

Consumer Understanding and Concerns About Ultra-Processed Foods: A Rapid Scoping Review of Current Evidence

Consumer Understanding and Concerns About Ultra-Processed Foods: A Rapid Scoping Review of Current Evidence

Executive Summary

In this guide

[In this guide](#)

1. [Executive Summary](#)
2. [Introduction.](#)
3. [Background](#)
4. [Methodology](#)
5. [Consumer understanding and awareness of the concept of ultra-processed foods](#)
6. [Consumer concerns, beliefs and behaviours around ultra-processed foods](#)
7. [Conclusion](#)
8. [References.](#)

Advisory Committee for Social Science

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This review of international literature on consumer understanding and concerns about ultra-processed foods (UPFs) has been commissioned by the Food Standards Agency (FSA) from its Advisory Committee for Social Science. It seeks

to identify gaps in the evidence on consumer perceptions of UPFs, particularly in the UK context, and suggest areas for further research.

There is no official classification of 'ultra-processed foods' in the UK, but coverage of classifications and debate from outside the UK has helped to stimulate debate in this country. There is increasing interest in the concept of ultra-processed foods (UPFs), with growing media attention to the potential negative health consequences of diets that consist of a significant proportion of energy from UPFs. Whilst there is mounting scientific evidence that high consumption of UPFs could have adverse health consequences, the findings of many of these studies are still subject to question.

Studies suggest that, whilst consumption of UPFs varies appreciably within the UK, these foods typically contribute well over 50% of total energy intake. Variation in consumption of UPFs within the population is associated with various factors, including age, gender, ethnicity and socio-economic status.

While there is a high level of awareness of the term UPFs, many consumers are not able to define the term and lack clear understanding of the available classifications of UPFs. It is important to recognise here, however, that there is no official and generally agreed definition of UPFs. Dominant themes in the literature on consumer understanding of UPFs are linked to industrial food processing, the existence of artificial ingredients and the nutritional composition of foods, and especially higher levels of substances perceived to be unhealthy, such as sugar, salt and sodium.

Whilst recognising the potentially less desirable attributes of UPFs, consumers do appreciate the benefits that these products bring, for example in terms of price, convenience and shelf-life. At the same time, however, there is evidence that many consumers desire to reduce their consumption of these foods, but that they often struggle to do so.

There is also evidence that consumers struggle reliably to distinguish foods that could be classified as ultra-processed from those that are not. Whilst some foods are consistently and correctly identified as UPFs, for example soft drinks and processed meats, others are quite frequently mis-classified, for example, some dairy products such as flavoured yoghurts. The existence of certain ingredients, such as those that are plant-based, is often the cause of consumers erroneously classifying highly processed foods as non-UPF.

A major theme in the literature, related to processed foods in general and UPFs specifically, is the notion of 'naturalness'. As a result, foods that undergo industrial processing – particularly those that involve chemical changes and contain artificial ingredients – are often viewed as 'unnatural' and, consequently, 'unhealthy'. At the same time, however, the existence of ingredients that are seen to be more natural (for example, plant-based or organic ingredients) can have a halo effect in that highly processed foods are, by implication, not interpreted as UPFs.

Overall, while it is possible to discern broad themes from the existing literature, there is a general paucity of studies on the nature and level of consumer beliefs and concerns about UPFs, both globally and in the UK. The implication is that communication with consumers about UPFs and designing and implementing efforts to address consumer concerns about UPFs, and to provide guidance to consumers when making choices about UPFs, will be challenging. Accordingly, we suggest areas for further research at the end of the paper.

Consumer Understanding and Concerns About Ultra-Processed Foods: A Rapid Scoping Review of Current Evidence

Introduction

In this guide

[In this guide](#)

1. [Executive Summary](#)
2. [Introduction.](#)
3. [Background](#)
4. [Methodology](#)
5. [Consumer understanding and awareness of the concept of ultra-processed foods](#)
6. [Consumer concerns, beliefs and behaviours around ultra-processed foods](#)
7. [Conclusion](#)
8. [References.](#)

The Food Standards Agency's role and current position on ultra-processed foods (UPFs) is set out on the Food Standards Agency (FSA) website[\[1\]](#). As stated, the

FSA's main remit in relation to UPFs is to regulate additives, as well as having a role, alongside other government departments, in protecting consumer interests in relation to food. The agency tracks consumer perceptions in relation to food through regular research such as the Food and You 2 survey, and the Consumer Insights Tracker. The FSA's scope covers England, Wales and Northern Ireland, with Scotland covered by Food Standards Scotland (FSS).

The FSA has a statutory remit to act in the interests of consumers, and provide clear, evidence-based information, and therefore seeks to identify the most effective way of doing this.

The FSA accordingly commissioned the Advisory Committee for Social Science (ACSS) working group on Wider Consumer Interests to scope and undertake a rapid evidence review. Bearing in mind the limitations of current research, an attempt was made to address the following research questions:

Consumer understanding and awareness

1. What do consumers understand by the concept of UPF?
2. Do consumers understand the current classifications of processed foods? How do consumers distinguish between different types of UPFs?
3. How do different consumer groups differ in their understanding and awareness of UPFs?

Consumer concerns and behaviours

4. What beliefs do consumers hold about the implications of ultra-processed food consumption (e.g. nutritional, health, sustainability)?
5. Do consumer beliefs differ by different types of UPFs?
6. What are the key drivers and/or influencing factors of consumer beliefs and practises around UPFs?
7. How do different consumer groups differ in their beliefs and practises around UPFs?

Consumer information needs

8. What are the information needs of consumers in the context of uncertainty over the nutritional and health impacts of UPFs and what is the role of risk

communication?

9. How can the FSA best support consumers with respect to their concerns and related behaviours when it comes to UPFs?

Professor Henson led the work, with input from the Wider Consumer Interests Working Group, the wider ACSS, and FSA colleagues. This paper represents an initial ACSS view based on the emerging literature on UPFs. It has not sought to answer research questions 8 and 9 on consumer information needs and the nature of FSA support, and further detail on this is covered in the Conclusions section. The paper concludes by suggesting additional areas of research that FSA or other relevant organisations might wish to consider to inform thinking on UPFs. It should not be taken to represent an ACSS or FSA position on the merits or otherwise of UPFs, or the implications of UPFs in the UK diet and health. However, the ACSS does suggest that the FSA should commission UK (or England, Wales and/or Northern Ireland) specific research into consumer views if it wishes to develop communication or policy approaches.

[1] Food Standards Agency website – Ultra-processed foods (2024)

<https://www.food.gov.uk/safety-hygiene/ultra-processed-foods>

Consumer Understanding and Concerns About Ultra-Processed Foods: A Rapid Scoping Review of Current Evidence

Background

In this guide

[In this guide](#)

1. [Executive Summary](#)
2. [Introduction.](#)
3. [Background](#)
4. [Methodology](#)
5. [Consumer understanding and awareness of the concept of ultra-processed foods](#)
6. [Consumer concerns, beliefs and behaviours around ultra-processed foods](#)
7. [Conclusion](#)

8. [References.](#)

The concept of ultra-processed food (UPF) has become the subject of significant debate and controversy, given trends towards increased consumption globally (especially in high-income and upper middle-income countries) and concerns that these trends may be associated with negative nutritional and health outcomes (Zhang and Giovannucci, 2023). Furthermore, there has been significant and growing media attention around UPFs, propelled by high-profile publications with provocative titles, such as ‘Ultra-Processed People: Why do We All eat Stuff That Isn’t Food and Why Can’t we Stop?’ (van Tulleken, 2023).

Evidence of the association between UPF consumption and negative health outcomes is accumulating (see for example Lane *et al.*, 2024), with some suggestions that the evidence is sufficient to support the use of the UPF concept to assess the healthiness of foods within the context of the diet as a whole, and to inform the development of new dietary guidelines (see for example Elizabeth *et al.*, 2020). Indeed, there is evidence that many national dietary guidelines refer to the degree to which foods have been processed, if not to UPFs specifically (Koios *et al.*, 2022). At the same time, however, there are concerns that many studies do not adequately control for potential confounding factors, such as other influences on nutritional and health status (Zhang and Giovannucci, 2023). Furthermore, consumer consumption patterns with respect to UPFs have changed over time, including when and where they are eaten, whilst the concept of UPF includes a diversity of foods that vary in their nutritional composition.

