
GRUPO
BIMBO
GB
MICRONUTRIENT
fortification

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GRUPO
BIMBO
NOURISHING A BETTER WORLD

GB NUTRITIONAL LANDSCAPING

CONTEXT

Malnutrition around the world

Access to adequate food that provides the energy and nutrients necessary for the optimal development of people is a great challenge at a global level. Food insecurity affects around 2 billion people in the world at the same time that 2 billion adults and 380 million children and adolescents face problems such as overweight and obesity.

Malnutrition affects 1 in 3 people globally. This represents a significant impact not only on people's health and well-being, but also has social and economic repercussions, estimating that malnutrition has a global economic cost of approximately 3.5 trillion USD per year.

Noncommunicable diseases related to poor diets are the leading causes of death and disability worldwide (6). Being such a complex problem, its solution must have a multifactorial approach where different actors are involved.

According to the World Health Organization, malnutrition refers to "deficiencies, excesses and imbalances in a person's caloric and nutrient intake." It ranges from undernutrition that includes emaciation, growth retardation, underweight, and vitamin and mineral deficiencies; as well as overweight, obesity and related non-communicable diseases.

Our fortification guidelines are focus on undernutrition, that refers not only to a lack of nutrients, but it is also a combination of diverse factors, insufficient intake of energy, protein and micronutrients exacerbated by infections or diseases. This type of malnutrition stunts children's growth, deprives them of essential vitamins and minerals, and makes them more susceptible to frequent and serious illnesses and infections.

Companies collect and analyze publicly available information from local governments and international health authorities on specific dietary gaps in the developing world to focus their efforts on developing foods that can address these gaps. This process reveals where there is a need for micronutrients, including iron. Zinc, vitamin A and vitamin D.

Micronutrient deficiencies

Overall, 2 billion people in the world are estimated to be deficient in key vitamins and minerals. particularly: vitamin A. iodine. iron and zinc. Most of these people live in low-income countries and are typically deficient in more than one micronutrient. Deficiencies occur when people do not have access to micronutrient-rich foods such as fruit. Vegetables, good sources of proteins and fortified foods. Usually because they are too expensive to buy or locally unavailable.

If micronutrient requirements cannot be met through dietary intake there are three key additional strategies which can be used to address deficiencies: Supplementation, fortification and biofortification.

THE BIG MICRONUTRIENT DEFICIENCIES

Anemia

Anemia is a public health problem that affects populations in both rich and poor countries. Although the primary cause is iron deficiency, it is seldom present in isolation. More frequently it coexists with several other causes, such as malaria, parasitic infection, nutritional deficiencies and haemoglobinopathies.

Anemia is defined as a hemoglobin concentration below a specified cut-off point, which can charge according to the age, gender, physiological status, smoking habits and altitude at which the population being assessed lives. This problem is associated with increased risks for maternal and child mortality. Iron-deficiency anaemia reduces the work capacity of individuals and entire populations, with serious consequences for the economy and national development. In addition, the negative consequences of iron-deficiency anemia on the cognitive and physical development of children and on physical performance-particularly the work productivity of adults-are major concerns. The numbers are staggering about 25% of the world's population are anemic, many because of iron deficiency; in resource-poor areas, the number is frequently exacerbated by infectious diseases.

The main risk factors for iron-deficiency anemia include a low dietary intake of iron or poor absorption of iron from diets rich in phytate or phenolic compounds. Populations groups with greater iron requirements, such as growing children and pregnant women, are particularly at risk. Overall, the most vulnerable, poorest and least educated groups are disproportionately affected by iron-deficiency anaemia.

Anemia

· 2 billion people are anemic, mainly because of a lack of iron in the diet.

· 468 million non-pregnant women are anaemic globally.

The population most at risk are:

· Pregnant women, infants and pre-school children are particularly at risk.
· 50% of pregnant women in devoloping countries are estimated to be anaemic.
· 40% of pre-school children in developing countries are estimated to be anaemic.

