related to globalization, which has caused people to become less physically active. Some of the factors include the event of public transport, mechanization, environments that are not suitable for physical activity, sedentary lifestyles, and many others. At the same time, energy consumption has increased, due to higher consumption of sugary drinks and greater availability and consumption of vegetable oils and processed foods, among others (Popkin, 1998). It is difficult to determine the primary cause of energy imbalance; however, some researchers believe that dietary factors hold the key. Swinborn et al. (2011) blame the obesity epidemic on changes in the global food system, with its constant production of more and more low-cost processed foods and use of sophisticated marketing campaigns. Although the epidemic began four decades ago in rich countries, efforts at prevention are just beginning and the evidence base for sustaining such interventions is limited, although it is increasing (Gortmaker et al., 2011). According to available empirical evidence and quantitative models, recommended strategies for improving the diet, increasing physical activity and preventing obesity include: educating the public and effectively communicating the benefits of adopting a healthy diet and healthy lifestyle habits; using fiscal interventions to increase the costs of including unhealthy ingredients in foods and reduce the cost of foods rich in fiber; establishing regulations to improve nutrition labeling; and restricting the advertising and marketing of sugary drinks and junk food to children (Cecchini *et al.*, 2010).

Returning to the main topic of this report, in the first 1,000 days of life, pregnant and nursing mothers should receive counseling on nutrition and diet, to help them understand that non-nutritious foods that do little more than fill the stomach, lead to overweight and obesity, as well as micronutrient deficiencies. The Guatemala diet, even in the case of young children, includes a significant amount of junk food and sugary drinks. Food aid programs also need to take the double nutrition burden into account and try to improve the quality of food baskets. In addition, schools should provide highly nutritious meals,

and the topics of diet and healthy lifestyles should be incorporated into the school curriculum.

The intervention “package”

Table 7 summarizes the effective interventions that are recommended for mothers and children. Decisions as to which interventions to include in the intervention ‘package’ should take into account the costs, the relative importance of the problems, the evidence regarding impact, and implementation feasibility. Since some programs are targeted to specific social and ethnic groups, there may be different packages for different areas of the country. Figure 13 shows a general outline of intervention options that the Technical Group on Nutrition, convened by the 2015 Mesoamerican Health Initiative, prepared for use by planners and program designers (Rivera et al., 2011). The target groups include pregnant women, nursing mothers and children under age two. The basic minimum package in the center of the chart is recommended for the entire population of Guatemala, regardless of social strata. This basic package also needs to include iodine-fortified salt and fortified basic food-stuffs. Universal interventions include the promotion of good breastfeeding practices (i.e. exclusive breastfeeding in the first six months, and supplemental breastfeeding until age two) and complementary feeding practices; water, sanitation and hygiene; prenatal iron and folic acid supplements for mothers; vitamin A supplementation for children (if the situational analysis determines they are warranted); immunizations; and the use of zinc and oral rehydration to treat diarrhea.

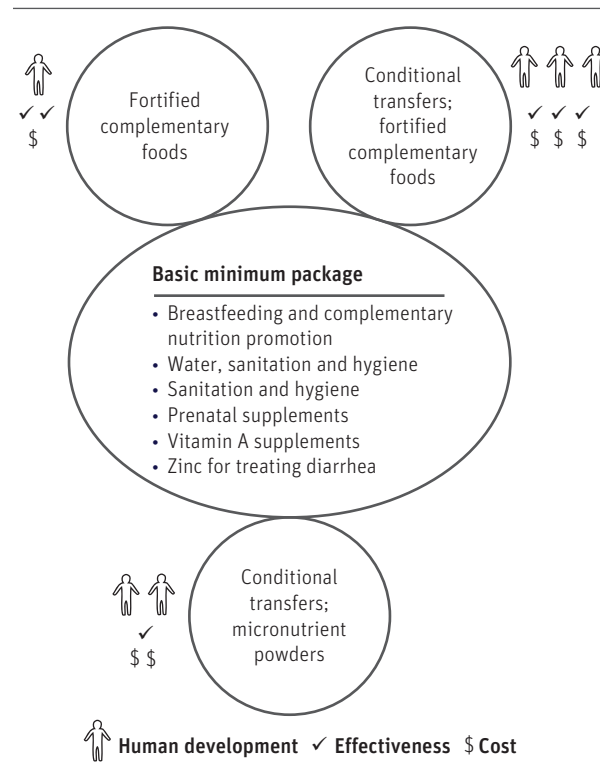
To increase its impact, the government has given priority to the regions, departments and municipalities facing major poverty, food insecurity and chronic malnutrition problems, which will receive additional interventions. Food and nutrition action plans have always aimed to reduce chronic malnutrition, but it has not been understood that this requires focusing such efforts around the first 1,000 days of life. Much emphasis has been placed on food distribution in SAN programs such as Bolsa Solidaria, but little importance has been given to ensuring that at least some of the foods are nutritionally appropriate for children under age two. One option would be to create a program to distribute fortified complementary

foods such as Vitacereal for children ages 6 and 24 months, which would enable programs to reach them during the window of opportunity and would have an impact on chronic malnutrition (above, left). The component for promoting good breastfeeding and complementary nutrition practices should provide ongoing support and counseling on the appropriate use of fortified foods. Without this component, fortified complementary foods are unlikely to have much impact.

Conditional cash transfers give families two options with the basic minimum package: using micronutrient powders (below), or fortified complementary foods (above, right). Education is also a crucial component of conditional cash transfers, to help women and their husbands understand how to make the best use of the funds in order to improve the family’s well-being. The conditions associated with the

FIGURE 13

Packages for preventing stunting in high prevalence areas and reducing micronutrient deficiencies, food insecurity and poverty (Adapted from Rivera et al., 2011)



transfers can be designed so as to encourage behaviors that improve the health and nutrition of mothers and children. Coupling the transfers with the use of fortified complementary foods would have a greater impact on chronic malnutrition than doing the same with micronutrient powders, but would be more expensive. However, the impact on iron deficiency and anemia is likely to be similar in both cases.

Change theory

Program designers should take change theory into account when developing programs (Figure 14). Simply understanding the nature of nutrition problems is not enough; it's also important to understand the policy challenges as well as the issues that must be surmounted during program implementation, such as low coverage, quality and demand, and utilization of MSPAS services. Activities should be evidence-based and they should be supported with effective training, supervision, monitoring and evaluation mechanisms. In addition, they should have strategies for increasing demand for services and community participation. Nutrition advocacy directed toward top-level government officials is also essential. Such activities are the key to producing high-quality programs, increasing service demand and utilization, and improving program impact on short, medium and long-term indicators of nutrition status.

Although it is more general in nature, the theory of change is closely related to what some researchers refer to as PIP (Program Impact Pathways), or mechanisms for determining program impact (Kim et al., 2011). PIP are dynamic models that logically outline the entire causal chain, including the intermediate impacts that interventions are expected to have on the way to solving problems such as chronic malnutrition, anemia and obesity. PIP are useful for designing monitoring systems because they identify which steps require data inputs. For example, in order to justify delivering bags of food as a means of reducing chronic malnutrition, programs would have to ensure that, among other things, sufficient funds are allocated for that purpose; food is purchased; deliveries are timely, and the correct amount and type of foods are included; consumption among children under age two is improving; and improvements in consumption as well as

in children's growth are measured. If the program has other components such as promotion and education, programs are required to report the degree to which messages are understood and if, for example, people used the recipes promoted by the program.

Specific recommendations

This study focuses attention on many key recommendations, such as the importance of the first 1,000 days of life; ensuring that programs are evidence-based; promoting WHO-recommended breastfeeding and complementary nutrition practices; giving fortified complementary foods to children ages 6 to 24 months in very poor or food-insecure families; as well as diarrhea's role in causing malnutrition and the urgent need to improve water and sanitation conditions. Likewise, other recommendations include the need to improve not only health care, but also strategies that increase demand and utilization of services; and creation monitoring and evaluation mechanisms. Below some of the new recommendations are outlined in greater detail.