The concept of UPF was first proposed as part of a classification of foods according to the level of processing in 2009 (Monteiro, 2009). Since that time, several schemes have evolved that categorise foods according to the level and form of processing (Gibney and Forder, 2022; Sadler *et al.* 2021; de Araujo *et al.* 2022; Jones, 2019; Gibney, 2019). Perhaps the most widely referenced scheme, however, is the NOVA classification developed by the Centre for Epidemiological Studies in Health and Nutrition at the University of São Paulo. The NOVA schema (Figure 1) defines a UPF as (Monteiro *et al.*, 2018; 2019):

“Formulations of ingredients, mostly of exclusive industrial use, that results from a series of industrial processes”.

As an example of an alternative definition, according to Poti *et al* (2015) a UPF is:

“Multi-ingredient industrially formulated mixtures processed to the extent that they are no longer recognizable as their original animal or plant source.”

It is noteworthy that these definitions of UPF are both complex and rather ‘fuzzy’, in that they include rather imprecise terms such as ‘mostly’, ‘multi’ and ‘series’. It might be expected, therefore, that consumers might struggle with the concept of UPFs and, even more, be unable to reliably differentiate between foods that do or do not fall into the category of UPFs.

Figure 1. NOVA classification of foods

Group	Definition	Examples
Unprocessed (unPF) and Minimally Processed Foods (MPF)	Products e.g. salt, sugar, oils, fats, or other substances are not added to the original food.	Edible parts of plants (seeds, fruits, leaves, stems, roots) or animals (muscle, offal, eggs, milk), and fungi, algae, and water, after separation from nature.
Processed culinary ingredients	Products derived from group 1 or else from nature by processes such as pressing, refining, grinding, milling, and drying.	Processed culinary ingredients include oils, butter, lard, sugar, and salt.
Processed Foods (PF)	Products manufactured by industry, which adds salt, sugar, or another substance to unprocessed food (unPF) to make them stable and more palatable.	Bottled vegetables or legumes (pulses) preserved in brine and vinegar, fruits in syrup, meat products and canned fish, smoked fish, freshly baked bread, and simple cheeses to which salt is added.

Ultra-processed Foods (UPF)	Products involving formulations of ingredients, most of exclusive industrial use, typically created by a series of industrial techniques and processes.	Carbonated soft drinks; sweet, fatty or salty packaged snacks; candies (confectionery); packaged bread and buns, cookies (biscuits), pastries, cakes and cake mixes; margarine and other spreads; sweetened breakfast cereals, fruit yogurt and 'energy' drinks; pre-prepared meat, cheese, pasta and pizza dishes; poultry and fish 'nuggets' and 'sticks'; sausages, burgers, hot dogs and other reconstituted meat products; powdered and packaged 'instant' soups, noodles and desserts; baby formula.
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Source: Petrus *et al.* (2021)

Numerous studies have examined the level, trends and patterns in consumption of UPFs globally (Marino *et al.*, 2021; Dicken *et al.*, 2023), most often as a percentage of dietary energy intake. Whilst over half of these studies focus on Brazil and the United States, it is possible to establish a comparative picture of consumption of UPFs across countries, with the United States and the UK consistently having the greatest consumption (exceeding 50% of total energy intake) amongst studied countries, and Italy the lowest (at around 10% of total energy intake) (Marino *et al.*, 2021).

Whilst there are appreciable differences in patterns of consumption within countries, it is possible to discern common factors associated with greater consumption of UPFs internationally. Thus, consumption as a percent of energy intake is consistently related to younger age, living in a single person household (and thus being unmarried or living in a single separated or divorced household) and living in an urban area (Marino *et al.*, 2021; Dicken *et al.*, 2023; Vignola *et al.*, 2021). The influence of gender, level of education, income and/or socio-economic status, however, is inconsistent across countries. Other factors found to be associated with higher consumption of UPFs include having obesity (Marino *et al.*, 2021), self-reporting of medium or high time scarcity (Djupegot *et al.*, 2017), and exhibiting stronger appetite drives when UPFs are observed by consumers (David *et al.*, 2017).

Several studies have examined consumption of UPFs in the UK (see for example, Lam and Adams, 2017; Adams and White, 2015; Madruga *et al.*, 2022; Rauber *et al.*, 2020; 2021a; 2021b; Onita *et al.*, 2021; Sauza *et al.*, 2022; Chavez-Ugalde *et al.*, 2024). Across these studies, intake of UPFs amongst adults varies from 53.1% to 67.8% of total energy intake (Marino *et al.*, 2021), with an average of 54% (Dicken *et al.*, 2023). Recent studies suggest significant consumption of UPFs by younger segments of the UK population. In the study by Chavez-Ugalde, *et al.* (2024), on average UPFs account for 65.9% of energy intake amongst individuals aged 11 to 18 years. In a longitudinal study, the contribution of UPFs to energy intake averaged 46.9% in children aged 21 months, and 59.4% when aged 7 years (Conway *et al.*, 2024).

Studies of the UK suggest that consumption has been somewhat stable over the period 2008 to 2016 (Dicken *et al.*, 2023). It is noteworthy, however, that Chavez-Ugalde *et al.* (2024) present evidence that consumption by individuals aged 11 to 18 years declined over the period 2008/09 to 2018/19. Across the population, higher consumption of UPF is associated with younger age, male gender, white ethnicity, and lower socio-economic status (Dicken *et al.*, 2023).

Whilst there is compelling evidence of widespread and significant consumption of UPFs in the UK, studies in the UK and elsewhere suggest that consumers frequently underestimate their consumption of these foods. For example, in a recent survey across 17 European countries (EiT Food Consumer Observatory, 2024)[\[1\]](#), only 12% of UK survey respondents reported daily consumption of UPF, with 10% reporting consumption five to six times per week, and 21% reporting consumption three to four times per week.[\[2\]](#) In total, 57% of UK respondents claimed that they consumed UPFs less than once or twice per week. In a 2023 survey of UK adults, 62% of respondents claimed that their diet consisted of little or no UPFs (IGD, 2023)[\[3\]](#). Only 7% of respondents reported that about a half of their diet consisted of UPFs.

[\[1\]](#) Note, the survey results from EiT research referenced here are industry-funded and not academic research.

[\[2\]](#) Note, however, that many consumers struggle accurately to distinguish between UPF and non-UPF (see below), such that self-reporting of UPF consumption is likely to be inaccurate.

[\[3\]](#) Note, the survey results from IGD research referenced here are industry-funded and not academic research.

Methodology

In this guide

[In this guide](#)

1. [Executive Summary](#)
2. [Introduction.](#)
3. [Background](#)
4. [Methodology](#)
5. [Consumer understanding and awareness of the concept of ultra-processed foods](#)
6. [Consumer concerns, beliefs and behaviours around ultra-processed foods](#)
7. [Conclusion](#)
8. [References.](#)

This rapid scoping review aims to provide a broad overview of the literature on consumer understanding, beliefs and concerns about UPFs to provide an indication of the status of current knowledge and key gaps, both internationally and with respect to the UK. The aim is to make recommendations with respect to the need for further research linked to consumer communication. It is not intended to be exhaustive in focus, and the literature was not identified through a process of systematic review, which would be beyond the scope of the review and available time and resources.

The identification of previous studies on consumer understanding, beliefs and concerns about UPFs were identified through a two-stage process. First, a search was undertaken using Google Scholar. Specifically, the search terms Ultra-processed Food/Ultra Processed Food/UPF and Consumer or Consumers' and Understanding or Beliefs were employed, whilst excluding the terms Diet and Consumption. The identified papers were sifted to exclude the numerous studies that focused on consumption patterns and/or the nutritional and health implications of UPF consumption. To provide a check that important papers had not been identified, the reference lists of this initial pool of papers were reviewed.