VITAMIN A DEFICIENCY

Vitamin A deficiency results from inadequate dietary intake of vitamin A to satisfy physiological needs. It may be exacerbated by high rates of infection, especially diarrhea and measles. It is common in developing countries but rarely seen in developed countries.
Vitamin A deficiency is a public health problem in more than half of all countries. Vitamin A deficiency can be defined clinically or sub-clinically.

Night blindness is one of the first signs of vitamin A deficiency. In its more severe forms, vitamin A deficiency contributes to blindness by making the cornea very dry and damaging the retina and cornea. An estimated 250 000-500 000 vitamin A-deficient children become blind every year and half of them die within 12 months of losing their sight. Vitamin A deficiency also contributes to maternal mortality and other poor outcomes of pregnancy and lactation. Furthermore, it diminishes the ability to fight infections. Even mild, subclinical deficiency can be a problem, as it may increase children's risk for respiratory and diarrheal infections, decrease growth rates, slow bone development and decrease the likelihood of survival from serious illness.

Vitamin A

- Vitamin A Deficiency
  250 million pre-school childre are vitamin A-deficient, because of this children go blinf every year.
- Why do you need vitamin A?
- For growth and development
- Whta it you don´t get enough?
- Impaired visin and night blindnes
- Inmune system could be weakened
- Young child are in great risk of illness and even death

ZINC DEFICIENCY

Zinc deficiency is largely related to inadequate intake or absorption of zinc from the diet, although excess losses of zinc during diarrhea may also contribute. The distinction between intake and absorption is important: high levels of inhibitors (such as fibre and phytates) in the diet may result in low absorption of zinc, even though intake of zinc may be acceptable. For this reason, zinc requirements for dietary intake are adjusted upward for populations in which animal products—the best sources of zinc—are limited and in which plant sources of zinc are high in phytates.

Severe zinc deficiency was defined in the early 1900s as a condition characterized by short stature, hypogonadism, impaired immune function, skin disorders, cognitive dysfunction and anorexia. Using food availability data, it is estimated that zinc deficiency affects about one-third of the world's population, with estimates ranging from 4% to 73% across subregions. Although severe zinc deficiency is rare, mild-to-moderate zinc deficiency is quite common throughout the world.

Worldwide, zinc deficiency is responsible for approximately 16% of lower respiratory tract infections, 18% of malaria and 10% of diarrheal disease.

In total 1.4% (0.8 million) of deaths worldwide were attributable to zinc deficiency: 1.4% in males and 1.5% in females. Attributable dalys were higher with zinc deficiency accounting for about 2.9% of worldwide loss of healthy life years.

Zinc

- Zinc deficiency
- Generally realed to poor absorption or intake of zinc from your diet

Why do you need zinc?

- Its essential for maintaining our inmmune system healthy and for growth and development of chikdren

OUR COMMITMENT

Launch fortified products to address under-nutrition through micronutrient fortification focus on Iron, Zinc Vitamin D and Vitamin A deficiency.

Developing products that help cover nutritional deficiencies.

Adequate food intake and nutrition are the basis for survival. health and a human being's growth in optimum conditions. Therefore, it's important for us to invest in the short. medium and long terms through the development of products aimed to benefit the current and future generations with nourishment deficiencies.

In Grupo Bimbo we understand that one of the most effective ways of helping to satisfy the health and nutritional needs of the community is to develop actions related to strengthening or enriching staple food, such as bread.

As part of our commitments to offer delicious and nutritious foods for everyone. GB has developed a rigorous methodology for Nutritional Land- scaping and set the guidelines for creating products that can address these nutrition gaps for vulnerable population.

Under our main strategy "Nourishing a better world", the area of Global Nutrition Sciences has developed different actions that contributes to the health and nutrition of our consumers.

