
## Episode 160 – Ultra-Processed Foods July 10, 2026

### Introduction

Food processing has existed since prehistoric times, when people used fermentation, sun-drying, salt, honey, sugar, and cooking to preserve food and limit the growth of harmful microorganisms. [1] [2] [3]

Industrial food processing involves physical, biological, and chemical methods used by manufacturers after food is harvested and before it is consumed or prepared as meals, either at home or elsewhere. The degree of processing varies by product. More complex forms often include ingredients not typically used in household kitchens, such as dyes, sweeteners,[1] artificial flavours, hydrogenated oils, and emulsifiers. [4]

Food processing itself is not the issue. Today, practically all food is processed to some extent, if only for preservation to ensure food safety and security. For years, food safety and security have been ensured by salting, drying, smoking, sugaring, pasteurizing, or fermenting. Presently, numerous additives, namely, preservatives and antioxidants, are also used. These processes make it possible to preserve food during storage and long-distance transport to supply large metropolitan areas, bridge seasonal gaps, and support households with reduced storage capacity (e.g., limited refrigeration) or inconsistent access to grocery stores. Some foods also require processing to be palatable, safe, or available year-round, including grains, pasteurized milk, and canned, dried, or frozen fruits and vegetables. Because the term “processing” is broad and imprecise, judging foods simply because they are “processed” is not practical. [5] [6]

### NOVA food classification

In 2009, Brazilian epidemiologist Monteiro and his team introduced the term ultra-processed foods and later developed the NOVA food classification system, which categorizes foods according to their processing. “Nova” in Portuguese means “new.” [7] [8]

Several food classification systems that account for food processing have been developed over the years and are used by various countries. Among these systems, NOVA is the most widely applied in the scientific literature because it identifies and defines ultra-processed foods. It has been used worldwide in nutrition[2] and public health

[1] Refer to Episode 118 for additional information on sugar substitutes.
[2] Listen to Episodes 144, 145, and 146 for discussion on nutrition and oral health.

research, policy, and guidance to support understanding of the health implications of different food products. [5] [9]

The NOVA system classifies all foods, beverages, and food products into four groups based on the extent and purpose of the processing they undergo. The system considers all physical, biological, and chemical methods used during the food manufacturing process, including the use of additives.

The four groups include:
1. Unprocessed or minimally processed foods
2. Processed culinary ingredients
3. Processed foods
4. Ultra-processed foods [10] [11]

**Group one: Unprocessed or minimally processed foods**
Unprocessed and minimally processed foods are altered through basic processes such as removing inedible parts, drying, crushing, grinding, roasting, boiling, pasteurizing, refrigerating, freezing, packaging, vacuum sealing, or non-alcoholic fermentation. These methods do not add salt, sugar, oils, fats, or other food substances. Their purpose is to extend the shelf life of foods such as grains, legumes, vegetables, fruits, nuts, milk, and meat, while often making them easier to store, prepare, or use in different ways. [11]

Examples of unprocessed or minimally processed foods include:
- Fresh, squeezed, chilled, frozen, or dried fruit and vegetables
- Grains such as brown, parboiled, or white rice, corn kernel, oats, and barley
- Legumes such as beans, lentils, and chickpeas
- Starchy roots and tubers such as potatoes, sweet potatoes, and cassava
- Fungi such as fresh or dried mushrooms
- Meat, poultry, fish, and seafood
- Fresh, powdered, chilled, or frozen eggs
- Fresh, powdered, or pasteurized milk
- Unsweetened fresh or pasteurized fruit or vegetable juices
- Flour, flakes, or grits made from corn, wheat, oats, or cassava
- Tree and ground nuts and seeds, with no added salt or sugar
- Whole, powdered, fresh, or dried herbs and spices, such as thyme, oregano, mint, pepper, cloves, and cinnamon
- Fresh or pasteurized plain yogurt
- Tea and coffee

Group one also includes foods made by combining two or more items from this group, including:
- Dried mixed fruits or granola made from cereals, nuts, and dried fruit with no added sugar, honey, or oil.
- Pasta, couscous, or polenta made with flour, flakes, or grits and water.
- Foods with added vitamins and minerals, usually to replace nutrients lost during processing, such as wheat or corn flour fortified with iron and folic acid. [5]

**Group two: Processed culinary ingredients**
Processed culinary ingredients are substances obtained directly from unprocessed foods, minimally processed foods, or natural sources, including oils, fats, sugar, and salt. These ingredients are produced through industrial processes, such as pressing, centrifuging, refining, extraction, or mining, and are primarily used in the preparation, seasoning, and cooking of group one foods. [11]

Examples of processed culinary ingredients include:
- Vegetable oils from seeds, nuts, or fruit (e.g., olives)
- Butter (including salted) and lard
- Sugar, molasses, honey, maple syrup
- Corn and other plant starches
- Mined salt, sea salt, including iodized salt [5]