Consumer understanding and awareness of the concept of ultra-processed foods

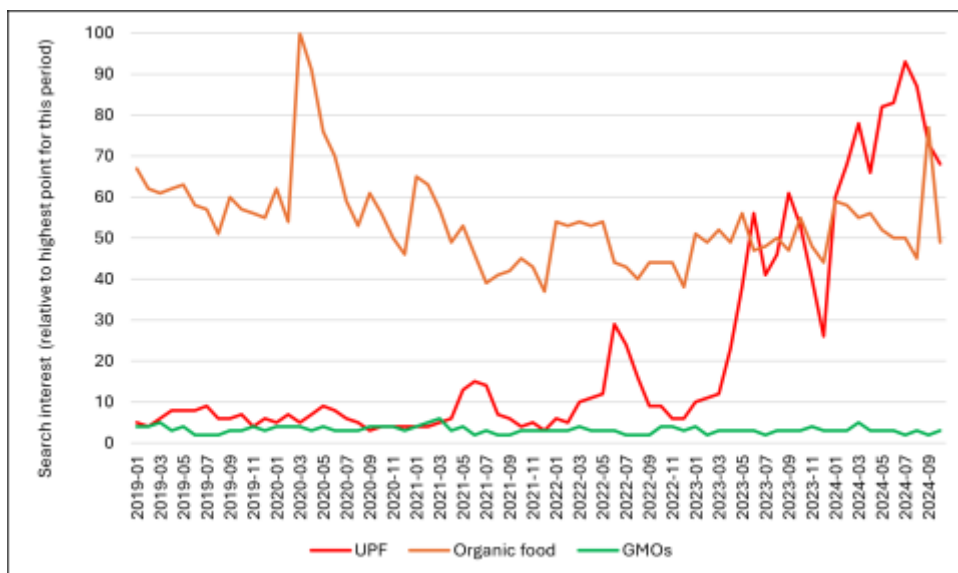
In this guide

[In this guide](#)

1. [Executive Summary](#)
2. [Introduction.](#)
3. [Background](#)
4. [Methodology](#)
5. [Consumer understanding and awareness of the concept of ultra-processed foods](#)
6. [Consumer concerns, beliefs and behaviours around ultra-processed foods](#)
7. [Conclusion](#)
8. [References.](#)

The scale of media attention to UPFs and internet activity on the subject suggests considerable and increasing interest in these foods. For example, Figure 2 reports the results of a Google Trends analysis of UK search activity on this search engine over the period January 2019 to September 2024. Compared with genetically modified organisms (GMOs) and organic food (as example issues that are of interest/concern to consumers), there was less search activity with respect to UPFs until early-2023. Since that time, however, the intensity of searches on UPFs increased considerably and, since the start of 2024, the number of searches on UPF have consistently exceeded those for GMOs and organic food.

Figure 2. UK Google global searches for term UPF, organic food and GMO, January 2019-September 2024



Source: Google Trends analysis - UK (17th October 2024). Note: numbers represent search interest relative to the highest point for the period January 2019 to September 2024. A value of 100 is the peak popularity for the term. A value of 50 means that the term is half as popular. A score of 0 means there was not enough data for this term.

The international literature suggests a high level of consumer awareness of the term 'UPF'. The largest number of studies relate to Brazil and other parts of Latin America. For example, in one study by Sarmiento-Santos *et al.* (2022), 82% of respondents declared that they were aware of the term UPF. Likewise, in a Uruguayan study, 91% of respondents could provide at least a basic explanation of UPF (Ares *et al.*, 2016). In other countries, a lower level of awareness of UPF has been recorded, for example 77% of respondents were familiar with the term in a Spanish study (Pedro-Botet *et al.*, 2022), whilst 55% of respondents had heard of the term in a study in Vermont in the United States (Rose *et al.*, 2023).

With respect to the UK, there is a paucity of studies on consumer awareness of UPFs. One study that addressed awareness directly is from IGD (2023). In this survey, 34% had neither seen nor heard of UPFs, while 26% had seen or heard of UPFs but were unsure what they were. The remaining 40% had seen or heard of UPFs and claimed broadly to know what UPFs were. In a recent study (Robinson *et al.*, 2024), 73% of respondents had heard of UPFs and 57% reported that they knew what UPFs were. Participants with a higher income and/or education level were more likely to report being aware of UPFs.

Previous studies suggest a relatively weak relationship between awareness of UPFs and a broadly correct understanding of what this term means. For example, in the Brazilian study by Sarmiento-Santos *et al.* (2022), there was only a modest

correlation (0.533) between respondents declaring awareness of UPFs and being able to demonstrate a correct understanding of the term. In a Canadian study in the province of Quebec, whilst 86% of respondents had heard of UPFs, only 17% had both heard of the term and declared that they knew well what it meant (Saulais *et al.*, 2023).

Factors influencing consumer understanding of UPFs

Across the various studies that explore consumer understanding of UPFs, several key factors can be identified as determinants of consumer understanding. Each is described in turn below.

Level of processing

A dominant theme in studies of consumer understanding of UPFs relates to broad ideas around level of processing and being a product of the food industry. For example, in the Brazilian study by Sarmiento-Santos *et al.* (2022), 78% of respondents indicated that their best definition related to the number of processes by the food industry a product had been subject to. Likewise, in the study by Ares *et al.* (2016), the concept of UPFs was strongly associated with the degree of industrial processing, with the most frequent descriptors being 'highly processed', 'processed more than once' and 'industrial products.' In a study of Swiss consumers (Hassig *et al.*, 2023), UPFs were broadly associated with the concept of 'foods produced by food industry.' Finally, the most frequent association with UPFs in the Bolhuis *et al.* (2022) study in the Netherlands, Italy and Brazil was food products subject to a series of industrial processes.

Of importance here is the linkage between level of processing and the fact that this processing has been undertaken by food businesses, and a distinction is made between processing by industry and being 'home-made'. Thus, products that have been subject to multiple processes are seen as distinct from those that are industrially produced if they are not the product of the food sector, suggesting that being home-made has a mitigating effect on the level of processing (Devia *et al.*, 2021). Furthermore, the degree of industrial processing is often used as a heuristic for the perceived naturalness of a food (Roman *et al.*, 2017).^[1] Thus, in the study by Ares *et al.* (2016), a common defining characteristic of UPFs was 'not home-made'. In a recent Brazilian study, "healthy food" is widely associated with "unprocessed foods" (Santos *et al.*, 2024).

Number and type of ingredients

A second major theme in the literature on consumer understanding of UPFs relates to the number of ingredients in a food, and the notion that ‘things have been added’ to a food. More specifically, the addition of ‘artificial’ additives/chemicals. For example, in the Aguirre *et al.* (2019) study of younger adults in Argentina and Ecuador, UPF was strongly associated with the presence of artificial ingredients and additives. There was, however, a significant difference between respondents in the two countries; whilst 40% of respondents made references to artificial ingredients in Ecuador, only 7% of respondents did so in Argentina. In the Bolhuis *et al.* (2022) study in the Netherlands, Italy and Brazil, UPF was widely associated with food products that contain artificial ingredients. Likewise, in the study by Ares *et al.* (2016), defining characteristics of UPF included ‘additives’, ‘chemical products’, ‘artificial ingredients’ or ‘non-natural ingredients.’ Indeed, Machin *et al.* (2022) suggests that certain ingredients (for example, high fructose corn syrup or additives) are used by consumers as simple cues to indicate ‘unhealthiness’.

Nutritional composition

A third theme relates to the nutritional composition of UPFs, and especially the level of sugar, fat, salt, and/or sodium. For example, in the study by Sarmiento-Santos *et al.* (2022), 88% of respondents related UPFs to high levels of sugar, fat and salt, and to low nutritional quality overall. This theme relates to the broader understanding of UPFs as being ‘unhealthy’ or ‘less healthy.’ In part this phenomenon relates to the more general observation that consumers tend to judge more highly processed foods to be less healthy than foods that are less processed (Evans *et al.*, 2010), although there does appear to be an additional ‘stigmatising’ effect of seeing a food product as a UPF with respect to being seen as highly processed and unhealthy (Hassig *et al.*, 2023). The literature does suggest, however, that there is appreciable variation in the degree to which UPF is defined as unhealthy. Thus, whilst 28% of respondents from Ecuador characterised UPF as unhealthy in the study by Aguirre *et al.* (2019), only 9% of Argentinian respondents in the same study made this link.

