



HHS Public Access

Author manuscript

J Acad Nutr Diet. Author manuscript; available in PMC 2023 February 01.

Published in final edited form as:

J Acad Nutr Diet. 2022 February ; 122(2): 309–319.e16. doi:10.1016/j.jand.2021.08.105.

Price trends of healthy and less healthy foods and beverages in Mexico from 2011–2018

Carolina Batis, PhD¹ [Faculty Researcher], Giovanna Gatica-Domínguez, PhD² [Research Assistant], Joaquín A Marrón-Ponce, MS² [Research Assistant], M. Arantxa Colchero, PhD³ [Faculty Researcher], Juan A. Rivera, PhD⁴ [Director of the National Institute of Public Health], Simon Barquera, PhD² [Director of the Health and Nutrition Research Center], Dalia Stern, PhD^{5,*} [Faculty Researcher]

¹CONACYT - Health and Nutrition Research Center, National Institute of Public Health, Cuernavaca, Mexico.

²Health and Nutrition Research Center, National Institute of Public Health, Cuernavaca, Mexico.

³Health Systems Research Center, National Institute of Public Health, Cuernavaca, Morelos, Mexico.

⁴National Institute of Public Health, Cuernavaca, Morelos, México.

⁵CONACyT-Population Health Research Center, National Institute of Public Health, Cuernavaca, Morelos, Mexico.

Abstract

Background.—Cost is one of the main drivers of food selection, thus it is important to monitor food prices. Evidence from low- and middle-income countries such as Mexico is limited.

Objective.—The aim of this study was to evaluate the price and price trend of healthy and less healthy food/beverage groups in Mexico from 2011 to 2018.

Design.—This study used time series of the prices of foods and beverages classified by 1) healthiness, 2) processing level, and 3) pairs of healthy/less healthy substitutes.

Setting.—Food and beverage prices used to estimate the Consumer Price Index were obtained. Prices were collected weekly from 46 cities (>20,000 habitants) distributed across the country.

* corresponding author: dalia.stern@insp.mx.

Address of the National Institute of Public Health: Avenida Universidad 655, Santa María Ahuacatitlán, 62100 Cuernavaca, Morelos, Mexico.

Author contributions: DS and CB designed the study; GGD and JAMP cleaned and prepared the datasets; DS, JAMP and CB conducted the analysis; MAC, JAR and SB aid with the interpretation of results; CB wrote the first draft of the manuscript. All authors reviewed and commented on subsequent drafts of the manuscript. CB and DS have primary responsibility for the final content. All authors read and approved the final manuscript.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Conflict of interest: All authors declare no conflict of interest to report

Main outcome measures.—Price trend (% change/year) from 2011–2018 for all food/beverage groups and price/100 g in 2018 for pairs of healthy/less healthy substitutes were obtained.

Statistical analyses.—Linear regression models were used for each food/beverage group with the logarithm of deflated price as the dependent variable and time (years) as the independent variable.

Results.—On average, prices for less healthy foods and beverages increased more than prices of healthy foods and beverages (foods: 1.72% vs. 0.70% change/year; beverages: 1.61% vs. -0.19% change/year). The price change was similar for unprocessed/minimally processed foods and ultra-processed foods (1.95% vs. 1.85% change/year), yet, within each processing category, the price of less healthy foods increased more. By pairs of substitutes (within food/beverage groups), the healthier option for bread, sodas, and poultry was more expensive (price/100g) in 2018, whereas for red meat, cheese, mayonnaise, and milk the healthier option was cheaper.

Conclusions.—Overall, the food prices of less healthy foods and beverages increased more than the food prices of healthy foods and beverages. However, by processing level there was no difference and for pairs of healthy/less healthy substitutes results were mixed. Continued monitoring of food prices is warranted and future research is needed to understand how these price changes affect dietary quality.

Keywords

price trends; food policy healthy foods; unhealthy foods; Mexico

INTRODUCTION

Unhealthy dietary habits account for 22% of all deaths globally among adults.¹ In Mexico, 17% of all deaths, 49% of cardiovascular-related deaths, and 34% of diabetes-related deaths are attributed to unhealthy dietary habits.¹ Diet quality in Mexico is sub-optimal, with an excessive contribution of sugar-sweetened beverages and discretionary energy-dense foods (25–30 %kcal) to total calorie intake,² and a low proportion of the population meeting the fruits and vegetables (20%) or legumes (2%) recommendations.³ Additionally, ultra-processed foods contribute to 30% of daily dietary energy of the Mexican population,⁴ and their consumption is clearly associated with higher intakes of dietary components to consume in moderation, such as added sugar and saturated fat.⁵ Moreover, purchases of ultra-processed foods have increased by 20% during the last decades.⁶

The cost of foods and beverages is one of the main drivers for food selection, particularly among lower-income groups.⁷ Since food prices can either encourage or discourage the adoption of healthy eating habits, it is important to monitor changes in food prices over time. The INFORMAS (The International Network for Food and Obesity/NCDs Research, Monitoring and Action Support) framework has proposed a methodology to monitor key aspects of the food environment, including a module of food prices.⁸ This module lays out an approach to compare price trends over time of foods classified based on their healthiness. Globally, many studies have used a similar approach,^{9–15} however, the evidence in Mexico is still scarce. A previous study evaluated trends of the affordability of foods according to

their energy density, or a nutrient index.¹⁶ Some other analyses have reported the prices of several food groups over time,^{17,18} but none of them focused on trends by the food group's healthfulness. To the best of our knowledge, an analysis by healthfulness, processing level of food groups, or by pair of substitutes has not been conducted in Mexico.

Following the INFORMAS protocol,¹⁹ the price and the price trend of food and beverages in Mexico from 2011–2018 were evaluated. The aim of this study was to identify if nutritious foods and beverages are, or are becoming over time, more or less expensive, in comparison with foods and beverages of lower nutritional quality. It is important to note that the comparison of food prices at a given point in time largely depends on the unit of analysis. In other words, when comparing very distinct food groups, the price per 100 kcal will make foods with low energy density seem very expensive, while the price per 100 g will reflect the opposite.^{20,21} Thus, the analysis focuses on price changes over time, with the exception of substitutes within food/beverage groups, where comparisons at a given point in time can be made. This study contributes to the global monitoring of food prices, and its contribution is particularly relevant as it comes from a middle-income country undergoing a nutrition transition, such as Mexico,^{22,23} where this type of evidence is limited.

METHODS

Price and nutrient data

To conduct a time series analysis, food and beverage prices from the National Institute for Geography and Statistics (INEGI for its acronym in Spanish) were obtained. INEGI is the entity responsible for collecting price data to estimate the Consumer Price Index (CPI) in Mexico. The CPI measures average weighted price changes of a basket of goods and services that are usually purchased by urban households. Prices are collected from 46 cities distributed across the 32 Mexican states. These cities have a population of >20,000 habitants, including the 10 most populated urban zones in the country. In each city, prices are obtained from a non-probabilistic sample of 16,000 points of sales (e.g., stores, vendors).²⁴ Food and beverage prices are collected weekly from the different points-of-sales, and monthly averages are reported in INEGI's website.

To obtain nutrition information of foods and beverages from INEGI, food items from the INEGI dataset were linked to the food codes of the Food Composition Table (FCT)²⁵ used to analyze the 24-hr recall of Mexico's National Health and Nutrition Survey (ENSANUT) 2012.^{26,27} Since INEGI provides more detailed data about a food/beverage item (e.g., brand, package size) compared to ENSANUT's FCT, many INEGI items were linked to a single food code from the FCT. The INEGI data is mostly reported by kilograms (kg) of the raw weight of a given food item. However, some items are reported in other units such as pieces, a handful, and liters. For those items, researchers estimated the weight in kg using ENSANUT's FCT information on beverage density and common portion size's weights. Additionally, to link to the FCT, food prices were yield-adjusted for waste, as the nutrients in the FCT are reported per 100 g of an edible portion. Prices are reported per 100 g and 100 kcal. In the case of 100 g all foods were converted to grams as consumed. For example, meats, beans, and rice are reported as 100g of cooked product, while milk powder was reconstituted to represent 100 g of liquid milk. The price of every food/beverage item was

adjusted for inflation with the CPI provided by INEGI to correspond to December 2018 prices.

Prices were collected by INEGI for a list of 101 generic foods and non-alcoholic beverages. Although the specific products (e.g., brand, package size) collected within each item slightly vary by month, the overall list of generic items remained consistent over the studied period (2011–2018). From 2,754,532 observations on foods and beverages of interest (excluding alcohol and miscellaneous items) reported in INEGI from 2011 to 2018, 2,722,097 (98.82%) observations were linked to a FCT food code. From those, 65,807 (2.42%) observations were excluded because it was not possible to estimate the weight in kg of the price reported, 30,439 (1.12%) INEGI observations were additionally excluded because there were <15 observations by food code per year. The final analytical sample included 2,625,851 observations. These observations were linked to 337 food codes from the FCT, each food code had on average 976 (range 15 – 10,534) price observations per year. This analysis was conducted using publicly available data, and does not involve human subjects.

Food/beverage groups by healthiness, processing level, and food/beverage pairs—Following the INFORMAS protocol,¹⁹ three sets of food/beverage group classifications were created using food code level information from the FCT (see Table 1 at www.jandonline.org for the complete classification of FCT foods) : 1) *Food/beverage groups by healthiness*, 2) *Processing level*, and 3) *Food/beverage pairs*.

1) Food/beverage groups by healthiness: Foods and beverages were classified into healthy and less healthy categories. Within the healthy category, five healthy food groups [fruits, vegetables, grains, dairy (reduced or full fat), white meat and alternatives], and four healthy beverage groups [plain milk (reduced or full fat), mineral water, bottled water, and bottled water (20 liter jug) were created. Bottled water was divided in two categories according to the size of the bottle (e.g., 20 liter jug) because the price can vary considerably and the 20 liter jug format is very common in Mexican households. Within the less healthy category, four less healthy food groups (sweetened grains, savory snacks, sweet snacks, processed & red meat), and five less healthy beverage groups [flavored milk, bottled fruit juice (including 100% fruit juice), regular soda, non-carbonated flavored drinks, and diet sodas & drinks] were created. Diet sodas and drinks are considered healthy beverages by INFORMAS, however, the new front-of-package labeling system in Mexico has a warning label for products that contain non-caloric sweeteners.²⁸ Thus, diet sodas and drinks were classified as less healthy.

