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[i], while the first randomised control trial (RCT) in 2019 found a causal relationship with weight gain.[ii] 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[iii]; poor liver health and metabolic syndrome[iv]; adult mental health disorders such as depression[v]; cardiovascular diseases (linked to increased sweetener intake)[vi]; all cause and cardiovascular mortality[vii]; all-cause mortality, coronary heart disease and cerebrovascular disease[viii]; increased risk of COVID-19 infection[ix]; dementia[x]; hypertension[xi]; chronic kidney disease[xii]; kidney function decline[xiii]; inflammatory bowel disease[xiv]; diabetes[xv]; colorectal cancer[xvi]; frailty[xvii]; bulimic, binge eating, and other eating disorders[xviii]; and subclinical thyroid dysfunction[xix].

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."[xx] The evidence increasingly suggests "that nutritional quality and ultra-processing should be considered as two correlated but distinct and complementary dimensions of the diet[xxi]. 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;[xxii] can contribute to smaller embryonic growth[xxiii]; 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.[xxiv] High UPF consumption by mothers during the child-rearing period was also associated with a higher risk of overweight or obesity in offspring[xxv]; with maternal UPF consumption 'tracking through' to the infant's diet[xxvi].

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;[xxvii] and increased risk of dental caries[xxviii]. The UK has the third-highest volume of UPF sales across 80 countries globally,[xxix] accounting for over 60% of food intake (a figure which has risen notably over the past five years)[xxx], and British children have the highest UPF consumption in Europe, with school meals and packed lunches contributing to this intake.[xxxi] Research published this year has found a graded inverse association between %kcal from UPFs and cardiovascular health score among

children and adolescents[xxxii]; with researchers also warning that "UPF consumption among British children is associated with perturbation of multiple metabolic traits."[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[xxxiv], with UPFs shown to impact on serotonergic and dopaminergic neurotransmission, brain integrity and function[xxxv]. Research published this year has also suggested that UPFs deliver calories more rapidly[xxxvi]; and that the reduction of bioaccessibility of dietary protein linked to processing techniques characteristic of UPFs might adversely affect digestion[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[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"[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[xl]. 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[xli]. Researchers this year also called for biodiversity losses linked to UPF production and consumption to receive greater attention.[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?[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[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[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

Intake of ultra-processed foods is associated with an increased risk of Crohn's disease: a cross-sectional and prospective analysis of 187,154 participants in the UK Biobank. Chen *et al.* Published 28th October 2022 in Journal of Crohn's and Colitis. https://doi.org/10.1093/ecco-jcc/jjac167

Ultra-processed foods and the development of obesity in adults. Harb *et al.* Published 24th October 2022 in European Journal of Clinical Nutrition. https://doi.org/10.1038/s41430-022-01225-z

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

Does the concept of "ultra-processed foods" help inform dietary guidelines, beyond conventional classification systems? Debate consensus. Astrup and Monteiro. Published 17th October 2022 in The American Journal of Clinical Nutrition. https://doi.org/10.1093/ajcn/nqac230

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

Greater Ultra-Processed Food Intake during Pregnancy and Postpartum Is Associated with Multiple Aspects of Lower Diet Quality. Nansel *et al.* Published 22nd September 2022 in Nutrients. https://doi.org/10.3390/nu14193933

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

Metabolic profiles of ultra-processed food consumption and their role in obesity risk in British children. Handakas *et al.* Published 14th September 2022 in Clinical Nutrition. https://doi.org/10.1016/j.clnu.2022.09.002

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

The association of ultra-processed food consumption with adult mental health disorders: a systematic review and dose-response meta-analysis of 260,385 participants. Mazloomi *et al.* Published 12th September 2022 in Nutritional Neuroscience. https://doi.org/10.1080/1028415X.2022.2110188

Periodontitis Is Associated with Consumption of Processed and Ultra-Processed Foods: Findings from a Population-Based Study. Cassiano *et al.* Published 10th September 2022 in Nutrients. https://doi.org/10.3390/nu14183735

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

OP12 Social inequalities in ultra-processed food intakes in the United Kingdom: A time trend analysis (2008–2018). Colombet *et al.* Published 7th September 2022 in Journal of Epidemiology & Community Health. http://dx.doi.org/10.1136/jech-2022-SSMabstracts.12

Ultra-processed Foods and Cardiometabolic Health Outcomes: from Evidence to Practice. Juul *et al.* Published 7th September 2022 in Current Atherosclerosis Reports. https://doi.org/10.1007/s11883-022-01061-3

Artificial sweeteners and risk of cardiovascular diseases: results from the prospective NutriNet-Santé cohort. Debras *et al.* Published 7th September 2022 in TheBMJ. https://doi.org/10.1136/bmj-2022-071204

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

Personalized microbiome-driven effects of non-nutritive sweeteners on human glucose tolerance. Suez *et al.* Published 1st September 2022 in Cell. https://doi.org/10.1016/j.cell.2022.07.016