Importantly, however, various studies have shown that whilst UPF as a broad concept is associated with ‘unhealthy’ foods, certain products in this category may not be so characterised. Thus, the fact that a food belongs to a certain food type (for example, dairy products versus snacks) may be sufficient for a UPF (for example, sweetened yogurt versus crisps) to be judged as either ‘healthy’ or ‘unhealthy’ (Machin *et al.*, 2020). Likewise, UPFs containing ingredients that are judged to be more ‘natural’ (such as organic ingredients) can, conversely, be

judged to be healthy. Visual cues associated with the product, for example package design, price, brand and labels can also mitigate perceptions that more heavily processed foods such as UPFs are 'unhealthy' (Machin *et al.*, 2020).

Consumer understanding of the classification of ultra-processed foods

The concept of UPFs lies within a broader categorisation of foods according to the level of processing and/or the ingredients they contain. The NOVA classification is outlined above as an example (Figure 1). Many studies on consumer understanding of UPFs explore the degree to which consumers can distinguish between foods according to the defining dimensions of this classification, and correctly allocate specific foods to particular categories, including UPFs (see for example, Sarimento-Santos *et al.*, 2022; Bolhuis *et al.*, 2022; Hassig *et al.*, 2023; EiT Food Consumer Observatory, 2024).

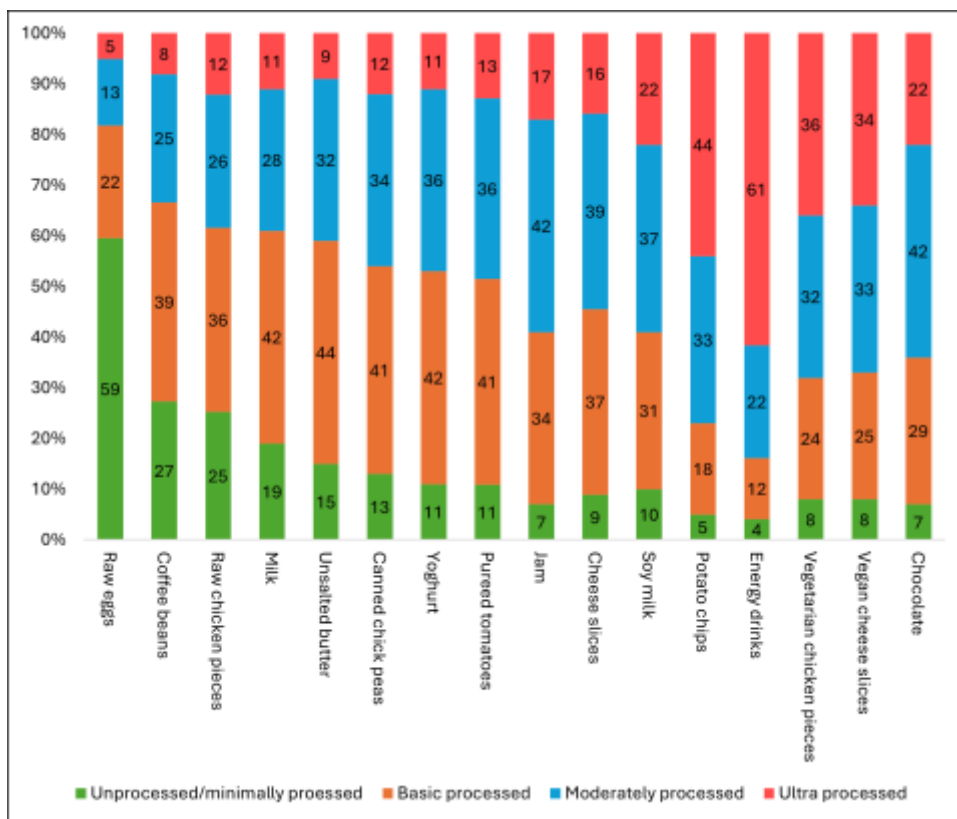
A more general literature outlines the ways in which consumers categorise foods, using multi-level and context-specific indicators and cues (Blake, 2008; Furst *et al.*, 2000). According to Furst *et al.* (2000), a common delineating factor is the distinction between 'fresh' and 'processed', with the notion of fresh often being employed to distinguish foods that have not been processed, have been processed in ways that are deemed to be 'natural', and/or foods that are home-made. Indeed, fresh foods are frequently distinguished from foods that are seen as commercially or industrially processed.

Across studies in numerous countries the general finding is that consumers are unaware of classifications of foods according to level of processing, and especially the NOVA classification, but more familiar with the term UPF. For example, the majority of respondents were unaware of the NOVA classification in the Netherlands (84%), Italy (75%) and even Brazil (58%) where the NOVA classification was developed and first applied (Bolhuis *et al.*, 2022). Further, when presented with the NOVA classification, consumers struggle accurately to allocate foods within this classification and often find it difficult to identify foods that are UPFs from those that are non-UPFs according to the NOVA classification. For example, 85% of respondents in one Brazilian study did not understand the NOVA classification, with an average rate of correct classification of only 42% (Monteiro *et al.*, 2022). Likewise, in a Spanish study, less than nine out of 22 UPFs were correctly identified by at least 50% of respondents (Pedro-Botet *et al.*, 2022).

The literature suggests that some foods are correctly identified as UPFs according to the NOVA classification on a frequent basis and across multiple countries. These include most frequently soft drinks and various processed meats (see for example, Ares *et al.*, 2016; Aguirre *et al.*, 2019; Basu *et al.* 2013a; Basu *et al.*, 2013b; Monteiro *et al.*, 2017; Sarmiento-Santos *et al.*, 2022; Fondevila-Gascon *et al.* 2022; Rybak *et al.*, 2024). Conversely, there is evidence of considerable uncertainty as to the classification of other foods, and whether they are UPFs, including milk and dairy products and bread (Ares *et al.*, 2016; Aguirre *et al.*, 2019; Sarmiento-Santos *et al.*, 2022). For example, in the study by Sarmiento-Santos *et al.* (2022), 44% of respondents believed that unsweetened yoghurt was a UPF.

The EiT Food Consumer Observatory (2024) covered 17 European countries, including the UK, and examined the ability of respondents to allocate 16 food products between the four NOVA categories (Figure 3). Whilst respondents frequently mis-classified foods, over- or under-estimating the degree to which they are processed, the rate of correct classification varied significantly between individual food items. For example, whilst 61% of respondents correctly identified an energy drink as a UPF, vegetarian chicken pieces and chocolate were only identified as UPF by 36% and 22% of respondents respectively. Several foods were also incorrectly identified as UPF on a frequent basis, including potato crisps (44%), soy milk (22%) and cheese slices (16%).

Figure 3. Consumer categorisation of foods according to NOVA classification



Source: EiT Food Consumer Observatory (2024). Proportion of consumers (%) categorising each food according to the 4 NOVA classifications. Note: In this figure the food items are ordered left to right from unprocessed/minimally processed (raw eggs, coffee beans, raw chicken pieces, milk), basic processed (unsalted butter, canned chick peas, yoghurt, pureed tomatoes), moderately processed (jam, cheese slices, soy milk, potato chips) to ultra-processed (energy drinks, vegetarian chicken pieces, vegan cheese slices, chocolate).

Related specifically to the UK, in the survey reported by IGD (2023), respondents were asked to classify 17 food products according to the NOVA classification. Of these products, nine were misclassified, including all but one of the UPFs. The misclassified UPFs included biscuits, frozen pizza, breakfast cereal, margarine, packaged bread, almond milk, and fruit yogurt. The level of processing of all these products was underestimated by respondents. Only soft drink was correctly categorised as a UPF.

In a further UK study (Robinson *et al.*, 2024) participants were presented with 10 food items and asked whether each was a UPF. These food items included five UPFs and five non-UPFs according to the NOVA classification. The proportion of respondents correctly identifying the UPFs ranged from 35% (baby formulas) to 66% (burgers). The proportion correctly identifying non-UPFs ranged from 51% (smoked meats) to 82% (maple syrup).