2) Processing level.: Following the NOVA, foods and beverages were classified as follows: a) unprocessed/minimally processed (foods obtained directly from nature or altered in ways that do not introduce any additional substances but may involve removal of inedible parts), b) processed culinary ingredients (substances obtained by pressing, extracting, refining or mining unprocessed or minimally processed foods), c) processed (manufactured products made by adding salt, sugar, fat or oil to unprocessed or minimally processed foods), and d) ultra-processed (manufactured formulations that have in their list of ingredients either food substances not commonly used in culinary preparations and/or additives).²⁹

3) Food/beverage pairs.: Pairs of foods and beverages of similar items but with a difference in nutrient content (e.g., low- vs. high-fat meat) were selected. The criteria to choose a food/beverage pair according to the INFORMAS protocol¹⁹ include the following: be based on the same ingredients or components, have the same end purpose, be a choice made at the point of purchase within the same food/beverage group, and have a difference in a key nutrient(s) such as saturated fat, salt, added sugar, and fiber.

Statistical analysis—Using all INEGI food price observations, the average price per 100 g in each year and food/beverage group were estimated. To estimate the linear change in prices over the 2011–2018 period by food/beverage group, linear regression models with a continuous variable for time (year) as the independent variable were used. The dependent variable was the logarithm of the price per 100 g. The logarithm of price instead of price was calculated to be able to interpret the linear coefficient as the relative (% change) price increase per year over the time period, as the relative increase is more comparable across food/beverage groups with different absolute prices. To simplify the tables, only estimates for 2011, 2014, and 2018 are presented, nonetheless the linear relative change was estimated using all years. Only in the case of food groups by healthiness the price of all years is presented in a figure.

For the analysis of food/beverage groups by healthiness groups were further disaggregated into subgroups and also estimated the price per 100 kcal (Table 2 at www.jandonline.org). For the analysis of groups by processing level, categories were additionally disaggregated into healthy and less healthy categories. In the analysis of food/beverage groups by healthiness and processing level, the focus was on the relative change over time, since absolute prices are not directly comparable across very distinct groups (e.g., fruits vs. sweet snacks), and the comparison is largely driven by the unit used (price per g or kcal). For the food/beverage pairs analysis, absolute price comparison between healthier and unhealthier options are provided because these are similar foods and their price is directly comparable. Given the large number of observations in the dataset, statistical tests were not conducted to interpret the significance of the results. All analyses were conducted in STATA 14.³⁰

RESULTS

The average price (deflated) per 100 g for items in the main healthy and less healthy food and beverage groups by year and the linear trend in percent change per year during the study period are presented in Figure 1. Out of five food and four beverage groups in the healthy category, only the prices for three groups (fruits, vegetables, and mineral water) increased by more than 1.5% per year. The remaining groups had a small price increase over time (white meat & alternatives, and plain milk), did not change (grains, bottled water), or even had a price decrease during the period [dairy, and bottled water (20 liter jug)]. For the less healthy category, all foods but sweet snacks, and almost half of the beverage groups had price increases greater than 1.5% per year. The largest increase was for non-carbonated flavored drinks (6.09% per year) and processed & red meat (2.79%). On average, the price increase was higher for less healthy vs healthy foods (1.72 vs 0.70%). Similarly, for beverages, less healthy beverages had an increase of 1.61% whereas the price of healthy beverages did not change (–0.19%). Additionally, disaggregated food and beverage groups and the cost per

100/kcal are presented in Table 2 at www.jandonline.org. As expected, the price trend in was similar per 100 g or 100 kcal. However, the absolute price was very different between g and kcal for food groups with very low or very high energy densities. For food groups with low energy density, such as fruits and non-starchy vegetables, the absolute price was higher per 100 kcal than per 100 g. In contrast, for foods with high energy density, such as cheese, poultry, nuts & seeds, and most of the less healthy foods, the absolute price was higher per 100 g than per 100 kcal.

Table 3 presents the price for foods and beverages classified by processing level. The price of unprocessed/minimally processed foods increased by 1.95% per year, 0.98% for processed foods, and 1.85% for ultra-processed foods. The price of processed culinary ingredients was stable (-0.32%). Within each processing level, the price increase for healthy foods and beverages was smaller, compared to the less healthy ones. Less healthy foods in the unprocessed/minimally processed category included red meat, whereas healthy foods and beverages in the ultra-processed category included canned tuna, industrialized bread, tortilla, tomato sauces, and cheeses.

The price per 100 g and the price trend for food/beverage pairs are presented in Table 4. For each food/beverage pair, the unhealthier option is presented first, followed by the healthier option. Out of 12 pairs analyzed in 2018, four had a higher price for the unhealthier option (red meat, cheese, mayonnaise, and milk), in three cases the unhealthier option was less expensive (poultry, soda, and bread loaf), and in the remaining pairs the prices were similar (tuna, yogurt, soft cheese, butter, and ready-to-eat cereal). Differences in price trends were consistent with differences in prices in 2018 for most pairs (e.g., both the price in 2018 and the price trend from 2011 to 2018 were higher for high-fat red meat vs. low-fat). However, there were some exceptions. For example, for yogurt and soft cheese, the price for yogurt and soft cheese food pairs in 2018 was similar, yet, the price trend of the healthier yogurt increased more than the less healthy one, while the price trend of the healthier soft cheese decreased. For milk, the price in 2018 was different within the food/beverage pair (unhealthier option more expensive) while the trend of both options remained stable. Finally, for soda, the healthier option was more expensive in 2018, but the price increase from 2011–2018 was smaller than the one observed for the unhealthier option.

DISCUSSION

Overall, price changes of foods and beverages were small for the 2011–2018 period. On average, prices of less healthy food and beverage groups increased slightly more than prices of healthy groups. By processing level, the price trend was similar for unprocessed/minimally processed and ultra-processed foods, however, within each processing category, the price of less healthy foods increased more than the price of healthy foods. By pairs of substitutes within food/beverage groups, results were heterogeneous for both, the price trend and the price comparisons in 2018. For some pairs, the healthier option was more expensive, while for others, the healthier option was less expensive.

Studies analyzing trends over time of different healthy and less healthy food groups using CPI data have been conducted in many countries. In New Zealand (2007–2017), foods

became more expensive, with no difference between healthier vs. less healthy foods.¹⁴ Similarly, in Australia (1989–2007), the increase in the price of core vs. non-core foods was similar (~3 % per year).¹³ In the UK (2002–2012), the price of healthier foods increased less than the price of less healthy options (3% vs 4% per year); grains increased by 1%; fruit, vegetables, and dairy by 2–3%, and animal sources and foods and drinks high in sugar/fat by >5% per year.¹⁰ In South Korea (1995–2015), the smallest increases in prices were observed for rice, processed meat, and fast-food (<4% per year); whereas food groups such as vegetables, animal products, milk, soda, and sweets had a similar price increase (4–8% per year).¹¹ The US (1980–2006) was the only country in which the price of the analyzed foods decreased over time. The decrease in food prices was comparable across groups, ranging from 0.5–2% decrease per year for fresh fruits, vegetables, dessert and snack foods.¹² However, the analysis of the US does not include the newer options of convenient pre-washed produce, which tend to be more expensive, compared to unpackaged or not pre-washed fruits and vegetables. Altogether, these studies suggest that the price trends of healthier vs. less-healthy food groups have been similar or that healthier foods have had smaller increases, as it was the case for the UK and Mexico.

Trends in prices of food groups by processing levels have been examined in New Zealand and Brazil. In New Zealand (2007–2017), prices of all foods increased over time with no difference in the rate of change by processing level.¹⁴ In Brazil (1995–2017), the price of both, processed and unprocessed foods increased, although the increment was large for processed foods. In contrast, the ultra-processed food's price decreased, particularly from 2006–2017.¹⁵ In Mexico, the price of processed foods increased the least, and unprocessed and ultra-processed foods had a comparable larger increasing price trend.

The present analysis was limited to recent data from the 2011–2018 period. Although the price of most food/beverage groups analyzed slightly increased or remained stable over time, important price changes might have happened over longer periods. Previous analyses have reported the prices for several food groups in Mexico since the '90s.^{17,18} According to these studies, during the '90s, the price of most foods decreased, while in the 2000s, results were mixed. Between 1992 and 1996, the price of fruits, vegetables, and nuts decreased on average 8 – 9% per year; while grains, dairy, discretionary food, and sugary drinks decreased 4 – 7% per year.¹⁷ Moreover, looking more closely at an analysis reporting prices from 1990 to 2004 of more disaggregated food groups, a mix of favorable and unfavorable changes was observed. Favorable changes included the decrease in the price of all the fruits analyzed, 2/3 of vegetables, beans, poultry, eggs, cheeses, and seafood; and the increase in the price of ice-cream and sodas. However, unfavorable changes included the increase in the price of grains and milk, and the decrease for sweet bread, cookies, potato chips and chocolate.¹⁸

Findings from other countries and earlier years in Mexico suggest that overall, there has not been a clear pattern between the changes in the price of foods and beverages and their nutritional quality. The results observed in this study indicating that between 2011 to 2018, less healthy foods/beverages had a slightly larger increase in price in comparison to healthier foods/beverages, are likely related to a fiscal policy implemented in 2014. This policy was intentionally designed to improve the food environment and prevent the development of overweight, obesity, and diabetes.³¹ Industrialized sugar-sweetened beverages and non-basic

energy-dense foods such as savory snacks, sweets, and baked goods were taxed [1 MXN peso (~0.05 USD) per liter or ~10%, and 8% tax, respectively]. Although not all of the foods/beverages classified as less healthy in the current analysis were subject to the tax, for some categories such as savory snacks, sweetened grains, regular soda and non-carbonated drinks most items were taxed. Figure 1 shows that for these categories, there was a slightly, almost imperceptible, higher increase in price in 2014 (6–7% increase in savory snacks and sweetened grains, and 11–13% increase in regular sodas and non-carbonated flavored drinks). Interestingly, processed and red meat were not taxed, yet, their price increase was one of the largest. According to Euromonitor, the main driver for the price increase in this food group was the growing global demand for beef, particularly from Asian countries. Therefore, Mexican producers increased and diversified their export to more countries, affecting the local prices of meat.³²

Regarding food/beverage pairs, for which the price per 100 g is directly comparable between healthier and less healthy alternatives, results were mixed. For bread, sodas, and poultry the healthier option (whole grain, artificially sweetened, or low-fat, respectively) was more expensive, whereas for red meat, cheese, mayonnaise, and milk the healthier option (low-fat, or plain for milk) was cheaper. The results of the current study differ from what has been previously reported. In a meta-analysis of five studies from the US, Canada, and New Zealand, when differences between food/beverage pairs were found, the healthier option was more expensive.⁹ Only in one study, the healthier option of cereals and cereals bars was less expensive. Overall, the results from the meta-analysis show that the largest price difference between healthier vs. less healthy food/beverage groups was for meats/protein (e.g., low- vs high-fat meat), small price differences were observed for grains, dairy, snacks, and fats, and the price difference was not statistically significant for soda/juice. An important aspect for consideration is that although the price comparison within food/beverage groups is one component of the food prices, these comparisons may become less relevant considering that some of the new global recommendations, such as the EAT-Healthy Reference Diet,³³ are now leaning towards discouraging the intake of entire food categories (e.g., refined grains or red meat), instead of advising consumers to select the healthier options within food categories.

