Chapter

Meaning and Health Impact of Food: Historical and Ecological Analysis

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Abstract

Currently the world is facing a viral contingency that has exposed the vulnerability in which the human being is in the face of the alarming statistics of obesity at all ages, increasing the numbers of diabetes, cardiovascular diseases, and cancer mainly. But not only health has suffered a deterioration worldwide but also the environment with impacts on the availability and quality of water, air pollution and soil deterioration. In México, the food culture has undergone changes derived from greater accessibility to industrialized foods, less physical activity, stress, replacement of consumption and the use of local foods. Currently in Mexico actions are being implemented to rescue agroecology, gastronomy, and food culture. Therefore, this chapter will have the purpose of integrating a historical, ecological and health impacts analysis with what food means and its source or origin for people.

Keywords: sustainable diet, food culture, obesity, industrialized food

1. Introduction

The economic, political, social, environmental and health impacts of the SARS-COV2 virus pandemic as well as the disease generated (COVID-19), worldwide are and will continue to increase, affecting the most vulnerable population. Before the contingency, there was already a deterioration in the health of the population with an increased prevalence for chronic degenerative diseases associated with obesity and unhealthy lifestyles (sedentary lifestyle and consumption of high-energy foods), as well as other problems of health (short stature, malnutrition, anemia, mainly). We are in a century with the greatest scientific advance, but with a population that suffers from hunger and at the same time with the highest figures in the loss and waste of food in the world [1].

In Mexico, according to the recent National Health and Nutrition Survey (ENSANUT-2018 for its acronym in Spanish) [2], there was an increase in the numbers of diabetes (10.3%), arterial hypertension (18.4%), dyslipidemias (19.5%) as well as one of the main risk factors: obesity and being overweight. Obesity and overweight have been exacerbated mainly in adolescents and young adults aged 20 years and over, where for the latter group, for every 10 adults 8 are overweight or obese. Another problem is food insecurity in households in Mexico, which was

70% for 2012 and for 2018 44.5%. Food insecurity had a decrease of 14.5%, but this increase in households with food security cannot be attributed to an improvement in access to nutritious food, since for this same year the consumption of industrialized foods with high energy intake, fat saturated and added sugars increased as well. This deterioration in the health of the population is one of the reasons why the worldwide morbidity and mortality figures for COVID-19 were high for the population living in extreme poverty and with the presence of the diseases [3, 4]. The health impacts have occurred as well as the deterioration of the environment, they have been increasing and there are several theories, including an obsolete economic model where vital resources such as water have been depleted. For Mexico, the lack of access to water in quantity and quality has been the result of mismanagement of the resource, mainly with overexploitation by the industrial sector and the lack of a reform to the National Water Law [5].

The models of production and of labor and economic organization have led to changes in the food culture and, therefore, to people's health and the deterioration of the environment. A production model that has generated greater contamination with impacts on the soil, generating more deteriorated crops, loss of health, which prevents ensuring the sustainability of future generations [6]. Several have been the industrial sectors whose production processes have generated great impacts on health and the environment. The figures for obesity and diabetes in Mexico and in the world have increased in the last three decades due to the construction of obesogenic environments [7]. The role of food has been part of this process, with access to more processed foods and more agrochemicals.

The soft drink industry has been one of the industries with the most evidence of its impacts not only on health but on the environment, mainly in water. For example, for every liter of soft drink produced, 1.7 liters of water are required [8]. In the 70's, Mexico was already the second place in the consumption of soft drinks and scientific evidence has shown that its consumption (sugary drinks) is a risk factor for developing obesity and diabetes by contributing 9.8% of the energy intake in the Mexican diet, while 16% are desserts, cookies, sweets [8–10]. Other data that have facilitated their access has been the price of the soft drink and the size of the portion that is sold in Mexico. The price is also different in rural and urban areas. For example, in 2017, for every 2.5 L of soft drink, the cost was 0.80 USD or 0.66 €, while in urban areas it was 1.30 USD or 1.06 € (**Figure 1**). The same happens with the 600 mL presentation, the cost was higher in urban populations,

Figure 1.
Soft drink cost in rural vs. urban areas in México. Source: Courtesy Monroy-Torres R (2017). http://bombochis.blogspot.com/2017/.