**Group three: Processed foods**
Processed foods are made by adding ingredients such as salt, sugar, or other ingredients from group two to unprocessed or minimally processed foods, often using preservation methods such as canning, bottling, or non-alcoholic fermentation, as seen in breads and cheeses. These processes are intended to extend shelf life and improve sensory qualities, such as taste, texture, and appearance, to make them more enjoyable. [11]

Examples of processed foods include:
- Canned or bottled vegetables and legumes
- Salted or sugared nuts and seeds
- Salted, dried, cured, or smoked meats and fish
- Canned fish
- Fruit in syrup
- Freshly made unpackaged breads and cheeses. [5]

**Group four: Ultra-processed foods**
Ultra-processed foods are mass-produced, industrially created products primarily made from ingredients not typically used in home cooking. They are referred to as "ultra-processed" because their production involves multiple industrial stages that break whole foods into components such as sugars, oils, fats, proteins, starches, and fibres. These components are then recombined using methods such as extrusion, moulding, and pre-frying. To enhance their appeal, additives such as colours, flavours, and emulsifiers are often used, along with sophisticated packaging.

While common ingredients such as sugar, oils, fats, and salt are used in both processed and ultra-processed foods, what distinguishes ultra-processed foods is the frequent use of industrially derived substances and additives designed to extend shelf life, preserve product qualities, or intensify taste, texture, colour, and aroma.

Characteristic ingredients of ultra-processed foods include substances rarely used in kitchens, such as high-fructose corn syrup, hydrogenated oils, protein isolates, and

mechanically separated meat, as well as cosmetic additives, such as flavour enhancers, colours, sweeteners, emulsifiers, thickeners, and glazing agents. These additives can mask undesirable sensory qualities from processing or packaging and make products especially attractive to see, taste, smell or touch. [11] [12]

Examples of ultra-processed foods include:

- Carbonated soft drinks and other sugar-sweetened beverages, such as fruit, cocoa, and energy drinks.
- Sweet or savoury packaged snacks
- Chocolate, candies, ice-cream
- Mass-produced packaged breads and buns containing emulsifiers and colours
- Margarines and other spreads
- Cookies, pastries, cakes, and cake mixes
- Breakfast cereals containing sugar, flavours, and colours
- Fruit yogurts
- Energy bars
- 'Health' and 'slimming' products such as meal replacement shakes and powders
- Fast food
- Preprepared ready-to-heat products including pasta and pizza dishes; poultry and fish 'nuggets' and 'sticks', sausages, burgers, hot dogs, and other processed meat products; and packaged 'instant' soups, noodles, and desserts. [5] [11] [13]

Ultra-processed foods are manufactured to be convenient, ready-to-consume, shelf-stable, hyperpalatable, and highly profitable, using low-cost ingredients, giving them strong commercial advantages over other NOVA food groups. These advantages are backed by strong branding, ownership by transnational corporations, and large-scale, aggressive marketing strategies, including vivid packaging, health claims, special deals with retailers to secure prime shelf space, franchised food outlets, and coordinated campaigns across social, electronic, broadcast, and print media, including campaigns directed at children and schools. Together, these product and marketing features help explain why ultra-processed foods have increasingly displaced unprocessed or minimally processed foods and freshly prepared meals in many parts of the world. [11]

**Prevalence**

Ultra-processed foods are designed to be hyperpalatable and appealing, offering a long shelf life and the convenience of being consumed anytime, anywhere. Their formulation, presentation, and marketing often encourage overconsumption. [14]

These products are also created and marketed to replace unprocessed and minimally processed options, including meals and dishes made from these healthier ingredients. Ultra-processed foods now dominate diets in many high-income countries. For example, ultra-processed foods account for approximately half the caloric intake in both Canada and the U.S. These foods are also rapidly expanding in low- and middle-income countries. [4] [11] [14] [15] [16] [17] [18]

A significant change in the food systems of high-income countries, and increasingly in low- and middle-income countries, is the replacement of dietary patterns based on meals prepared from unprocessed or minimally processed foods with diets that rely on ultra-processed food and beverages. This shift results in diets that are excessively energy-dense, high in free sugars, unhealthy fats, and salt, and low in dietary fibre, increasing the risk of obesity[3] and other diet-related chronic diseases. The proportion of ultra-processed products in food supplies can serve as an indicator of a population's overall diet quality. [19]

Sales of ultra-processed foods and sugar-sweetened beverages are rising, especially in lower-middle-income and upper-middle-income countries. These sales are increasing rapidly, particularly in East and Southeast Asia, with projected figures approaching those of high-income countries by 2035. [20]

**Global expansion via tobacco companies**

Fazzino et al. (2026) outline how U.S. tobacco corporations expanded into global food markets from the mid-1980s to the mid-2000s. During the 1980s, prominent U.S. tobacco firms Philip Morris and RJ Reynolds leveraged their robust cash reserves to enter the food and beverage industry. Amid escalating regulatory and public scrutiny of tobacco products, these investments served to diversify assets, reduce financial risk, and boost their corporate image. [21]