Public Health and Social Assistance Ministry (MSPAS)

Health services are essential, but they alone are not sufficient to have a large impact on chronic malnutrition. Unfortunately, MSPAS is a weak link in the program implementation chain; it needs to increase its technical proficiency, as well as obtain more funds to enable it to extend coverage of quality programs.

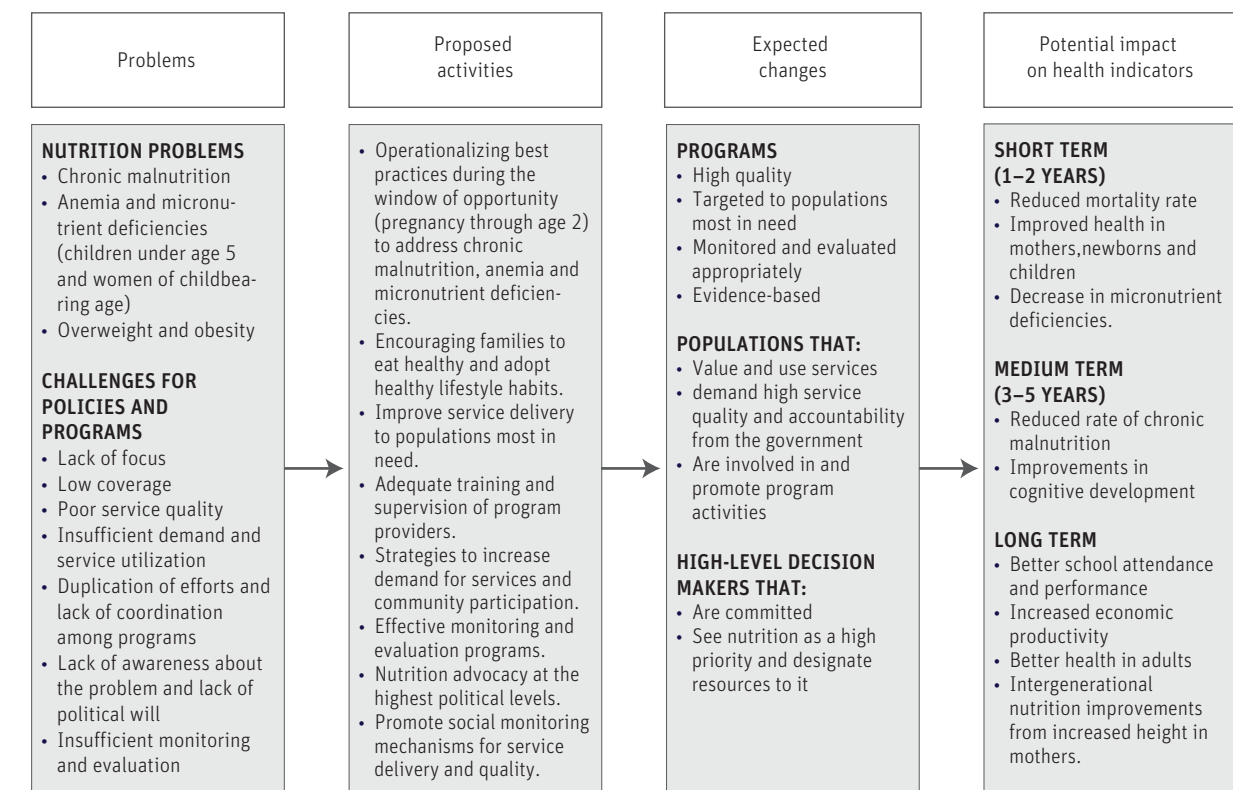
Mi Familia Progres (MIFAPRO)

Although it is too early to gauge its impact, similar programs have been essential for reducing poverty and chronic malnutrition in countries such as Brazil and Mexico. This program should be continued and its service delivery system should be strengthened. The conditions employed by the program should be associated more closely with nutrition. In addition, financial management tends to be the Achilles heel of such programs; thus it is also an area for improvement. Finally, the program's monitoring and evaluation mechanism is weak and should be strengthened.

Strengthening the culture of monitoring and evaluation

Experiences in countries such as Brazil and Mexico, where programs are routinely monitored and are subjects of

FIGURE 14

Change theory for better nutrition status in Guatemalan mothers and children (adapted from Rivera et al., 2011)

operational programmatic research, show us that such practices are beneficial. The government should make evaluation a regular component of such programs and allocate funds to hire external teams from qualified research institutes or universities to carry out these activities.

Periodic surveys

Guatemala should continue to conduct periodic national nutrition and health surveys. These surveys should also include specific questions on participation in programs to document coverage. In addition, they should include indicators of micronutrient deficiencies, such as anemia and vitamin A, and collect information on dietary intake (the Mexican survey uses a seven-day food frequency questionnaire), physical activity and sedentary lifestyle. Dietary information is very useful for examining consumption patterns and deficiencies in nutrients intake.

Along with information on physical activity, such information is essential for informing policies and programs to address the double nutrition burden.

Addressing the double nutrition burden

There is no doubt that Guatemala has a double nutrition burden. The solutions to yesterday's problems of chronic malnutrition and micronutrient deficiencies are still very distant; but new problems associated with societies in nutrition transitions have also surfaced, including obesity and chronic diseases associated with diet and lifestyle. Policies and programs need to focus on these issues and to stop claiming that the deficiencies stem from a lack of energy, rather than poor diet quality. This report focuses on recommendations pertaining to the nutrition status of mothers and children under age two, and emphasizes promoting healthy eating habits.

Growth monitoring

Health promoters have a lot of work to do, but it's also important to note what they should not do. The series in *The Lancet* on maternal and child nutrition did not include growth monitoring as one of its recommendations, due to a lack of studies on its usefulness in the absence of counseling (Bhutta et al., 2008). In other words, while evidence exists showing that growth monitoring is effective when coupled with counseling, there is no data showing that monitoring alone is valuable. In Central America, growth monitoring is enthusiastically embraced and the general belief holds that it has been a good platform for providing counseling. It is also believed to be well-received by mothers. However, such beliefs are based merely on anecdotal impressions. Growth monitoring in Guatemala is based on WHO standards of weight for age (not a minimum weight table, as in the past). The information provided via counseling varies with age, as it should; however in practice, it does not vary according to the child's position along the growth curve. This calls into question the added value of growth monitoring. Weight and height should be measured in surveys and assessments, but community health staff currently have little capacity to use such measurements. Without adequate training, it is difficult to accurately measure height for weight. The recommendations of this study are as follows:

- Since postnatal growth delays (height and weight) occur when children are between 0 to 24 months of age, growth monitoring should not be done in children over age two.
- A study should be undertaken to compare the effectiveness of growth monitoring coupled with counseling, to counseling alone, to assess differences in staff performance and learning, as well as in mothers' willingness and ability to comply with recommended practices.
- The feasibility and capacity of having community health staff to measure height and to use that indicator for growth monitoring should be studied.
- Growth monitoring coupled with counseling should be continued only for children under age two until the results of the above-mentioned studies are known.

Hospital Amigo del Niño

Promoting exclusive breastfeeding in the first six months and supplemental breastfeeding after complementary

foods are introduced, through the second year of life, is a priority for Guatemala. This requires the use of consistent messaging by all health and nutrition workers and organizations aimed at women and families before and during pregnancy, at birth and later during childhood. The Hospital Amigo del Niño initiative launched by UNICEF in 1991, implements a set of activities in various places where mothers go to give birth, including hospitals, maternity healthcare centers, and rural childbirth facilities (UNICEF, 2011a). To be certified as "Amigo del Niño" (a "friend of the child"), hospitals or facilities must agree not to accept free or very low-priced samples of breast milk substitutes or to permit the use of bottles or pacifiers. They also must agree to promote breastfeeding and implement the ten steps to successful breastfeeding (such as having a written policy that is communicated to all staff, educating all pregnant women about the benefits of breastfeeding and teaching them how to practice it, helping mothers initiate breastfeeding within a half-hour of giving birth, etc.). Having a policy that puts childbirth standards in place in Guatemala will increase the percentage of deliveries that occur in healthcare settings. The Hospital Amigo del Niño program should be readopted, despite the fact that UNICEF no longer provides the same level of support as it did previously.