There is some evidence that consumers use specific food processing operations and/or modes of food preparation as heuristics to identify UPFs (both correctly and incorrectly). These include, for example, frying or freezing, and the fact that foods are microwaveable. For example, in the study by Sarmiento-Santos *et al.* (2022), 74% of respondents incorrectly identified frozen potatoes and frozen broccoli as UPF according to the NOVA classification. Conversely, 84% correctly identified microwave noodles as a UPF in the study by Pedro-Botet *et al.* (2022).

At the same time, it is evident that certain food ingredients mitigate the frequency with which consumers classify foods as UPFs. These include ingredients that are plant-based and/or organic. Thus, for example, plant-based hamburgers were judged to have low levels of processing in the study by Rybak *et al.* (2024). As a further example, in the EiC Food Consumer Observatory (2023) survey, vegetarian chicken pieces and vegan cheese slices were only correctly identified as UPF by 36% and 34% of respondents, respectively (Figure 3).

Consumer differences in awareness and understanding of UPF

Across the limited number of studies of consumer understanding of the NOVA classification and/or UPF and the ability to correctly classify foods accordingly, minimal attention is given to variations across consumers according to socio-demographic or other variables. Amongst the few exceptions, in the Spanish study by Pedro-Botet *et al.* (2022), the rate of correctly classifying foods as UPF was greater amongst women, those aged 21 to 50 years and university students, and lower by those living in a family. Correctly identifying UPF was also positively associated with greater consumption of fruit (perhaps indicating greater concern about food and health?) and being familiar with the UPF concept and term.

In the recent UK study by Robinson *et al.* (2024), there was a greater propensity to correctly identify UPFs amongst certain consumer sub-groups, for example those with higher levels of education, females and older participants. These same groups, however, were also more likely to incorrectly classify non-UPFs, suggesting a tendency to classify more foods (both correctly and incorrectly) as UPFs.

[1] More generally, being 'home-made' or 'non-industrial' is widely synonymous with being 'natural' (Devia *et al.*, 2021).

Consumer Understanding and Concerns About Ultra-Processed Foods: A Rapid Scoping Review of Current Evidence

Consumer concerns, beliefs and behaviours around ultra-processed foods

In this guide

[In this guide](#)

1. [Executive Summary](#)
2. [Introduction.](#)
3. [Background](#)
4. [Methodology](#)
5. [Consumer understanding and awareness of the concept of ultra-processed foods](#)
6. [Consumer concerns, beliefs and behaviours around ultra-processed foods](#)
7. [Conclusion](#)
8. [References.](#)

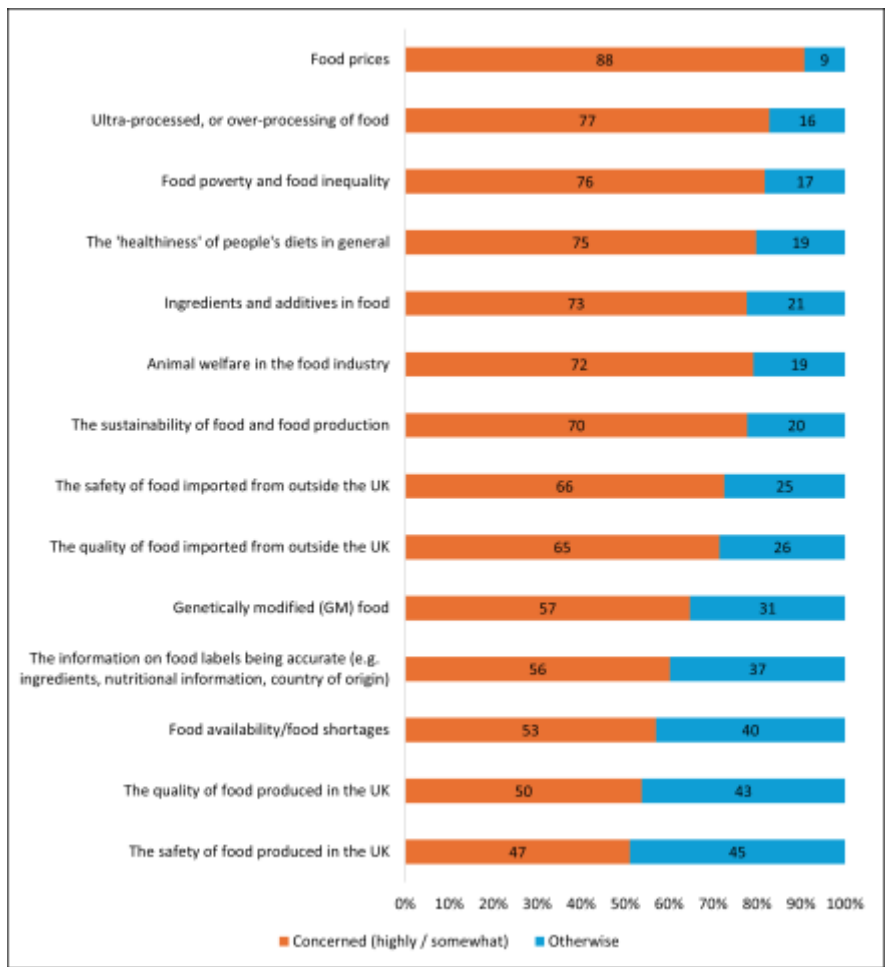
Consumer concerns about UPFs

Since August 2023, the FSA's Consumer Insights Tracker has collected data on consumer concerns about "ultra-processed or over-processing of food."

Specifically, respondents are presented with the question: "Thinking about food in the UK in general. At the moment, how concerned, if at all, do you feel about each of the following topics?" Respondents rate 14 items on a scale according to their level of concern, including that which relates to UPF.

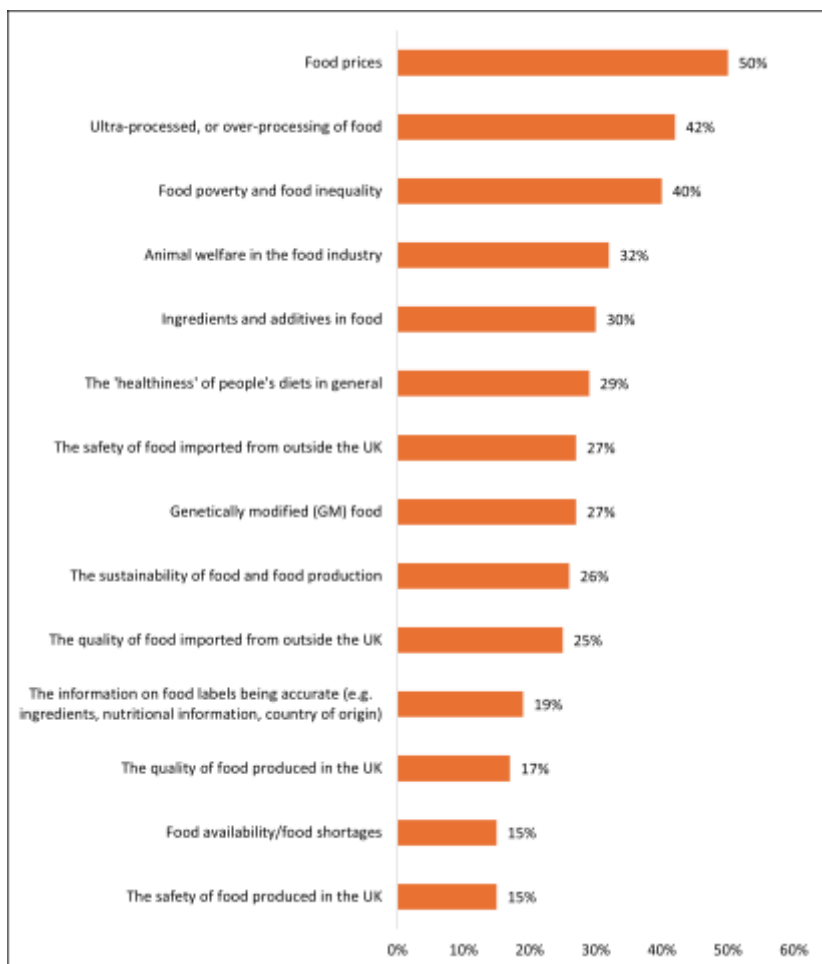
In June 2024, 77% of respondents indicated that they were concerned about ultra-processed or over-processed food (Figure 4), second only to food prices (88%), but in a larger group of items including food poverty and food inequality (76%) and the 'healthiness' of people's diets in general (75%).^[1] In total, 42% of respondents indicated that they were 'very concerned' about ultra-processed or over-processed food, again second only to food prices (50%) and with food poverty and food inequality (40%) exhibiting a comparable level of concern (Figure 4).