For two decades, tobacco firms heavily invested in food companies and systematically applied the corporate growth and product-engineering strategies they had perfected in the tobacco industry. They acquired local food companies to establish regional infrastructures and created integrated sales and distribution networks that combined both tobacco and food operations. To capture leading global market shares, Philip Morris expanded into Canada, Europe, and parts of Asia. RJ Reynolds primarily targeted Mexico, Central America, South America, and parts of Europe and Asia. Collectively, this meant large portions of the globe were covered by one or both tobacco companies. [21]

To develop products, tobacco firms engineered food items using tactics mirrored from cigarette manufacturing. They manipulated portion sizes by introducing "king-size" sugary drinks and snacks to increase consumption, echoing the earlier introduction of king-size cigarettes. Furthermore, they formulated "low-fat" or "light" food options designed to retain a "full flavour" profile, appealing to health-conscious consumers while keeping the food hyperpalatable. This strategy directly replicated the industry's historical marketing of "low-tar" and "low-nicotine" cigarettes as healthier alternatives to encourage use over cessation.[4] [21]

The global dissemination of these highly engineered, ultra-processed foods has had severe public health consequences, contributing to a global rise in obesity and cardiometabolic diseases. Because food is a necessity for survival, a food system

[3] Refer to Episodes 120, 121, and 122 for discussion on obesity.
[4] Listen to Episode 101 for additional information on tobacco use and cessation.

saturated with these hyperpalatable products presents unique regulatory challenges compared to tobacco. While some less-saturated regions, such as South America, have successfully implemented warning labels and other measures, more heavily saturated markets may require stronger regulations targeting the specific nutrient profiles and properties that drive addictive eating behaviours. [21]

Although tobacco companies divested from the food sector in the early mid-2000s, their profit-maximizing, addictive business models left a legacy widely adopted across the global food industry. Today, these tobacco corporations have shifted their investments toward other health-harming sectors, including alcohol, cannabis,[5] nicotine pouches,[6] and vaping products.[7] Public health researchers warn that because these companies can rapidly transfer institutional knowledge to accelerate the growth of new addictive products, global policymakers may need to implement coordinated regulations to counter these enduring threats to global health. [21]

**Consumption in Canada**

High-income countries, including Canada, have food environments saturated with ultra-processed products. Complex sociocultural and contextual factors shape dietary habits. The physical location of eating, whether at home, work, or restaurants, influences food availability, social dynamics such as dining alone or with others, and the amount of food consumed. Consequently, these environments and social contexts interact with specific eating occasions, whether main meals or snacks, to shape food choices, portion sizes, and perceptions of what foods are acceptable or appropriate to consume. [22]

Polsky et al. (2025) analyzed how consumption of ultra-processed and minimally processed food varies by location and occasion in Canada. The study found the home was the primary eating location, accounting for 70% of total daily energy intake, with dinner contributing roughly one-third. Meals consumed at home or in institutions such as schools and workplaces had significantly healthier profiles, characterized by lower intake of ultra-processed foods and higher intake of minimally processed foods. Notably, at-home dinners offered the most favourable nutritional profile across all age groups: 30.6% ultra-processed food versus 53.9% minimally processed food. Conversely, restaurant dining was high in ultra-processed foods, with over 50% of energy for adults and over 65% for children and adolescents. [22]

Ultra-processed foods also accounted for more than half of the energy consumed at breakfast, both at home and in other eating locations. Breakfast is often a simple meal that requires little preparation, particularly when pressed for time, with commonly consumed foods including breakfast cereals, packaged breads, and other ready-to-eat foods. The findings suggest breakfast meals can have similarly unfavourable processing profiles regardless of where they are consumed. [22]

Seale et al. (2020) examined the variety of ultra-processed food consumption among 6,062 participants, aged 18 years and older, representing 24.7 million Canadian adults.

[5] Listen to Episode 58 for discussion on cannabis.
[6] Refer to Episode 131 for additional information on nicotine pouches.
[7] Refer to Episode 19 for additional information on vaping and e-cigarettes.

The findings show ultra-processed food consumption is pervasive in Canada, with almost all Canadian adults (99%) consuming an ultra-processed food product at least once weekly. Chocolate, chips, pretzels, cold breakfast cereal, and fast food were the most common ultra-processed foods consumed. The variety of ultra-processed foods was greatest among males, young participants, those with high income, and those with obesity. The study demonstrates the need for increased public programs and policies to promote and educate the Canadian population about the benefits of minimally processed and fresh foods. [23]

**Addictive qualities**

The rise of ultra-processed foods began in the 1980s, when major tobacco corporations acquired large food companies, including Kraft and General Foods, and became leading producers of these products. Tobacco industry documents reveal the strategies used to increase the addictive properties of cigarettes were applied to ultra-processed foods, particularly through formulations that combine rewarding ingredients such as fat, sugar, and salt to increase palatability and repeat consumption. The commercial success of these products is substantial, and emerging evidence supports their direct role in promoting overeating. For example, an inpatient feeding trial found participants consumed 500 more calories per day on an ultra-processed diet than on a macronutrient-matched diet of minimally processed foods. [24] [25]