Short stature in mothers is a risk factor for childbirth complications. Strategies for improving the nutritional status of mothers are expected to also improve intrauterine growth in their babies, which could increase the risk of complications during childbirth. Strategies should be created in parallel with those of nutrition programs to identify women at high risk for complications during delivery and to ensure that they receive appropriate care in childbirth centers staffed by qualified personnel.

Food Fortification

The high and growing prevalence of anemia suggests that diet quality is a huge problem, and that other micronutrient deficiencies may also exist. The food fortification program should be strengthened and expanded in two regards: adding a greater number of micronutrients, such as zinc and vitamin B12 (El Salvador and other countries are already doing this); and expanding the types of foods that are fortified. In addition to wheat flour, corn meal, semolina and rice should be included.

Vitamin A deficiency

Evidence suggests that the current program for combating vitamin A deficiency should be reviewed. The recent national survey found very few low serum retinol cases. There may also be cases with very high levels. Sugar fortification levels should be reviewed and probably reset, given high sugar consumption levels. A public education program should also be initiated to reduce sugar consumption. Obtaining data on dietary intake would greatly facilitate this analysis; such data should be gathered periodically. The need to continue providing children with massive doses of vitamin A should also be reviewed. A committee of experts should be convened to analyze the situation.

Sensationalization of the acute malnutrition problem

Hunger is an explosive issue, and it only takes a single news report on one case of severe malnutrition to dramatize the situation. As reported a couple of years ago, Guatemala has some localized cases of severe malnutrition and occasional outbreaks occur in its dry corridor. Fortunately, however, acute malnutrition has long since

ceased to be a common problem in Guatemala. It's important to avoid the temptation to distort the situation and thus, shift the focus of nutrition and health priorities, as has occurred under MSPAS' proposal to «scour the country to look for cases» of acute malnutrition, and its plan to build multiple nutritional recovery centers. Responses to news of an outbreak should be based on a reliable methodology that checks for clinical signs using weight for height, not arm perimeter, given the high margin of error in the case the latter indicator. Clinically confirmed cases should receive therapeutic nutrition to enable their recovery. Global experience shows cases of severe malnutrition generally occur only after extended periods of food shortages. A monitoring system such as SIVIM (see section 6) would enable a rapid response to disasters and would alert leaders to anticipated food and resource shortages.

In short, MSPAS and international agency response efforts should take the magnitude of the problem into account and not be influenced by sensationalism, which can distort priorities and adversely affect chronic malnutrition prevention programs.

BREASTFEEDING PROTEINS GRO BIRTH NUTRITION VITAMINS FEE 8 MICRONUTRIENTS GROWTH MINERALS BREASTFEEDING PROTEINS GROWTH BIRTH NUTRITION VITAMINS FEEDING

NUTRITION AND GUATEMALA'S FUTURE

Guatemala is facing an uncertain future, given its nation-wide nutrition problems. On the one hand, it has to deal with chronic malnutrition and problems associated with micronutrient deficiencies, especially anemia. On top of this, it faces emerging problems including obesity and chronic diseases.

Chronic malnutrition is the most important problem afflicting the nation, since it affects almost half of young children, and has strong negative effects on human capital and economic productivity. In addition, it is closely linked to poverty and is more common in the indigenous population. More resources should be allocated to prevention strategies and efforts to improve nutrition status in marginalized populations, such as the use of fortified complementary foods and conditional cash transfers. In addition, every child in Guatemala should receive a basic minimum package of health and nutrition interventions. The damage caused by chronic malnutrition occurs in a very short period of time—the first 1,000 days of life. A World Bank monograph states that nutrition in early life is not just a matter of welfare or human rights, it is also a financial investment and an engine of economic growth; better nutrition reduces poverty (World Bank, 2006). Another benefit of improving nutrition in the first 1,000 days is the reduction of risks for chronic diseases in adulthood. Guatemala has one of the highest chronic malnutrition rates in the world, and by far the highest in the Americas. Despite the achievements of 2002–2008/2009, it will take another four decades to end chronic malnutrition if the rate of progress remains the same.

Anemia affects nearly half of children under the age of five, as well as one in three pregnant women and one in five women non-pregnant women of childbearing age. The ravages of anemia include higher maternal and neonatal mortality, an increased risk of preterm birth, lower

birth weights and adverse effects on cognitive development. The epidemiology of anemia contrasts with chronic malnutrition in two ways. First, it is a nation-wide epidemic and is not associated with poverty and ethnicity. This implies the need for very comprehensive prevention strategies. Second, it has increased at an alarming rate between 2002 and 2008/2009, likely due to the deterioration observed in diet quality, which also probably contributes to obesity. Scientific research has indicated how to solve the problems of both chronic malnutrition and anemia; and if the country is willing to make the commitment, it has enough experience to deliver better services and prevention programs.

Fortunately, acute malnutrition is not a public health problem in Guatemala. However, this does not mean that there are no pockets of acute malnutrition or isolated cases in the country. Unfortunately, overreaction to these few cases has created the perception that acute malnutrition is a large problem and led to a distortion of MSPAS' priorities. To rectify the situation, effective surveillance systems are needed to provide programs with timely information to prevent and mitigate disasters.

Guatemala should have recognized its obesity problem and its consequences long ago, including huge and very costly adverse effects on life expectancy and economic productivity, as well as the very high costs of treatment. One of every two women of childbearing age is overweight or obese, and the numbers increase with each national survey. Guatemalan children are now being born not only stunted, but also overweight; and the long-term implications of this trend are not yet known. In addition, overweight and obesity affect the entire population almost equally, whether rich or poor, non-indigenous or indigenous. At the same time, Guatemala's success in resolving deficiencies is still very limited. The challenge

for Guatemala is to find a way to manage the dual nutrition agenda in an integrated and effective manner that

will enable future generations to achieve healthy growth without falling into the trap of obesity.

BIBLIOGRAPHY

- Acción Contra el Hambre. 2010. Situación alimentaria y nutricional en el corredor seco de Centroamérica. Análisis de casos en Guatemala, Honduras y Nicaragua. http://www.accioncontraelhambre.org/files/file/informes/Corredor_Seco.pdf.
- Albalak R, Ramakrishnan U, Stein AD, van der Haar F, Haber MJ, Schroeder D, Martorell R. 2000. Co-occurrence of Nutrition Problems in Honduran Children. *J Nutr*; 130:2271–2273.
- Banco Mundial. 2006. Revalorización del papel fundamental de la nutrición para el desarrollo. Washington, DC: Banco Mundial.
- Barros FC, Matijasevich A, Requejo JH, Giugliani E, Maranhão AG, Moneti CA, *et al.* 2010. Recent Trends in Maternal, Newborn, and Child Health in Brazil: Progress toward Millennium Development Goals 4 and 5. *Am J Public Health*; 100:1877–1889.
- Behrman JR, Calderon MC, Preston SH, Hoddinott J, Martorell R and Stein AD. 2009. Nutritional Supplementation in Girls Influences the Growth of Their Children: Prospective Study in Guatemala. *Am J Clin Nutr*; 90(5): 1372–1379.
- Berglund S, Westrup B and Domellöf M. 2010. Iron Supplements Reduce the Risk of Iron Deficiency Anemia in Marginally Low Birth Weight Infants. *Pediatrics*; 126(4):e874–83.
- Bhutta ZA, Ahmed T, Black RE, Cousens S, Dewey K, Giugliani E, *et al.* 2008. What Works? Interventions for Maternal and Child Undernutrition and Survival. Maternal and Child Undernutrition 3. *Lancet*; 371:417–440.
- Black RE, Allen LH, Bhutta ZA, Caulfield LE, de Onis M, Ezzati M *et al.*, 2008. On behalf of the Maternal and Child Undernutrition Study Group. Maternal and Child Undernutrition: Global and Regional Exposures and Health Consequences. Maternal and Child Undernutrition 1. *Lancet*; 371:243–260.
- Brotanek JM, Gosz J, Weitzman M and Flores G. 2007. Iron Deficiency in Early Childhood in the United States: Risk Factors and Racial/Ethnic Disparities. *Pediatrics*; 120:568–575.
- Bryce J, Coitinho D, Darton-Hill I, Pelletier D, Pinstrup-Andersen P. 2008. Maternal and Child Undernutrition: Effective Action at National Level. Maternal and Child Undernutrition 4. *Lancet*; 371:510–526.
- CDC/USAID. 2011. Sistema Integrado de Vigilancia de la Malnutrición (SIVIM). Presentación en PowerPoint.
- Centers for Disease Control and Prevention (CDC). 1998. Recommendations to Prevent and Control Iron Deficiency in the United States. *MMWR*; 47:NO.RR–3.
- Cecchini M, Sassi F, Lauer JA, Lee YY, Guajardo-Barron V and Chisholm D. 2010. Tackling of Unhealthy Diets, Physical Inactivity, and Obesity: Health Effects and Cost-Effectiveness. *Lancet*; 376(9754):1775–84.
- Chen Y and Zhou LA. 2007. The Long-term Health and Economic Consequences of the 1959–1961 Famine in China. *J Health Econ*; 26:659–681.
- Consejo Nacional de Seguridad Alimentaria y Nutricional (CONASAN). 2011a. Plan estratégico de seguridad alimentaria y nutricional – PESAN 2012–2016. Guatemala.