The study of the association between dietary quality and cost has important methodological complexities that can lead to contradictory findings depending on the approach used. In Table 2 at www.jandonline.org, the price per grams and price per energy for the food groups by healthiness is presented. The motivations for presenting both units were twofold. The first one was that both measures have been used in previous studies, and hence, comparisons with other studies could be conducted, not only in terms of the absolute costs by the food group but also on the differential costs between food groups. The second motivation for including both units was to emphasize that conclusions of whether healthy foods, such as fruits and vegetables, are cheaper in comparison with less healthy foods, such as chips and baked goods, cannot be made as the answer will depend on the unit used. According to this study, healthy foods would be considered more expensive if analyzed by kcal, and less expensive if analyzed by grams. Studies concluding that healthy foods are less affordable based on energy cost (\$/kcal) have been strongly criticized by some authors.^{34,35} The possible alternative to make a fair comparison between food groups is to use a portion size

that could be considered an equivalent or substitute. In the case of food/beverage pairs, this is very straightforward, as 100 g of skim milk is clearly a substitute for 100 g of whole milk. However, between very distinct food groups (e.g., legumes, vegetables, dairy, salty snacks, and sweets) it would be challenging to find an equivalent portion size, or even to select foods that could be substituted for each other. Another methodological challenge arises when comparing the price of food/beverage groups over time. The trend could be estimated as the absolute change per year (\$ change/year) or the relative change (% change/year). Similar to previous studies,^{11–13} the current study estimated the relative change in prices, as larger absolute changes are more likely to occur for food groups with higher costs, and the cost of food will also depend on the unit (kcal or gr, this is even more problematic). For example, the main conclusion of the UK¹⁰ analysis previously discussed, was that the absolute price of healthy foods rose faster than less healthy ones. However, the authors estimated cost per kcal. If the authors had evaluated cost per grams, healthy foods would have had a lower cost (as has been previously reported in the UK)²⁰ and a smaller absolute increase in price. Moreover, the authors also reported relative changes, and according to these, healthy foods had lower increases than less healthy ones.¹⁰ More research is needed to understand which metric of change (absolute or relative) is more meaningful to the consumer when faced simultaneously with the price changes of several types of foods. In the meantime, relative changes might be more suitable for monitoring purposes because results are consistent, regardless if the price was evaluated by grams or kcal.

This study is not without limitations. First, the time-span analyzed (2011–2018) is very recent and relatively short. However, this period included the implementation of taxes to less healthy foods and beverages in 2014. Furthermore, to overcome this limitation, the literature prior to 2011 was thoroughly described to provide a longer-term vision of the price trends in Mexico. Another limitation is that CPI price data used for this analysis only captures prices in urban areas.²⁴ The trends observed are likely different in rural areas. A previous study evaluating changes in prices on taxed sugary beverages and non-basic energy-dense foods around the time of the tax implementation found that the price increase in rural areas was smaller compared to urban areas.³⁶ Hence, it is likely that in rural areas the increase in price between healthy and less healthy taxed foods/beverages was comparable, instead of the higher increase in the prices of less healthy foods/beverages that the current study found in urban areas. It should also be acknowledged that the classifications used for the foods and beverages are subjective. Nonetheless, to the best of our knowledge, this is the first study conducted with Mexican data comparing the price of food/beverage pairs and the price trends of foods and beverages classified by healthiness and by processing level. An important strength of the present analysis is the large number of observations included, all of which were linked to a nutrition food composition table, classified into food groups, and converted into grams of edible weight. Additionally, the food products included in the CPI data, and the frequency of the price data collected represents well what is more commonly purchased by Mexicans. Previous studies using CPI data prices reported that results did not differ whether products were weighted by their volume share or not.³⁷ Finally, the framework proposed by the INFORMAS food prices module provides a sound and common approach to enhance comparability across time and populations.

CONCLUSION

In summary, this study shows that price trends of unprocessed and ultra-processed foods were similar, and findings were mixed for food/beverage pairs. Yet, it was found that an important piece of the food prices improved: prices of less healthy foods and beverages increased slightly more than the prices of healthy foods and beverages over the 2011–2018 period. This was likely largely related to the tax to sugary beverages and non-basic energy-dense foods implemented in 2014. However, this does not ensure that current food prices are already appropriate to facilitate the adoption of a healthy diet. More research is needed to understand how prices of each food/beverage group fit into a total healthy/unhealthy diet, and how much price differential needs to exist between healthy vs. less healthy foods/beverages to encourage consumers to switch to healthier foods and meaningfully improve their dietary quality. Continued monitoring of food prices is warranted as this is an important piece of the overall food environment.

Funding:

This research was funded primarily by Bloomberg Philanthropies with support from the International Development Research Center (107731-001) and the NIH R01DK108148.

REFERENCES

1. Afshin A, Sur PJ, Fay KA, et al. Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet* 2019;393(10184):1958–1972. doi:10.1016/S0140-6736(19)30041-8 [PubMed: 30954305]
2. Aburto TC, Pedraza LS, Sánchez-Pimienta TG, et al. Discretionary Foods Have a High Contribution and Fruit, Vegetables, and Legumes Have a Low Contribution to the Total Energy Intake of the Mexican Population. *J Nutr* 2016;146(Suppl):1881–1887. doi:10.3945/jn.115.219121
3. Batis C, Aburto TC, Sanchez-Pimienta TG, Pedraza LS, Rivera JA. Adherence to dietary recommendations for food group intakes is low in the Mexican population. *J Nutr* 2016;146(9):1897S–1906S. doi:10.3945/jn.115.219626 [PubMed: 27511940]
4. Marrón-Ponce JA, Sánchez-Pimienta TG, Louzada ML da C, Batis C. Energy contribution of NOVA food groups and sociodemographic determinants of ultra-processed food consumption in the Mexican population. *Public Health Nutr* 2018;21(1):87–93. doi:10.1017/S1368980017002129 [PubMed: 28937354]
5. Marrón-Ponce JA, Flores M, Cediel G, Monteiro CA, Batis C. Associations between Consumption of Ultra-Processed Foods and Intake of Nutrients Related to Chronic Non-Communicable Diseases in Mexico. *J Acad Nutr Diet* 2019;119(11):1852–1865. doi:10.1016/j.jand.2019.04.020 [PubMed: 31262695]
6. Marrón-Ponce JA, Tolentino-Mayo L, Hernández-F M, Batis C. Trends in ultra-processed food purchases from 1984 to 2016 in Mexican households. *Nutrients* 2019;11(1). doi:10.3390/nu11010045
7. Darmon N, Drewnowski A. Contribution of food prices and diet cost to socioeconomic disparities in diet quality and health: a systematic review and analysis. *Nutr Rev* 2015;73(10):643–660. doi:10.1093/nutrit/nuv027 [PubMed: 26307238]
8. Lee a., Mhurchu CN, Sacks G, et al. Monitoring the price and affordability of foods and diets globally. *Obes Rev* 2013;14(S1):82–95. doi:10.1111/obr.12078 [PubMed: 24074213]
9. Rao M, Afshin A, Singh G, Mozaffarian D. Do healthier foods and diet patterns cost more than less healthy options? A systematic review and meta-analysis. *BMJ Open* 2013;3(12):e004277. doi:10.1136/bmjopen-2013-004277

10. Jones NRV, Conklin AI, Suhrcke M, Monsivais P. The growing price gap between more and less healthy foods: Analysis of a novel longitudinal UK dataset. *PLoS One* 2014;9(10). doi:10.1371/journal.pone.0109343
11. Kim TH, Park Y, Myung J, Han E. Food price trends in South Korea through time series analysis. *Public Health* 2018;165:67–73. doi:10.1016/j.puhe.2018.09.007 [PubMed: 30384030]
12. Kuchler F Price Trends Are Similar for Fruits, Vegetables, and Snack Foods. *Econ Res Rep* 2008;55. <https://www.ers.usda.gov/publications/pub-details/?pubid=45952>. Accessed April 9, 2020.
13. Burns C, Sacks G, Gold L. Longitudinal study of Consumer Price Index (CPI) trends in core and non-core foods in Australia. *Aust N Z J Public Health* 2008;32(5):450–453. doi:10.1111/j.1753-6405.2008.00278.x [PubMed: 18959549]
14. Mackay S, Vandevijvere S, Lee A. Ten-year trends in the price differential between healthier and less healthy foods in New Zealand. *Nutr Diet* 2019;76(3):271–276. doi:10.1111/1747-0080.12457 [PubMed: 30033532]
15. Maia EG, Dos Passos CM, Levy RB, Bortoletto Martins AP, Mais LA, Claro RM. What to expect from the price of healthy and unhealthy foods over time? The case from Brazil. *Public Health Nutr* 2020;23(4):579–588. doi:10.1017/S1368980019003586 [PubMed: 31937385]
16. Colchero MA, Guerrero-López CM, Molina M, Unar-Munguía M. Affordability of Food and Beverages in Mexico between 1994 and 2016. *Nutrients* 2019;11(1). doi:10.3390/nu11010078
17. Colchero MA, Unar-Munguía M, Hernández-Licona G, Minor Campa E. Evolución del gasto, costo y consumo de alimentos y bebidas en México (1992–2016). In: *La Obesidad En México. Estado de La Política Pública y Recomendaciones Para Su Prevención y Control*; 2018:77–88.
18. Ortiz-Hernández L [Price evolution of foods and nutrients in Mexico from 1973 to 2004]. *Arch Latinoam Nutr* 2006;56(3):201–215. [PubMed: 17249479]
19. Mackay S, Vandevijvere S, Waterlander WE. INFORMAS Protocol: Food Prices Module; 2017. <https://www.informas.org/modules/food-prices/>. Accessed February 14, 2021.
20. Jones NRV, Monsivais P. Comparing Prices for Food and Diet Research: The Metric Matters. *J Hunger Environ Nutr* 2016;11(3):370–381. doi:10.1080/19320248.2015.1095144 [PubMed: 27630754]
21. Carlson A, Frazão E. Are Healthy Foods Really More Expensive? It Depends on How You Measure the Price. *Econ Inf Bull* 2012;96. www.ers.usda.gov. Accessed March 5, 2020.
22. Pérez-Ferrer C, McMunn A, Zaninotto P, Brunner EJ. The nutrition transition in Mexico 1988–2016: The role of wealth in the social patterning of obesity by education. *Public Health Nutr* 2018;21(13):2394–2401. doi:10.1017/S1368980018001167 [PubMed: 29745353]
23. Batis C, Dénova-Gutiérrez E, Estrada-Velasco BI, Rivera J. Malnutrition prevalence among children and women of reproductive age in Mexico by wealth, education level, urban/rural area and indigenous ethnicity. *Public Health Nutr* 2020;23(s1):77–88. doi:10.1017/S1368980019004725
24. Instituto Nacional de Estadística y Geografía, INEGI. Índice Nacional de Precios Al Consumidor: Documento Metodológico; 2013.
25. Ramírez Silva I, Rivera Dommarco JA, Barragán Vázquez del Mercado S, et al. Base de Alimentos de México (BAM): Compilación de la composición de los alimentos frecuentemente consumidos en el país. Versión 1.1 www.redpidieta.mx. Published 2019. Accessed May 22, 2019.
26. Lopez-Olmedo N, Carriquiry AL, Rodriguez-Ramirez S, et al. Usual Intake of Added Sugars and Saturated Fats Is High while Dietary Fiber Is Low in the Mexican Population. *J Nutr* 2016;146(9):1856S–1865S. doi:10.3945/jn.115.218214 [PubMed: 27511932]
27. Romero-Martínez M, Shamah-Levy T, Franco-Núñez A, et al. Encuesta Nacional de Salud y Nutrición 2012: Diseño y Cobertura. *Salud Publica Mex* 2013;55(Suppl 2):S332–S340. [PubMed: 24626712]
28. White M, Barquera S. Mexico Adopts Food Warning Labels, Why Now? *Heal Syst Reform* 2020;6(1). doi:10.1080/23288604.2020.1752063
29. Monteiro CA, Cannon G, Levy RB, et al. Ultra-processed foods: what they are and how to identify them. *Public Health Nutr* 2019;22(5):936–941. doi:10.1017/S1368980018003762 [PubMed: 30744710]