Ultra-processed foods are engineered to heighten reward, accelerate delivery of reinforcing ingredients, and disrupt appetite regulation, contributing to compulsive consumption. [26]

LaFata et al. (2025) contend that ultra-processed foods can trigger addictive behaviours that resemble the clinical criteria used to diagnose substance use disorders.[8] Their paper synthesizes evidence from nearly 300 studies across 36 countries showing these foods are associated with cravings, loss of control, and continued intake despite adverse consequences. [27]

Neuroimaging studies indicate individuals with compulsive intake of ultra-processed foods show brain-circuit disruptions similar to those observed in substance use disorders. Notably, GLP-1 receptor agonist medications that reduce cravings for ultra-processed foods also reduce compulsive drug use among people with substance use disorders, highlighting the shared neurobiological mechanisms. [27]

Evidence indicates GLP-1 receptor agonists influence eating behaviour through central neural pathways that also regulate reward-driven and compulsive actions. These medications reduce appetite and shift food preferences by lowering cravings for high-calorie savoury and sugary foods, including sugar-sweetened beverages. [27] [28]

The evidence for addictive patterns of ultra-processed food intake is growing. However, some scientists and clinicians argue that more evidence is needed before ultra-processed-food addiction can be formally recognized. [27]

[8] Refer to Episodes 104 and 105 for additional information on substance use disorders.

One argument against such a diagnosis is that, unlike tobacco or alcohol, food is required for survival and therefore cannot be considered addictive. However, this objection overlooks important distinctions among foods. Minimally processed foods, such as fruits, vegetables, and whole grains, are not associated with addictive patterns of intake. In contrast, ultra-processed foods high in refined sugars and fats share more commonalities with addictive substances, particularly in how they engage brain reward systems. [27]

Nicotine offers a useful comparison. Tobacco companies increased the addictive potential of cigarettes by processing nicotine with flavour enhancers and additives and delivering it rapidly in high doses. Ultra-processed foods are developed through a comparable strategy where sugars and fats are isolated from their natural forms, concentrated, combined with additives that enhance flavour, mouthfeel, and absorption, and marketed in ways that strengthen conditioning and repeated use. Just as a cigarette has little in common with a tobacco leaf, many ultra-processed foods bear limited resemblance to the agricultural ingredients from which they are derived. [27]

The authors call on public health leaders, clinicians, and policymakers to recognize the addictive potential of ultra-processed foods and enact protective measures similar to those used in tobacco control, including restrictions on marketing to children, clearer labelling, and public education. [27]

A study of older U.S. adults indicates addiction to ultra-processed foods is more prevalent among those who grew up during the rapid expansion of these foods in the 1970s and 1980s. During this time, added sugars and saturated fats became more common in the food supply, largely because tobacco-owned food manufacturers created ultra-processed products with addictive qualities. Early exposure to these items may have shaped long-term consumption patterns among today's older adults. Although the tobacco industry sold off much of its food manufacturing holdings in the mid-2000s, the practices it established are still in use today, leaving a lasting impact on the food supply. [29]

Gearhardt et al. (2026) investigated the nutritional characteristics of commonly consumed foods with addictive potential. The study involved a diverse sample of 1,664 U.S. adults (55% female) who rated the perceived addictiveness of 297 commonly consumed foods, 74% of which were ultra-processed. Machine-learning models were used to identify nutritional predictors of addictiveness. [30]

The results indicated foods higher in carbohydrates, glycemic load, energy density, and fat were rated as more addictive. Examples of these foods included fast-food pepperoni pizza, store-bought chocolate chip cookies, and glazed doughnuts. In contrast, the lowest-rated items included canned kidney beans, cooked green peppers, and celery. [30]

This study highlights a nutritional profile associated with perceived addictive potential. The findings provide a framework for identifying foods likely to encourage compulsive

intake and inform policies aimed at creating a healthier, less addictive food environment. [30]

Lock et al. 2026 examined the prevalence of ultra-processed food addiction in 2,038 older U.S. adults using the modified Yale Food Addiction Scale 2.0, a standardized tool adapted from diagnostic criteria for substance use disorders. In this context, the "substance" refers to highly rewarding ultra-processed foods and drinks, such as chocolate, salty snacks, sugar-sweetened beverages, and fast food. The scale assesses 13 addiction-related experiences, including strong cravings, repeated unsuccessful attempts to cut down, withdrawal symptoms, and avoiding social activities because of fear of overeating. [29]

Overall, 12% of participants met criteria for ultra-processed food addiction, with prevalence higher among females (17%) than males (7.5%). The highest rate was reported among females aged 50 to 64, at 21%, compared with 12% of females and 4% of males aged 65 to 80. [29]

Adults aged 50 to 80 who met criteria for ultra-processed food addiction were more likely to report being overweight and to describe their mental or physical health as fair or poor. These findings are notable because many people in this age range were children, adolescents, or young adults when ultra-processed foods became widely available. [29]