- Consejo Nacional de Seguridad Alimentaria y Nutricional (CONASAN). 2011b. Priorización de municipios para la focalización de intervenciones en seguridad alimentaria y nutricional. Guatemala.
- Dabelea D, Snell-Bergeon JK, Hartsfield CL, Bischoff KJ, Hamman RF and McDuffie RS. 2005. Increasing Prevalence of Gestational Diabetes Mellitus over Time and by Birth Cohort. *Diabetes Care*; 28(3):579–584.
- Delgado HL. 2010a. Status and Trends in Chronic Malnutrition in Guatemala. *Technical Report*. USAID Health Care Improvement Project. Bethesda, MD: University Research Co., LLC (URC).
- Delgado HL. 2010b. Basis for Addressing the Situation of Chronic Malnutrition in Guatemala. *Technical Report*. USAID Health Care Improvement Project. Bethesda, MD: University Research Co. LLC (URC).
- De-Regil LM, Fernández-Gaxiola AC, Dowswell T and Peña-Rosas JP. 2010. Effects and Safety of Periconceptional Folate Supplementation for Preventing Birth Defects. *Cochrane Database Syst Rev*; 10:CD007950.
- Dibley MJ, Titalley CR, d'Este C and Agho K. 2012. Iron and Folic Acid Supplements in Pregnancy Improve Child Survival in Indonesia. *Am J Clin Nutr*; 95(1):220–30.
- FAO 2011. The State of Food Insecurity in the World.
- Farina A, Dini B, Mattioli M, Rosa S and Rizzo N. 2010. Offspring Birth Weight in Second-generation 'Small for Gestational Age' Infants. *Prenatal Diagnosis*; 30:551–554.
- Fiedler JL and Helleranta M. 2010. Recommendations for Improving Guatemala's Food Fortification Program based on Household Income and Expenditure Survey (HIES) Data. *Food Nutr Bull*; 31(2):251–69.
- Flegal KM, Carroll MD, Ogden CL and Curtin LR. 2010. Prevalence and Trends in Obesity among US Adults, 1999–2008. *JAMA*; 303(3):235–241.
- Gortmaker SL, Swinburn BA, Levy D, Carter R, Mabry PL, Finegood DT, Huang T, Marsh T and Moodie ML. 2011. Changing the Future of Obesity: Science, Policy, and Action. *Lancet*; 378(9793):838–47.
- Groeneveld IF, Solomons NW and Doak CM. 2007. Nutritional Status of Urban Schoolchildren of High and Low Socioeconomic Status in Quetzaltenango, Guatemala. *Rev Panam Salud Pública*; 22(3):169–77.
- Gutiérrez JP. 2011. Evaluación externa de impacto del programa de transferencias monetarias condicionadas: Mi Familia Progresiva. Instituto Nacional de Salud Pública. Cuernavaca, México.
- Hawkesworth S, Dangour AD, Johnston D, Lock K, Poole N, Rushton J, Uauy R and Waage J. 2010. Feeding the World Healthily: The Challenge of Measuring the Effects of Agriculture on Health. *Philos Trans R Soc Lond B Biol Sci*; 365(1554):3083–97.
- Herring SH and Oken E. 2011. Obesity and Diabetes in Mothers and Their Children: Can We Stop the Intergenerational Cycle? *Current Diabetes Report*; 11:20–27.
- Hidalgo E and García CA. 2008. El sistema de salud en Guatemala, 2. Entre el hambre y la obesidad; La salud en un plato. Guatemala: Programa de las Naciones Unidas para el Desarrollo.
- Hoddinott J, Maluccio JA, Behrman JR, Flores R and Martorell R. 2008. Effect of a Nutrition Intervention during Early Childhood on Economic Productivity in Guatemalan Adults. *Lancet*; 371 (9610):411–416.
- Huang C, Li Z, Wang M and Martorell R. 2010. Early Life Exposure to the 1959–1961 Chinese Famine has Long-term Health Consequences. *J Nutr*; 140(10):1874–8.
- ICEFI/UNICEF. 2011. Protegiendo la nueva cosecha. Un análisis del costo para erradicar el hambre en Guatemala 2012–2021. Boletín No. 4, Guatemala.
- Imdad A and Bhutta Z. Iron or Iron/Folic Acid Supplementation in Pregnancy. *Paediatric and Perinatal Epidemiology*, en prensa.

- Imhoff-Kunsch B, Flores R, Dary O and Martorell R. 2007. Wheat Flour Fortification is Unlikely to Benefit the Neediest in Guatemala. *J Nutr*; 137(4):1017–22.
- Imhoff-Kunsch B and Martorell R. 2011. Caracterización de los patrones de consumo aparente en Centroamérica utilizando en los datos de la Encuesta sobre el Consumo y Gastos de los Hogares.
- Instituto de Investigaciones Económicas y Sociales (IDIES). 2009. Universidad Rafael Landívar. Evaluación del programa Mi Familia Progresá: Estudio de percepción incluyendo procesos. Guatemala.
- Instituto de Investigaciones Económicas y Sociales (IDIES). 2010. Universidad Rafael Landívar. Estudio de percepción de actores clave y madres beneficiarias en el programa Mi Familia Progresá (MIFAPRO). Guatemala.
- Kim SK, Habicht J-P, Menom P and Stoltzfus RC. 2011. How Do Programs Improve Child Nutrition? Program impact Pathways of Three Non-governmental Organization Intervention Projects in the Peruvian Highlands. IFPRI Discussion Paper O1105.
- Klebanoff MA, Schulsinger C, Mednick BR and Secher NJ. 1997. Preterm and Small-for-gestational-age Birth across Generations. *Am J Obstet Gynecol*; 176(3):521–526.
- Kramer MS, Aboud F, Mironova E, Vanilovich I, Platt RW, Matush L, *et al.* 2008. Breastfeeding and Child Cognitive Development: New Evidence from a Large Randomized Trial. *Arch Gen Psychiatry*; 65:578–84.
- Lutter CK, Daelmans BM, de Onis M, Kothari MT, Ruel MT, Arimond M, Deitchler M, Dewey KG, Blössner M and Borghi E. 2011. Undernutrition, Poor Feeding Practices, and Low Coverage of Key Nutrition Interventions. *Pediatrics*; 128(6):e1418–27.
- Maluccio JA, Hodinott J, Behrman JR, Martorell R, Quisumbing AR and Stein AD. 2009. The Impact of Improving Nutrition during Early Childhood on Education among Guatemala Adults. *Economic Journal*; 119:734–63.
- Martínez R and Fernández A. 2007. Impacto social y económico de la desnutrición infantil en Centroamérica y República Dominicana. *CEPAL/PMA*, Chile. http://documents.wfp.org/stellent/groups/public/documents/liaison_offices/wfp142944.pdf
- Martorell R, Melgar P, Maluccio JA, Stein AD and Rivera JA. 2010. The Development and Legacy of the INCAP Oriente Studies 1969–2009: The Nutrition Intervention Improved Adult Human Capital and Economic Productivity. *J Nutr*; 140(2):411–414.
- Martorell R, Mendoza FS and Castillo RO. 1989. Genetic and Environmental Determinants of Growth of Mexican Americans. *Pediatrics*; 84(5):864–71.
- Martorell R, Habicht J-P, Yarbrough C, Lechtig A, Klein RE and Western KA. 1975. Acute Morbidity and Physical Growth in Rural Guatemalan Children. *American Journal of Diseases of Children*; 129:1296–1301.
- Martorell R, Yarbrough C, Yarbrough S and Klein RE. 1980. The Impact of Ordinary Illnesses on the Dietary Intakes of Malnourished Children. *Am J Clin Nutr*; 33:345–350.
- Martorell R, Rivera J and Lutter CK. 1990. Interaction of Diet and Disease in Child Growth. In: S.A. Atkinson, L.A. Hanson, and R.K. Chandra (eds.), *Breastfeeding, Nutrition, Infection, and Infant Growth in Developed and Emerging Countries*. St. John's, Newfoundland, Canada: ARTS Biomedical Publishers and Distributors, pp. 307–321.
- Martorell R, Flores R and Hickey M. 2002. Stunting in Guatemala: Analyses of Change over 15 Years. Agricultural Policy Development Project, Research Report #8. Cambridge, MA: ABT Associates.
- Mason JB, Sanders D., Musgrove P, Soekirman I and Galloway R. 2006. Community Health and Nutrition Programs. In: DT Jamison, JG Breman, AR Measham *et al.* (eds). *Disease Control Priorities in Developing Countries*. 2nd Edition. Ch 56, pp. 1053–1074. Washington, DC: Banco Mundial.
- Ministerio de Salud y Deportes, Viceministerio de Salud y Deportes. 2008. Plan estratégico 2007–2011 del programa sectorial de Desnutrición Cero. La Paz, Bolivia. <http://www.sns.gob.bo/aplicacionesweb/pmdc1/documentos/ct-conan/pdf/Plan%20Estrategico%20PDC.pdf>.

