Ultra-Processed Foods – evidence review 2022

In the past 12 months a torrent of new evidence has linked ultra-processed foods (UPFs) to adverse health and environmental outcomes. The evidence was already compelling. A 2020 review found 37 of 43 published papers had established a clear association between UPFs and poor health, while the first randomised control trial (RCT) in 2019 found a causal relationship with weight gain. This had prompted a policy response from national governments across the world, from Brazil to Canada to France, though not in the UK. The evidence published throughout 2022 has only accentuated the urgency of a response. There is much we are still to learn, but UK policymakers cannot afford to wait any longer.

This year we learned –

**UPFs are harmful in ways which extend beyond their nutrient profile:** Research published this year found a clear association between increased UPF consumption and: obesity; poor liver health and metabolic syndrome; adult mental health disorders such as depression; cardiovascular diseases (linked to increased sweetener intake); all cause and cardiovascular mortality; all-cause mortality, coronary heart disease and cerebrovascular disease; increased risk of COVID-19 infection; dementia; hypertension; chronic kidney disease; kidney function decline; inflammatory bowel disease; diabetes; colorectal cancer; frailty; bulimic, binge eating, and other eating disorders; and subclinical thyroid dysfunction.

Increasingly researchers are controlling for nutrients of known concern. “Consistent across many studies, adjustment for fat, sugar and sodium intake, or adjustment for adherence to a range of healthy or unhealthy dietary patterns has a minimal impact on the adverse associations between UPF intake and a diverse range of health-related outcomes. These findings strongly point towards aspects of ultra-processing as being important factors that impact health, and question the ability to conclude that the adverse outcomes from UPFs can be solely attributed to their nutritional quality.” The evidence increasingly suggests “that nutritional quality and ultra-processing should be considered as two correlated but distinct and complementary dimensions of the diet. Policy responses must therefore address both nutritional quality and ultra-processing within diets.

**Children and infants are of particular concern:** A growing body of evidence suggests that UPFs are of heightened concern for infants and children, with plausible effects tracking from pre-conception to birth and beyond. Research published this year showed that: UPF consumption during gestation can lead to increased oxidative stress and affect pregnancy outcomes; can contribute to smaller embryonic growth; with UPF consumption during the 3rd trimester of pregnancy associated with reduced child ability to process verbal stimuli and verbally express thoughts at 4-5 years of age. High UPF consumption by mothers during the child-rearing period was also associated with a higher risk of overweight or obesity in offspring, with maternal UPF consumption ‘tracking through’ to the infant’s diet.

Furthermore, population-based birth cohort studies have shown that increased UPF consumption among infants is associated with increased BMI and lower length/height-for-age scores from 2 to 4 years of age, and increased risk of dental caries. The UK has the third-highest volume of UPF sales across 80 countries globally, accounting for over 60% of food intake (a figure which has risen notably over the past five years), and British children have the highest UPF consumption in Europe, with school meals and packed lunches contributing to this intake. Research published this year has found a graded inverse association between %kcal from UPFs and cardiovascular health score among
children and adolescents\textsuperscript{xxxii}; with researchers also warning that “UPF consumption among British children is associated with perturbation of multiple metabolic traits.”\textsuperscript{xxxiii}

**Multiple biological mechanisms may be in play:** While UPFs are clearly associated with poor health, the mechanisms which underpin the association are still being investigated. Research published this year suggests that multiple social and biological mechanisms might be at play, with studies probing the role of the microbiome and appetite pathways in the brain and the interplay between the gut-brain axis and canonical reward systems\textsuperscript{xxxiv}, with UPFs shown to impact on serotonergic and dopaminergic neurotransmission, brain integrity and function\textsuperscript{xxxv}. Research published this year has also suggested that UPFs deliver calories more rapidly\textsuperscript{xxxvi}; and that the reduction of bioaccessibility of dietary protein linked to processing techniques characteristic of UPFs might adversely affect digestion\textsuperscript{xxxvii}. RCTs on the effects of non-nutritive sweeteners in humans have found that sweeteners commonly present in UPFs can impair glycemic response in healthy adults\textsuperscript{xxxviii}.

There’s clearly a lot going on, and the drivers of poor health appear to extend beyond the human metabolism into society. One scientist says: “We conclude that [UPF] appeal is a multi-dimensional construct generated through the interplay of the products themselves, the people consuming them, and the practices of the corporations that manufacture, market, and distribute them\textsuperscript{xxxix}. This suggests that policy responses should be multifaceted, extending cohesively across diets and society.