30. StataCorp LP. Stata Statistical Software Version 14 College Station, TX. 2015.
31. Barrientos-Gutiérrez T, Colchero MA, Sánchez-Romero LM, Batis C, Rivera-Dommarco J. Position paper on taxes to nonessential energy-dense foods and sugar-sweetened beverages. *Salud Publica Mex* 2018;60:586–591. [PubMed: 30550120]
32. Euromonitor International. Meat in Mexico. Passport 2020;(February).
33. Willett W, Rockström J, Loken B, et al. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *Lancet* 2019;393(10170):447–492. doi:10.1016/S0140-6736(18)31788-4 [PubMed: 30660336]
34. Lipsky LM. Are energy-dense foods really cheaper? Reexamining the relation between food price and energy density. *Am J Clin Nutr* 2009;90(5):1397–1401. doi:10.3945/ajcn.2008.27384 [PubMed: 19776139]
35. Frazão E, Carlson A, Stewart H. Energy-adjusted food costs make little economic sense. *Am J Clin Nutr* 2011;93(4):861; author reply 862–3. doi:10.3945/ajcn.110.009639 [PubMed: 21270375]
36. Colchero M, Zavala J, Batis C, Shamah-Levy T, Rivera-Dommarco J. Cambios en los precios de bebidas y alimentos con impuesto en áreas rurales y semirurales de México. *Salud Publica Mex* 2017;59(2):137–146. doi:10.21149/7994 [PubMed: 28562714]
37. Colchero MA, Salgado JC, Unar-Munguía M, Molina M, Ng S, Rivera-Dommarco JA. Changes in Prices After an Excise Tax to Sweetened Sugar Beverages Was Implemented in Mexico: Evidence from Urban Areas. Nugent RA, ed. *PLoS One* 2015;10(12):e0144408. doi:10.1371/journal.pone.0144408 [PubMed: 26675166]

RESEARCH SNAPSHOT

Research Question:

Are nutritious foods becoming more or less expensive over time in comparison with foods of lower nutritional quality?

Key Findings:

In this time series analysis, the price of less healthy foods increased more than the price of healthy foods (1.72 vs 0.70%). Similarly, less healthy beverages had a price increase of 1.61%, while the price of healthy beverages did not change over time (-0.19%). Price trends of unprocessed and ultra-processed foods were similar and results for pairs of healthy/less healthy substitutes were mixed.

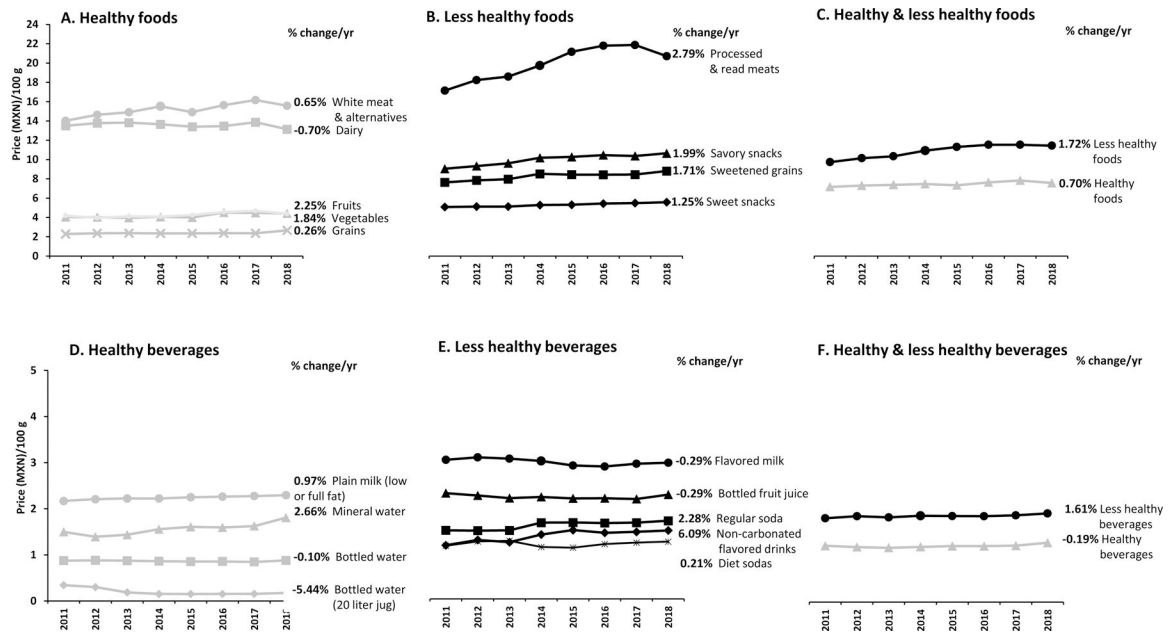


Figure 1. Average food/beverage price per year and average food/beverage price trend from 2011 to 2018 by healthiness in Mexico.

A) Healthy foods, B) Less healthy foods, C) Average of healthy and less healthy food, D) Healthy beverages, E) Less healthy beverages, and F) Average of healthy and less healthy beverages. Prices were obtained from those used to estimate the Consumer Price Index. The average price trend was estimated with a linear regression with the $\log(\text{price})$ as the dependent variable and time (years 2011–2018) as the independent variable. MXN is Mexican pesos (~0.05 USD)

Table 1.

Classification of foods and beverages from the Food Composition Table linked to food prices (2011–2018) in Mexico according to three classification systems

Foods and beverages from the Food Composition Table	Classification systems		
	Healthy ^a and less healthy ^b food/beverage groups	Food/beverage groups by processing level and healthiness	Food/beverage pairs
APPLES, RAW, WITH SKIN	Fruits	Un/min processed - Healthy foods	
BANANA, TABASCO, RAW	Fruits	Un/min processed - Healthy foods	
BANANA, DOMINICO, RAW	Fruits	Un/min processed - Healthy foods	
BANANAS, RAW, NFS	Fruits	Un/min processed - Healthy foods	
COCONUT MEAT, DRIED, NOT SWEETENED	Fruits	Un/min processed - Healthy foods	
GRAPEFRUIT, RAW,	Fruits	Un/min processed - Healthy foods	
GRAPES, RED OR GREEN, RAW	Fruits	Un/min processed - Healthy foods	
GUAVAS, RAW	Fruits	Un/min processed - Healthy foods	
KIWIFRUIT, GREEN, RAW	Fruits	Un/min processed - Healthy foods	
LEMON, RAW	Fruits	Un/min processed - Healthy foods	
LIMES, RAW	Fruits	Un/min processed - Healthy foods	
MAMMY-APPLE, (MAMEY), RAW	Fruits	Un/min processed - Healthy foods	
MANGOS, CRIOLLO, RAW	Fruits	Un/min processed - Healthy foods	
MANGOS, MANILA, RAW	Fruits	Un/min processed - Healthy foods	
MANGOS, RAW, NFS	Fruits	Un/min processed - Healthy foods	
MELONS, CANTALOUPE, RAW	Fruits	Un/min processed - Healthy foods	
MELONS, HONEYDEW, RAW	Fruits	Un/min processed - Healthy foods	
NECTARINES, RAW	Fruits	Un/min processed - Healthy foods	
ORANGES, RAW, ALL VARIETIES	Fruits	Un/min processed - Healthy foods	
PAPAYAS, RAW	Fruits	Un/min processed - Healthy foods	
PEACHES, RAW	Fruits	Un/min processed - Healthy foods	
PEARS, CRIOLLA, RAW	Fruits	Un/min processed - Healthy foods	
PEARS, MANTEQUILLA, RAW	Fruits	Un/min processed - Healthy foods	
PINEAPPLE, RAW, ALL VARIETIES	Fruits	Un/min processed - Healthy foods	
PLANTAINS, RAW	Fruits	Un/min processed - Healthy foods	
PLUM, RAW	Fruits	Un/min processed - Healthy foods	
PRICKLY PEARS, RAW	Fruits	Un/min processed - Healthy foods	
SOURSOP, RAW	Fruits	Un/min processed - Healthy foods	
STRAWBERRIES, RAW	Fruits	Un/min processed - Healthy foods	
TAMARINDS, RAW	Fruits	Un/min processed - Healthy foods	
TANGERINES, (MANDARIN ORANGES), RAW	Fruits	Un/min processed - Healthy foods	
WATERMELON, RAW	Fruits	Un/min processed - Healthy foods	
CHILE, CANNED, NFS	Vegetables	Processed - Healthy foods	
CHILES, JALAPENO, WHOLE, CANNED	Vegetables	Processed - Healthy foods	