If micronutrient requirements cannot be met through dietary intake there are three key additional strategies which can be used to address deficiencies:

- **Supplementation:** A substance or product that is added to a person's diet to make sure they get all the nutrients they need. It may include vitamins, minerals, protein, or fat,
- ·**Fortification:** fortification involves the addition of small amounts of micronutrients to food products often commonly consumed by the general population (such as cereals. wheat flours and rice)
- ·**Biofortification:** is the process of breeding staple crops to have higher levels of essential nutrients either through selective breeding or genetic modifications.

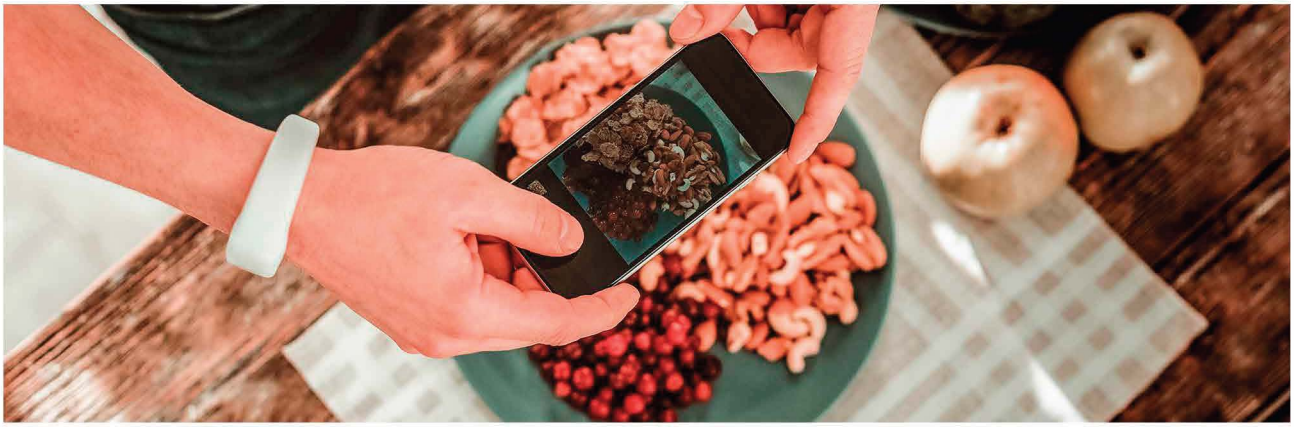
As part of our commitments to offer delicious and nutritious foods for everyone. GB has developed a rigorous methodology for Nutritional Landscaping and set the guidelines for creating products that can address these nutrition gaps for vulnerable population.

GB NUTRITIONAL LANDSCAPING

· Fundamentals

This tool considers the international and local dietary guidelines and recommendations based on science

- General Principles for the Addition of Essential Nutrients to Foods (CXG-9-1987), CODEX Alimentarius.
- Guidelines on food fortification with micronutrients, WHO/FAO
- Local nutrition surveys performed by sanitary and government authorities.
- Local Dietary Reference Values (DVR)



Our method

- **Identify dietary needs** both geographically and within a specific population group to promote launching new products with the micronutrients needed.
- **Generate** easy-to know Country profiles.
- **Develop and update** global nutritional guidelines based on micronutrient fortification and bring together nutrition-related indicators in standardized form.
- **Track** changes over time and monitor progress in a specific population.

GB NUTRITIONAL LANDSCAPING

Our method

1. Data Research

Includes the identification of publicly disclosed official reports per country.
And the research of additional papers to hace as many information as possible.

2. Information Analysis

Analyze the micronutrient-related information and create a chart of micronutrient deficiency and policies or programs.

3. Country Profile

Create a summary that contains Country description including back-ground, location, population, prevalence of malnutrition and a technical analysisi of wheat flour fortification.

4. Definition of Local Strategies

Develop products focused on covering micronutrient deficiencies based on local needs.
The products developed must be staple foods with a score of at least 3 stars based on the HSR methodology and be classified in the daily consumption portfolio.