Unlike traditional substance use disorders, which historically have been more common among older males, ultra-processed food addiction showed a higher prevalence among older females in this study. One possible explanation is the aggressive marketing of "diet" ultra-processed foods to females in the 1980s. Low-fat cookies, microwaveable meals, and other carbohydrate-heavy products were promoted as weight-control solutions, even though their engineered nutrient profiles may have reinforced addictive eating patterns. [29]

Females now aged 50 to 64 may therefore have been exposed to ultra-processed foods during a sensitive developmental window, which may help explain the elevated prevalence observed in this group. [29]

The researchers also suggest individuals who perceive themselves as overweight may be especially vulnerable to "health-washed" ultra-processed foods, products marketed as low-fat, low-calorie, high-protein, or high-fibre but still formulated to heighten appeal and cravings. This may be particularly concerning for people trying to reduce calorie intake, especially females, who often face greater societal pressure around weight. [29]

Together, the findings raise important questions about whether exposure to ultra-processed foods during childhood, adolescence, or early adulthood may increase later vulnerability to addictive eating patterns. Because children and adolescents today consume an even higher share of calories from ultra-processed foods than today's middle-aged adults did in their youth, early prevention may be essential to reducing long-term addiction risk across the lifespan. [29]

**Brain differences in young children**

Ottino-González et al. (2026) warn that ultra-processed foods may be linked to measurable differences in brain structure by age 6. The researchers followed 144 children from infancy through age 6, tracking children's diets over time and using MRI scans to measure brain structure. [31]

For every 10% increase in ultra-processed food intake, brain volume was nearly 2% smaller in regions involved in reward processing, emotion regulation, motivation, and sensorimotor integration. The study found no association between ultra-processed foods and cognitive performance. However, the researchers state that changes in brain structure may appear before changes in memory, thinking, or behaviour. [31]

These findings highlight childhood as a sensitive period for exposure to ultra-processed food, with potential long-term implications for physical, behavioural, and mental health. More research is needed to understand what these structural differences may mean for long-term health. [31]

**Lunchables**

A case study by Schmidt (2026) revealed how the tobacco company Philip Morris used cigarette research, flavour engineering, and behavioural science to turn Lunchables into one of the most successful ultra-processed foods for children. Lunchables are prepackaged meal and snack kits designed for children. [32]

Using previously undisclosed internal company documents, the study traced product development, showing how the company used its knowledge of cigarette formulation to design Lunchables to appeal strongly to children. [32]

Lunchables, prepackaged, grab-and-go meal and snack products developed primarily for children, were in premarket development at General Foods in 1985 when Philip Morris acquired the company. The company later brought Lunchables to market and developed the brand over the next 23 years. In 1987, the company bought Kraft and merged it with General Foods to create the second-largest food corporation in the world, Kraft General Foods. [32]

The tobacco company applied its cigarette product-development methods to Lunchables in two main ways. First, it used a consumer-driven product-development strategy aimed at maximizing enjoyment and appeal. Second, it adapted its "better-for-you" reformulation strategy, originally used to market filtered and low-nicotine cigarettes, to create Low-Fat Lunchables, an approach intended to retain consumers concerned about childhood obesity. [32]

Lunchables includes processed meats and cheeses, refined carbohydrates, and sugar-sweetened beverages. Even the reformulated "better-for-you" Lunchables continued to contain highly processed ingredients and cosmetic additives, such as emulsifiers, enzymes, preservatives, and artificial flavours. [32]

These brightly packaged “grab-and-go” meals and snacks contain food in separate compartments, designed to appeal to children's desire for play and independence. They also aimed to alleviate parents’ guilt about choosing a prepackaged meal by including familiar ingredients such as Oscar Mayer processed meat and Kraft cheese. [32]

As public concern about childhood obesity grew in the 1990s, Lunchables faced significant criticism. A leading pediatrician described the product as a "nutritional disaster,"[9] while the American College of Cardiology referred to it as a "blood pressure bomb." In response, Philip Morris introduced Low-Fat Lunchables in 1995 as a product intended to “reduce guilt” and maintain the loyalty of health-conscious parents. [32]

Corporate memos and reports leading up to Lunchables’ launch in 1988 indicate the product was designed to appeal to children’s desire for “control over their lunch” and to give them “permission to play with their food.” According to one executive in the documents, “Lunchables aren’t about lunch. It’s about kids being able to put together what they want to eat, anytime, anywhere.” [32]

When food developers encountered challenges improving the taste of artificial fats used in Low-Fat Lunchables, they consulted tobacco specialists with expertise in nicotine and flavour neuroscience. Consumer testing included brainwave sensory tests using electroencephalographs (EEGs).