	Mexico	Germany
Maximum amount of soft drink sold.	3 L (0.80 USD or 0.66 €)	2 L (2.14 USD or 1.74€)
Cost per 600 mL [a,b,c]	0.75 USD (0.62 €).	2.43 to 3.65 USD (2–3 €)
Liters per capita consumed (Ref. [11], d).	142 to 233	97 to 135.5
Water required to produce one liter of soft drink [11]	1.71 L	
Global position in bottled water consumption [11]	2	6
Diabetes in the adult population (%)	10.3%	7.4%
Obesity and overweight in adults 20 years and older [2]	75.2% 2018	82.4% 2016

Source: Websites: a) https://super.walmart.com.mx/refrescos/refresco-coca-cola-botella-de-600-ml/00000007500761 b) https://marginalrevolution.com/marginalrevolution/2009/09/why-is-cocacola-so-expensive-in-europe.html; c) https://www.expatistan.com/price/coke/berlin; d) Liters per capita according Euromonitor International 2013. Dollar and Euro Exchange, on december 28, 2020.

Table 1.
Soft drink consumption and health statistics in Mexico and Germany.

which may explain its accessibility in all regions of the country. In **Table 1** a comparative summary of some data on soft drinks in Mexico (Latin American Country) is presented. and contrasting it with a European country like Germany.

1.1 A historical perspective

Today the diet is different from what was used in other times. Not only have the inputs with which food is prepared have changed, but also the eating patterns, the way they are prepared and the value of these. All this has had an impact on the nutrition of the population. This change has been caused by different factors that have to do with cultural miscegenation and with the cultural influences that have been established in Mexico over time, even with the scourge of natural phenomena such as droughts, floods, and diseases.

Environmental devastations have been constant throughout history; one of them occurred precisely in the 16th century, when the Spanish arrived. This does not mean that the environment had not changed previously, but rather that, according to specialists in environmental history, they were of lesser magnitude than those that occurred after the arrival and settlement of the Spanish. They brought new ways of producing food by introducing both sowing and cattle grazing [12].

Regarding the diet consumed by the natives, Guillermo Santamaría, an Augustinian friar from the 16th century, affirmed that the Chichimeca Indians consumed wild fruits and roots, in addition to hunting products and sometimes fishing. What they most consumed was corn, beans, squash, chili, tunas, nopales, pitahayas, xoconoxtle, sweet potatoes and mesquite pods, from which they even made bread that they could keep for a long time. The diet was based on plants that were collected by women, but also on those that were planted in cornfields or family gardens. In addition to the above, they also fed on game animals such as snakes, lizards, rabbits, hares, and deer that men hunted in the field. Pulque or tuna or mesquite ferments were used as drinks. Livestock was an important source of food, but also of devastation of the environment, since they ate both the plants of the cornfields and those that grew wild, destroying tunnels, nopaleras, mesquitales and magueyales causing a shortage of food [13].

As can be seen, little by little the diet was modified over time, since, from being made up of legumes, fruits, vegetables, and cacti, it was transformed, and various products of animal origin were added. Among the incorporations of great importance were the sugars with which jams, crystallized sweets, eggnog, and desserts are prepared. Flours, with which a great variety of breads, cakes and cakes were prepared to which seasonal fruits were added. Another incorporated ingredient was lard, which accompanied food not only as an element for cooking, but as an ingredient that added flavor. This was included abundantly in almost most of the cooked foods. He even added to foods that already contained fat, increasing their fat content, mainly those of the saturated type. This had a reason, since fat was an ingredient valued as something that provided energy to individuals, so it is recommended that as much of it be eaten and even the sick was recommended to eat pots or lamb broths to soon to be reestablished [14]. Currently we know that these eating behaviors have a risk to people's health and have probably been the cause of several diseases, but at that time they were not considered that way.

Wondering European travelers constantly related the quantity and variety of fruits and vegetables that were observed throughout New Spain. This shows the fertility of the soil and there was an intensive agriculture based on the rain cycle in each region. But all this was modified by climate change, since the rainy seasons have been significantly altered and that has led to the implementation of irrigation systems that have ended the water reserves in the subsoil. The climates affected food production, both the torrential rains that flooded the fields and the droughts that regularly hit some parts of New Spain. All these natural disasters caused food shortages and the few that did exist were priced at high prices. Because of the scarcity, the population modified their diet, and perhaps these circumstances probably caused the population to adopt a diet based on plants, vegetables and cacti [14].

During New Spain there was a great biodiversity of food and with them its greater accessibility but that depended on the regions and climates, the most common was that people ate prepared food per day. But if there were perishable or more decomposing foods, then a preservation process was applied to them to be able to consume them later.