**UPFs are an environmental issue:** The first conceptual framework for the environmental impacts of UPFs was published this year\textsuperscript{xli}. An associated review found UPFs to be responsible for significant dietary environmental impacts, including for between 17 and 39% of total diet-related energy use, 36–45% of total diet-related biodiversity loss, up to one-third of total diet-related greenhouse gas emissions, land use and food waste and up to one-quarter of total diet-related water-use among adults in a range of high-income countries. A Brazilian study looking at the period 1987 to 2018 similarly found a massively increased environmental footprint associated with UPFs, with GHG emissions from UPFs increasing by 245% across the period\textsuperscript{xlii}. Researchers this year also called for biodiversity losses linked to UPF production and consumption to receive greater attention.\textsuperscript{xlii}

**The policy debate is becoming more nuanced:** Should policymakers advise the elimination of UPFs or their reduction? Should these foods come with warning labels?\textsuperscript{xliii} Do individual products drive poor health outcomes, or should policies (and the academic debate) be framed around the overall pattern of the diet? Scholars have discussed these questions across the year, seeking to ameliorate the polarity and tension which has characterised the UPF debate to date\textsuperscript{xliv}.

While there is much that we are still to learn, a growing consensus is emerging that the dietary and health impacts of UPFs need to be understood across nutri-biochemical, food and dietary pattern levels, with each level revealing distinct dimensions and characteristics that can inform our scientific analysis and policy responses\textsuperscript{xlv}. The epidemiological evidence overwhelmingly suggests that there is more going on than traditional nutrient profiling models alone explain. This is not to say nutrient profiling models are incorrect, only the science pertaining to UPFs should be considered in tandem. This suggests that policy responses should seek to address both the nutritional quality of foods and ultra-processing within diets, and ultimately oriented towards re-balancing diets away from UPFs towards a diverse range of fresh and minimally processed whole foods.
Annex A: A summary of papers published on ultra-processed foods and their associated impacts between 1st November 2021 and 31st October 2022


Trends in food consumption according to the degree of food processing among the UK population over 11 years. Madruga et al. Published 19th October 2022 in British Journal of Nutrition. https://doi.org/10.1017/S0007114522003361


Association between Ultra-Processed Food Consumption and Diabetes in Chinese Adults—Results from the China Health and Nutrition Survey. Li and Shi. Published 7th October 2022 in Nutrients. https://doi.org/10.3390/nu14204241

Does Consumption of Ultra-Processed Foods Matter for Liver Health? Prospective Analysis among Older Adults with Metabolic Syndrome. Konieczna et al. Published 5th October 2022 in Nutrients. https://doi.org/10.3390/nu14194142

Maternal consumption of ultra-processed foods and subsequent risk of offspring overweight or obesity: results from three prospective cohort studies. Wang et al. Published 5th October 2022 in TheBMJ. https://doi.org/10.1136/bmj-2022-071767


From ultra-processed foods to ultra-processed dietary patterns. Scrinis and Monteiro. Published 15th September 2022 in Nature Food. https://doi.org/10.1038/s43016-022-00599-4


Consumption of ultra-processed foods and growth outcomes in early childhood: 2015 Pelotas Birth Cohort. Dos Santos Costa et al. Published 12th September 2022 in British Journal of Nutrition. 10.1017/S0007114522002926


Effectiveness of a minimally processed food-based nutritional counselling intervention on weight gain in overweight pregnant women: a randomized controlled trial. Saes Sartorelli et al. Published 10th September 2022 in European Journal of Nutrition. https://doi.org/10.1007/s00394-022-02995-9


Potential reductions in ultra-processed food consumption substantially improve population cardiometabolic-related dietary nutrient profiles in eight countries. Martinez Steele et al. Published 3rd September 2022 in Nutrition, Metabolism & Cardiovascular Diseases. https://doi.org/10.1016/j.numecd.2022.08.018


Association of ultra-processed food consumption with colorectal cancer risk among men and women: results from three prospective US cohort studies. Wang et al. Published 31st August 2022 in TheBMJ. https://doi.org/10.1136/bmj-2021-068921


Ultra-processed food: a global problem requiring a global solution. Dicken and Batterham. Published 26th August 2022 in The Lancet. https://doi.org/10.1016/S2213-8587(22)00248-0


Cross-sectional examination of ultra-processed food consumption and adverse mental health symptoms. Hecht et al. Published 28th July 2022 in Public Health Nutrition. https://doi.org/10.1017/S1368980022001586

Gender and socio-economic stratification of ultra-processed and deep-fried food consumption among rural adolescents: A cross-sectional study from Bangladesh. Islam et al. Published 28th July 2022 in Plos One. https://doi.org/10.1371/journal.pone.0272275

Association of Ultraprocessed Food Consumption With Risk of Dementia: A Prospective Cohort Study. Li et al. Published 27th July 2022 in Neurology. https://doi.org/10.1212/WNL.00000000000200871


The Fecal Metabolome Links Diet Composition, Foacidic positive ion conditions, chromatographicallyyoD Processing, and the Gut Microbiota to Gastrointestinal Health in a Randomized Trial of Adults Consuming a Processed Diet. Karl et al. Published 26th July 2022 in The Journal of Nutrition. https://doi.org/10.1093/jn/nxac161


The Ultra-Processed Food Content of School Meals and Packed Lunches in the United Kingdom. Parnham et al. Published 20th July 2022 in Nutrients. https://doi.org/10.3390/nu14142961


Ultra-Processed Food Consumption and Mental Health: A Systematic Review and Meta-Analysis of Observational Studies. Lane et al. Published 21st June 2022 in Nutrients. https://doi.org/10.3390/nu14132568