The tobacco company continued to develop the Lunchables brand until 2007, when it sold Kraft. However, the ultra-processed food industry continued to grow. As of July 2025, the Kraft Heinz website listed at least 52 varieties of Lunchables products. [32]

These findings underscore the need to expand existing consumer protection laws and public health policies designed to protect children from tobacco products to also encompass ultra-processed foods. [32]

However, commercial lobbying is often a barrier to the development and implementation of public health policies. Between 1998 and 2020, the ultra-processed food industry spent US$1.15 billion on lobbying in the United States, surpassing the tobacco, alcohol, and gambling industries. [33]

**Cost**

Ultra-processed foods are often significantly cheaper than minimally processed foods, which can shape dietary choices and reinforce inequities in diet quality. [34]

In a 2019 study, ultra-processed foods cost US$0.55 per 100 calories, compared with US$1.45 per 100 calories for minimally processed or unprocessed foods. Over the 12-year study period, prices for ultra-processed foods also rose less than prices for unprocessed and minimally processed foods. [35]

[9] Listen to Episodes 135 and 136 for additional information on hypertension.

Hall et al. (2019) reported that ingredients for 2,000 calories per day of ultra-processed meals cost US$106/week, whereas ingredients for unprocessed meals cost US$151/week, or 42% more, based on prices at a local supermarket chain. [25]

The cost of healthy diets is widely recognized as a key factor in population diet quality, but affordability is only one part of access. People living with disabilities, chronic disease, inadequate housing, or limited kitchen facilities may face barriers to accessing, storing, preparing, and cooking fresh foods, making ultra-processed options more feasible in some circumstances. [34] [36] [37] [38]

Food prices and overall diet costs contribute to socioeconomic disparities in diet quality and may influence health outcomes. Lower-cost, energy-dense, nutrient-poor foods, particularly those made with refined grains, added sugars, and added fats, are often more affordable than diets based on minimally processed lean meats and fish, fresh vegetables and fruit, or home-prepared meals. [39]

As a result, associations between lower socioeconomic status and higher rates of obesity and other chronic diseases may be partly explained by the affordability and reward value of processed, highly palatable, energy-dense foods. Consistent with this pattern, Gupta et al. (2020) found higher energy intake from ultra-processed foods was associated with lower food spending and lower socioeconomic status. [39] [40]

Together, these findings suggest reducing reliance on ultra-processed foods requires more than individual choice. Policies and supports should improve the affordability, availability, and practicality of minimally processed foods through measures such as targeted subsidies, stronger retail access, and better food preparation infrastructure.

**Food insecurity in Canada**

Health Canada defines food insecurity as the inability to acquire or consume sufficient food in terms of quantity or quality in socially acceptable ways, or the uncertainty of being able to do so. Approximately one in four Canadians (24%) live in food-insecure households, equating to nearly 10 million people, including 2.4 million children. Additionally, nearly half of people in one-parent families (44.4%), especially those in which the parent is female (47.4%), live in food-insecure households. [41] [42]

Household food insecurity is a well-established social determinant of health in Canada, associated with various adverse health outcomes among children and adults. The relationship between household food insecurity and measures of ill health is graded, with more severe food insecurity associated with a higher likelihood of physical and mental health issues, hospitalization, and premature death. [43]

In Canada, both adults and children living in food-insecure households consume significantly more ultra-processed food and have poorer overall diet quality than those in food-secure households. Limited access to affordable and nutritious food forces individuals to rely on cheaper, calorie-dense, nutrient-poor options, leading to higher rates of obesity and related health problems. [43]

International research emphasizes the importance of investing in social protection programs and implementing more generous wage-setting policies to reduce food insecurity rates. Studies in Canada have illustrated the close relationship among food insecurity, income support policies, and labour market conditions. Specifically, research on social assistance, child benefits, minimum wages, income tax thresholds, and public pensions indicates that policies designed to ensure more adequate and secure incomes for low-income households are crucial for decreasing both the prevalence and severity of household food insecurity in Canada. [43]

**Consumer understanding of processed foods**

Research shows ultra-processed foods are not all associated with the same health outcomes. Some, such as processed meats, are linked to increased risk of chronic disease, while others, including certain plant-based foods, may be associated with reduced risk. For example, evidence indicates processed meat consumption is associated with diabetes and cardiovascular disease.[10] Whereas some plant-based ultra-processed foods, such as breakfast cereals, are associated with a lower risk of these conditions. [44]

Chen et al. (2023) found frequent consumption of processed meat was associated with a 44% increased diabetes risk, while consumption of ultra-processed cereals was associated with a 22% reduction in diabetes risk.[11] [45]

Lin et al. (2025) found moderate consumption of muesli and bran cereal was associated with lower mortality risks related to cardiovascular disease and cancer. [46]

These findings may point to knowledge gaps, with consumers not able to distinguish between healthier and less healthy processed foods.

Barnard et al. (2025) investigated this issue through an online survey involving 2,174 U.S. adults to assess public understanding of processed foods and their health associations. Thirty-nine percent of respondents believed all processed foods are unhealthy, 40% did not believe all processed foods were unhealthy, and the remaining respondents were unsure or did not know. When asked which foods increase type 2 diabetes risk, 51% cited sugar, 19% cited desserts, 15% cited carbohydrates in general, 7% cited processed foods, and only 1% cited meat products. [44]

Most young participants did not identify processed meat as a processed food, nor did they identify these foods as contributing to the risk of developing type 2 diabetes. This is an important public health concern considering that consumption of both processed and unprocessed meat is associated with increased risk of diabetes, colorectal cancer, and cardiovascular disease. [44]

[10] Refer to Episodes 37, 79, 80, and 81 for additional information on cardiovascular disease.
[11] Listen to Episodes 91, 93, and 94 for additional information on diabetes.