Food depended for the most part on what was grown and harvested locally, as there were several factors that made it difficult to transport food for mass consumption, either because the food was not kept for so long or because the roads were not conducive to transport them agilely. Most of what was produced was concentrated in the cities, and not only the inhabitants of the city but also those of the rancherias and nearby towns came to it to trade food. In the Bajio area and in others of New Spain (today Mexico) such as Puebla, Michoacan, and Jalisco, they were mainly dedicated to the cultivation of cereals such as wheat and corn, and this determined the diet of the population, since they ate what they harvested, and what was left they sold to buy the rest that they needed. All these limitations made the diets very unbalanced, since most of the population did not have access to all kinds of food, and those who had a comfortable economic position ate the diet that they valued as adequate: fats, sugars and flours in excess causing some diseases [14].

Because the population had an inadequate diet, it was more vulnerable to being attacked by epidemics. For example, cholera was a feared disease for its symptoms (diarrhea and vomiting) that generated high mortality in the population, which is why some foods were prohibited. In epidemics it became common for diets to be changed to control the disease; for example, for the cholera epidemic that affected the state of Guanajuato in 1850, it was recommended that foods laden with spices and fats should not be eaten, that the meats were not salted, salted, or highly seasoned, and that pork meat should not be eaten, the lard bread, the vegetables, the fruits, the seeds that have skin or skins and the milk. Among the foods that were

allowed were tender meats, such as chicken, hen, mutton, tender veal, roasted, cooked, and simply seasoned: well-boiled bread, rice, or noodle soups, atole, sago, champurrado and chocolate [15]. All the above tells us about the valuation about healthy or adequate to eating.

Later, with the French influence that the Porfirian regime promoted in Mexico, other culinary practices were introduced. French rolls or brioches, desserts and wines were incorporated. However, this French-style food practically had its impact on the upper social classes. In this national historical period, the commercialization of food and its derivatives was promoted; this increase was due to the construction of the railway in which large quantities of products can be transported in a shorter time [16].

Already in the twentieth century in Mexico, a boom began with the advent of industrialized products. At the beginning of the century, the influence of American food was more in the northern states, but little by little its commercialization spread throughout the country. These products included soft drink, which was gradually incorporated as part of the diet, as well as foods that contained high energy density foods [11, 17].

With technological development, refrigerators were manufactured in the second half of the 20th century, which generated a change in the way of preserving food, replacing the drying, salting, smoking and fermentation of food [18]. And although these techniques were not stopped, the truth is that the kitchen was revolutionized because food can be preserved in greater quantity and for longer. However, this brought both positive and negative changes in the way of cooking and eating, because with this they stopped consuming fresh foods such as fruits and vegetables and meats that were acquired daily. Large quantities of industrialized bread canned, and frozen products also began to be consumed. The milk is industrialized, and the consumption of natural milk almost completely disappears. Animal fats were changed to vegetable fats. But one of the most significant changes will be the use of corn flour for the rapid and industrialized preparation of tortillas, leaving nixtamal almost in disuse. The industrialization of income a homogenization of food throughout the country, reducing over the years the consumption and use of regional and local foods.

Subsequently, with the intense commercial exchange between Canada, the United States and Mexico through NAFTA or NAFTA (for its acronym in English) there have been accelerated changes in what is consumed, eaten and cooked. All this

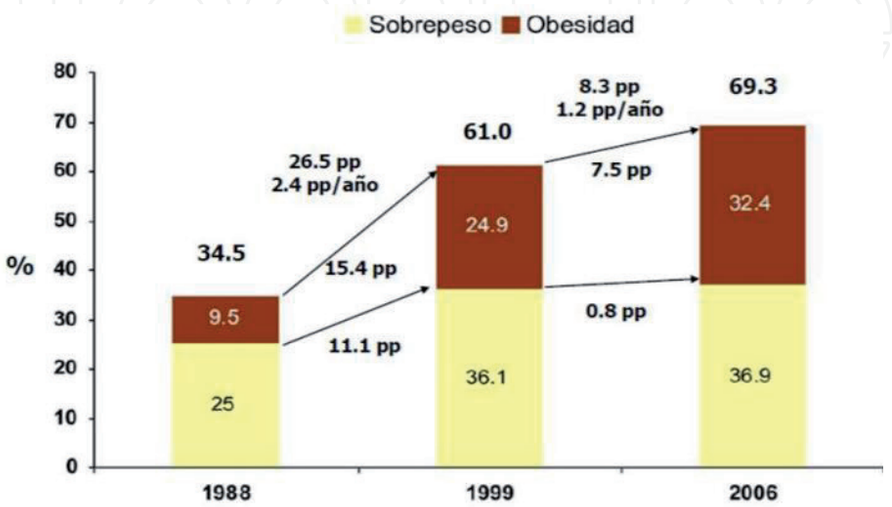

Figure 2.
Increase of overweight and obesity in Mexico from 1980 to 2006. Source: National Agreement for food health. Strategy for overweight and obesity 2010 [20].

has resulted in culinary practices being transformed. Industrialized products are more at hand to be consumed. **Figure 1** presents a chronology of health statistics 10 years before and after the entry into force of NAFTA (1994) [19].

