NUTRITION AND BEHAVIOUR UNIT, UNIVERSITY OF BRISTOL - WRITTEN EVIDENCE (FDO0056)

House of Lords Select Committee on Food, Diet and Obesity (call 3344): Written evidence from the Nutrition and Behaviour Unit at the University of Bristol

About the Nutrition and Behaviour Unit (University of Bristol)

The Nutrition and Behaviour Unit has been established since 2006 and it forms one of the largest groups of its kind studying human food choice, dietary behaviour, and appetite control.

Located within the School of Psychological Science at the University of Bristol, our work has been supported by a range of funding agencies, including; the Biotechnology and Biological Sciences Research Council (BBSRC), the Economic and Social Research Council (ESRC), the Engineering and Physical Sciences Research Council (EPSRC), the EU Seventh Framework Programme (EU FP7), the Medical Research Council (MRC), and the National Institute for Health Research (NIHR).

Currently, members of the NBU (Professor Jeff Brunstrom and Dr Dani Ferriday) lead the UK BBSRC-OIRC 'Consumer Lab' hub – a 5-year initiative to build partnerships between academic and industry researchers, exploring ways to facilitate the translation of academic research to enable the food industry to deliver a healthier diet.

Brunstrom and Ferriday are also affiliated with the Population Diet and Physical Activity Theme of the Bristol-NIHR Biomedical Research Centre.

This submission is made on behalf of the following researchers:

Professor Jeff Brunstrom, Professor of Experimental Psychology
Dr Dani Ferriday, Senior Lecturer
Dr Annika Flynn, Research Associate
Emeritus Professor Peter Rogers, Professor of Biological Psychology

Executive summary

This submission focuses on claims concerning the role of ultra-processed foods (UPFs) in promoting obesity. Specifically, it addresses question 1 (key trends in food, diet and obesity, and the evidential base for identifying these trends) and question 8 (the role of the food and drink industry in driving food and diet trends and on the policymaking process) posed by the Committee.

Key concerns about the evidential base for the connection between UPFs and obesity

1) The *quality* of the evidence concerning the connection between UPFs and obesity.
    a. Evidence in this area is primarily derived from observed correlations between food choice and obesity. There is little acknowledgement that correlations can be explained by confounding variables and/or reverse causality. To implement evidence-supported strategies that reduce obesity, researchers need to demonstrate that consumption of UPFs *causes* obesity.
    b. Only one randomised controlled trial (RCT) has attempted to do this. However, a single RCT is unlikely to deliver a definitive answer. To illustrate this point, we highlight two concerns, one relating to ecological validity and a second relating to a failure to account for dietary adaptation (changes in behaviour can occur over time).
2) The *interpretation* of the evidential base by researchers and commentators.
    a. Claims are often oversimplified and are made without reference to a long history of research which relates food composition to dietary behaviour.
    b. Claims are often made based on intuition or, perhaps mistakenly, based on the assumption that causal associations are grounded in scientific evidence when this evidence is missing.

The role of the food and drink industry in driving food and diet trends and on the policymaking process

There is a tendency to view consumers as 'passive recipients' of products developed and marketed to us by the food industry. This narrative overlooks a complex reciprocal relationship between consumers and producers. Consumer preference is governed by food composition, and, in turn, this drives product development.

We recommend:

1. There is an urgent need for RCTs that investigate the **causal effects** of UPF consumption on energy balance.
2. Future research funding calls should encourage researchers to include 'scientific triangulation' in their approach - stronger scientific conclusions can be drawn when different methods are used, and findings coalesce around the same conclusion.

3. The Government convenes groups of experts to produce consensus statements on what is and is not known about UPFs and energy balance, and publish guidance on conducting, reporting, and interpreting research in this area.
4. To improve population-level diet and health, funding agencies should actively promote academic-industry collaborations.

Question 1: Key trends in food, diet, and obesity, and the evidential base for identifying these trends

We have concerns about the quality and interpretation of the current evidential base supporting the proposition that UPFs increase energy intake and promote obesity.

Concerns about the quality and interpretation of the evidential base

Regarding the *quality* of the current evidential base, a causal relationship between UPF intake and energy balance is plausible; however, currently, we lack sufficient high-quality evidence to confirm this with confidence. Specifically, evidence in this area is derived primarily from observational (*i.e.*, correlational) studies, together with one randomised controlled trial (RCT). Both sources have limitations, which we discuss below.

Limitations of observational studies

Correlation does not mean causation

Many studies report a positive association between UPF consumption and obesity and overweight. However, because they employ an observational design, they can only provide evidence for a correlation, not causation.

For example, a reliable association is often observed between skipping breakfast and risk of overweight or obesity. However, RCTs do not show that skipping breakfast increases body weight. If anything, they show a reduction in calorie intake and body weight when breakfast is skipped.

Similarly, there is a positive association between low-calorie sweetener consumption and having overweight or obesity, but RCTs show that replacing some of the sugar in the diet with low-calorie sweeteners reduces body weight. RCTs also show that the effect on body weight of long-term consumption of low-calorie sweetened drinks is equivalent to the effect of consuming water. (Food and drink products containing low-calorie sweeteners are classified as UPFs).

In these examples, the different outcomes for correlational and intervention studies (RCTs) can mainly be explained by reverse causality. For example, obesity causes one to skip breakfast, and/or to use low-calorie sweeteners, as strategies to reduce one's calorie intake and body weight. As such, they illustrate why caution needs to be applied when evaluating evidence based on a correlation.

Confounding in dietary research

Another problem with correlational evidence is 'confounding.' Here, a relevant example is the finding that missing breakfast in young people is associated with poorer educational attainment. This evidence has been used to support the setting up of school breakfast clubs. However, an

unintended consequence is that some children then consume two breakfasts – one at home and one at school, thereby increasing the risk of calorie over-consumption.

Furthermore, the evidence that missing breakfast, per se, harms learning performance is weak at most. Rather, the correlation between missing breakfast and educational outcomes is most likely explained by relatively more difficult home and family circumstances of young people who miss breakfast on school days.

In other words, missing breakfast is a 'marker' for a less nurturing and perhaps less aspirational home environment. This confound is not, or cannot, be fully controlled for in the statistical analyses of the observational study datasets.

The potential for correlations to mislead us about causation matters. Without a sound evidential base, there is a risk that resource aimed at improving public health is misdirected.

Recommendation 1: There is an urgent need for randomised controlled trials (RCTs) that investigate the causal effects of UPF consumption on energy balance

Recognising the limitations of a single RCT

To date, only one RCT has attempted to demonstrate causality between UPF consumption and energy balance.

In a randomised cross-over trial, Dr Kevin Hall from the US National Institute of Diabetes and Digestive and Kidney Diseases exposed 20 participants to a diet comprising ultra-processed foods versus minimally processed foods. In each case, calorie intake and body weight were assessed over 14 days. Both diets were matched across a range of characteristics (e.g., calories served, fat, carbohydrate, protein content).

The key finding is that when participants consumed UPFs, they ate ~500 kcal more per day and there was a corresponding increase in body weight. This study represents initial evidence supporting a cause-and-effect relationship between UPF consumption and increased energy intake/changes in body weight.

This single study is important, however it is not definitive. For example, three concerns are outlined below.

Concern 1: Ecological validity

The UK National Diet and Nutrition Survey (2008–2014) shows that UPFs account for 56.8% of total energy intake in the UK diet. This is substantially lower than the UPF diet in Kevin Hall's study. Furthermore, in this US-based study, foods were freely available and were served in unusually large - typically too large to be consumed in their entirety.

For these reasons, results should not be extrapolated to everyday life because doing so will likely overestimate the effects of UPF exposure. In this regard, we recommend that UK-relevant RCTs are needed to investigate whether reducing the proportion of UPFs in the diet reduces body weight, under free-living conditions.

Concern 2: Duration of the study
Hall's RCT assessed responses over 28 days (2 diets x 14 days). It is well established that responses to food change over time and that this is due to learning and adaptation.

An example from our laboratory is an RCT where participants were served a portion of spaghetti Bolognese that was either a standard or reduced energy density. The two versions of spaghetti Bolognese were presented in the same packaging and were rated similarly for taste and initial liking. However, as shown in Annex A, over 5 days, participants reported a reduction in liking for the reduced-energy version compared to the standard-energy version.

Similarly, data from Hall's RCT show that participants adapted to the diets over time. Specifically, the effect of UPFs on food intake was greater at the beginning of the exposure period, such that after 14 days, the difference between intake (kcals) of UPFs and unprocessed foods was greatly diminished (see Annex B). In turn, this suggests that the two diets might have promoted the same energy intake, had the participants been exposed to the diets for a longer period.

Concern 3: Capability to isolate underlying drivers of food intake
A strength of Hall's RCT is that it was conducted in a 'residential' setting, which enabled energy intake and expenditure to be monitored closely. Again, such studies permit causal inferences to be drawn. However, because participants selected their meals from a complex 'buffet' of available foods, it can be challenging to isolate specific characteristics of UPFs that impact food choice and energy intake.

In raising these concerns our objective is not to diminish the importance or rigour of Hall's RCT. It is an important piece of work, conducted to a high standard. Rather, our motivation is to highlight that **many questions remain**, and that **to deliver actionable evidence, more high-quality research is needed, especially RCTs**.

Recommendation 2: Fund academic research that embraces scientific triangulation

To improve the *quality* of the evidence base for trends in diet and obesity, we also advocate for an approach drawing on a mixed economy of methods.

Studies in non-human animals can help to provide evidence for causal mechanisms. However, with animal data alone, it can be difficult to estimate likely effect sizes in human populations. By contrast, studies revealing population-level associations between UPF intake and health outcomes can indicate real-world effect sizes. However, as noted above, causal inference is more challenging in these observational studies.

In response, we note that others have sought to promote the merits of 'scientific triangulation' – the idea that stronger scientific inference can be drawn when different methodological approaches produce outcomes that converge on the same conclusion. As an example, epidemiological studies (including those employing Mendelian randomisation analysis) observe a relationship between sodium consumption and elevated blood pressure. In addition, intervention studies using a variety of methodologies (e.g., nutrition education, self-help materials, salt substitutes, and food reformulation) have found that a modest reduction in salt intake reduces blood pressure in hypertensive and normotensive participants. Together, these different approaches converge to confirm that the relationship between salt consumption and elevated blood pressure is likely causal.

Rather than merely advocating for scientific triangulation, **we recommend that future funding calls should strongly encourage researchers to include scientific triangulation in their approach**. In so doing, research quality will improve, along with the quality and strength of the scientific inference that can be drawn from this research.

Concerns about scientific myths and misconceptions – misplaced assumptions about the current evidential base

Here, we are not implying that current conclusions are, necessarily, wrong. Rather, we suggest that claims about the negative impact of UPFs are often based on misunderstanding, oversimplification, or incorrect extrapolation of scientific evidence.

For example, it is not uncommon to hear UPFs described as 'energy-dense,' meaning that they contain more calories than other foods when compared on a gram-for-gram basis.

However, to conclude that greater energy density causes more calories to be consumed would be an oversimplification, because it would ignore thousands of studies showing how humans and other animals can often show remarkable sensitivity to the energy density of commonly

consumed foods and drinks, how this sensitivity can moderate food choice and energy intake, and how these responses to energy density can be learned over time.

We are not saying that food-energy density does not matter. Rather, any claim about the negative effects of a food characteristic should be grounded in the existing research literature and, in our view, this literature is often oversimplified or overlooked by commentators and policymakers.

A related concern is that conclusions are sometimes based on instinct or personal experience, habits, or conventional wisdom, rather than direct observation and scientific evidence.

However, several widely accepted 'truths' about UPFs remain to be tested formally. One simple recent example is the often-reported claim that UPFs are more palatable than unprocessed offerings. Remarkably, this view is widely held, yet only one study published in 2024 directly tested this idea.

Specifically, research from our group found no evidence that level-of-processing or food energy density predicts food liking and food reward. Similarly, claims are made about the tendency for foods high in fat, sugar, and salt (HFSS) to be 'hyperpalatable,' yet there are no published studies that have tested this by assessing and comparing the palatability of HFSS and non-HFSS foods directly.

Together, we see a disconnect between researchers contributing to scientific evidence, and agencies, policymakers, and commentators who are acting in the public interest but who are unaware of scientific evidence, oversimplify it, or perhaps wrongly assume that evidence exists.

We also argue that those who inform public debate around UPFs often lack an understanding of the extant literature, and this disconnect between scientists and other agencies leads to stronger-than-warranted conclusions about the impact of UPFs. In this regard, it is perhaps worth noting that the UK can boast considerable expertise in this area and 2024 marks 50 years of one of the largest annual gatherings of experts in human eating behaviour in the world (The British Feeding and Drinking Group).

Recommendation 3: Publish consensus statements and guidelines for standards of research in this area

We recommend that the Government convenes groups of experts to produce and publish consensus statements on what is and is not known about UPFs and energy balance, including a clear statement of the strength of the evidence supporting each claim.

Building on these consensus statements, we recommend that the Government should commission a report outlining standards for research

in this area. This might form a guide for both academic and non-academic commentators alike, clarifying the relative merits of studies conducted in humans, non-humans, real-world settings, and so on, and highlighting the importance of discriminating studies based on factors such as experimental control, effect size, and the capacity to draw causal inference.

Question 8: The role of the food and drink industry in driving food and diet trends, and the policymaking process

Recognising human 'nutritional intelligence'

We challenge the idea that the food industry drives trends in diet. Rather, we argue that the food industry is highly sensitive to consumer feedback and sales. Thus, it is the reciprocal industry-consumer relationship that drives trends in food and diet, not the food industry operating autonomously, and in isolation.

Scientists are motivated by the principle of parsimony – the idea that we should favour simple and concise explanations over those that are more complex. However, an underlying danger is that simplification leads to oversimplification.

In the case of nutritional psychology, we sometimes observe complex interactions with foods and our food environment, patterns which are reliable and replicable, but which are then translated into oversimplified 'universals' or 'principles' that can be easily communicated, but which fail to capture the complex patterns of behaviour on which they are grounded.

When this happens, they wrongly cast human interaction with foods as simple and, in turn, this leads us to conclude that human dietary behaviour is passive and disengaged, and therefore our food intake is driven largely by the foods that are available to us, foods that are largely determined by 'the food industry.'

As an example, we often hear that overweight and obesity are caused by the food industry delivering increasingly energy-rich products. While the energy density of food is likely important and while it may be tempting to draw such a simple conclusion, human interaction with foods of varying energy density is far from simple, and decades of research, including our own (see for example, Brunstrom et al., 2018; Brunstrom et al., 2023; Flynn et al., 2022), suggests that the relationship is quite complex.

Studies conducted in a controlled laboratory environment sometimes suggest that humans are insensitive to the energy content of foods and that they eat the same weight (g) of food, regardless of its calorie content (Robinson et al., 2022).

However, studies assessing interactions with familiar, everyday foods, provide a different picture and demonstrate a surprising sensitivity to food energy density (Brunstrom et al., 2008; Brunstrom et al., 2018, Flynn et al., 2022; Flynn et al., 2023a, Flynn et al., 2023b).

More generally, human sensitivity to food composition is likely far more nuanced than many would lead us to believe, and it is also likely that the type of calorie (i.e., protein, fat, or carbohydrate) or other nutritional qualities of food (e.g., fibre and the blend of carbohydrate and fat) can influence dietary behaviour (Buckley et al., 2019, DiFeliceantonio et al., 2018; Perszyk et al., 2021; Rogers et al., 2024).

This implicit sensitivity to the composition of everyday foods (including even micronutrient content, Brunstrom & Schatzker, 2022) is captured in our concept of 'nutritional intelligence' (Brunstrom et al., 2023).

If consumers unconsciously discriminate and select foods based on their composition, then this means that the success or failure of a commercial product will, in part, be determined by this process.

Thus, rather than characterising the food industry as a force that drives diet and consumer behaviour, it might be more accurate to imagine consumers having collective agency. Specifically, their preferences and purchasing habits feedback to influence decisions around product innovation and reformulation, so the interaction between the consumer and the producer is reciprocal.

In summary, we would suggest that **the food and drink industry is not solely responsible for determining the foods on supermarket shelves**, that **the consumer and consumer preferences are key drivers as well**, and that this interplay should be acknowledged in discussions moving forward.

Research funding in collaboration with the food industry

Researchers who collaborate with pharmaceutical and medical device companies are often accused of a conflict of interest, even though these collaborations are actively encouraged by UKRI. This tendency to vilify certain groups of researchers extends to those who are funded by, or work in collaboration with, the food industry. Often this is based on the false assumption that their research and its interpretation will be biased, failing to recognise the myriad sources of bias and incentives that can influence academic research, irrespective of its funding source.

Issuing unsubstantiated challenges to the personal and academic integrity of industry-funded researchers has other negative consequences; it is time-consuming, it undermines public confidence in science, and it polarises the academic community, which prevents some of our best scientists from working on problems that could bring immediate population-level benefit.

When researchers work with the food industry, conflicts of interest are often claimed. However, equally problematic is 'white-hat bias.' White-hat bias occurs when research takes place in the service of what may be perceived to be righteous ends, but which leads to the distortion of information and a failure to interpret outcomes objectively. In this regard, researchers who have an interest in obesity and its attendant causes may be especially vulnerable. Indeed, there are examples of white hat bias in obesity research, yet this is rarely acknowledged. Our proposed triangulation approach (outlined above) will also help to minimise the risk of this kind of bias.

A final benefit of encouraging academic-industry collaboration is that it ensures that academic research is actionable and that it can be easily translated and used by the food industry to promote human health.

Recommendation 4: Actively promote academic-industry collaborations to improve population diet and health

With our 5-year BBSRC OIRC 'Consumer Lab', we are already seeing the benefits of promoting academic-industry partnerships. Building on this success, and that of other BBSRC OIRCS hubs, we recommend that even greater resource should be allocated.

Indeed, rather than polarising academic and industry researchers, we should be working together to deliver the tools and knowhow that will be needed to effect meaningful population-level changes to purchasing and eating habits.

To do this, **we need to build academic-industry partnerships that can leverage fundamental research on consumer behaviour**. In turn, **this will generate theory-driven strategies that de-risk product innovation and deliver new products that are both healthy and commercially viable**.

Annex A

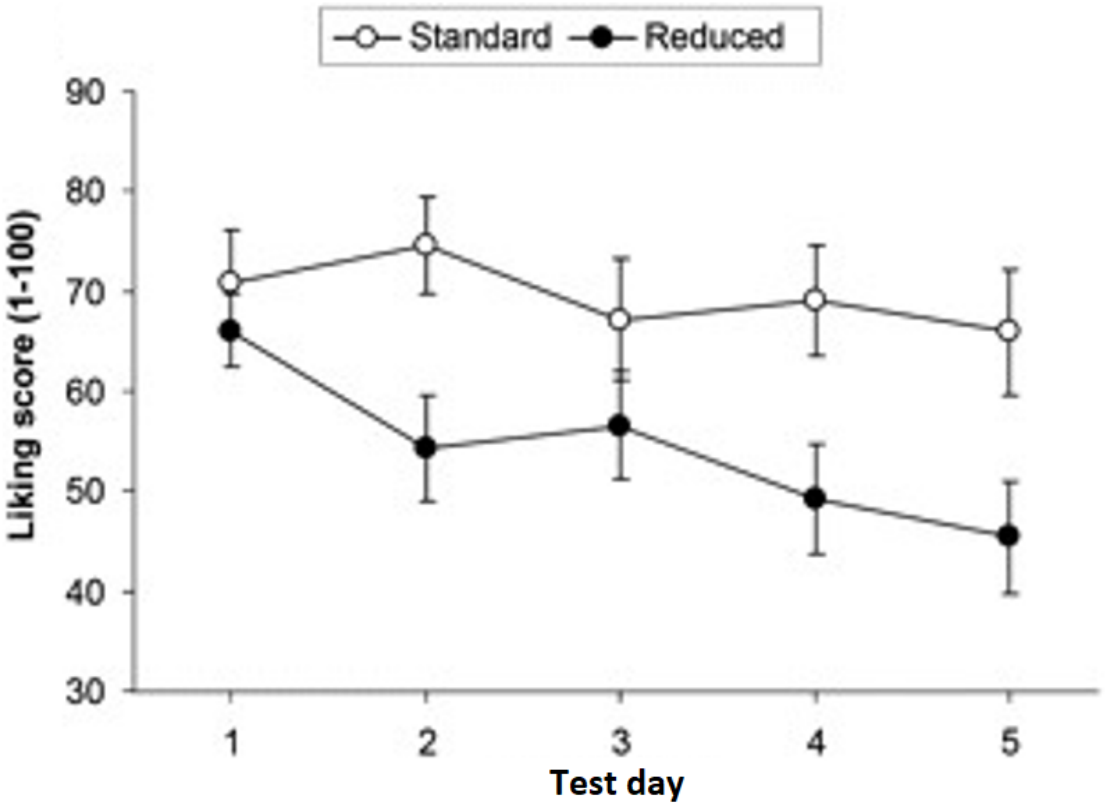

Figure 1: Mean (±SEM) liking scores for the standard (n = 18) and the reduced (n = 18) Spaghetti Bolognese across 5 test sessions (days)

Annex B

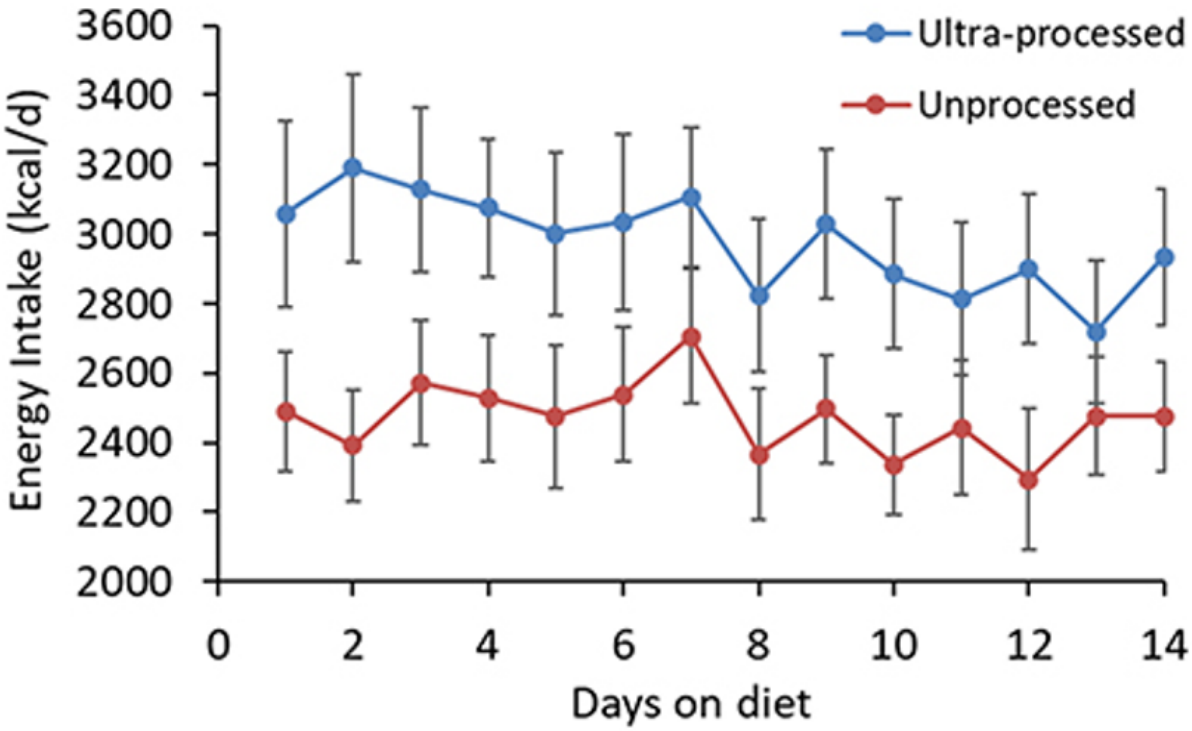

Figure 2: Energy intake across the 14 days in the UPF and unprocessed conditions

6 April 2024