Prospective association between ultra-processed food consumption and incidence of elevated symptoms of common mental disorders. Werneck et al. Published 9th June 2022 in Journal of Affective Disorders. https://doi.org/10.1016/j.jad.2022.06.007


Association Between Ultraprocessed Food Consumption and Risk of Incident CKD: A Prospective Cohort Study. Du et al. Published 6th June 2022 in American Journal of Kidney Diseases. https://doi.org/10.1053/j.ajkd.2022.03.016


The impact of nutritional warnings on the mental associations raised by advertisements featuring ultra-processed food products. Pérez et al. Published 30th May 2022 in Food Quality and Preference. https://doi.org/10.1016/j.foodqual.2022.104648


Efforts in adopting the ultra-processed food and soft drinks labeling legislation in a COVID-19 environment: The cases of Colombia and Mexico. Mayett-Moreno and Sabogal-Salamanca. Published 20th May 2022 in Business and Society Review. https://doi.org/10.1111/basr.12272


Clinical Considerations of Ultra-processed Food Addiction Across Weight Classes: an Eating Disorder Treatment and Care Perspective. Wiss. Published 2nd May 2022 in Food Addiction. 
https://doi.org/10.1007/s40429-022-00411-0

https://doi.org/10.1093/ajcn/nqac053

The regulation of ultra-processed food products: the challenge of ruling the market. De Almeida Figueiredo and Recine. Published 22nd April 2022 in Cadernos de Saúde Pública. 
https://doi.org/10.1590/0102-311X00207220

Ultra-Processed Food Availability and Sociodemographic Associated Factors in a Brazilian Municipality. Serafim et al. Published 20th April 2022 in Frontiers in Nutrition. 
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https://doi.org/10.1093/jn(nxac082)

https://doi.org/10.1556/2006.2022.00009

https://doi.org/10.1093/ajcn/nqac073

Ultra-processed foods should be central to global food systems dialogue and action on biodiversity. Marrocos Leite et al. Published 28th March 2022 in BMJ Global Health. 
https://gh.bmj.com/content/7/3/e008269


https://doi.org/10.1039/D1FO003279H

Consumption of Ultra-Processed Food and Cognitive Decline among Older Adults With Type-2 Diabetes. Weinstein et al. Published 19th March 2022 in The Journals of Gerontology. 
https://doi.org/10.1093/gerona/glac070

Associations Between Ultra-Processed Food Consumption and BMI, Sedentary Time, and Adverse Dietary Habits in Active Young Adults. Capra et al. Published 18th March 2022 in Journal of Exercise and Nutrition. https://doi.org/10.53520/jen2022.103121

https://doi.org/10.1093/ajcn/nqac068

Ultra-processed foods consumption reduces dietary diversity and micronutrient intake in the Mexican population. Marrón-Ponce et al. Published 12th March 2022 in Journal of Human Nutrition and Dietetics. https://doi.org/10.1111/jhn.13003

Ultra-processed foods and cancer risk: from global food systems to individual exposures and mechanisms. Kliemann et al. Published 2nd March 2022 in British Journal of Cancer. https://doi.org/10.1038/s41416-022-01749-y


Impact of nutrient warning labels on choice of ultra-processed food and drinks high in sugar, sodium, and saturated fat in Colombia: A randomized controlled trial. Mora-Plazas et al. Published 10th February 2022 in Plos One. https://doi.org/10.1371/journal.pone.0263324

The association between ultra-processed food consumption and obesity in the ZOE PREDICT 1 cohort in the United Kingdom. Lee et al. Published 8th February 2022 in Proceedings of the Nutrition Society. https://doi.org/10.1017/S0029665122000052


Dissecting ultra-processed foods and drinks: Do they have a potential to impact the brain? Contreras-Rodriguez et al. Published 2nd February 2022 in Reviews in Endocrine and Metabolic Disorders. https://doi.org/10.1007/s11154-022-09711-2


Chronic diseases are first associated with the degradation and artificialization of food matrices rather than with food composition: calorie quality matters more than calorie quantity. Fardet & Rock. Published 24th January 2022 in European Journal of Nutrition. https://doi.org/10.1007/s00394-021-02786-8

Ultra-processed food and incident type 2 diabetes: studying the underlying consumption patterns to unravel the health effects of this heterogeneous food category in the prospective Lifelines cohort. Duan et al. Published 13th January 2022 in BMC Medicine. https://doi.org/10.1186/s12916-021-02200-4

The UnProcessed Pantry Project (UP3): A Community-Based Intervention Aimed to Reduce Ultra-Processed Food Intake Among Food Pantry Clients. Shanks et al. Published 1st January 2022 in Family and Community Health. 10.1097/FCH.0000000000000310


The Role of Diet Quality in Mediating the Association between Ultra-Processed Food Intake, Obesity and Health-Related Outcomes: A Review of Prospective Cohort Studies. Dicken and Batterham. Published 22nd December 2021 in Nutrients. https://doi.org/10.3390/nu14010023


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