Figure 4. Consumer concerns about food issues, June 2024



Source: FSA Consumer Insights Tracker (2024b) Q. Thinking about food in the UK in general. At the moment, how concerned, if at all, do you feel about each of the following topics? Base: June 2024 (n=2,056). Respondents were shown all of the topics listed and asked how concerned, if at all, they felt about each. Figures for 'Concerned' shown in chart are the proportion 'highly concerned' or 'somewhat concerned', and 'Otherwise' are the proportion 'Not very concerned' and 'Not concerned at all', 'Don't know' or 'Don't know enough to comment'.

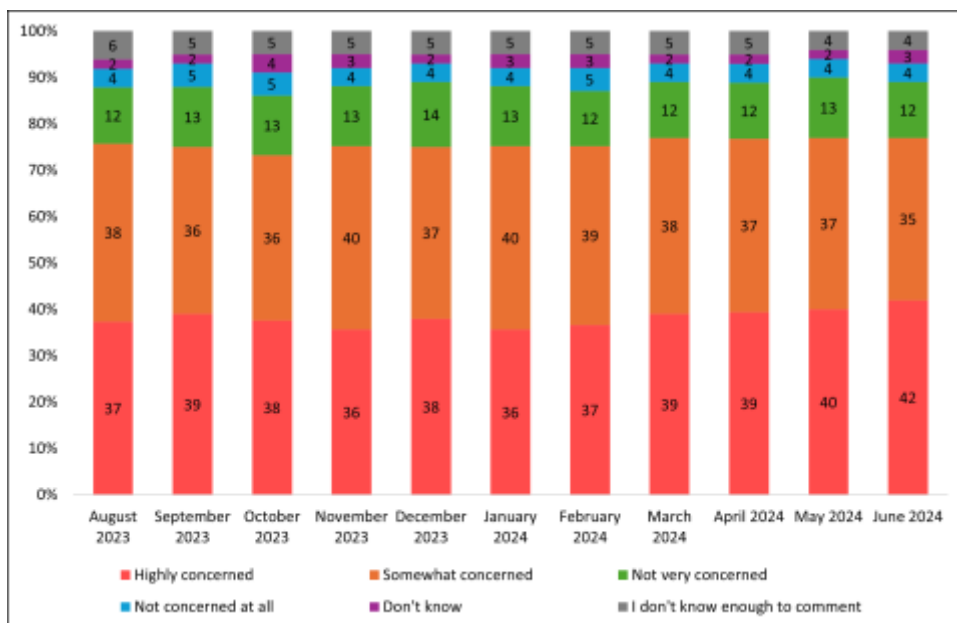
Figure 5. Proportion of consumers highly concerned about food issues, June 2024



Source: FSA Consumer Insights Tracker (2024b) Q. Thinking about food in the UK in general. At the moment, how concerned, if at all, do you feel about each of the following topics? Base: June 2024 (n=2,056). Respondents were shown all of the topics listed and asked how concerned, if at all, they felt about each. Figures shown in chart are the proportion 'highly concerned'.

Looking to possible trends about UPFs over time, there is some evidence that concern has increased in recent months (Figure 6). In total, 36% of respondents indicated that they were 'highly concerned' about ultra-processed or over-processing of food in January 2024, increasing statistically significantly to 42% in June 2024. Over this same period, however, the proportion who exhibit concern (highly or somewhat concerned) has remained virtually unchanged, from 76% in January 2024 to 77% in June 2024.

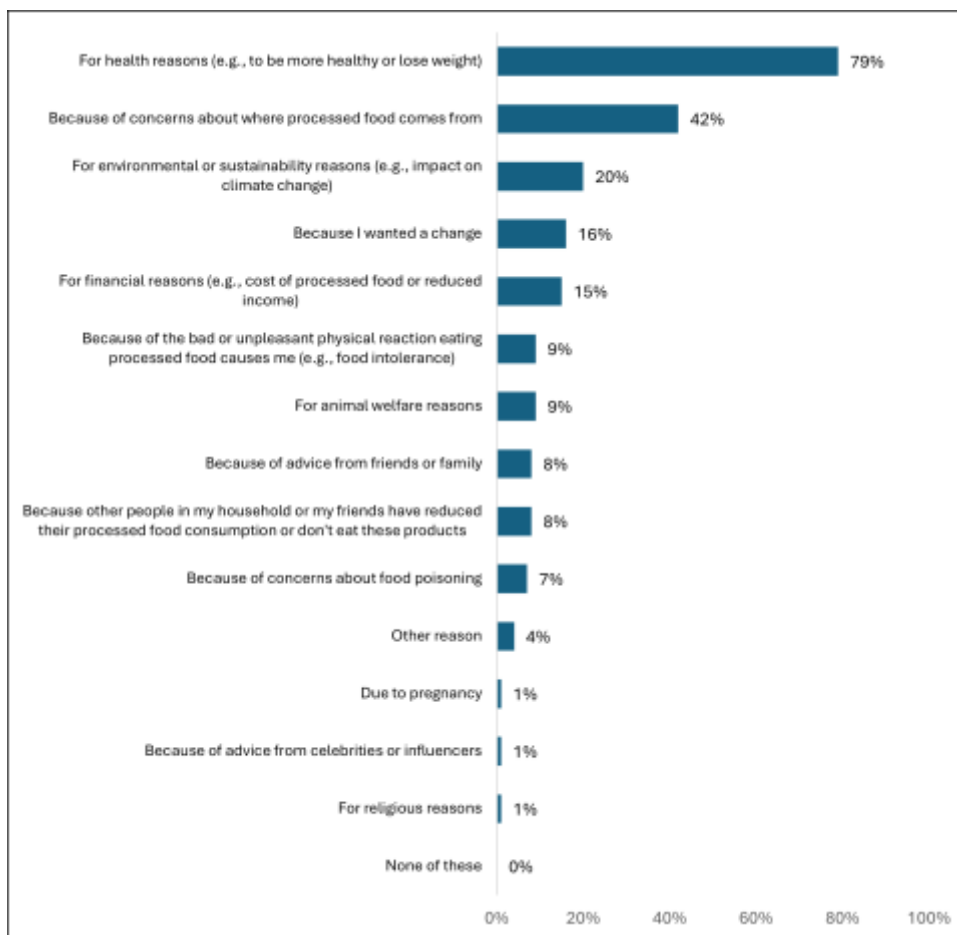
Figure 6. Consumer concerns about ultra-processed or over-processing of food, August 2023 to June 2024



Source: FSA Consumer Insights Tracker (2024b) Q. Thinking about food in the UK in general. At the moment, how concerned, if at all, do you feel about each of the following topics? Base: approximately n=2,000 per month.

Data from Food and You 2 (FSA, 2024a) suggest that consumers in England, Wales and Northern Ireland exhibit a propensity to reduce consumption of processed foods. 43% of respondents to the survey in October 2023 - January 2024 (Wave 8) reported that they had reduced consumption of processed foods in the last 12 months. This was the most frequently reported change in food behaviour, followed by minimising food waste (38%). The most frequently cited reason for having reduced consumption of processed foods was health reasons or to lose weight (Figure 7).

Figure 7. Reasons for reducing consumption of processed foods in last 12 months



Source: FSA Food and You 2, Wave 8 (FSA, 2024a). Base: Online respondents who had eaten less processed food in the last 12 months (n=1,783)

In the FSA's 'The UK Public's Interests, Needs and Concerns Around Food' research, 61% of respondents expressed concerns about the 'over-processing' of food in the future (FSA, 2022a). Further, FSA research in 2018 provided evidence of consumer concerns about the longer-term health effects of consuming processed foods, and of the additives and levels of sugar, fat and salt these contain (FSA, 2018). Conversely, in a recent survey by IGD (2023), of the top factors influencing the food and drink products that consumers choose to buy, the level of processing ranked 16th, with the top factors being price, taste, quality and freshness.[\[2\]](#)

Consumer beliefs about UPFs

In trying to understand consumer beliefs and concerns about UPFs it is important to recognise that UPFs are on the continuum of unprocessed to processed foods, and reflect the centrality of consumer beliefs and concerns about food processing and processed foods in general. Indeed, in the context of information and choice

overload, there is evidence that consumers give disproportionate importance to more salient and less complex information when making food choices, with (judgements of) the level of processing being a prominent cue (Koster, 2009).