The research emphasizes the importance of educating clients about the differences between healthful and unhealthful ultra-processed foods, as well as the benefits of minimally processed and unprocessed foods. [44]

**Identifying ultra-processed foods**

Because food labels do not disclose the processing methods used, ultra-processed foods can sometimes be difficult to identify. In some cases, it is obvious whether a food is ultra-processed. For example, fresh vegetables, fruits, starchy roots and tubers, pasteurized milk, chilled meat, plant oils, sugar, and salt are not ultra-processed.

For packaged foods where classification is less clear, ingredient labels are the best guide. Products such as breads and breakfast cereals may be minimally processed, processed, or ultra-processed depending on their ingredients. Generally, basic ingredients usually indicate minimally processed or processed foods, while added colours, flavours, emulsifiers, and similar additives usually indicate ultra-processing.

A practical way to identify ultra-processed foods is to check whether the ingredient list includes at least one item characteristic of this group. For example, either industrial food substances rarely used in home kitchens or additives designed to make the product more palatable and appealing.

Industrial food substances may include protein isolates, hydrolyzed proteins, mechanically separated meat, high-fructose corn syrup, fruit juice concentrate, invert sugar, maltodextrin, dextrose, lactose, fibre extracts, hydrogenated oils, or other extracted sources of protein, carbohydrate, or fat. Their presence can indicate that a product is ultra-processed.

Cosmetic additives often appear near the end of ingredient lists. These include flavours, flavour enhancers, colours, emulsifiers, sweeteners, thickeners, and agents used for foaming, gelling, glazing, bulking, carbonating, or similar effects. Many common cosmetic additives are easy to identify because they are listed by class, such as flavouring, colour, emulsifier, or sweetener.

A product is likely to be ultra-processed when the packaged product contains industrial substances rarely used in kitchens or additives mainly intended to improve taste, texture, colour, sweetness, or appearance. [11]

**Health impact**

There is growing evidence high consumption of ultra-processed foods is associated with poorer dietary quality and adverse health outcomes. Current evidence indicates that dietary factors impact numerous noncommunicable diseases, and several studies show health benefits associated with appropriate consumption of plant-derived foods, including fruits, vegetables, whole grains, nuts, and legumes. Beyond nutrient content alone, the way foods are produced and formulated may also affect human health. [47] [48]

Evidence on dietary quality supports this concern. A meta-analysis by Martini et al. (2021) found higher ultra-processed food intake was associated with increased consumption of free sugars, total fats, and saturated fats, and a lower intake of fibre, protein, potassium, zinc, magnesium, and vitamins A, C, D, E, B12, and niacin. These findings suggest that greater consumption of ultra-processed foods is associated with poorer overall diet quality**.** [48]

Health outcome evidence is also substantial. A comprehensive umbrella review by Lane et al. (2024), based on evidence from nearly 10 million participants, concluded greater consumption of ultra-processed food was associated with elevated risk of 32 adverse health outcomes, particularly cardiometabolic disorders such as overweight, obesity, type 2 diabetes, and cardiovascular disease; common mental disorders such as anxiety and depression;[12] and premature mortality. Together, these findings support continued attention to ultra-processed food consumption as an important public health concern. [47]

**Environmental impact**

Ultra-processed foods have significant negative environmental impacts, including plastic pollution and intensive agricultural practices. The production and consumption of these products harm the environment due to excessive packaging waste, long transport routes, high energy consumption, and resource-intensive industrial farming. Their manufacture and distribution contribute to climate change, pollution, biodiversity loss, and the depletion or degradation of natural resources, such as water, soil, and energy. [6] [14] [49]

**Plastics**

The ultra-processed food system is linked to plastic production, creating a cycle where plastic packaging facilitates the expansion of ultra-processed foods, and the production of these foods contributes to plastic pollution. Plastics, particularly single-use plastics, make ultra-processed food production faster, more cost-effective, more profitable, and more widely available. They provide low-cost, lightweight barriers against oxygen, moisture, and light to extend shelf life, enabling centralized mass production and global distribution. These food packaging materials are also easy to process. However, plastic cannot degrade and poses several other environmental issues, including disposal and recycling. [50] [51]

Single-use plastics encourage higher consumption through convenient, portable, and microwavable packaging. The environmental and waste management costs associated with plastic are transferred to municipalities and ecosystems. This effectively subsidizes the ultra-processed food industry, enabling it to grow rapidly, offer lower prices than fresh foods, and normalize frequent consumption. [50]

Plastic pollution associated with ultra-processed foods presents significant environmental challenges. Major corporations in the ultra-processed food sector, such as Coca-Cola, Pepsi, Danone, and Nestlé, rank among the top five global plastic

[12] Listen to Episode 88 for discussion on mental health.