It should be noted that the change in diet that has originated is not exclusive to Mexico but to a global scope, in which products, foods and culinary tastes have been standardized. As we previously pointed out, this type of industrialized diet based on sugars, flours and fats has resulted in high levels of obesity, diabetes, and hypertension, as we will see in a moment. In 1988, overweight and obesity was 34.5% and 5 years after signing the FTA (1999), overweight and obesity increased to 61% and whose trend has been to increase to 75.2% of overweight and obesity combined. The population in Mexico as represented in **Figure 2** [19, 21].

As of the Free Trade Agreement, there was an increase in the price of the basic food basket (fruit, vegetables, beans, corn, beef, chicken, and eggs) while there was a decrease in the price of industrialized food [17].

2. Indicators (economic, environmental, food and health)

The impacts generated on the environment and health attributed to human action have been widely documented. There is data that shows that a total of natural resources exceeding 60 billion tons per year have been extracted so far in the 21st century, at the same time the richest 10% of the world's population monopolized 40% of the energy and 27% of the materials [22].

Climate change has been another factor that adds to the environmental challenges in the era of the so-called "anthropocene". In recent decades, climate changes have shown their effects on ecosystems, productive sectors and society. In agriculture, these impacts are reflected in the yield of crops, affecting in a more profound way the sectors of the population living in poverty, since they have fewer possibilities of generating resilience strategies in the face of predatory rules imposed by the market. In the same way, the possibility of protecting the places they inhabit due to hydrometeorological phenomena is annulled.

Diseases related to the effects of climate change such as the case of vectors such as the mosquito that transmits dengue and malaria, likewise, increases in mortality associated with extreme heat events have been documented [23]. The increasing and accelerated pace of demand for natural resources and energy has generated negative impacts on ecosystems, as well as serious socio-environmental consequences. As biophysical limits continue to be transgressed, we will see more and more irreversible and damaging effects on health, nature and coexistence systems, with the danger of falling into a deterioration that generates new pathologies, ailments and impossible health problems to elucidate in the short and medium term. Hence the need to pay special attention to this process to carry out actions that allow us to have a more harmonious relationship with our environment and therefore a better quality of life.

The latest estimates indicate that in Mexico about 50% of natural ecosystems have been lost, the main effects have been in ecosystems that are more productive, accessible and with better soils. The forests have been the terrestrial ecosystems of the country that have suffered the greatest disturbances due to human activities, both in eliminated and degraded areas [23]. The factors associated with the loss of habitat are related to the change of land use to give way to agricultural, livestock, industrial, tourism, oil and mining activities, among others [24].

In addition to the above, the water quality indicators show that 12 million people lack access to drinking water, 102 of the 653 aquifers in Mexico are overexploited, 46% of the water is lost due to leaks in the supply networks, 80% of water

bodies present some type of contamination by industrial discharges [25]. Water contamination is a public health problem, digestive system diseases derived from consuming contaminated water are the third most important cause of infant death in Mexico [26, 27].

2.1 Environmental and health situation in Mexico

Likewise, the generation of urban solid waste (MSW) in Mexico reached 53.1 million tons in 2015. The increase in the generation of urban solid waste can be explained as a result of multiple factors, recognizing urban growth among the most important, industrial development and the change in consumption patterns of the population. The environmental and health consequences of the increase in MSW are presented through factors such as: the generation of biogases, contamination of soils and bodies of water, as well as the proliferation of harmful fauna and transmission of diseases [26, 28].

The global burden of diseases attributed to environmental factors is estimated at around 25% of the total for the general population and around 38% for the child population. The increase in non-communicable diseases and obesity rates in Mexico are alarming, there are several factors that have triggered this phenomenon, one of them is the high consumption of sugary drinks and ultra-processed products with high amounts of fats or sugars, low in content. Fiber and refined flours [29].

In Mexico, in 2016, 72.5% of adults were overweight and obese. Obesity increases the risk of suffering from other diseases such as diabetes mellitus, ischemic heart disease, hypertension, cerebrovascular diseases, cancer, among others, which decrease the quality of life and increase the risk of death among those who suffer from them. Obesity also represents high medical costs, estimated at 151,894 million pesos in 2014 alone, which is equivalent to 34% of public spending on health and causes an estimated loss of productivity of 71,669 million pesos per year [2, 29].