There is a plentiful literature that suggests consumers make negative associations between industrial (as opposed to domestic) food processing and the healthiness of food (see for example, Machin *et al.*, 2020); Aguirre *et al.*, 2019), Bhawra *et al.*, 2021), Dube *et al.*, 2016). Processing, however, is not considered a linear attribute from 'more' to 'less'. Instead, distinctions are made between processing methods that are considered traditional^[3] (and that tend to be judged as more natural), rather than modern industrial processes (Etale and Siegrist, 2021) and/or that involve chemical processes (and that tend to be judged as less natural) than physical changes (Evans *et al.*, 2010; Rozin, 2005). There is evidence, furthermore, that consumers distinguish between foods that are 'home-made' and that are industrially processed, such that processing is almost synonymous with industrial and commercial production (Devia *et al.*, 2021; Rozin *et al.*, 2004; Battacchi *et al.*, 2020).

A prominent theme in the literature on consumer perceptions of processing in the context of food is the notion of 'naturalness' (Etale and Siegrist, 2021). In turn, perceptions of naturalness have been shown to be a key driver of consumer evaluations of taste, healthiness and sustainability, with more natural foods, for example being judged to be healthier and more sustainable (Hartmann *et al.*, 2022, Roman *et al.*, 2017; Peschel *et al.*, 2019). Beyond the influence of organic versus conventional production, for example, the literature highlights the importance of the (perceived) age of a technology (with recency being evaluated negatively) and whether it is regarded as 'traditional' (Cerjak *et al.* 2011). Also, the degree of human contact in the production of a food (Abouab and Gomez, 2015), the scale of production (Etale and Siegrist., 2021) and the use of machinery and automation, with a focus on efficiency of inputs and time rather than quality of the final product (Cirne *et al.* 2019). The more steps a food undergoes in its production, the less natural it tends to be perceived to be regardless of whether this process results in a nature-identical or 'healthier' product (Etate and Siegrist, 2018; Rozin, 2006). The nature of the process is also important. Thus, perceived naturalness tends to be reduced more with the addition rather than subtraction of ingredients (Rozin *et al.*, 2009), especially of substances that are seen as 'artificial' (Ares *et al.*, 2021; Staub *et al.*, 2020). Also, when these processes bring chemical changes rather than physical transformation (Evans *et al.*, 2010).

There is some evidence that concerns about the processing of food are intertwined with broader beliefs and concerns about the food system (Cirne *et al.* 2019). For example, findings from the FSA's own research 'The UK Public's Interests, Needs and Concerns Around Food' (FSA, 2022a) suggests that, as food systems have evolved, they have become globalised, and increasingly business-focused and profit-driven. In turn, that this has driven the greater focus on processed foods and, consequently, reduced the availability of foods that are seen as natural, fresh and healthy, and less accessible. These concerns are, furthermore, wrapped up in beliefs and concerns with respect to transparency and control; knowing what is in food and being able to avoid things considered undesirable. In this research, consumers saw unprocessed or minimally processed food choices as too expensive and / or time consuming, and 25% felt that heavily processed foods were often the only option available to them. People associated several negative issues with more processed food, such as being less ethical and environmentally friendly food production practices; more use of additives, pesticides and hormones; reduced 'quality' and 'safety' for consumers; and lower animal welfare. Unhealthy foods were often assumed to be more processed, less nutritious, and higher in saturated fat, sugar, salt and additives.

Because of the tendency for consumers to use the extent of processing as a heuristic in their food choices, there is evidence of halo effects on perceptions of the quality and safety of processed foods. Thus, the level of processing can mask the benefits in terms of the safety and nutritional quality of food products (Huppe and Zander, 2021; Knorr and Augustin, 2021; Sadler *et al.*, 2021). Conversely, adverse beliefs about processed foods can be offset by the presence of 'more desirable' ingredients that are perceived as 'healthy' and/or 'environmentally friendly', such as plant-based or organic substances (MacDiarmid, 2021).

With respect to UPFs specifically, several studies have explored consumer beliefs and concerns about UPFs, with the majority focused on Brazil and other countries of Latin America. There are very few studies on consumer beliefs and concerns in the UK.

A dominant theme in the literature is the link between consumer beliefs about UPFs and the perception that they are unhealthy (see for example, Ares *et al.*, 2016; Saulais *et al.*, 2023). There are two key dimensions to such perceptions.

First, that UPFs contain artificial ingredients that have been added, including chemical additives that pose longer-term safety issues (see for example, Ares *et al.*, 2016; Aguirre *et al.*, 2019). For example, in the study by Aguirre *et al.* (2019), when respondents were asked to explain what they understood by UPF, a key

theme was 'highly processed containing many artificial ingredients.' As noted above, however, this association differed significantly across the two countries in the study, with a much stronger association by respondents in Ecuador than in Argentina. Rose *et al.* (2023), indeed, suggest that additives and other added ingredients are a key factor in consumer perceptions of the healthiness of UPFs.

Second, that UPFs contain high levels of sugar, fat and salt that render them unhealthy and/or diminish their nutrient density (see for example, Ares *et al.*, 2016; Bolhuis *et al.*, 2022; Rose *et al.*, 2023; Machin *et al.*, 2020). For example, in Bolhuis *et al.* (2022), UPFs were rated as unhealthy by 55% of respondents in the Netherlands and Italy and 75% of respondents in Brazil. Further, 70% of respondents in Brazil, 51% of those in Italy and 38% of those in the Netherlands believed that UPFs contribute to weight gain. In all three countries, UPFs with a low nutritional score were rated as highly processed and unhealthy. Further, there is evidence that, in assessing the healthiness of UPFs, priority is given to added ingredients such as sugar (Rose *et al.*, 2023). At the same time, however, there is evidence of significant variation in the perceived healthiness of UPFs (see for example, Sanchez-Stiles *et al.*, 2022) with certain ingredients (such as 'natural' grains), for example, signalling that products are more or less healthy to the consumer.

Perceived benefits of UPFs

Whilst not the focus of most studies, there is some evidence that consumers do recognise UPFs to have beneficial characteristics. Indeed, there is evidence that UPFs can exhibit a strong appetite drive and feelings of pleasantness and arousal, even when respondents are only presented with visual cues (David *et al.*, 2017; Lemos *et al.*, 2022). In the study of Uruguayan consumers by Ares *et al.* (2016), respondents recognised the convenience of UPFs and that they have an extended shelf life that often means they have a lower price and are less wasteful. Similar findings are reported in the recent Brazilian study by Santos *et al.* (2024). Indeed, the study of Machado *et al.* (2017) show that purchases of UPF in Brazil are quite highly price-sensitive, with a 1% increase in price reducing the calories acquisition from UPF by 0.59%. Further, there is some evidence that the (lower) price of UPFs, for example, can influence the (greater) degree to which they are perceived to be unhealthy (Machin *et al.*, 2020), in turn influencing the propensity to purchase and consume.

The recent study by EiT Food Consumer Observatory (2024) in 17 European countries, including the UK, presents a more holistic picture of how consumers

visualise UPFs. Thus, dominant characterisations are UPFs being seen as bad for health and the environment, compared to minimally processed foods, but being more convenient and having a lower price. Indeed, dominant drivers for consumption of UPF are convenience and price. In the UK specifically, UPFs are associated with high quantities of 'chemicals', sugar, salt and fat, and with few natural ingredients and hardly resembling raw state foods (IGD, 2023). In turn, these foods are perceived as unnatural and unhealthy. At the same time, various barriers to reduced consumption of UPFs are recognised, including habit and familiarity, family preferences, shelf life, preparation time and the potential for greater food wastage.