Foods and beverages from the Food Composition Table	Classification systems		
	Healthy ^a and less healthy ^b food/beverage groups	Food/beverage groups by processing level and healthiness	Food/beverage pairs
CHILES, JALAPENO, SLICED CANNED	Vegetables	Processed - Healthy foods	
CHILES, SERRANO, PICKLED	Vegetables	Processed - Healthy foods	
CORN, SWEET, YELLOW, CANNED	Vegetables	Processed - Healthy foods	
GREEN SAUCE, AVERAGE	Vegetables	Processed - Healthy foods	
MUSHROOMS, CANNED, DRAINED SOLIDS	Vegetables	Processed - Healthy foods	
PEAS, GREEN, CANNED, NO SALT ADDED	Vegetables	Processed - Healthy foods	
SAUCE, SALSA, READY-TO-SERVE	Vegetables	Ultra-processed - Healthy foods	
TOMATO PRODUCTS, CANNED, PUREE, NO SALT	Vegetables	Ultra-processed - Healthy foods	
TOMATO PRODUCTS, CANNED, SAUCE	Vegetables	Ultra-processed - Healthy foods	
AVOCADOS, RAW, ALL VARIETIES	Vegetables	Un/min processed - Healthy foods	
BEET GREENS, RAW	Vegetables	Un/min processed - Healthy foods	
BEETS, RAW	Vegetables	Un/min processed - Healthy foods	
BROCCOLI, RAW	Vegetables	Un/min processed - Healthy foods	
CABBAGE, RAW	Vegetables	Un/min processed - Healthy foods	
CABBAGE, RED, RAW	Vegetables	Un/min processed - Healthy foods	
CARROTS, RAW	Vegetables	Un/min processed - Healthy foods	
CAULIFLOWER, RAW	Vegetables	Un/min processed - Healthy foods	
CELERY, RAW	Vegetables	Un/min processed - Healthy foods	
CHARD, SWISS, RAW	Vegetables	Un/min processed - Healthy foods	
CHAYOTE, FRUIT, RAW	Vegetables	Un/min processed - Healthy foods	
CHILE MORITA	Vegetables	Un/min processed - Healthy foods	
CHILES, GUAJILLO, DRIED	Vegetables	Un/min processed - Healthy foods	
CHILES, MULATTO, DRIED	Vegetables	Un/min processed - Healthy foods	
CHILES, PIQUIN, DRIED W/SEEDS	Vegetables	Un/min processed - Healthy foods	
CHILES, SMOKED, DRIED	Vegetables	Un/min processed - Healthy foods	
CHIVES, RAW	Vegetables	Un/min processed - Healthy foods	
CORIANDER (CILANTRO) LEAVES, RAW	Vegetables	Un/min processed - Healthy foods	
CORN, SWEET, WHITE, RAW	Vegetables	Un/min processed - Healthy foods	
CUCUMBER, WITH PEEL, RAW	Vegetables	Un/min processed - Healthy foods	
GARLIC, RAW	Vegetables	Un/min processed - Healthy foods	
LETTUCE, COS OR ROMAINE, RAW	Vegetables	Un/min processed - Healthy foods	
LETTUCE, GREEN LEAF, RAW	Vegetables	Un/min processed - Healthy foods	
LETTUCE, RED LEAF, RAW	Vegetables	Un/min processed - Healthy foods	
NOPALES, RAW	Vegetables	Un/min processed - Healthy foods	
ONIONS, WHITE, RAW	Vegetables	Un/min processed - Healthy foods	
ONIONS, YELLOW, RAW	Vegetables	Un/min processed - Healthy foods	
PARSLEY, FRESH	Vegetables	Un/min processed - Healthy foods	

Foods and beverages from the Food Composition Table	Classification systems		
	Healthy ^a and less healthy ^b food/beverage groups	Food/beverage groups by processing level and healthiness	Food/beverage pairs
PEAS, GREEN, RAW	Vegetables	Un/min processed - Healthy foods	
PEPPER, POBLANO, RAW	Vegetables	Un/min processed - Healthy foods	
PEPPER, CHILACA, RAW	Vegetables	Un/min processed - Healthy foods	
PEPPER, HABANERO, RAW	Vegetables	Un/min processed - Healthy foods	
PEPPER, TORNACHILE, RAW	Vegetables	Un/min processed - Healthy foods	
PEPPERS, ANCHO, DRIED	Vegetables	Un/min processed - Healthy foods	
PEPPERS, HOT CHILI, RED, RAW	Vegetables	Un/min processed - Healthy foods	
PEPPERS, JALAPENO, RAW	Vegetables	Un/min processed - Healthy foods	
PEPPERS, PASILLA, DRIED	Vegetables	Un/min processed - Healthy foods	
PEPPERS, SERRANO, RAW	Vegetables	Un/min processed - Healthy foods	
PEPPERS, SWEET, RED, RAW	Vegetables	Un/min processed - Healthy foods	
PURSLANE, RAW	Vegetables	Un/min processed - Healthy foods	
RADISHES, RAW	Vegetables	Un/min processed - Healthy foods	
RED CHILI PEPPER (BIRD'S BEAK CHILI), DRIED	Vegetables	Un/min processed - Healthy foods	
SPINACH, RAW	Vegetables	Un/min processed - Healthy foods	
SQUASH, SUMMER, ZUCCHINI	Vegetables	Un/min processed - Healthy foods	
TOMATOES, GREEN, RAW	Vegetables	Un/min processed - Healthy foods	
TOMATOES, ORANGE SALADET, RAW	Vegetables	Un/min processed - Healthy foods	
TOMATOES, ORANGE BOLA, RAW	Vegetables	Un/min processed - Healthy foods	
VEGETABLES, MIXED, FROZEN	Vegetables	Un/min processed - Healthy foods	
WHITE POTATO, BAKED, PEEL NOT EATEN	Vegetables	Un/min processed - Healthy foods	
YAMBEAN (JICAMA), RAW	Vegetables	Un/min processed - Healthy foods	
BREAD, PITA, WHITE, UNENRICHED	Grains	Processed - Healthy foods	
FRIED TORTILLA	Grains	Processed - Healthy foods	
BREAD, MULTI-GRAIN, WHOLE-GRAIN	Grains	Ultra-processed - Healthy foods	Bread loaf-Whole wheat
BREAD, TOASTED	Grains	Ultra-processed - Healthy foods	
BREAD, WHEAT	Grains	Ultra-processed - Healthy foods	Bread loaf-White
FLOUR TORTILLA	Grains	Ultra-processed - Healthy foods	
ROLLS, HOTDOG, PLAIN	Grains	Ultra-processed - Healthy foods	
ROLLS, HAMBURGER, PLAIN	Grains	Ultra-processed - Healthy foods	
TORTILLAS, READY-TO-BAKE OR -FRY, CORN	Grains	Ultra-processed - Healthy foods	
BAKED TOSTADAS, NON-FAT	Grains	Un/min processed - Healthy foods	
CORN FLOUR, MASA, ENRICHED, WHITE	Grains	Un/min processed - Healthy foods	

Foods and beverages from the Food Composition Table	Classification systems		
	Healthy ^a and less healthy ^b food/beverage groups	Food/beverage groups by processing level and healthiness	Food/beverage pairs
CORN FLOUR, MASA, ENRICHED, YELLOW	Grains	Un/min processed - Healthy foods	
CORN FLOUR, MASA, UNENRICHED, WHITE	Grains	Un/min processed - Healthy foods	
CORN FLOUR, WHOLE-GRAIN, WHITE	Grains	Un/min processed - Healthy foods	
CORNSTARCH	Grains	Un/min processed - Healthy foods	
OATS	Grains	Un/min processed - Healthy foods	
PASTA, DRY	Grains	Un/min processed - Healthy foods	
PRE-COOKED CORN (FOR POZOLE)	Grains	Un/min processed - Healthy foods	
RICE, WHITE, PRECOOKED OR INSTANT	Grains	Un/min processed - Healthy foods	
RICE, WHITE, REGULAR	Grains	Un/min processed - Healthy foods	
SNACKS, POPCORN, AIR-POPPED	Grains	Un/min processed - Healthy foods	
SPAGHETTI, DRY, UNENRICHED	Grains	Un/min processed - Healthy foods	
TORTILLA AVERAGE	Grains	Un/min processed - Healthy foods	
TORTILLA, CORN	Grains	Un/min processed - Healthy foods	
WHEAT, FLOUR, REFINED	Grains	Un/min processed - Healthy foods	
CHEESE, CEMEMBERT	Dairy	Processed - Healthy foods	
CHEESE, COW, FRESH	Dairy	Processed - Healthy foods	
CHEESE, GOAT, SEMISOFT TYPE	Dairy	Processed - Healthy foods	
CHEESE, MEXICAN, QUESO ANEJO	Dairy	Processed - Healthy foods	
CHEESE, MEXICAN, QUESO ASADERO	Dairy	Processed - Healthy foods	
CHEESE, MEXICAN, QUESO CHIHUAHUA	Dairy	Processed - Healthy foods	
CHEESE, OAXACA	Dairy	Processed - Healthy foods	Cheese-Oaxaca (low fat)
CHEESE, AMERICAN	Dairy	Ultra-processed - Healthy foods	
CHEESE, CHEDDAR	Dairy	Ultra-processed - Healthy foods	
CHEESE, COTTAGE	Dairy	Ultra-processed - Healthy foods	Soft cheese-Cottage (low fat)
CHEESE, CREAM	Dairy	Ultra-processed - Healthy foods	Soft cheese-Double cream cheese (high fat)
CHEESE, EDAM	Dairy	Ultra-processed - Healthy foods	
CHEESE, GOUDA	Dairy	Ultra-processed - Healthy foods	
CHEESE, MANCHEGO	Dairy	Ultra-processed - Healthy foods	Cheese-Manchego (high fat)
CHEESE, MOZZARELLA, WHOLE MILK	Dairy	Ultra-processed - Healthy foods	