Another problem related to health and the environment is exposure to air pollutants in cities and exposure to chemicals such as pesticides. It is estimated that 42% of chronic lung diseases are due to environmental risk factors related to occupational exposure to dust and chemicals, as well as air pollution in closed spaces due to the burning of solid fuels such as the use of firewood for cooking or as heating [23].

Regarding pesticides, the most frequent use of these occurs in agricultural activity. The prevailing agro-industrial system leads to the intensification of food production and this resulted in the excessive use of pesticides. In Mexico, pesticides are used that are prohibited in other countries, without rigorous controls being carried out for their use, supervision or information that account for the risks and level of danger that they bring with them, in such a way that we are directly or indirectly exposed to the harmful effects that they generate [30].

The soil is the natural resource from which food comes and, the conservation of the earth is thanks to the biogeochemical cycles that allow the movement of elements such as nitrogen, carbon, oxygen, sulfur, water among other elements in the form of cycles that it occurs through living beings and the environment. These cycles have been altered by atmospheric pollution, water exploitation, over-paving of the soil, the intensive use of agrochemicals derived from an economic system and lifestyle of people that has not allowed biogeochemical cycles to be generated. For example, it is known that the long-term use of agrochemicals as fertilizers has impacts on the diversity and density of soil bacteria. The justification for its use derives from achieving greater production to feed a growing world population, but this is only achieving a loss of crops due to a deterioration of the soil and its biogeochemical cycles [31, 32].

The problem shows us that the idea of unlimited economic growth, production dynamics, as well as consumption patterns are increasingly unsustainable; if the trend described above continues, it could put life at risk in all its aspects. Dimensions. We are faced with a scenario that urges us to think of an economy that has life support at its center. Mexico occupies the 7th place as a world producer of vehicles and with an important participation in the market, as can be seen in **Table 2**.

Figure 3 shows the 2010 water map, where the problems of water availability in the country can be observed, and in regions where economic productivity is higher, so it is important to consider the impact of the automotive industry, of soft drinks, sugar, mining, paper, textiles, among the main ones. These industries affect the availability of water in addition to generating many pollutants to the water [11, 33]. On the other hand, overexploitation of water leads to the presence of pollutants such as arsenic and fluoride, where there are several regions in Mexico where high levels of arsenic and dental fluorosis have been found impacting the health of the population [26, 27].

7th world producer of vehicles in general with 3.6 million vehicles [4,5].	**Of the main assembly companies, 21 have a presence in 14 states of the country [9]**
7th world producer of light vehicles with 3.4 million vehicles [4,6]	More than 300 first level suppliers (TIER 1) of the terminal industry [5]
4th Exporter of light vehicles With 2.8 million vehicles [7]	Creation of 81,927 jobs in the automotive terminal industry [10]
5th world producer of heavy vehicles with 191,000 vehicles [4,5]	Participation of the automotive and auto parts industry: National GDP[10]: 3% Manufacturing GDP[10]: 18% Foreign Direct Investment[8] (FDI): 20% Total, exports[9]: 27%
4th Exporter of heavy vehicles with 156,900 vehicles [5]	

Source: Adapted and extracted from ProMéxico with information from [1]MarketLine, estimates [2]OICA [3]Fortune Global 500, 2015 [4]OICA [5]ANPACT [6]AMIA [7]Global Trade Atlas y AMIA [8]Ministry of Economy [9]ProMexico [10] National Institute of Statistic and Geography (INEGI-by its acronym in Spanish).

Table 2.
Data on vehicle production in Mexico.

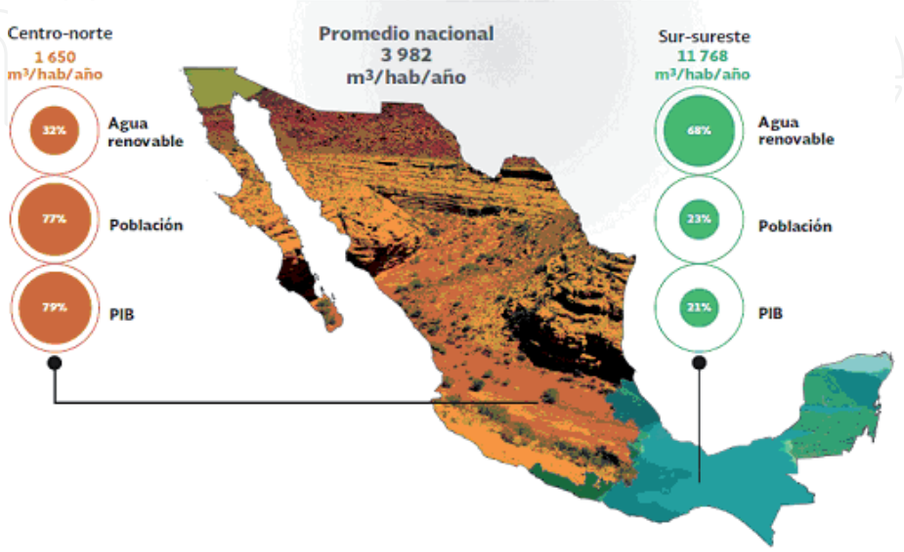

Figure 3.
Source: CONAGUA. www.dof.gob.mx/nota_detalle_popup.php?codigo=5339732.