COUNTRY PROFILES

Based on the Global Hunger Index (GHI), we identify the countries with the highest score and then create a working plan based on the GB presence to study the micronutrient deficiencies, also the products available in the region.
In 2019 we´ve started with the developing countries in America with higher (GHI) that showed a need to cover nutrition.

GHI	COUNTRY
20.6	Guatemala
16.9	Venezuela
12.9	Honduras
11.3	Ecuador
9.6	El Salvador
8.8	Panama
8.3	Peru
6.7	Paraguay
6.2	Mexico

ANEX 1. EXAMPLE OF A COUNTRY PROFILE

Location

Based on the Global Hunger Index (GHI), we identify the countries with the highest score and then create a working plan based on the GB presence to study the micronutrient deficiencies, also the products available in the region.
In 2019 we´ve started with the developing countries in America with higher (GHI) that showed a need to cover nutrition.

Population: 128.5 million

The site of several advanced Amerindian civilizations-including the Olmec, Toltec, Teotihuacan. Zaptotec, Maya anda Aztec-Mexico was conquered and colonized by Spain in the early 16th century. Administered as the Viceroyalty of New Spain for three centuries, it achieved independence early in the 19th century. Ongoing economic and social concerns include low real wages, high underemployment, inequitable income distribution and few advancement opportunities for the largely indigenous population in the impoverished southern states.

Most of the population is found in the middle of the country between the states of Jalisco and Veracruz; approximately a quarter of the population lives in and around Mexico City.
In 2019 we´ve started with the developing countries in America with higher (GHI) that showed a need to cover nutrition gaps:

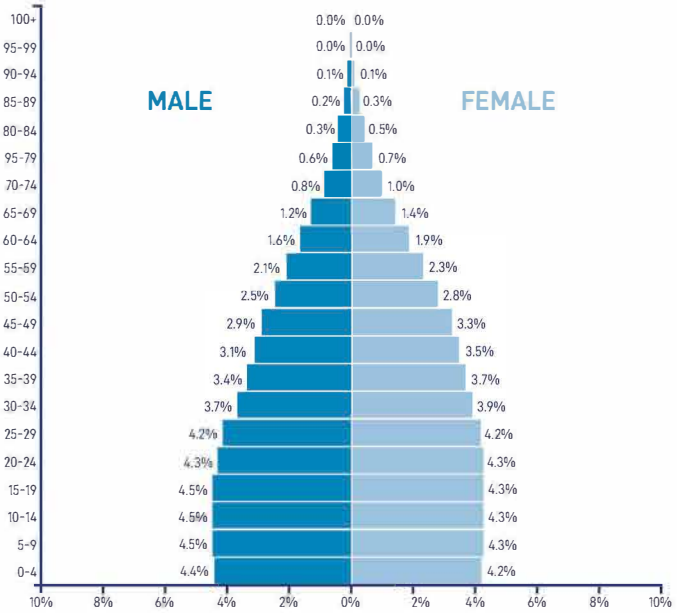


Figure 1. Population pyramid - Mexico 2019[2]

MALNUTRITION BURDEN

Although it performs well against other developing countries. Mexico still experiences a malnutrition burden among its under-five population. As of 2016. the national prevalence of under-five overweight is 5.3%, which has increased slightly from 5.2% in 2015. The national prevalence of under-five stunting is 10%. which is less than the developing country average of 25%. Mexico's under-five wasting prevalence of 2% is also Less than the developing country average of 8.9%. Mexico's adult population also face a malnutrition burden. 14.6% of women of reproductive age have anemia, and 11.4% of adult women have diabetes, compared to 9.1% of men. Meanwhile, 40.2% of women and 30.5% of men have obesity

Table 1. % Prevalence of malnutrition[3]