- Ministerio de Salud y Deportes. 2010. 5ta Evaluación internacional al Programa Multisectorial Desnutrición Cero (PMD-C), La Paz, Bolivia. <http://www.sns.gob.bo/aplicacionesweb/pmdc1/index.php?ID=Evaluacion>
- Ministerio de Salud Pública y Asistencia Social (MSPAS). 2010. Encuesta Nacional de Salud Materno-infantil 2008 (ENSMI-2008/2009. Ministerio de Salud Pública y Asistencia Social (MSPAS)/Instituto Nacional de Estadística (INE/Centros de Control y Prevención de Enfermedades (CDC). Guatemala.
- Ministerio de Salud Pública y Asistencia Social (MSPAS). 2009. Plan Nacional para la Prevención y Atención de la Desnutrición Infantil en Guatemala. Dirección de Regulación, Vigilancia y Control de la Salud. Guatemala.
- Ministerio de Salud Pública y Asistencia Social (MSPAS). 2011. Lineamientos para la búsqueda activa de caso de desnutrición aguda, Guatemala.
- Monteiro CA, Benicio MH, Conde WL, Konno S, Lovadino AL, Barros AJ and Victora CG. 2010. Narrowing Socioeconomic Inequality in Child Stunting: The Brazilian Experience, 1974–2007. *Bull World Health Organ*; 88(4):305–11.
- Morales N, Pando E and Johannsen J. 2010. Comprendiendo el Programa Desnutrición Cero en Bolivia: un análisis de redes y factores. Notas técnicas # IDB-TN_138. División de la Protección Social y Salud. Banco Interamericano de Desarrollo. <http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=35176287>
- Musgrove P. 1993. Feeding Latin America's Children. *World Bank Res Obs*; 8(1):23–45.
- Okebe JU, Yahav D, Shbita R and Paul M. 2011. Oral iron supplements for children in malaria-endemic areas. *Cochrane Database Syst Rev*; 10:CD006589. Review.
- Organización Mundial de la Salud (OMS). 2011. Banco de datos antropométricos; OMS. <http://www.who.int/nut-growthdb/database/en/>
- Palmieri MS, Méndez HC, Delgado HV, Flores RA and Palma de Fulladolsa P. 2009. ¿Ha crecido Centroamérica? Análisis de la situación antropométrica-nutricional en niños menores de 5 años de edad en Centroamérica y República Dominicana para el periodo 1965–2006. Monografía, Programa Regional de Seguridad Alimentaria y Nutricional para Centroamérica (PRESANCA).
- Palmieri M and Delgado HL. 2011. Análisis situacional de la malnutrición en Guatemala: sus causas y abordaje. Programa de las Naciones Unidas para el Desarrollo 42 p. (Cuadernos de Desarrollo Humano; 2009/2010–7).
- Pelletier DL and Hoey L. 2011. Bolivia's Multisectoral Zero Malnutrition Program: Insights on Commitment, Collaboration, and Capacities. In: DL Pelletier, Guest editor. Mainstreaming Nutrition in National Policy Agenda: Successes, Challenges, and Emergent Opportunities. *Food Nutr Bull*; 32(S2):S70–S81.
- Peña-Rosas JP and Viteri FE. 2009. Effects and Safety of Preventive Oral Iron or Iron + Folic Acid Supplementation for Women during Pregnancy. *Cochrane Database Syst Rev*; 4:CD004736.
- Poder TG, 2011. He J. How Can Sanitary Infrastructures Reduce Child Malnutrition and Health Inequalities? Evidence from Guatemala. *Journal of Developmental Effectiveness*; 3(4):543–566.
- Popkin BM. 1998. The Nutrition Transition and Its Health Implications in Lower Income Countries. *Public Health Nutr*; 1:5–21.
- Programa Mundial de Alimentos (PMA). 2010. Dimensión nutricional de las redes de protección social en Centroamérica y República Dominicana. Panamá.
- PNUD. 2011 Mi Familia Progresá (MIFAPRO). Ejercicio de apreciación sustantiva, PNUD, Guatemala.
- Ramakrishnan U, Aburto N, McCabe G, Stoltzfus R and Martorell R. 2004. Multi-micronutrient Interventions but not Vitamin A or Iron Supplements Alone Improve Child Growth: Results of Three Meta-Analyses. *J Nutr*; 134(10):2592–602.
- Red Humanitaria. 2009. Resultados de la valoración de inseguridad alimentaria y nutricional en los