Influencing factors in consumer concerns, beliefs and behaviours around ultra-processed foods

Several studies, predominantly in Latin America, have explored the impact of provision of information on consumer perceptions of the healthiness of UPFs and/or their propensity to purchase and consume such products (Taille *et al.*, 2020). Studies have explored the impact of nutrition labels on purchase and consumption behaviour with respect to UPFs (Machin *et al.*, 2017; Shamim *et al.*, 2020), and also the impact of warning text and labels (Bollard *et al.* 2016; Adasme-Berrios *et al.*, 2022; Rybak *et al.*, 2024; Perez *et al.*, 2022; Fernandes *et al.*, 2022; Botelho *et al.* 2019; Khandpur *et al.*, 2018; 2019; Ares *et al.*, 2018; Arrua *et al.* 2017). For example, in the study by Adasme-Berrios *et al.* (2022), a nutrition warning increased the intention to avoid UPFs and reduced the eating motivation for such foods, further enhancing the intention to avoid. This was achieved without any impact on the nutritional knowledge of participants in the study. The results of some studies, however, present a less clear or more nuanced picture. For example, in the study in Uruguay by Machin *et al.* (2017), front-of-pack nutrition information reduced the perceived healthiness of UPF amongst low-income respondents. but not medium and high-income respondents.

Whilst there are claims by critics of UPFs (see for example, van Tulleken, 2023) that the appeal and widespread consumption of these foods reflects the degree and ways in which they are marketed, there is a paucity of studies on the choice of UPFs in the real world setting and/or the impact of marketing-related factors. One exception is Moran *et al.* (2019) that investigates the factors influencing the purchase of UPFs by households with children. The marketing of these products and in-store position are identified as key factors. Experiments in simulated supermarket settings (see for example, Botelho *et al.*, 2019) also provide evidence that health information at the point of purchase can have an

appreciable impact on the purchase of UPFs, even in the context of total food purchases.

Only a small sub-set of the studies on consumer understanding, beliefs and concerns about UPFs have examined variations within populations, predominantly based on socio-demographic variables (see for example Saulais *et al.*, 2023; Pedro-Botet *et al.*, 2022). For example, in the study by Pedro-Botet *et al.* (2022), women, respondents aged 21 to 50 years and those living with a family were better able to identify UPFs. Broadly, however, whilst confirming that there is variation across population sub-groups, there appears to be limited systematic variation when examined across countries, making it difficult to extrapolate the findings from studies in one country to another.

Data from the FSA's Consumer Insights Tracker with respect to concern about 'ultra-processed and over-processing of food' do suggest significant variation (at the 95% level) across socio-demographic groups. Thus, in June 2024, the proportion of respondents expressing concern was greater in women than men, whilst the proportion not concerned was greater in men than women. Respondents aged 35 years and older had a greater proportion that were concerned than those aged 16 to 34 years. The proportion of respondents concerned about ultra-processed and over-processed food was significantly higher in those with a level of education of A-level or higher than those with GCSE, O Level or NVQ12. There was no systematic relation between the level of concern and social grade and no significant variation by region. In terms of consumption behaviour, data from Food and You 2 (FSA, 2024a) shows that the frequency of reporting reduced consumption of processed foods in the last 12 months was significantly greater amongst women, but there was no systematic relationship with age, household income or having children in the household.

[1] One concern with this item is the inclusion of the term 'over-processed' food with ultra-processed food. There is the possibility that this might present to respondents as a more evaluative item, leading to higher levels of concern than if the term ultra-processed food or UPF was presented alone.

[2] Care should be taken in comparing the results of these studies. Thus, for example, reference to 'over-processing' which is a more evaluative term, likely triggered a different response from respondents than a more neutral term such as 'level of processing'.

[3] Notions of traditional are often related to processes that have been used for long periods of time, applied on a smaller scale and/or that are seen as more 'artisanal'.

Conclusion

In this guide

[In this guide](#)

1. [Executive Summary](#)
2. [Introduction.](#)
3. [Background](#)
4. [Methodology](#)
5. [Consumer understanding and awareness of the concept of ultra-processed foods](#)
6. [Consumer concerns, beliefs and behaviours around ultra-processed foods](#)
7. [Conclusion](#)
8. [References.](#)

Broadly, this rapid review suggests that the current literature on consumer awareness and understanding of UPFs, and related beliefs and concerns about these foods, is rather limited. Whilst the non-systematic and rapid nature of this review could well mean that some existing studies have been missed, this does not undermine the broad conclusion that there is a paucity of research in this area, both internationally and in the UK specifically.

Whilst recognising the limitations of current evidence, it is possible to discern some key points from the existing literature:

- UPFs constitute a significant proportion of the diet for many consumers in high-income countries like the UK.
- There is considerable public discourse on the potential negative health and other consequences of UPFs, that is the cause of growing consumer concerns about these foods. There is evidence that many consumers desire to reduce their consumption of UPFs as a result of this.
- Whilst there is widespread awareness of UPFs as a concept, many consumers do not understand the specific nature of UPFs well and are unable reliably to distinguish UPFs from other levels of food processing. In part, this reflects

the rather complex and wide-ranging definition of UPFs and the fact that the distinction between UPF and other forms of processing is somewhat fuzzy.

- It is apparent that consumers have rather negative beliefs about UPFs, for example in terms of their healthiness and sustainability. Broadly, these concerns are wrapped up in beliefs and worries about industrial food processing more generally.
- At the same time, consumers do recognise the benefits that these foods can bring, for example in terms of price, convenience and shelf-life.
- There is some evidence that the provision of information on UPFs can influence beliefs about these products and purchase intentions. Impacts on actual purchase behaviour, however, are largely unknown.

A key implication of these findings is that, whilst consumers may be receptive to communications about UPFs, designing and implementing an effective communication strategy around UPFs will be challenging. If consumers are not clear about what a UPF is (according to existing, but not official UK classifications), and where understandings and beliefs about UPFs vary widely within the population, designing effective and equitable communication is likely to need further insight into consumer perspectives. For this reason, the ACSS have not at this stage sought to answer research questions 8 and 9 on information needs and the nature of FSA support but have provided areas for potential future research.

The review suggests the need for more research on consumer awareness and understanding of UPFs, and beliefs and concerns about these foods, specific to the UK. The extrapolation of results from studies elsewhere, and especially from Latin America where the food and wider context is quite different, is unlikely to provide reliable guidance on how UK consumers see UPFs and the implications for their purchase and consumption behaviour. In part, further research needs to delve deeper into some of the key issues thrown up by this review, specifically for the UK:

- How reliably can consumers discern UPFs and distinguish 'Ultra' processed foods from other levels of food processing, for example based on the NOVA classification?
- What concerns do consumers have about UPFs and why?
- How do consumer understanding and concerns about UPFs vary by products?
- How do consumer concerns about UPFs relate to concerns about food processing and/or the food industry more broadly?

- To what extent do consumers want to reduce or change their consumption of UPFs and what factors do they think make this more or less difficult?

Furthermore, there are some other key questions that the existing literature does not apparently address, both in the UK and internationally. The following questions could be explored in more extended further research:

- What factors do consumers use to distinguish UPFs from other types of processed foods, and how do these factors vary between consumers?
- What trade-offs might consumers make between perceived risks and benefits of UPFs?
- How can actual consumer purchasing behaviour of UPFs be tracked and explored?
- What additional information do consumers need and/or want when it comes to UPFs both generally and where the science is uncertain, and who should this come from?
- What information would help consumers make decisions about UPFs that are of benefit, rather than detriment to them?
- What actions (for example labelling and/or regulation) do consumers want to see when it comes to UPFs and who do they think should be responsible for such actions?
- What, if any, are the implications of the current largely negative media narrative around UPFs for consumer perceptions of food safety and nutrition and impacts of food choices?

Consumer Understanding and Concerns About Ultra-Processed Foods: A Rapid Scoping Review of Current Evidence

References

In this guide

[In this guide](#)

1. [Executive Summary](#)
2. [Introduction.](#)
3. [Background](#)
4. [Methodology](#)
5. [Consumer understanding and awareness of the concept of ultra-processed foods](#)

6. [Consumer concerns, beliefs and behaviours around ultra-processed foods](#)
7. [Conclusion](#)
8. [References.](#)

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