Foods and beverages from the Food Composition Table	Classification systems		
	Healthy ^a and less healthy ^b food/beverage groups	Food/beverage groups by processing level and healthiness	Food/beverage pairs
CHEESE, PARMESAN, HARD	Dairy	Ultra-processed - Healthy foods	
YOGURT, PLAIN, WHOLE MILK	Dairy	Ultra-processed - Healthy foods	Yogurt-Plain full fat
FISH, SALMON, CANNED	White meat and alternatives	Processed - Healthy foods	
FISH, SARDINE, CANNED IN TOMATO SAUCE	White meat and alternatives	Processed - Healthy foods	
FISH, SARDINE, CANNED IN OIL	White meat and alternatives	Processed - Healthy foods	
MOLLUSKS, OYSTER, EASTERN, CANNED	White meat and alternatives	Processed - Healthy foods	
REFRIED BEANS, CANNED, TRADITIONAL STYLE	White meat and alternatives	Processed - Healthy foods	
FISH, TUNA, CANNED IN OIL	White meat and alternatives	Ultra-processed - Healthy foods	Tuna-Oil base
FISH, TUNA, CANNED IN WATER	White meat and alternatives	Ultra-processed - Healthy foods	Tuna-Water base
BEANS, BLACK, MATURE SEEDS, RAW	White meat and alternatives	Un/min processed - Healthy foods	
BEANS, KIDNEY, MATURE SEEDS, RAW	White meat and alternatives	Un/min processed - Healthy foods	
BEANS, KIDNEY, RED, MATURE SEEDS, RAW	White meat and alternatives	Un/min processed - Healthy foods	
BEANS, NAVY, MATURE SEEDS, RAW	White meat and alternatives	Un/min processed - Healthy foods	
BEANS, PINTO, MATURE SEEDS, RAW	White meat and alternatives	Un/min processed - Healthy foods	
BEANS, SMALL WHITE, MATURE SEEDS, RAW	White meat and alternatives	Un/min processed - Healthy foods	
BROADBEANS, IMMATURE SEEDS, RAW	White meat and alternatives	Un/min processed - Healthy foods	
CHICKEN, BREAST, WITH SKIN	White meat and alternatives	Un/min processed - Healthy foods	
CHICKEN, BREAST, WITHOUT SKIN	White meat and alternatives	Un/min processed - Healthy foods	Poultry-Breast without skin
CHICKEN, NFS	White meat and alternatives	Un/min processed - Healthy foods	
CHICKEN, THIGH OR LEG, WITH SKIN	White meat and alternatives	Un/min processed - Healthy foods	Poultry-Thigh and leg
CHICKEN, WING	White meat and alternatives	Un/min processed - Healthy foods	
CHICKPEAS, MATURE SEEDS, RAW	White meat and alternatives	Un/min processed - Healthy foods	
CRUSTACEANS, CRAB, ALASKA KING, RAW	White meat and alternatives	Un/min processed - Healthy foods	

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Foods and beverages from the Food Composition Table	Classification systems		
	Healthy ^a and less healthy ^b food/beverage groups	Food/beverage groups by processing level and healthiness	Food/beverage pairs
CRUSTACEANS, SHRIMP, MIXED SPECIES, COOKED	White meat and alternatives	Un/min processed - Healthy foods	
CRUSTACEANS, SHRIMP, MIXED SPECIES, RAW	White meat and alternatives	Un/min processed - Healthy foods	
EGG, WHOLE, RAW, FRESH	White meat and alternatives	Un/min processed - Healthy foods	
FISH FILLET, FRESH, ALL TYPES	White meat and alternatives	Un/min processed - Healthy foods	
FISH RAW, AVERAGE	White meat and alternatives	Un/min processed - Healthy foods	
FISH, CATFISH, CHANNEL, WILD	White meat and alternatives	Un/min processed - Healthy foods	
FISH, GROUPER, MIXED SPECIES, RAW	White meat and alternatives	Un/min processed - Healthy foods	
FISH, MACKEREL, ATLANTIC, RAW	White meat and alternatives	Un/min processed - Healthy foods	
FISH, MOJARRA, FRESH, RAW	White meat and alternatives	Un/min processed - Healthy foods	
FISH, MULLET, STRIPED, RAW	White meat and alternatives	Un/min processed - Healthy foods	
FISH, SEA BASS, MIXED SPECIES, RAW	White meat and alternatives	Un/min processed - Healthy foods	
FISH, SHARK, MIXED SPECIES, RAW	White meat and alternatives	Un/min processed - Healthy foods	
FISH, SNAPPER, MIXED SPECIES, RAW	White meat and alternatives	Un/min processed - Healthy foods	
FISH, TROUT, MIXED SPECIES, RAW	White meat and alternatives	Un/min processed - Healthy foods	
LENTILS, RAW	White meat and alternatives	Un/min processed - Healthy foods	
MOLLUSKS, CLAM, MIXED SPECIES	White meat and alternatives	Un/min processed - Healthy foods	
MOLLUSKS, OCTOPUS, COMMON, RAW	White meat and alternatives	Un/min processed - Healthy foods	
MOLLUSKS, OYSTER, PACIFIC, RAW	White meat and alternatives	Un/min processed - Healthy foods	
MOLLUSKS, SQUID, MIXED SPECIES, RAW	White meat and alternatives	Un/min processed - Healthy foods	
PEANUTS, NFS	White meat and alternatives	Un/min processed - Healthy foods	
PORGY FISH, RAW	White meat and alternatives	Un/min processed - Healthy foods	
POT BEANS	White meat and alternatives	Un/min processed - Healthy foods	
WATER, BOTTLED	Bottled water	Un/min processed - Healthy beverages	
CARBONATED BEVERAGE, CLUB SODA	Mineral water	Un/min processed - Healthy beverages	
INFANT FORMULA, POWDER	Plain milk	Ultra-processed - Healthy beverages	
MILK, CANNED, EVAPORATED	Plain milk	Ultra-processed - Healthy beverages	
MILK, DRY, LACTOSE-FREE	Plain milk	Ultra-processed - Healthy beverages	

Foods and beverages from the Food Composition Table	Classification systems		
	Healthy ^a and less healthy ^b food/beverage groups	Food/beverage groups by processing level and healthiness	Food/beverage pairs
MILK, DRY, NONFAT, INSTANT, VIT D ENRICHED	Plain milk	Ultra-processed - Healthy beverages	
MILK, DRY, NONFAT, INSTANT	Plain milk	Ultra-processed - Healthy beverages	
MILK, DRY, WHOLE	Plain milk	Ultra-processed - Healthy beverages	
MILK, FLUID, LACTOSE-FREE, 1% FAT	Plain milk	Un/min processed - Healthy beverages	
MILK, FLUID, LACTOSE-FREE, WHOLE FAT	Plain milk	Un/min processed - Healthy beverages	
MILK, FLUID, 1% FAT	Plain milk	Un/min processed - Healthy beverages	
MILK, FLUID, 2% FAT	Plain milk	Un/min processed - Healthy beverages	Milk-Plain
MILK, WHOLE FAT	Plain milk	Un/min processed - Healthy beverages	Milk-Plain
BREAD, PAN DULCE, SWEET YEAST BREAD, BAKERY	Sweetened grains	Ultra-processed foods-Less healthy foods	
BREAD, PAN DULCE, SWEET YEAST BREAD, PACKAGED	Sweetened grains	Ultra-processed foods-Less healthy foods	
CEREAL READY-TO-EAT, COCOA KRISPIES®	Sweetened grains	Ultra-processed foods-Less healthy foods	
CEREALS READY-TO-EAT, SPECIAL K®	Sweetened grains	Ultra-processed foods-Less healthy foods	
CEREALS READY-TO-EAT, WHOLE GRAIN FLAKES, FITNESS®	Sweetened grains	Ultra-processed foods-Less healthy foods	
CEREALS READY-TO-EAT, COCOA, NESQUICK®	Sweetened grains	Ultra-processed foods-Less healthy foods	
CEREALS READY-TO-EAT, CORN FLAKES	Sweetened grains	Ultra-processed foods-Less healthy foods	
CEREALS READY-TO-EAT, CORN POPS®	Sweetened grains	Ultra-processed foods-Less healthy foods	
CEREALS READY-TO-EAT, FROSTED FLAKES	Sweetened grains	Ultra-processed foods-Less healthy foods	Ready-to-eat cereals-Frosted corn flakes
CEREALS READY-TO-EAT, TRIXX®	Sweetened grains	Ultra-processed foods-Less healthy foods	
CEREALS READY-TO-EAT, KELLOGG'S ALL-BRAN®	Sweetened grains	Ultra-processed foods-Less healthy foods	Ready-to-eat cereals-High bran/fiber wheat
CEREALS READY-TO-EAT, MAIZORO CORN FLAKES®	Sweetened grains	Ultra-processed foods-Less healthy foods	
CEREALS READY-TO-EAT, QUAKER, NUTRIFLAKES®	Sweetened grains	Ultra-processed foods-Less healthy foods	
CEREALS READY-TO-EAT, RAISIN BRAN®	Sweetened grains	Ultra-processed foods-Less healthy foods	
CEREALS READY-TO-EAT, RAISIN BRAN EXTRA®	Sweetened grains	Ultra-processed foods-Less healthy foods	
CEREALS READY-TO-EAT, FROSTED CORN FLAKES, AZUCARADAS®	Sweetened grains	Ultra-processed foods-Less healthy foods	
CEREALS READY-TO-EAT, NFS	Sweetened grains	Ultra-processed foods-Less healthy foods	

Foods and beverages from the Food Composition Table	Classification systems		
	Healthy ^a and less healthy ^b food/beverage groups	Food/beverage groups by processing level and healthiness	Food/beverage pairs
CEREALS, OATS, REGULAR AND QUICK	Sweetened grains	Ultra-processed foods-Less healthy foods	
CHOCORROLES®	Sweetened grains	Ultra-processed foods-Less healthy foods	
CINAMON COOKIES	Sweetened grains	Ultra-processed foods-Less healthy foods	
COOKIES, BARRITAS®	Sweetened grains	Ultra-processed foods-Less healthy foods	
COOKIES, TRIKI TRAKES®	Sweetened grains	Ultra-processed foods-Less healthy foods	
COOKIES, BUTTER, COMMERCIALY PREPARED	Sweetened grains	Ultra-processed foods-Less healthy foods	
COOKIES, MARSHMALLOW, CHOCOLATE-COATED	Sweetened grains	Ultra-processed foods-Less healthy foods	
COOKIES, SUGAR, COMMERCIAL, REGULAR	Sweetened grains	Ultra-processed foods-Less healthy foods	
DOUGHNUTS, WHEAT, SUGARED OR GLAZED	Sweetened grains	Ultra-processed foods-Less healthy foods	
GANSITO, MARINELA®	Sweetened grains	Ultra-processed foods-Less healthy foods	
MAIZE, FLOUR, SWEETENED	Sweetened grains	Ultra-processed foods-Less healthy foods	
NUTRI-GRAIN® CEREAL BARS, FRUIT	Sweetened grains	Ultra-processed foods-Less healthy foods	
PANCAKE MIX	Sweetened grains	Ultra-processed foods-Less healthy foods	
PINGUINOS, MARINELA®	Sweetened grains	Ultra-processed foods-Less healthy foods	
PLATIVOLOS®	Sweetened grains	Ultra-processed foods-Less healthy foods	
RICE AND WHEAT CEREAL BAR	Sweetened grains	Ultra-processed foods-Less healthy foods	
SUAVICREMAS®	Sweetened grains	Ultra-processed foods-Less healthy foods	
SUBMARINOS®	Sweetened grains	Ultra-processed foods-Less healthy foods	
SWEET COOKIE WITH MARSHMALLOW	Sweetened grains	Ultra-processed foods-Less healthy foods	
WHEAT FLOUR, WHITE, CAKE, ENRICHED	Sweetened grains	Ultra-processed foods-Less healthy foods	
CORN, SNACK WITH CILE	Savory snacks	Ultra-processed foods-Less healthy foods	
CRACKERS, SALTINE, HIGH-FAT	Savory snacks	Ultra-processed foods-Less healthy foods	
CRACKERS, SALTINE, LOW-FAT	Savory snacks	Ultra-processed foods-Less healthy foods	
FRIED CORN TORTILLA	Savory snacks	Ultra-processed foods-Less healthy foods	
JAPANESE STYLE PEANUTS	Savory snacks	Ultra-processed foods-Less healthy foods	
SALTY SNACKS, TORTILLA CHIPS	Savory snacks	Ultra-processed foods-Less healthy foods	
SNACKS, POPCORN, OIL-POPPED	Savory snacks	Ultra-processed foods-Less healthy foods	
SNACKS, PORK SKINS, PLAIN	Savory snacks	Ultra-processed foods-Less healthy foods	
SNACKS, POTATO CHIPS, PLAIN, SALTED	Savory snacks	Ultra-processed foods-Less healthy foods	
FRUIT COCKTAIL, CANNED, SWEETENED	Sweet snacks	Processed – Less healthy foods	
MANGOS, CANNED WITH SYRUP	Sweet snacks	Processed – Less healthy foods	
PEACHES, CANNED WITH SYRUP	Sweet snacks	Processed – Less healthy foods	
PINEAPPLE, CANNED WITH SYRUP	Sweet snacks	Processed – Less healthy foods	