3. Technology and its ecological, food and health impacts: analysis and proposals

We understand by technology, in a general way, the application of knowledge to generate new methods, processes, services and devices. Technological innovation, on the other hand, is the transformation of an idea into a product, equipment, or operational process, including new forms of social organization. When studying technological innovation, the analysis of the generation /adoption /implementation/monitoring and evaluation processes of technologies should be included [34].

3.1 Impact of technology on ecology

The extinction of species in the Anthropocene, global climate change and the damage to natural ecosystems caused by human activities, are part of an environmental and socio-ecological crisis that manifests itself at local, regional, and global scales. This crisis calls into question the social coexistence and the bases of the very existence of humanity. The Sustainable Development Goals (SDGs) are also indicative of a general framework of poverty, hunger, food insecurity, malnutrition, unsustainable agricultural practices, inequity (economic, social and gender), waste of natural resources, excessive energy consumption and violence and insecurity [34].

3.2 Impact of technology on food production

Crop production technology has changed significantly in recent decades. First, between 1980 and 1990 the direct sowing technique expanded rapidly to replace conventional tillage; later, production was intensified through a greater use of agrochemicals, mainly fertilizers; later transgenic crops were incorporated; and, more recently, differential management by environments, also called "precision agriculture" [26], began to spread.

Expected changes in income and demographics will lead to increased consumption of meat, dairy products, fruits, vegetables, and edible oils, increasing demand for agricultural raw materials. More consumers will enjoy an economic and lifestyle situation that will allow them to buy more processed and packaged foods, as well as a growing variety of convenience and luxury food items, but which will not necessarily increase the demand for agricultural raw materials. The ability of the agricultural and food industries to continue to respond to the undoubted increase in demand over the coming decades will largely depend on the increased application of existing technologies, as well as the exploitation of new and innovative technologies [27].

Since its inception, industrial development has polluted the air, water, and land, irreversibly affecting, in some cases, ecosystems. The rapid and excessive use of natural resources and the disregard for preventive measures have favored environmental pollution. In Latin American and Caribbean countries, the overlap of old communicable diseases with new chronic degenerative diseases is notable, together with environmental risk factors or lifestyles that are the cause of increasing morbidity and mortality, and the increase in the costs of health care and decreased productivity and quality of life [28].

The gap is growing, in the generation and application of technology between countries of the center and the countries of the periphery substantially increased the magnitude of poverty in developing countries. Thus, despite spectacular increases in agricultural productivity in recent decades, undernutrition persists in many nations in Asia, Africa and to a lesser extent in Latin America.

Undoubtedly, food insecurity, more than a production problem, is a problem of access to available food [29].

According to Lorenzana [29], world food production grew at an unprecedented rate because of the application of the modern system between 1950 and 1970. By then, energy was cheap and there was worldwide the possibility of expanding areas cultivated. This expansion in food production occurred primarily in industrialized countries, especially the U.S.A., Canada, Australia, and New Zealand. The high subsidies that producers enjoyed in countries like the U.S.A. and Canada made it possible to offer abundant and low-priced food, not only for domestic consumption but also for export. Developing countries, with levels of technological advance far below industrialized countries, took advantage of the low international prices of cereals and later of oilseeds. It was simply cheaper to import the staples than to grow them. The fertile lands in the Third World countries were dedicated to the sowing of non-basic products for export, generating foreign exchange that industrialization required. This is how, during those two decades, there was food in abundance and at low prices.

Several reports indicate that the modernization of food production has had negative consequences on food security. Long ago the human diet was varied, it was made up of various species of plants and animal species. The development of technology and agricultural production methods generated a tendency to focus on the most productive and profitable species, being those that were commercialized in urban areas more profitable, with the rural areas having greater purchasing power. Changes in lifestyles, mainly in large cities, coupled with economic fluctuation, contributed to a more monotonous diet. With technology transfer in developing countries, traditional consumption patterns increasingly resemble Western patterns [29].