- departamentos del corredor seco del oriente de Guatemala, Quiché e Izabal. Guatemala: INFORME.
- Rivera JD, Villalpando S, García AG, González de Cossio T, Bonvecchio A, Shamah Levy T, Flores Aldana M and Martorell R. Desnutrición en México: Avances en la política social, recomendaciones y retos por vencer. *Salud Pública de México*, en prensa.
- Rivera JA, Martorell R, González W, Lutter C, González de Cossio T, Flores-Ayala R, Uauy R and Delgado H. 2011. Grupo Técnico de Nutrición del SMS. Prevención de la desnutrición de la madre y el niño: el componente de nutrición de la Iniciativa Salud Mesoamérica 2015. *Salud Pública de México*; 53(3):S303–S311.
- Ruel MT, Menon P, Habicht JP, Loechl C, Bergeron G, Pelto G, Arimond M, Maluccio J, Michaud L and Hankebo B. 2008. Age-based Preventive Targeting of Food Assistance and Behaviour Change and Communication for Reduction of Childhood Undernutrition in Haiti: A Cluster Randomised Trial. *Lancet*; 371(9612):588–95.
- Santos LMP, Paes-Sousa R, Miazagi E, Silva TF and Medeiros da Fonseca AM. 2011. The Brazilian Experience with Conditional Cash Transfers: A Successful Way to Reduce Inequity and to Improve Health. World Conference on Social Determinants of Health. 19–21 de octubre, Brasil.
- Secretaría de Seguridad Alimentaria y Nutricional (SESAN). 2011. Plan estratégico de seguridad alimentaria y nutricional para Occidente – Planocc 2012–2016, Guatemala.
- Secretaría de Planificación y Programación de la Presidencia (SEGEPLAN). 2011. Informe al Congreso: «Tercer año cumpliendo, vamos por más». Ciudad de Guatemala.
- Sorensen WC, Cappello M, Bell D, Difedele LM and Brown MA. 2011. Poly-helminth Infection in East Guatemalan School Children. *J Glob Infect Dis*; 3(1):25–31.
- Stein AD, Wang M, Ramírez-Zea M, Flores R, Grajeda R, Melgar P, Ramakrishnan U and Martorell R. 2006. Exposure to a Nutrition Supplementation Intervention in Early Childhood and Risk Factors for Cardiovascular Disease in Adulthood: Evidence from Guatemala. *Am J Epidemiol*; 164(12):1160–70.
- Stein AD, Wang M, Martorell R, Norris SA, Adair LS, Bas I, Sachdev HS, Bhargava SK, Fall CH, Gigante DP and Victora CG. 2010. Cohorts Group. Growth Patterns in Early Childhood and Final Attained Stature: Data from Five Birth Cohorts from Low- and Middle-income Countries. *Am J Hum Biol*; 22(3):353–9.
- Stoltzfus RJ. 2011. Iron Interventions for Women and Children in Low-income Countries. *J Nutr*; 141(4):756S–762S.
- Swinburn BA, Sacks G, Hall KD, McPherson K, Finegood DT, Moodie ML and Gortmaker SL. 2011. The Global Obesity Pandemic: Shaped by Global Drivers and Local Environments. *Lancet*; 378(9793):804–14.
- UNICEF. 2011a. Baby-friendly Hospital Initiative. December. <http://www.unicef.org/programme/breastfeeding/baby.htm>.
- UNICEF. 2011b. State of the World's Children.
- UNICEF and WHO. 2004. Low Birthweight: Country, Regional and Global Estimates.
- Vásquez C. Se reduce deficiencia de vitamina A en niños, diciembre 2011. <http://www.s21.com.gt/nacionales/2011/12/14/se-reduce-deficiencia-vitamina-ninos>.
- Victora CG, Adair L, Fall C, Hallal PC, Martorell R, Richter L and Sachdev HS. 2008. Maternal and Child Undernutrition: Consequences for Adult Health and HumanCapital. *Lancet* 371:340–357.
- Victora CG, Barreto ML, do Carmo Leal M, Monteiro CA, Schmidt MI, Paim J, Bastos FI, Almeida C, Bahia L, Travassos C, Reichenheim M, Barros FC and the Lancet Brazil Series Working Group. 2011. Health Conditions and Health-policy Innovations in Brazil: The Way Forward. *Lancet*; 377:3042–2053.
- Victora CG, de Onis M, Hallal PC, Blössner M and Shrimpton R. 2010. Worldwide Timing of Growth Faltering: Revisiting Implications for Interventions. *Pediatrics*; 125(3):e473–80.
- Walker SP, Wachs TD, Grantham-McGregor S, Black MM, Nelson CA, Huffman SL, Baker-Henningham H, Chang SM,

Hamadani JD, Lozoff B, Gardner JM, Powell CA, Rahman A and Richter L. 2011. Inequality in Early Childhood: Risk and Protective Factors for Early Child Development. *Lancet*; 378(9799):1325–38.

Webb Girard A and Olude O. Nutrition Education and Counseling Provided during Pregnancy: Effects on Maternal, Neonatal, and Child Health Outcomes. *Paediatric and Perinatal Epidemiology*, en prensa.

World Health Organization (WHO). 2006a. Child Growth Standards Based on Length/Height, Weight and Age. *Acta Paediatr Suppl*; 450:76–85.

World Health Organization (WHO). 2006b. Preventive Chemotherapy in Human Helminthiasis. Coordinated Use of Anthelmintic Drugs in Control Interventions: A Manual for Health Professionals and Programme Managers. Geneva, Switzerland: World Health Organization.

World Health Organization (WHO) 2009. Pregnancy, Childbirth, Postpartum and Newborn Care: A Guide for Essential Practice. 2nd ed. Geneva: WHO; 2006c World Health Organization. Child Growth Standards and the Identification of Severe Acute Malnutrition in Infants and Children: A Joint Statement (WHO/UNICEF).

World Health Organization (WHO). 2011a. Iron Deficiency Anaemia: Assessment, Prevention and Control: A Guide for Programme Managers. Geneva, Switzerland: World Health Organization. http://www.who.int/nutrition/publications/en/ida_assessment_prevention_control.pdf

World Health Organization (WHO). 2011b. Deworming to Combat the Health and Nutritional Impact of Intestinal Worms Biological, Behavioural and Contextual Rationale. <http://www.who.int/elena/titles/bbc/deworming/en/>

World Health Organization (WHO). 2011c. Guideline: Use of multiple micronutrient powders for home fortification of foods consumed by infants and children 6–23 months of age. http://www.who.int/elena/titles/micronutrient-powder_infants/en/

Zeng L, Dibley MJ, Cheng Y, Dang S, Chang S, Kong L and Yan H. 2008. Impact of Micronutrient Supplementation during Pregnancy on Birth Weight, Duration of Gestation, and Perinatal Mortality in Rural Western China: Double Blind Cluster Randomized Controlled Trial. *BMJ* 2008; 337:a 2001. doi: 10.1136/bmj.a2001. Erratum in: *BMJ*. 337:a2522.

ANNEXES

TABLE A1. WHO malnutrition indicators for children ages 3 to 59 months ^{+,**}

Geographic characteristics	Percentage with chronic malnutrition (% short stature)	Percentage with acute malnutrition (% low weight for height)	Percentage with global malnutrition (% low weight for age)
Area			
Urban	34.3	1.0	8.2
Rural	58.6	1.6	15.9
Region			
Metropolitan	26.3	1.4	7.3
North	59.4	1.2	10.4
Northeast	47.0	1.6	14.4
Southeast	38.9	1.2	10.0
Central	45.0	1.1	11.4
Southwest	54.0	2.0	14.6
Northwest	70.8	1.0	21.2
Petén	41.9	1.0	9.0
Department			
Guatemala	26.3	1.4	7.3
El Progreso	25.3	1.7	8.0
Sacatepéquez	51.4	1.6	8.5
Chimaltenango	61.2	1.2	14.5
Escuintla	32.4	0.8	10.2
Santa Rosa	28.9	1.7	7.7
Sololá	72.3	1.0	17.3
Totonicapán	82.2	0.9	24.5
Quetzaltenango	43.1	1.5	10.0
Suchitepéquez	43.5	2.3	12.5
Retalhuleu	34.6	2.3	11.5
San Marcos	53.5	2.9	14.4
Huehuetenango	69.5	1.0	20.8
Quiché	72.2	1.0	21.5
Baja Verapaz	59.4	1.6	14.9
Alta Verapaz	59.4	1.1	9.3
Petén	41.9	1.0	9.0
Izabal	40.4	2.8	13.2
Zacapa	45.9	0.4	16.0
Chiquimula	61.8	1.2	16.9
Jalapa	49.3	0.2	11.6
Jutiapa	36.8	1.8	10.5
Total	49.8	1.4	13.1

+ Percentage (*) of children ages 3–59 months who were identified as malnourished according to three anthropometric indicators: height for age, weight for height and weight for age, by geographic location. ENSMI-2008/2009.

** MSPAS, 2008 National Survey of Maternal and Child Health (ENSMI-2008/09). Ministry of Public Health and Social Assistance (MSPAS)/National Institute of Statistics (INE)/Centers for Disease Control and Prevention (CDC). Guatemala (2010).