Foods and beverages from the Food Composition Table	Classification systems		
	Healthy ^a and less healthy ^b food/beverage groups	Food/beverage groups by processing level and healthiness	Food/beverage pairs
CARAMEL SAUCE FROM GOAT MILK, (CAJETA)	Sweet snacks	Ultra-processed foods-Less healthy foods	
FLAN, CARAMEL CUSTARD, DRY MIX	Sweet snacks	Ultra-processed foods-Less healthy foods	
FROZEN NOVELTIES, ICE TYPE, POP	Sweet snacks	Ultra-processed foods-Less healthy foods	
GELATIN DESSERTS, DRY MIX, REDUCED CALORIE	Sweet snacks	Ultra-processed foods-Less healthy foods	
ICE CREAM, BAR OR STICK, WITHOUT COVER	Sweet snacks	Ultra-processed foods-Less healthy foods	
ICE CREAM, FRUIT, WITH MILK	Sweet snacks	Ultra-processed foods-Less healthy foods	
ICE CREAMS, VANILLA, LIGHT	Sweet snacks	Ultra-processed foods-Less healthy foods	
ICE, FRUIT	Sweet snacks	Ultra-processed foods-Less healthy foods	
JELLIES	Sweet snacks	Ultra-processed foods-Less healthy foods	
MARSHMALLOW POP	Sweet snacks	Ultra-processed foods-Less healthy foods	
TAMARIND CANDY	Sweet snacks	Ultra-processed foods-Less healthy foods	
YOGURT, FRUIT VARIETY, WHOLE MILK	Sweet snacks	Ultra-processed foods-Less healthy foods	Yogurt-Flavored full fat
YOGURT, FRUIT, LOW FAT	Sweet snacks	Ultra-processed foods-Less healthy foods	
BEEF, CURED, DRIED	Processed and red meat	Processed – Less healthy foods	
BEEF, MEAT DRIED & SALTED	Processed and red meat	Processed – Less healthy foods	
PORK, CURED, SHOULDER, ARM	Processed and red meat	Processed – Less healthy foods	
SMOKED PORK CHOP	Processed and red meat	Processed – Less healthy foods	
BEEF, SAUSAGE	Processed and red meat	Ultra-processed foods-Less healthy foods	
BOLOGNA, TURKEY	Processed and red meat	Ultra-processed foods-Less healthy foods	
CHORIZO, PORK AND BEEF	Processed and red meat	Ultra-processed foods-Less healthy foods	
FISH, SURIMI	Processed and red meat	Ultra-processed foods-Less healthy foods	
TURKEY HAM	Processed and red meat	Ultra-processed foods-Less healthy foods	
MORTADELLA, BEEF, PORK	Processed and red meat	Ultra-processed foods-Less healthy foods	
PATE, LIVER, NOT SPECIFIED, CANNED	Processed and red meat	Ultra-processed foods-Less healthy foods	
PORK AND TURKEY SAUSAGE, PRE-COOKED	Processed and red meat	Ultra-processed foods-Less healthy foods	
PORK, CURED, BACON, RAW	Processed and red meat	Ultra-processed foods-Less healthy foods	
PORK, CURED, BREAKFAST STRIPS, RAW OR UNHEATED	Processed and red meat	Ultra-processed foods-Less healthy foods	
PORK, CURED, HAM, PATTIES, UNHEATED	Processed and red meat	Ultra-processed foods-Less healthy foods	

Foods and beverages from the Food Composition Table	Classification systems		
	Healthy ^a and less healthy ^b food/beverage groups	Food/beverage groups by processing level and healthiness	Food/beverage pairs
SALAMI, COOKED, BEEF AND PORK	Processed and red meat	Ultra-processed foods-Less healthy foods	
SAUSAGE, BERLINER, PORK, BEEF	Processed and red meat	Ultra-processed foods-Less healthy foods	
TURKEY, CHORIZO	Processed and red meat	Ultra-processed foods-Less healthy foods	
BEEF, LEAN	Processed and red meat	Un/min processed – Less healthy foods	Red meat-Low fat
BEEF, AGUAYON	Processed and red meat	Un/min processed – Less healthy foods	
BEEF, COMPOSITE RETAIL CUTS	Processed and red meat	Un/min processed – Less healthy foods	
BEEF, COMPOSITE RETAIL CUTS, 1/4" FAT	Processed and red meat	Un/min processed – Less healthy foods	
BEEF, FLANK, STEAK, TRIMMED TO 0" FAT	Processed and red meat	Un/min processed – Less healthy foods	
BEEF, GROUND, 80% LEAN MEAT / 20% FAT	Processed and red meat	Un/min processed – Less healthy foods	
BEEF, GROUND, 85% LEAN MEAT / 15% FAT	Processed and red meat	Un/min processed – Less healthy foods	
BEEF, HEART	Processed and red meat	Un/min processed – Less healthy foods	
BEEF, INTESTINES	Processed and red meat	Un/min processed – Less healthy foods	
BEEF, KIDNEYS	Processed and red meat	Un/min processed – Less healthy foods	
BEEF, LIVER	Processed and red meat	Un/min processed – Less healthy foods	
BEEF, RIB, 1/4" FAT	Processed and red meat	Un/min processed – Less healthy foods	
BEEF, RIB, SHORTRIBS	Processed and red meat	Un/min processed – Less healthy foods	Red meat-High fat
BEEF, ROUND, TIP ROUND, ROAST	Processed and red meat	Un/min processed – Less healthy foods	
BEEF, TENDERLOIN, STEAK, 1/8" FAT	Processed and red meat	Un/min processed – Less healthy foods	
BEEF, TONGUE	Processed and red meat	Un/min processed – Less healthy foods	
BEEF, TRIPE	Processed and red meat	Un/min processed – Less healthy foods	
BEEF, RIB, 1/4" FAT	Processed and red meat	Un/min processed – Less healthy foods	
PORK, CURED, SHOULDER, BLADE ROLL	Processed and red meat	Un/min processed – Less healthy foods	
PORK, FRESH, BACKRIBS	Processed and red meat	Un/min processed – Less healthy foods	
PORK, FRESH, COMPOSITE RETAIL CUTS	Processed and red meat	Un/min processed – Less healthy foods	
PORK, FRESH, GROUND, RAW	Processed and red meat	Un/min processed – Less healthy foods	

Foods and beverages from the Food Composition Table	Classification systems		
	Healthy ^a and less healthy ^b food/beverage groups	Food/beverage groups by processing level and healthiness	Food/beverage pairs
PORK, FRESH, SHOULDER	Processed and red meat	Un/min processed – Less healthy foods	
PORK, FRESH, SPARERIBS	Processed and red meat	Un/min processed – Less healthy foods	
CARBONATED BEVERAGE, COLA	Regular soda	Ultra-processed – Less healthy beverages	Soda- Regular
CARBONATED BEVERAGE, GRAPE SODA	Regular soda	Ultra-processed – Less healthy beverages	
CARBONATED BEVERAGE, ORANGE	Regular soda	Ultra-processed – Less healthy beverages	
CARBONATED BEVERAGE, APPLE	Regular soda	Ultra-processed – Less healthy beverages	
CARBONATED BEVERAGE, SPRITE, LEMON-LIME	Regular soda	Ultra-processed – Less healthy beverages	
ORANGE-FLAVOR DRINK, POWDER	Non-carbonated flavored drinks	Ultra-processed – Less healthy beverages	
FLAVORED WATER, SYRUP CONCENTRATE	Non-carbonated flavored drinks	Ultra-processed – Less healthy beverages	
APPLE JUICE, CANNED OR BOTTLED, UNSWEETENED	Bottled fruit juice	Ultra-processed – Less healthy beverages	
APRICOT NECTAR, CANNED	Bottled fruit juice	Ultra-processed – Less healthy beverages	
CRANBERRY JUICE COCKTAIL, BOTTLED	Bottled fruit juice	Ultra-processed – Less healthy beverages	
GRAPE JUICE, CANNED OR BOTTLED, UNSWEETENED	Bottled fruit juice	Ultra-processed – Less healthy beverages	
GRAPEFRUIT JUICE, WHITE, CANNED, SWEETENED	Bottled fruit juice	Ultra-processed – Less healthy beverages	
JUICE, APPLE AND GRAPE BLEND	Bottled fruit juice	Ultra-processed – Less healthy beverages	
ORANGE-GRAPEFRUIT JUICE, CANNED, UNSWEETENED	Bottled fruit juice	ORANGE-GRAPEFRUIT JUICE, CANNED, UNSWEETENED	
PINEAPPLE JUICE, CANNED OR BOTTLED	Bottled fruit juice	Ultra-processed – Less healthy beverages	
VEGETABLE JUICE COCKTAIL, CANNED	Bottled fruit juice	Ultra-processed – Less healthy beverages	
MILK, CHOCOLATE, NFS	Flavored milk	Ultra-processed – Less healthy beverages	Milk- Flavored
SOYMILK OR SOY JUICE, WITH ADDED SUGAR	Flavored milk	Ultra-processed – Less healthy beverages	
CARBONATED BEVERAGE, LOW CALORIE, COLA	Diet sodas & drinks	Ultra-processed – Less healthy beverages	Soda-Diet
FRUIT-FLAVORED DRINK, LOW CALORIE	Diet sodas & drinks	Ultra-processed – Less healthy beverages	
FRUIT-FLAVORED BEVERAGE, POWDER, LOW CALORIE	Diet sodas & drinks	Ultra-processed – Less healthy beverages	
TEA, INSTANT, SWEETENED, LEMON-FLAVORED	Diet sodas & drinks	Ultra-processed – Less healthy beverages	
FAT, BEEF TALLOW		Processed culinary ingredients	
HONEY		Processed culinary ingredients	
MILK, CANNED, CONDENSED, SWEETENED		Processed culinary ingredients	