For some years and perhaps due to the general recognition of the role of diet in the achievement and maintenance of health, an intense search began, in most cases with great scientific rigor, on food and its effect on health [18].

3.3 Technological and health trends

Some trends in which not only the search for healthy food is combined, but also the possibility of eating properly in today's difficult world, show that the general public looks for less processed foods with a similar appearance and quality to freshly prepared ones. These include fresh or minimally processed foods, prepared or precooked dishes (refrigerated, frozen), semi-prepared or precooked products that only require heating for consumption and "fast food" in which it is valued that it is quick to consume, easy to carry and which are also healthy products [30].

Technologies have been developed focused on the maintenance or preservation of food, whose objective is the search for alternative heat treatments and the development of non-thermal preservation treatments, to achieve healthier products, with a longer shelf life, and to instead offer the consumer food with minimal processing. These treatments include electrical pulses that are based on the exposure of a food to an electric field, achieving that of microorganisms by destroying the cell membrane, high pressures in which the high hydrostatic pressure has partial sterilization effects, obtaining products of optimal microbiological quality. With few modifications in aroma, flavor, and nutritional value [30].

Other technologies used in food preservation are irradiation, ideal for solid or even frozen foods, the pulses of light which, as the name implies, are flashes of light of great intensity and short duration that eliminate microorganisms and bio conservation in which the Normal bacterial flora of food is controlled to increase its shelf life. It can also favor the growth of a natural microorganism, to limit the growth of others [30].

3.4 Loss and waste foods and its reduction

Recent estimates indicate that a third (30 to 40%) of the food produced globally is lost and wasted in the global food system. Food insecurity is an issue that motivates greater production and quality of food through sustainable ways, but at the same time allows reducing food loss and waste [31, 32].

Along with reducing food loss and waste (FLW) are new ways to preserve food for more. For example, the dehydration of fruits and vegetables with CO_2 that excludes negative aspects of conventional dehydration, resulting in a product with better quality, low refrigeration cost, the nutritional quality is maintained and when the product is rehydrated it acquires the appearance of a fresh product [31].

The reduction of food loss must be sought from initial production (farm) to final consumption at home, through short marketing chains. One option is to obtain foods from local markets and thereby reactivate local economies [31].

On the other hand, public policies should be established that motivate both the government and the private sector to develop infrastructure for roads, transportation, storage, and refrigeration facilities, which allows reducing food losses. In addition, sensitize the population to avoid the compulsive purchase of food and provide information and knowledge that allows the actors of the agri-food chains to have standards of safety and hygiene, guaranteeing quality food. However, it is necessary to reactivate the exchange of food, at the local level, to reduce the loss of foods. Likewise, carry out research to develop innovations that allow the elaboration of food products from the remnants [31, 32].

The challenge is not only the production of food for a population in constant growth, but also how to ensure sufficient clean water, agricultural land, energy, and labor, in such a way that the adverse effects on the environment are reduced and satisfying the basic needs of present and future generations [31]. Despite the technological development generated in recent decades, there is still a deficiency in food production, as well as in its transformation; on the other hand, the immense amounts of FLW in the entire food chain causing problems of food insecurity, in addition to serious contamination problems, which opens a huge possibility for the development of strategies to improve the food security conditions of the population.

4. Health impacts: an analysis of the main determinants

The changes in health with an increase in the prevalence of chronic degenerative diseases are increasing according to the statistics at the world and national level. These results are a summary of the main problems that continue to be sustained in the country such as obesity, overweight, dyslipidemia, hypertension and an innovation in this survey is the data on blood lead levels and the frontal labeling questionnaire (**Table 3**). For physical activity, only 29% of the population performs physical activity for less than 150 minutes per week and the other extreme, 28.1% performs 1680 minutes per week. The survey separates figures for food security and breastfeeding by urban and rural area, but those presented in the table are for urban areas.

For the consumption of fruit, vegetables, and legumes, they were below 50% of the different age groups except for the consumption of legumes that was 54.4 for the group of 20 and over. For non-recommended foods, non-dairy drinks sweetened or with added sugars were among the highest for the population of all age groups without difference, being in a range 83.3% for the group of 1 to 4 years to 85.5% for the group 20 and over [33].