polluters. Additionally, plastics are predominantly derived from non-renewable fossil fuels, the extraction and production of which lead to toxic emissions. [50] [52]

Plastic used in the manufacturing, packaging, and supply chains of ultra-processed foods creates macroplastics that clog sanitation systems, as well as micro- and nanoplastics that accumulate in soil, water, atmosphere, and within humans and animals. Evidence indicates that highly processed foods may contain more microplastics compared to minimally processed foods. [50] [53]

The increasing consumption of ultra-processed foods may also explain the emerging evidence of micro- and nanoplastics found in human blood. While the health effects of microplastics and nanoplastics are not yet fully understood, animal studies suggest they pose risks to reproductive, digestive, and respiratory health, with links to colon cancer. [54]

The ultra-processed food industry leverages recycling claims as a competitive advantage to drive consumer loyalty, despite established evidence of the harms associated with both recycled and biobased food packaging. Biobased packaging is extracted from biomass, chemically synthesized, or produced by microorganisms. Though these materials are renewable, they are not always degradable. [50] [51]

Only 9% of the world's plastics have been successfully recycled once, and less than 1% have been recycled twice. Many plastic products, such as multilayer flexible packaging, are difficult, if not impossible, to recycle. Recycling alone will never be sufficient to manage the current and increasing levels of plastic production. To address plastic waste, millions of people globally resort to open burning, which contributes to greenhouse gas emissions, climate change, air pollution, and severe transnational toxicity. [50] [54] [55]

**Agriculture**

Ultra-processed foods cause significant environmental harm across their supply chain. The production of these food products drives demand for intensive agricultural practices, such as monocultures,[13] heavy tillage, and industrial meat production systems. These practices rely heavily on fossil fuels for machinery, fertilizers, and pesticides, contributing to soil degradation. [50]

Ultra-processed foods are responsible for 17% to 39% of diet-related energy use, 36% to 45% of diet-related biodiversity loss, up to one-third of diet-related greenhouse gas emissions, land use, and food waste, and up to one-quarter of diet-related water use. [56]

While the negative environmental impacts are not exclusive to ultra-processed foods, they are largely avoidable because these products are not essential for health, and many could be eliminated from diets without replacement. Engineered and marketed for

[13] Monoculture is repeatedly growing the same crop on the same land, which leads to soil degradation, reduced biodiversity, and increased use of pesticides and fertilizers [59] [60]

overconsumption, ultra-processed foods lead to unnecessary food production and use of ecosystem resources. [50]

Ultra-processed foods are also associated with:

- Land degradation.
- Agrobiodiversity loss.[14] Ultra-processed foods drive agrobiodiversity loss because they rely on a few large-scale crops, such as corn, soy, wheat, and palm oil, rather than a variety of plant species. Many animal-based ingredients in these foods come from confined livestock fed these crops. [57]
- Eutrophication.[15]
- Acidification of soil and water systems.
- Desertification, which diminishes the long-term availability of farmland.[16]

These adverse effects are unevenly distributed. The Global South produces a significant portion of the raw materials for ultra-processed foods, including approximately 60% of global exports of oils, fats, and sugar, causing local environmental damage, while profits benefit transnational corporations. [50] [56] [58]

**Take home messages:**

- Ultra-processed foods are mass-produced products that undergo multiple stages of industrial processing. They are typically energy-dense, low in dietary fibre and essential micronutrients, and high in added sugars, sodium, and unhealthy fats.
- Their defining feature is the use of industrial additives not commonly found in home cooking, such as hydrogenated oils, artificial flavours and colours, preservatives, and emulsifiers. These ingredients are used to make products highly palatable, convenient, and shelf stable.
- Advances in food science and technology have created products with sensory and nutritional properties that can intensify brain reward responses. As a result, these foods may encourage craving, overconsumption, and addiction-like eating patterns.
- Although ultra-processed foods are convenient and appealing in a fast-paced society, high consumption is linked to significant health concerns and broader environmental harms, including plastic pollution, intensive agricultural practices, and unnecessary use of ecosystem resources.
- Effective policies to ensure more adequate and secure incomes for low-income households are required to reduce the prevalence and severity of household food insecurity in Canada, which may also decrease consumption of ultra-processed foods and their related adverse health effects.

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[14] Agrobiodiversity refers to the diverse range of plants, animals, microorganisms, and their ecosystems that are used directly or indirectly for agriculture and food production. Agrobiodiversity promotes sustainable farming practices, reducing dependence on chemicals, conserving water and soil, and supporting healthy agroecosystems. [63]

[15] Eutrophication is the process by which a body of water becomes overly enriched with minerals and nutrients (e.g., nitrogen and phosphorus). This excess enrichment triggers rapid plant and algae growth, which ultimately depletes the water's oxygen levels and harms aquatic life. [61]

[16] Desertification refers to land degradation in arid, semi-arid, and dry sub-humid areas resulting from various factors, including climate variations and human activities. [62]

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**Client Resources**

Canada Food Guide
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Canada's food guide: Food guide snapshot
https://www.canada.ca/en/health-canada/services/food-guide/explore/snapshot.html

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