TABLE A2. WHO malnutrition indicators for children ages 3 to 59 months^{+,**}

Selected characteristics	Percent with chronic malnutrition (% stunted)	Percent with acute malnutrition (% with wasting)	Percent with overall malnutrition (% low weight/height)
Characteristics of the mother			
Ethnicity			
Indigenous	65.9	1.3	16.8
Non-indigenous	36.2	1.5	10.1
Level of education			
No formal education	69.3	1.6	19.9
Primary	50.3	1.4	12.6
Secondary	21.2	1.1	5.1
College	14.1	0.6	2.1
Economic quintile			
1 (poorest)	70.2	1.4	20.8
2	59.7	1.4	14.3
3 (middle-income)	43.8	1.9	11.3
4	25.5	1.2	5.2
5 (richest)	14.1	0.7	3.2
Characteristics of the child			
Age in months			
3–5	23.5	0.5	4.6
6–11	33.5	0.9	9.6
12–23	52.3	2.8	16.1
24–35	55.4	1.5	13.6
36–47	54.5	0.9	13.7
48–59	51.7	0.8	12.9
Gender			
Male	50.5	1.4	13.9
Female	49.0	1.4	12.4
Birth order			
First-born	38.6	1.7	8.9
Second or third	44.9	1.1	11.9
Fourth or fifth	60.0	1.3	16.3
Sixth or later	64.8	1.7	18.3
Time between pregnancies			
First pregnancy	38.6	1.7	8.9
Less than 24 months	60.6	1.3	16.9
24–47	60.2	1.3	16.4
48 or more months	37.3		9.7
Total	49.8		13.1

+ Percent (*) of children ages 3 to 59 months that are considered to be malnourished according to three anthropometric indicators: height for age, weight for height, and weight for age, by according to selected characteristics. ENSMI-2008/2009.

** MSPAS, 2008 National Survey of Maternal and Child Health (ENSMI-2008/09). Ministry of Public Health and Social Assistance (MSPAS)/National Institute of Statistics (INE)/Centers for Disease Control and Prevention (CDC). Guatemala (2010).

TABLE A3. Anemia in children ages 6 to 59 months^{+,**}

Geographic characteristics	Children with anemia
Area	
Urban	46.2
Rural	48.6
Region	
Metropolitan	40.7
North	46.8
Northeast	52.2
Southeast	48.3
Central	51.9
Southwest	49.0
Northwest	47.5
Petén	48.5
Department	
Guatemala	40.7
El Progreso	37.8
Sacatepéquez	54.2
Chimaltenango	53.5
Escuintla	50.2
Santa Rosa	51.4
Sololá	56.1
Totonicapán	62.2
Quetzaltenango	40.2
Suchitepéquez	37.7
Retalhuleu	45.3
San Marcos	52.6
Huehuetenango	47.7
Quiché	47.4
Baja Verapaz	49.8
Alta Verapaz	46.1
Petén	48.5
Izabal	53.0
Zacapa	53.7
Chiquimula	55.5
Jalapa	43.9
Jutiapa	50.3
Total	47.7

+ Percentage (*) of children ages 6–59 months with anemia, according to selected characteristics. Guatemala, 2002–2008. ENSMI-2008/2009.

** MSPAS, 2008 National Survey of Maternal and Child Health (ENSMI-2008/09). Ministry of Public Health and Social Assistance (MSPAS)/National Institute of Statistics (INE)/Centers for Disease Control and Prevention (CDC). Guatemala (2010).

TABLE A4. Anemia in children ages 6 to 59 months^{+,++}	
Selected characteristics	Children with anemia
Ethnicity	
Indigenous	49.5
Non-indigenous	46.3
Mother's level of education	
No formal education	48.3
Primary	49.2
Secondary	44.0
College	36.0
Gender of the child	
Male	48.7
Female	46.7
Age of the child in months	
6–11	72.1
12–23	58.7
24–35	47.9
36–47	40.9
48–59	31.0
Birth order	
First-born	47.9
Second or third	46.9
Fourth or fifth	46.8
Sixth or later	50.0
Time between pregnancies	
First pregnancy	47.9
Less than 24 months	49.7
24–47	48.3
48 months or more	44.9
Less than 36 months	49.2
36 months or more	45.6
Economic quintile	
1 (poorest)	50.7
2	51.4
3 (middle income)	46.2
4	43.2
5 (richest)	39.8
Total	47.7

+ Percentage (*) of children ages 6–59 months with anemia, according to selected characteristics. Guatemala, 2002–2008. ENSMI-2008/2009.

++ MSPAS, 2008 National Survey of Maternal and Child Health (ENSMI-2008/09). Ministry of Public Health and Social Assistance (MSPAS)/National Institute of Statistics (INE)/Centers for Disease Control and Prevention (CDC). Guatemala (2010).

TABLE A5. Height of mothers of children under age 5 ^{+,**}

Geographic Characteristics	Average height	Percent shorter than 145 cm ⁺⁺⁺
Area		
Urban	149.4	25.0
Rural	147.1	35.4
Region		
Metropolitan	149.9	20.5
North	146.7	39.2
Northeast	149.5	23.2
Southeast	150.4	17.7
Central	148.9	25.7
Southwest	147.1	36.2
Northwest	144.9	50.5
Petén	149.0	22.4
Department		
Guatemala	149.9	20.5
El Progreso	151.8	9.9
Sacatepéquez	147.5	32.8
Chimaltenango	146.9	42.1
Escuintla	150.6	13.0
Santa Rosa	150.8	14.7
Sololá	144.4	55.7
Totonicapán	145.3	50.4
Quetzaltenango	147.7	34.0
Suchitupéquez	148.2	31.4
Retalhuleu	150.1	18.2
San Marcos	146.9	33.5
Huehuetenango	145.2	47.3
Quiché	144.5	53.9
Baja Verapaz	148.0	32.9
Alta Verapaz	146.4	40.8
Petén	149.0	22.4
Izabal	149.8	21.1
Zacapa	150.5	18.3
Chiquimula	147.5	34.4
Jalapa	149.2	20.9
Jutiapa	151.4	17.3
Total	148.0	31.2

+ Average height and percent (*) shorter than 145 centimeters, in women ages 15 to 49, who are not currently pregnant and who had given birth to 1 or more child in the 5 years preceding the survey, by geographic characteristics. ENSMI-2008/2009.

** MSPAS, 2008 National Survey of Maternal and Child Health (ENSMI-2008/09). Ministry of Public Health and Social Assistance (MSPAS)/National Institute of Statistics (INE)/Centers for Disease Control and Prevention (CDC). Guatemala (2010).

+++ 145 cm is the cut-off point for risk of having low birthweight babies.

TABLE A6. Height of mothers of children under age 5 ^{+,**}

Selected characteristics	Average height	Percent shorter than 145 cm ⁺⁺⁺
Age Group		
15-19	148.6	24.4
20-24	148.2	30.8
25-29	148.1	30.6
30-34	148.4	30.6
35-39	147.4	33.7
40-44	146.6	39.7
45-49	146.5	41.0
Ethnicity		
Indigenous	145.3	48.3
Non-indigenous	150.0	19.0
Level of education		
No formal education	145.3	48.8
Primary	147.8	30.6
Secondary	151.2	15.3
College	154.0	4.6
Economic quintile		
1 (poorest)	145.5	46.9
2	146.8	36.3
3 (middle-income)	147.9	29.8
4	150.3	18.6
5 (richest)	152.5	10.2
Total	148.0	31.2

+ Average height and percent (*) shorter than 145 centimeters, in women ages 15 to 49, who are not currently pregnant and who had given birth to 1 or more child in the 5 years preceding the survey, by geographic characteristics. ENSMI-2008/2009.

** MSPAS, 2008 National Survey of Maternal and Child Health (ENSMI-2008/09). Ministry of Public Health and Social Assistance (MSPAS)/National Institute of Statistics (INE)/Centers for Disease Control and Prevention (CDC). Guatemala (2010).

+++ 145 cm is the cut-off point for risk of having low birthweight babies.