On health issues and at the time this review is being carried out, we can observe that sufficient evidence has been generated on the impacts on the industrialization

Indicators	ENSANUT* 2012 Percentage (%)	ENSANUT* 2018 Percentage (%)
Food security	30	44.5
Diarrheal disease from 0 to 4 years old.	11	11.8
Diabetes in the population aged 20 years and over	9.2	10.3
Hypertension in the population aged 20 years and over.	16.6	18.4
Cholesterol and triglycerides in the population aged 20 years and over	13	19.5
Tobacco habit in the population 10 to 19 years old	1.5 a 9.5	5.1
Exclusive breastfeeding	14.4	28.6

*Source: Monroy-Torres R [33]. *National Health and Nutrition Survey [ENSANUT].*

Table 3.
Comparison between main results of the ENSANUT 2012 vs. 2018.*

of food and accessibility to them by the population, a recent study found that the consumption of two glasses a day of soda was associated with higher mortality [OR, 1.17; 95% CI: 1.11–1.22; P < 0.001], mainly in participants who presented obesity, although not for those who were overweight [34].

4.1 The meaning of eating

What are the impacts of the industrial revolution up to the era of globalization? Where mobility and commercial exchange (products, services, and food) is more efficient while work and family life is more sedentary and inheritance or eating habits are acquired from social networks, television, different media [17]. The integration of sugar and with it a boom in sugar mills until its replacement in the era of biofuels (high fructose corn syrup). Although the factors associated with obesity and chronic diseases are multiple, the medical literature shows that the consumption of sugary drinks and diets with high energy density are two of the risk factors that contribute to the excess burden of these diseases.

The act of eating is complex, food has a vital component by providing nutrients for the functioning of the human body or organism; but food has cultural meanings, attributes, it is something more than the sum of food, something more than its nutrients or culinary preparation or knowing the origin of these [17]. This meaning will depend on internal and external factors, the latter such as social, political and economic factors that give meaning and that act becomes beyond thinking only about nutrients and health. This must be considered to integrate the meanings.

5. Conclusion

Talking about the meaning of food and food is talking about the main diseases that occur in this XXI century as well as before, during and after the contingency by COVID-19, such as the impacts that an obsolete economic system has had on reduce people's health and generate an impact on the environment. The multidisciplinary approach allowed to have indicators with which the origin and trajectory of the health-disease processes must be understood from the meaning of food, such as: an economic system and production of goods and services different from that of 40 years ago. That has changed the lifestyle of people, with greater sedentary

lifestyle, time to rest and eat, family life, greater stress, greater access to processed or industrialized food, with processes that entail great environmental impacts on water, soil, and air.

With the advent of science and biotechnology, such as the production of high fructose corn syrup, coupled with the contradictory social policies on food that took place in governments since the 70's, where the increase in the consumption of soft drinks began. In the Mexican population, a disarticulation in achieving health indicators in the population laid the foundations since the boost to the sugar union that was justified with foreign companies with great conflicts of interest, and accelerated growth in the country, lead to a lack of control in terms of economy that will contribute to health promotion. It has always been said that Mexican food is extremely rich and diverse in ingredients, that is true, but it is also true that it contains many elements that are not suitable for a good diet. Knowing how we have developed our food culture allows us to understand the positive and negative effects it has had. The latter should lead us to reflect on the interactions that are generated with health, food, ecology, social, economic, and political aspects.

What effects does colonization have on a food system?

- Consider agroecological models instead of traditional ones: Faced with the health and environmental impacts that the prevailing agri-food system has generated, it is proposed as an alternative to agroecology, since it allows us to rebuild sustainable production systems that take as a principle the biophysical limits of nature, allowing biodiversity. Agroecology in turn promotes the channels between producers and consumers through access to healthy food in short proximity circuits, recognizing the importance of peasant wisdom and a right to food.

- Obesogenic environments have changed food culture and therefore the concept of health-disease.

- The loss and waste of food as a devaluation of food.

- Technology for social benefits and to increase the conservation of food without compromising the benefit of being consumed fresh to obtain the greatest benefit from its nutrients.

Finally, the exponential growth of the population leads to a demand for food that has justified the use of agrochemicals, but the production of more food also generates greater loss and waste of food, in addition to not achieving a nutritional enrichment of food in the face of soil. That has been deteriorating. Work life has led to both parents of a household having the need to both go out to work, without being able to invest in food education and therefore generate a food culture, leaving food and therefore destiny in the hands of the agribusiness of the health of minors or any member of the family. The lack of physical activity and time, coupled with greater access to energy-dense foods is what has contributed to the increase in the statistics of chronic degenerative diseases such as diabetes, hypertension, and dyslipidemias. Despite living in an era with greater access to information than ever before, the evidence shows that the act of eating and deciding is somewhat more complex, as is the complexity of human development itself, but this complexity is the methodology that It must be considered to address the current obesogenic environments through the approach and understanding of the meaning of food and health from an ecological and historical context.

Conflict of interest

The authors declare no conflict of interest.

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