Foods and beverages from the Food Composition Table	Classification systems		
	Healthy ^a and less healthy ^b food/beverage groups	Food/beverage groups by processing level and healthiness	Food/beverage pairs
OIL, CANOLA		Processed culinary ingredients	
OIL, CORN		Processed culinary ingredients	
OIL, OLIVE		Processed culinary ingredients	
OIL, PAM® COOKING SPRAY, ORIGINAL		Processed culinary ingredients	
OIL, SAFFLOWER		Processed culinary ingredients	
OIL, SOYBEAN		Processed culinary ingredients	
OIL, SUNFLOWER		Processed culinary ingredients	
SALT, TABLE		Processed culinary ingredients	
SUGARS, GRANULATED		Processed culinary ingredients	
VEGETABLE SHORTENING		Processed culinary ingredients	
VINEGAR, CIDER		Processed culinary ingredients	
BUTTER, SALTED			Butter-Salted
BUTTER, WITHOUT SALT			Butter-Not salted
SALAD DRESSING, MAYONNAISE, LIGHT			Mayonnaise-Low fat
SALAD DRESSING, MAYONNAISE, REGULAR			Mayonnaise-Regular

^aHealthy food/beverage groups: fruits, vegetables, grains, dairy, white meat and alternatives, bottled water, mineral water, and plain milk.

^bLess healthy food/beverage groups: sweetened grains, savory snacks, processed and red meat, regular soda, non-carbonated flavored drinks, bottled fruit juice, flavored milk, and diet sodas & drinks

Table 2.

Average price per year and average price trend from 2011 to 2018 by healthiness for food and beverage groups and subgroups in Mexico.

Food subgroups	Price (MXN) ^a /100 g				Price (MXN) ^a /100 kcal			
	2011	2014	2018	Linear trend ^b (% change/year)	2011	2014	2018	Linear trend ^b (% change/year)
Healthy foods^c	7.61	7.93	8.04	0.70	7.05	7.37	7.67	0.74
Fruits	4.04	4.06	4.42	2.25	8.20	8.28	9.00	2.08
Vegetables	4.18	4.09	4.38	1.84	8.80	8.79	9.79	2.15
Starchy vegetables	2.48	2.64	3.16	2.75	2.73	2.90	3.46	2.74
Non-starchy vegetables	4.32	4.21	4.47	1.75	9.31	9.28	10.24	1.97
Grains	2.29	2.35	2.67	0.26	0.80	0.82	0.89	-0.01
Corn tortillas	1.52	1.53	1.51	-0.79	0.63	0.63	0.62	-0.78
Corn	2.48	2.75	3.64	1.84	0.98	1.05	1.25	1.62
Other grains	2.82	2.85	2.94	0.09	0.89	0.9	0.92	-0.01
Dairy	13.50	13.65	13.14	-0.70	4.27	4.44	4.19	-0.54
Plain yogurts	3.29	3.48	3.74	2.08	3.71	3.92	4.21	2.08
Cheeses	13.75	13.91	13.39	-0.66	4.28	4.45	4.19	-0.61
White meat and alternatives	14.03	15.51	15.58	0.65	13.17	14.52	14.50	0.59
Poultry	10.06	11.19	10.34	-0.43	4.38	4.95	4.59	-0.21
Fish & sellfish	23.90	26.40	27.34	2.15	24.79	27.33	27.87	2.02
Eggs	4.14	5.33	4.45	-1.00	3.51	4.52	3.77	-1.00
Legumes	1.72	1.63	1.79	0.07	1.47	1.35	1.46	0.19
Nuts & seeds	13.72	16.33	16.64	2.87	2.29	2.73	2.78	2.87
Healthy beverages^c	1.21	1.18	1.28	-0.19	-	-	-	-
Bottled water (20 liter jug)	0.34	0.15	0.17	-5.44	-	-	-	-
Bottled water	0.87	0.86	0.88	-0.10	-	-	-	-
Mineral water	1.50	1.56	1.80	2.67	-	-	-	-
Plain milk	2.17	2.22	2.29	0.97	2.23	2.33	2.26	0.87
Less healthy foods^c	10.32	11.60	12.14	1.72	4.31	4.80	5.07	1.92
Sweetened grains	8.10	9.04	9.34	1.71	1.95	2.17	2.22	1.62
Ready-to-eat cereals	8.07	8.33	8.32	0.10	2.20	2.26	2.27	0.18
Sweetened baked goods	8.11	9.23	9.56	2.22	1.88	2.14	2.21	2.17
Savory snacks	9.61	10.78	11.34	1.99	1.89	2.12	2.19	1.78
Sweet snacks	5.40	5.61	5.93	1.25	4.36	4.41	4.95	1.36
Sweets and desserts	6.26	6.60	7.01	1.62	4.69	4.81	5.49	1.68
Flavored yogurts	3.50	3.49	3.77	0.80	3.75	3.77	4.17	1.19
Processed and red meat	18.19	20.94	21.97	2.79	9.06	10.49	10.92	3.05
Red meats	15.53	18.58	19.63	3.55	8.6	10.19	10.61	3.61
Processed meats	22.34	24.53	25.11	1.56	9.77	10.95	11.33	2.29
Less healthy beverages^c	1.99	2.06	2.10	1.61	3.14	3.35	3.47	3.26

Food subgroups	Price (MXN) ^a /100 g				Price (MXN) ^a /100 kcal			
	2011	2014	2018	Linear trend ^b (% change/year)	2011	2014	2018	Linear trend ^b (% change/year)
Regular soda	1.49	1.65	1.69	2.28	3.60	4.01	4.15	2.46
Non-carbonated flavored drinks	1.16	1.39	1.48	6.09	0.38	0.46	0.47	6.19
Bottled fruit juice	2.29	2.21	2.26	-0.29	5.30	5.29	5.81	0.44
Flavored milk	3.02	2.99	2.95	-0.29	4.76	4.72	4.89	0.08
Diet sodas and drinks	1.15	1.12	1.24	0.21	1.67	2.25	2.02	6.99

^aPrices were obtained from those used to estimate the Consumer Price Index. MXN is Mexican pesos (~0.05 USD)

^bThe average price trend was estimated with a linear regression with the log(price) as the dependent variable and time (years 2011–2018) as the independent variable.

^cAverage prices and trends were estimated from the averages of the food groups included in each healthy/ less healthy category.

Average price (per 100g) per year and average price trend from 2011 to 2018 for foods and beverages by level of processing and healthiness in Mexico.

Table 3.

NOVA food groups	Price (MXN) ^d /100 g					Linear trend ^b (% change/year)
	2011	2014	2018	7.63	1.95	
Unprocessed/minimally processed foods	6.54	7.05	7.63			
Healthy foods	5.50	5.69	6.17			1.74
Less healthy foods ^c	15.53	18.58	19.63			3.55
Healthy beverages	1.24	1.25	1.29			0.18
Less healthy beverages ^d	-	-	-			-
Processed culinary ingredients	4.10	3.91	3.97			-0.32
Processed foods	12.59	13.50	13.39			0.98
Healthy foods	9.08	9.44	9.72			0.50
Less healthy foods	20.12	21.98	21.79			2.26
Healthy beverages ^e	-	-	-			-
Less healthy beverages ^e	-	-	-			-
Ultra-processed foods	9.12	9.93	10.70			1.85
Healthy foods ^f	9.01	9.25	9.53			0.52
Less healthy foods	11.90	13.19	14.12			1.86
Healthy beverages ^g	2.63	2.68	2.70			1.03
Less healthy beverages	1.68	1.79	1.87			2.38

^aPrices were obtained from those used to estimate the Consumer Price Index. MXN is Mexican pesos (~0.05 USD)

^bThe average price trend was estimated with a linear regression with the log(price) as the dependent variable and time (years 2011–2018) as the independent variable.

^cIncludes red meat

^dNone of the less healthy beverages are unprocessed or minimally processed foods

^eNone of the healthy beverages and less healthy beverages are processed foods

^fIncludes canned tuna, industrialized bread and tortilla, industrialized tomato sauce/puree, industrialized cheeses

^gIncludes powdered milk

Table 4.

Average price (per 100g food/beverage) per year and average price trend from 2011 to 2018 by food/beverage pairs in Mexico.

Food/beverage pairs	Price (MXN) ^a /100 g			
	2011	2014	2018	Linear trend ^b (% change/year)
Red meat				
High fat	31.10	37.04	47.15	6.46
Low fat	19.34	24.19	26.97	4.92
Poultry				
Thigh and leg with skin	9.56	10.41	9.32	-1.31
Breast without skin	13.85	15.41	15.63	0.82
Tuna				
Oil base	8.55	9.93	11.10	2.51
Water base	8.43	9.65	11.49	3.04
Milk				
Flavored	3.02	2.99	2.95	-0.29
Plain (reduced or full fat)	1.58	1.62	1.65	0.49
Yogurt				
Flavored full fat	3.20	3.27	3.40	0.49
Plain full fat	3.29	3.48	3.74	2.08
Soft cheese				
Double cream cheese(high fat)	8.82	9.63	10.12	1.79
Cottage (low fat)	10.60	11.37	10.03	-1.37
Cheese				
Manchego (high fat)	15.89	16.08	15.94	-0.17
Oaxaca (low fat)	13.01	13.58	12.06	-1.32
Butter				
Salted	14.90	15.50	16.11	1.81
Not salted	14.03	14.74	16.22	2.20
Mayonnaise				
Regular	7.03	7.01	7.46	0.16
Low fat	7.04	7.17	6.58	-0.70
Soda				
Regular	1.57	1.80	1.91	3.34
Diet	2.30	2.45	2.91	1.83
Ready-to-eat cereal				
Frosted corn flakes	8.13	9.56	9.37	1.43
High bran/fiber wheat	9.23	9.88	9.11	1.37
Bread loaf				
White	4.52	4.57	4.70	0.38
Whole wheat	5.33	5.36	6.10	2.37

^aPrices were obtained from those used to estimate the Consumer Price Index. MXN is Mexican pesos (~0.05 USD)

^bThe average price trend was estimated with a linear regression with the log(price) as the dependent variable and time (years 2011–2018) as the independent variable.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript