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'Processing' nutrition advice: how to inform guidelines on ultra-processed food

Communication | Editorial | Invited contribution | **Perspective** | Report | Review

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Abstract

Food processing has been part of our food environment for millennia, but recent advances in technology have taken processing to the next level, creating myriad packaged foods that our ancestors would not even have recognised as edible. Whilst this advancement in processing was certainly advantageous at a time of significant malnutrition following the World Wars, its adoption as a staple of our diet has fundamentally changed the way we eat and, along with it, our health. Recent evidence suggests that the consumption of ultra-processed foods is linked to metabolic morbidity, but these findings are not reflected in nutritional advice in the UK. I argue that public health advice and policy in the UK does not go far enough to highlight the risks of consuming ultra-processed food and, by focusing on a reductionist approach to nutrition, actually promotes the consumption of these products. I further recommend that Public Health England should consider adopting a whole foods approach to nutrition advice. Not only would this serve to minimise the confusion over macronutrient balances, it would also promote the consumption of whole, unprocessed or minimally processed foods, thereby fostering an improvement in our collective health and wellbeing.

The food and nutrition landscape has changed rapidly over the last few decades. In the 1950s, rationing was still in place for many foods across the UK, and convenience foods were a rarity. Fast-forward 70 years and you find an almost unrecognisable food environment, with supermarkets full of ultra-processed food, and fast-food restaurants dominating high streets. This may not seem problematic; technology has brought myriad changes to the way we live our lives, largely to the benefit of our collective wellbeing. Indeed, industrial food processing arose as a solution to the crisis of malnutrition in Europe following the Great Depression and World Wars [1]. Efforts were channelled into producing energy-dense food that does not readily spoil, resulting in the introduction of vast quantities and huge varieties of ultra-processed food into our food environment. This certainly achieved the initial goal of population survival but has now fundamentally changed the way we eat and, along with it, our health.

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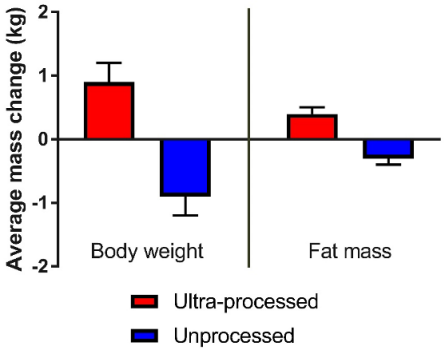

Figure 1: **Ultra-processed diets increase body weight and fat mass as compared to energy- and macronutrient-matched unprocessed diets.** Consumption of an ultra-processed diet for two weeks significantly increases both body weight and fat mass (0.9 ± 0.3 kg and 0.4 ± 0.1 kg, respectively), whereas ad libitum consumption of an energy- and macronutrient-matched unprocessed diet over the same time period resulted in significant body weight and fat mass loss (-0.9 ± 0.3 kg and -0.3 ± 0.1 kg, respectively). Data are expressed as mean ± standard deviation. Figure produced using data from [2].

Food processing in some manner, such as heating, grinding or chopping, has formed part of our food environment for millennia. However, the commercial production of ultra-processed food is a relatively recent development. Ultra-processed foods are defined as '*formulations of food substances often modified by chemical processes and then assembled into ready-to-consume hyper-palatable food and drink products*' [3]. Examples of this are everywhere, including biscuits, crisps, breakfast cereals and ready meals. As such, the amount of processed foods consumed in the UK has increased dramatically since the 1960s, such that an average of 65.6% of calories are from processed food, 86.6% of which is ultra-processed [4]. In the same timeframe, rates of obesity have increased significantly, from only 1% of the population to a staggering 28% in 2018, accompanied by a concurrent increase in the rates of other non-communicable metabolic conditions such as type 2 diabetes mellitus, hypertension and dyslipidaemia [5]. Whilst the emergence of this metabolic disease epidemic occurred concurrently with ever-increasing consumption of ultra-processed foods, this by no means provides evidence that the two phenomena are linked. However, their association has prompted many scientists to question why they have tracked together, and whether one may be causative of the other. Observational studies have demonstrated that the availability of ultra-processed foods is positively associated with the prevalence of obesity in both adults and children [6, 7], and that increasing consumption of ultra-processed foods is associated with significantly increased risk of not only cardiovascular and cerebrovascular diseases – such as coronary artery disease and stroke – but also of all-cause mortality, with each additional serving increasing mortality by 18% [8, 9]. These cohort studies are of course limited by confounders, such as differences in physical activity levels and dietary compositions, as well as the known association between socioeconomic status and compliance with health initiatives. However, they indicate that ultra-processed food consumption may be negatively associated with general wellbeing, and positively associated with body mass index.

These observations have subsequently been supported by randomised controlled trials and animal studies, which are significantly more robust in terms of scientific rigour. Comparison of ultra-processed food with unprocessed food using energy- and macronutrient-matched diets (i.e. diets that are similar in terms of calorie, protein, fat and carbohydrate content but that vary in their level of processing) demonstrated that energy intake was significantly increased on the ultra-processed diet, averaging an extra 508 calories per day with associated weight gain (Figure 1) [2]. Animal studies have shown that consumption of ultra-processed foods alters the microbiome, resulting in dysregulation of satiety mechanisms – the mechanisms that control how 'full' we feel – and thereby promoting increased food consumption and subsequent metabolic diseases such obesity, diabetes and colitis [10, 11]. All of these findings combine to form evidence in support of an association between ultra-processed food consumption and adverse health outcomes. Though causality remains to be established, findings like these have important implications for nutrition advice and policies, providing a robust basis for public health initiatives. As such, countries like Brazil and France have added 'avoidance of ultra-processed foods' to their nutrition guidance. However, the situation in the UK is quite different.

The NHS' response to the aforementioned studies has been to state that the evidence is 'not strong enough' to advocate against eating such products, and that some foods need to be processed in order for them to be safe for consumption [12]. Admittedly, no causal link between ultra-processed foods and disease has been established yet, and we'd still be contracting tuberculosis from milk if we didn't have some forms of processing such as pasteurisation. However, neither is the evidence so lacking that they can entirely ignore the issue. The Eatwell Guide is a document issued by Public Health England with the aim of improving the health and wellbeing of the British public through nutrition [13]. Whilst containing many good tips on nutrition for health, such as advice to limit refined sugar consumption, it fails to even mention the potential dangers of ultra-processed food. The term 'processed' is only used in the context of meat, and is not used at all to describe any other food. The guide does say to limit 'foods high in fat, salt and sugars', and states that these foods 'are not needed in the diet', but a lot of ultra-processed food does not fall into that category. In fact, the Guide actively promotes the consumption of some ultra-processed food, suggesting that an 'ideal' food diary would be cereal for breakfast, a sandwich for lunch, and an evening meal of pasta. This gives the impression that ultra-processed food is safe for consumption, and that there is no evidence to the contrary. Whilst one can say that there is insufficient evidence to establish causality, should that be a reason to completely ignore the worrying implications of the research that has been performed so far?

Another issue with the Eatwell Guide is the fact that all advice is based on macronutrients and caloric intake. It recommends daily upper limits for calories as well as limits the consumption of certain individual nutrients by weight. Whilst this reflects the reductionist view of much scientific research, it does not translate very well into the real world: not many people would eat an apple or a cucumber while knowing its exact nutritional composition. Unprocessed foods do not require a nutrition label under EU Regulations [14] so by virtue of eating unprocessed foods, one is essentially unable to follow public health nutrition guidance because quantifying nutrient intake is extremely difficult indeed. This means that people inevitably move towards buying processed food in order to find a nutrition label that allows them to count up and control for each macronutrient in order to follow nutrition guidance, thereby raising the consumption of additives such as artificial sweeteners, emulsifiers and flavourings, and displacing the consumption of nutrient-dense whole foods. I would argue that these actions will actually serve to *reduce* the nutritive benefit of our diet and therefore impact *negatively* on our health, despite following government-issued advice to the letter. This reductionist approach also permits processed food manufacturers to reformulate products to comply with guidelines, adhering to arbitrary upper limits for saturated fat and sugar in order to market products as 'healthy', despite those products being highly processed and therefore likely to be significantly worse for health than any whole food. What's more, various 'tricks of the trade' are still permitted in these products, such as the known act of intentionally altering macronutrient composition to achieve 'the bliss point'; the perfect ratio of fats, sugars and sodium that humans find irresistible, promoting both overeating and addiction [15]. In the words of Pringles, '*Once you pop, you can't stop*'.

It seems strange that there isn't a mention of the dangers of ultra-processed food in the Eatwell Guide, given the evidence (or lack thereof) for historical nutritional advice. The research that initiated the vendetta against saturated fat is the Seven Countries Study by Ancel Keys and colleagues, which stated that consumption of saturated fat was associated with the incidence of coronary artery disease [16]. However, this research was plagued with scientific errors, not least that countries and populations that did not fit the hypothesis were excluded, such as the Inuit and the Maasai who consume large amounts of saturated fat and have significantly lower rates of heart disease than populations of developed nations [17]. Further studies ensued, but the theory was still highly contested. Nevertheless, dietary advice changed. Since then, both the most comprehensive systematic review with meta-analysis, and the most up-to-date analysis of prospective trials concluded that there was no effect of consuming saturated fats on cardiovascular events nor mortality [18]. Yet Public Health England continues to advocate against the consumption of

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saturated fats. On the other hand, the accumulating evidence to suggest that the consumption of ultra-processed food is associated with poorer health outcomes is not sufficient for even a paragraph in our nutrition advice on the potential dangers of these foods. Perhaps the £28.2bn *per annum* contributed to the UK economy by the food and drink industry is complicating matters, as it is likely that no government would wish to issue guidance that deprives the economy of this investment – regardless of the potential health benefits such guidance may have [19].

Given all of this evidence, my advice to Public Health England would be to issue new guidance that *at the very least* highlights the growing evidence suggesting ultra-processed foods may be detrimental to health. Whilst my favourite advice from writer Michael Pollan – '*Don't eat anything your great-grandmother wouldn't recognise as food*' [20] – may be a little extreme, sufficient evidence has accumulated to justify warning against the consumption of such foods. Advocating for a ban on the sale of ultra-processed food would be both unreasonable and untenable, thus policy makers need to rethink their priorities, placing more emphasis on promoting the health benefits of unprocessed foods and improving their affordability and accessibility. Additional policy should be implemented to restrict marketing of ultra-processed foods and to add warnings to their packaging. Reformulation of processed foods to comply with arbitrary macronutrient limits defined by the Eatwell Guide should be discouraged. Programmes to educate children and young adults on the health benefits of whole foods as well as the potential dangers of ultra-processed foods should be included in the National Curriculum. Whilst these are just a few examples of relatively simple policies, they have the potential to alter the health of our nation for the better. Without their implementation, I fear the current epidemic of chronic metabolic disease will continue to expand, and our waistlines along with it.

References

[1] European Food Information Council, "Evolution of food processing and labelling in food production," December 2014. [Online]. Available: https://www.eufic.org/en/food-production/article/food-production-1-3-the-evolution-of-meeting-nutritional-needs-through-proc

[2] K. D. Hall, A. Ayuketah, R. Brychta, H. Cai, T. Cassimatis, K. Y. Chen, S. T. Chung, E. Costa, A. Courville, V. Darcey *et al.*, "Ultra-processed diets cause excess calorie intake and weight gain: an inpatient randomized controlled trial of ad libitum food intake," *Cell metabolism*, vol. 30, no. 1, pp. 67–77, 2019.

[3] C. A. Monteiro, G. Cannon, R. B. Levy, J.-C. Moubarac, M. L. Louzada, F. Rauber, N. Khandpur, G. Cediel, D. Neri, E. Martinez-Steele *et al.*, "Ultra-processed foods: what they are and how to identify them," *Public health nutrition*, vol. 22, no. 5, pp. 936–941, 2019.

[4] F. Rauber, M. L. da Costa Louzada, E. M. Steele, C. Millett, C. A. Monteiro, and R. B. Levy, "Ultra-processed food consumption and chronic non-communicable diseases-related dietary nutrient profile in the uk (2008–2014)," *Nutrients*, vol. 10, no. 5, p. 587, 2018.

[5] A. Conolly, S. Craig, and S. Gebert, "Health Survey for England 2018: Overweight and obesity in adults and children," *NHS Digital*, December 2019. [Online]. Available: https://files.digital.nhs.uk/52/FD7E18/HSE18-Adult-Child-Obesity-rep.pdf

[6] C. A. Monteiro, J.-C. Moubarac, R. B. Levy, D. S. Canella, M. L. da Costa Louzada, and G. Cannon, "Household availability of ultra-processed foods and obesity in nineteen European countries," *Public health nutrition*, vol. 21, no. 1, pp. 18–26, 2018.

[7] C. S. Costa, B. Del-Ponte, M. C. F. Assunção, and I. S. Santos, "Consumption of ultra-processed foods and body fat during childhood and adolescence: a systematic review," *Public health nutrition*, vol. 21, no. 1, pp. 148–159, 2018.

[8] B. Srour, L. K. Fezeu, E. Kesse-Guyot, B. Allès, C. Méjean, R. M. Andrianasolo, E. Chazelas, M. Deschasaux, S. Hercberg, P. Galan *et al.*, "Ultra-processed food intake and risk of cardiovascular disease: prospective cohort study (nutrinet-santé)," *bmj*, vol. 365, p. l1451, 2019.

[9] A. Rico-Campà, M. A. Martínez-González, I. Alvarez-Alvarez, R. de Deus Mendonça, C. de la Fuente-Arrillaga, C. Gómez-Donoso, and M. Bes-Rastrollo, "Association between consumption of ultra-processed foods and all cause mortality: Sun prospective cohort study," *bmj*, vol. 365, p. l1949, 2019.

[10] T. Sen, C. R. Cawthon, B. T. Ihde, A. Hajnal, P. M. DiLorenzo, B. Claire, and K. Czaja, "Diet-driven microbiota dysbiosis is associated with vagal remodeling and obesity," *Physiology & behavior*, vol. 173, pp. 305–317, 2017.

[11] J. Suez, T. Korem, D. Zeevi, G. Zilberman-Schapira, C. A. Thaiss, O. Maza, D. Israeli, N. Zmora, S. Gilad, A. Weinberger *et al.*, "Artificial sweeteners induce glucose intolerance by altering the gut microbiota," *Nature*, vol. 514, no. 7521, pp. 181–186, 2014.

[12] NHS Website, "Does 'ultra-processed' food cause earlier death?" May 2019. [Online]. Available: https://www.nhs.uk/news/food-and-diet/does-ultra-processed-food-cause-earlier-death/

[13] Public Health England, "The Eatwell Guide: helping you eat a healthy, balanced diet," 2018. [Online]. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/742750/Eatwell_Guide_booklet_2018v4.pdf

[14] European Parliament and Council of the European Union, "Regulation No 1169/2011," *Annex V. OJ L*, vol. 304, no. 47, 2011.

[15] M. Moss, "The extraordinary science of addictive junk food," in *Expanding Addiction: Critical Essays*, R. Granfield and C. Reinarman, Eds. Routledge, 2013.

[16] A. Keys, A. Mienotti, M. J. Karvonen, C. Aravanis, H. Blackburn, R. Buzina, B. Djordjevic, A. Dontas, F. Fidanza, M. H. Keys *et al.*, "The diet and 15-year death rate in the seven countries study," *American journal of epidemiology*, vol. 124, no. 6, pp. 903–915, 1986.

[17] G. Taubes, "What if it's all been a big fat lie?" *The New York Times Magazine*, July 2002. [Online]. Available: https://www.nytimes.com/2002/07/07/magazine/what-if-it-s-all-been-a-big-fat-lie.html

[18] Scientific Advisory Committee on Nutrition, "Saturated fats and health," 2019. [Online]. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/814995/SACN_report_on_saturated_fat_and_health.pdf

[19] Food and Drink Federation, "The food and drink industry: economic contribution and growth opportunities," 2017. [Online]. Available: https://www.fdf.org.uk/publicgeneral/FDF-GT-Exec-Summary.pdf

[20] M. Pollan, "Unhappy meals," *The New York Times Magazine*, January 2007. [Online]. Available: https://www.nytimes.com/2007/01/28/magazine/28nutritionism.t.html

About the Author

Jennie is a 2nd year British Heart Foundation PhD student at the Institute of Metabolic Science, researching the impact of non-alcoholic fatty liver disease on cardiac function. Having seen the impact of public health initiatives on quality of life in her capacity as Clinical Cardiac Scientist in the NHS, she is passionate about contributing to public policy, particularly with regard to prevention of non-communicable disease.

Conflict of interest The Author declares no conflict of interest.