AGE	INDICATOR	% PREVALENCE		YEAR
		MALE	FEMALE	
< 5 years	Stunting	10.07	10.07	2016
	Wasting	2.6	2.6	2016
	Overweight	5.3	5.3	2016
Child and adolescent (5-19) years	Underweight	9.7	10.07	2016
	Overweight	35.8	2.6	2016
	Obesity	16.8	5.3	2016
Adult (20 and more)	Anemia in WRA	X	14.6	2016
	Diabetes	9.1	11.4	2014
	Overweight	42.5	36.6	2016
	Obesity	30.5	40.2	2016

VITAMIN AND MINERAL DEFICIENCIES

Table2. Prevalence of micronutrient deficiencies

Recommended Dietary Allowances	Prevalence of micronutrient deficiency	Health issues related to deficiencies	Current strategies to address deficiencies	Promising strategies	Reference
IRON					
8 mg	Children (6-11 years) 13%	Iron deficiency with potential adverse impact on growth, cognitive development and development of human capital.	Fortification of wheat flour with iron (40 mg-kg).	Coverage extension programs that include NGO and public-private alliances.	Encuesta Nacional de Salud en Escolares 2008. ENSANUT 2006 y 2012.
11 mg men 15 mg women	Teenagers (12-19 years) 11%				
8 mg	Anemia in men (20-49 years) 6%				
18 mg	Anemia in women (20-49 years) 19%				
8 mg	Anemia in elderly men (50 and more) 10-30%				
8 mg	Anemia in elderly women (50 and more 28-50%				
ZINC					
5-8 mg	Children (6-11 years) 26%	Child growth failure; morbidity and cognitive development; human capital.	Fortification of wheat flour with iron (40 mg-kg).	Limited impact of educational strategies on the use of complementary foods.	Encuesta Nacional de Salud en Escolares 2008.

VITAMIN B12

2.4 mcg	Women (20-49 years) 8.5%	Deficiency is associated with macrocytic anemia.	There are no national vitamin B12 food fortification programs.	Complementary foods of social programs, based on flours.	Prevalence of iron, folate and vitamin B12 deficiencies in 20 to 49 year old women: Ensault 2012

VITAMIN D

12mg (600 IU)	Children (6-11 years) 36.6%	Vitamin D sufficiency prevents rickets in children and osteomalacia un adults. Together with calcium vitamin D also helps protect older adults from osteoporosis.	Fortifies milk and powder products.	Sun exposure. Consumption of fortified dairy products.	Vitamin D deficiency is common and is associated with over-weight in Mexican children aged 1-11 years

POLICY TITLE	START YEAR
Sin Hambre, Cruzada Nacional	2018
Marco de Cooperacion de las Naciones Unidas para el Desarrollo en Mexico	2014
NORMA Oficial Mexicana NOM-247-SSA1-2008, Productos y servicios. Cereales y sus productos.	2008

PROGRAMME TITLE AND ACTIONS	START YEAR
Vitamin and mineral nutrition - Complementary food fortification	2009
Vitamin and mineral nutrition - Condiment and seasonings fortification	2009
Vitamin and mineral nutrition - Iodine supplementation	2009
Vitamin and mineral nutrition - Margarine/butter fortification	2009

Nutrients Added Through Fortification (parts per million)[4]

Cereals	Vitamins & Minerals							
	Iron	Type of Iron	Zinc	Folic Acid	B12	Niacin	Rivoflamin	Thiamin
Wheat	40	Ferrous sulfate Ferrous fumarate	40	2		35	3	5
Maize	40	Ferrous sulfate Ferrous fumarate	40	2		35	3	5

A

Fortification of wheat flour with Iron

Flour fortification with zinc can lead to a massive diminution of this mineral deficiency.

B

Multifortification of weath flour with Iron, Zinc.

Flour fortification with zinc and iron can address children (6-11) deficiencies.

C

Fortification of wheat flour Iron and vitamin B12

Flour fortification with zinc and vitamin B12 can address women (20-49 years) deficiencies

D

Fortification of maize flour

Options A, B and C should also be considered on maize flour.

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