TABLE A7. Anemia in pregnant and non-pregnant women ages 15 to 49 ^{+,**}

Geographic Characteristics	Non-pregnant	Pregnant
Area		
Urban	19.1	27.5
Rural	23.1	30.0
Region		
Metropolitan	16.6	30.1
North	21.7	33.1
Northeast	27.4	32.1
Southeast	13.8	17.8
Central	21.2	26.4
Southwest	25.3	33.8
Northwest	22.9	23.9
Petén	21.3	34.1
Department		
Guatemala	16.6	30.1
El Progreso	20.8	19.4
Sacatepéquez	19.9	24.9
Chimaltenango	20.5	24.7
Escuintla	22.1	27.4
Santa Rosa	12.9	22.3
Sololá	22.6	19.8
Totonicapán	32.3	36.3
Quetzaltenango	20.6	35.3
Suchitepéquez	21.1	31.5
Retalhuleu	23.7	44.8
San Marcos	29.0	34.0
Huehuetenango	21.1	17.9
Quiché	24.8	30.3
Baja Verapaz	19.3	31.9
Alta Verapaz	22.2	33.3
Petén	21.3	34.1
Izabal	35.3	36.9
Zacapa	20.8	19.4
Chiquimula	27.3	41.3
Jalapa	15.0	7.3
Jutiapa	13.3	21.3
Total	21.4	29.1

+ Percentage (*) of non-pregnant women ages 15–49 with anemia who had a child within 5 years of the survey, and percentage (**) of pregnant women age 15–49 with anemia, according to geographical characteristics. Guatemala, 2002–2008. ENSMI-2008/2009.

** MSPAS, 2008 National Survey of Maternal and Child Health (ENSMI-2008/09). Ministry of Public Health and Social Assistance (MSPAS)/National Institute of Statistics (INE)/Centers for Disease Control and Prevention (CDC). Guatemala (2010).

TABLE A8. Anemia in pregnant and non-pregnant women ages 15 to 49 ^{+,**}

Selected Characteristics	Non-pregnant	Pregnant
Age Group		
15-19	21.0	27.6
20-24	20.4	28.9
25-29	19.3	28.8
30-34	20.7	30.4
35-39	24.5	26.5
40-44	28.6	49.6
45-49	28.6	+++
Ethnicity		
Indigenous	24.9	32.2
Non-indigenous	19.0	26.6
Level of education		
No formal education	27.8	33.0
Primary	20.8	28.8
Secondary	16.3	26.2
College	15.6	21.4
Economic quintile		
1 (poorest)	27.9	29.9
2	25.1	37.8
3 (middle-income)	16.7	28.1
4	17.6	20.6
5 (richest)	14.7	20.2
Total	21.4	29.1

+ Percentage (*) of non-pregnant women ages 15-49 with anemia who had a child within 5 years of the survey, and percentage (**) of pregnant women age 15-49 with anemia, according to geographical characteristics. Guatemala, 2002-2008. ENSMI-2008/2009.

++ MSPAS, 2008 National Survey of Maternal and Child Health (ENSMI-2008/09). Ministry of Public Health and Social Assistance (MSPAS)/National Institute of Statistics (INE)/Centers for Disease Control and Prevention (CDC). Guatemala (2010).

+++ Fewer than 25 cases.

TABLE A9. Body mass index as an indicator of nutrition status in non-pregnant women ^{+,**}

Geographic characteristics	Body mass index (BMI)				Total	Average BMI
	Underweight (less than 18.5)	Normal (between 18.5 and 24.9)	Overweight (between 25.0 and 29.9)	Obese (30.0 or higher)		
Area						
Urban	1.8	40.5	37.5	20.3	100.0	26.5
Rural	1.5	53.0	33.4	12.1	100.0	25.2
Region						
Metropolitan	2.5	38.7	37.3	21.5	100.0	26.5
North	0.7	53.3	34.8	11.2	100.0	25.4
Northeast	1.2	51.2	32.4	15.2	100.0	25.5
Southeast	2.1	50.7	31.3	15.9	100.0	25.5
Central	2.6	39.5	37.1	20.7	100.0	26.3
Southwest	1.1	48.7	36.3	13.9	100.0	25.6
Northwest	0.8	58.3	34.0	6.9	100.0	24.6
Petén	1.6	43.4	30.6	24.4	100.0	26.5
Department						
Guatemala	2.5	38.7	37.3	21.5	100.0	26.5
El Progreso	1.2	48.7	31.9	18.3	100.0	25.8
Sacatepéquez	—	39.2	38.9	21.9	100.0	26.7
Chimaltenango	1.0	41.1	43.7	14.2	100.0	26.0
Escuintla	4.5	38.6	32.4	24.5	100.0	26.4
Santa Rosa	2.0	44.7	33.2	20.1	100.0	26.2
Sololá	1.6	53.3	32.5	12.6	100.0	25.4
Totonicapán	0.6	51.8	36.5	11.1	100.0	25.2
Quetzaltenango	0.8	45.3	39.6	14.3	100.0	25.9
Suchitepéquez	2.0	39.8	39.0	19.2	100.0	26.2
Retalhuleu	1.5	42.5	35.2	20.8	100.0	26.3
San Marcos	0.8	53.9	34.7	10.7	100.0	25.2
Huehuetenango	0.7	62.2	31.3	5.8	100.0	24.3
Quiché	1.0	54.3	36.7	8.0	100.0	24.9
Baja Verapaz	1.6	60.4	28.8	9.1	100.0	24.8
Alta Verapaz	0.4	51.6	36.3	11.7	100.0	25.6
Petén	1.6	43.4	30.6	24.4	100.0	26.5
Izabal	1.3	42.5	39.0	17.2	100.0	26.1
Zacapa	2.0	49.5	31.1	17.4	100.0	25.6
Chiquimula	0.7	61.7	27.3	10.4	100.0	24.7
Jalapa	2.0	56.5	28.8	12.7	100.0	25.1
Jutiapa	2.4	50.3	32.1	15.2	100.0	25.3
Total	1.6	47.9	35.1	15.4	100.0	25.7

+ Percentage (*) of non-pregnant women ages 15–49 who had a child within 5 years of the survey, by body mass index category, according to geographic characteristics. Guatemala, 2002–2008. ENSMI-2008/2009.

** MSPAS, 2008 National Survey of Maternal and Child Health (ENSMI-2008/09). Ministry of Public Health and Social Assistance (MSPAS)/National Institute of Statistics (INE)/Centers for Disease Control and Prevention (CDC). Guatemala (2010).

TABLE A10. **Body mass index as an indicator of nutrition status in non-pregnant women ^{+,**}**

Geographic Characteristics	Índice de masa corporal (IMC)				Total	Average BMI
	Underweight (<18.5)	Normal (18.5–24.9)	Overweight (25.0–29.9)	Obese (≥ 30.0)		
Age group						
15–19	5.5	65.1	25.4	4.1	100.0	23.4
20–24	1.6	55.0	31.6	11.8	100.0	25.1
25–29	1.3	48.5	35.2	15.0	100.0	25.7
30–34	0.6	42.0	38.2	19.2	100.0	26.4
35–39	1.0	38.2	38.3	22.5	100.0	26.9
40–44	0.8	34.5	42.3	22.4	100.0	27.1
45–49	1.2	36.5	46.7	15.6	100.0	26.5
Ethnicity						
Indigenous	0.7	52.5	35.3	11.5	100.0	25.4
Non-indigenous	2.2	44.6	34.9	18.3	100.0	26.0
Level of Education						
No formal education	0.8	53.5	33.8	12.0	100.0	25.3
Primary	1.6	47.2	35.2	16.0	100.0	25.8
Secondary	2.5	44.3	35.6	17.6	100.0	26.0
College	1.5	38.7	39.8	19.9	100.0	26.5
Socioeconomic quintile						
1 (poorest)	1.4	62.0	28.6	8.1	100.0	24.4
2	1.4	50.6	35.2	12.8	100.0	25.4
3 (middle)	1.4	43.8	37.9	16.8	100.0	26.1
4	1.4	37.8	36.8	24.0	100.0	26.8
5 (richest)	3.0	35.9	41.3	19.7	100.0	26.5
Total	1.6	47.9	35.1	15.4	100.0	25.7

+ Percentage (*) of non-pregnant women ages 15–49 who had a child within 5 years of the survey, by body mass index category, according to geographic characteristics. Guatemala, 2002–2008. ENSMI-2008/2009.

** MSPAS, 2008 National Survey of Maternal and Child Health (ENSMI-2008/09). Ministry of Public Health and Social Assistance (MSPAS)/National Institute of Statistics (INE)/Centers for Disease Control and Prevention (CDC). Guatemala (2010).



Interamerican Development Bank
1300 New York Avenue N.W.
Washington, D.C. 20577, USA
www.iadb.org