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

Joint association of food nutritional profile by Nutri-Score front-of-pack label and ultra-processed food intake with mortality: Moli-sani prospective cohort study. Bonaccio *et al.* Published 31st August 2022 in TheBMJ. https://doi.org/10.1136/bmj-2022-070688

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

Associations of ultra-processed food consumption with cardiovascular disease and all-cause mortality: UK Biobank. Chen *et al.* Published 25th August 2022 in European Journal of Public Health. https://doi.org/10.1093/eurpub/ckac104

The association between maternal ultra-processed food consumption during pregnancy and child neuropsychological development: A population-based birth cohort study. Puig-Vallverdú *et al.* Published 19th August 2022 in Clinical Nutrition. https://doi.org/10.1016/j.clnu.2022.08.005

Impact of ultra-processed food intake on the risk of COVID-19: a prospective cohort study. Zhou *et al.* Published 16th August 2022 in European Journal of Nutrition. https://doi.org/10.1007/s00394-022-02982-0

The impact of caloric availability on eating behavior and ultra-processed food reward. Kelly *et al.* Published 10th August 2022 in Appetite. https://doi.org/10.1016/j.appet.2022.106274

Ultra-processed foods and human health: from epidemiological evidence to mechanistic insights. Srour *et al.* Published 8th August 2022 in The Lancet Gastroenterology & Hepatology. https://doi.org/10.1016/S2468-1253(22)00169-8

Maternal and child characteristics correlated with frequency of consuming ultra-processed food by children aged 6 to 24 months old. Martins Soares *et al.* Published 5th August 2022 in Revista Brasileira de Saúde Materno Infantil. https://doi.org/10.1590/1806-9304202200020010

Respective contribution of ultra-processing and nutritional quality of foods to the overall diet quality: results from the NutriNet-Santé study. Chantal *et al.* Published 4th August 2022 in European Journal of Nutrition. https://doi.org/10.1007/s00394-022-02970-4

The battle against ultra-processed food consumption in a post-COVID-19 era. Wiles. Published 1st August 2022 in South African Journal of Clinical Nutrition. https://doi.org/10.1080/16070658.2022.2105492

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.0000000000200871

Ultra-processed food consumption and dental caries in children and adolescents: a systematic review and meta-analysis. Morales Cascaes *et al.* Published 27th July 2022 in British Journal of Nutrition. https://doi.org/10.1017/S0007114522002409

The Fecal Metabolome Links Diet Composition, Foacidic positive ion conditions, chromatographicallyod 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

Ultra-Processed Food Consumption during Pregnancy and Its Association with Maternal Oxidative Stress Markers. Rodríguez-Cano *et al.* Published 21st July 2022 in Antioxidants. https://doi.org/10.3390/antiox11071415

A conceptual framework for understanding the environmental impacts of ultra-processed foods and implications for sustainable food systems. Anastasiou *et al.* Published 21st July 2022 in Journal of Cleaner Production. https://doi.org/10.1016/j.jclepro.2022.133155

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

Association between Ultra-Processed Food Consumption and Frailty in American Elder People: Evidence from a Cross-Sectional Study. Hao *et al.* Published 6th July 2022 in The journal of nutrition, health & aging. https://doi.org/10.1007/s12603-022-1824-6

Ultra-Processed Foods Consumption Increases the Risk of Hypertension in Adults: A Systematic Review and Meta-Analysis. Wang *et al.* Published 24th June 2022 in American Journal of Hypertension. https://doi.org/10.1093/ajh/hpac069

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

A high periconceptional maternal ultra-processed food consumption impairs embryonic growth: The Rotterdam periconceptional cohort. Smit *et al.* Published 8th June 2022 in Clinical Nutrition. https://doi.org/10.1016/j.clnu.2022.06.006

Ultra-processed food intake and animal-based food intake and mortality in the Adventist Health Study-2. Orlich *et al.* Published 7th June 2022 in The American Journal of Clinical Nutrition. https://doi.org/10.1093/ajcn/nqac043

Relationship between Ultra-Processed Food Consumption and Risk of Diabetes Mellitus: A Mini-Review. Almarshad *et al.* Published 7th June 2022 in Nutrients. https://doi.org/10.3390/nu14122366

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

Contribution of ultra-processed food to the nutritional dietary profile of young children school feeding. Retondario *et al.* Published 3rd June 2022 in Revista de Nutrição. https://doi.org/10.1590/1678-9865202235e210106

Assessment of the Commitments and Performance of the European Food Industry to Improve Population Nutrition. Van Dam *et al.* Published 1st June 2022 in International Journal of Public Health. https://doi.org/10.3389/ijph.2022.1604116

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

Individual and family predictors of ultra-processed food consumption in Spanish children: The SENDO project. García-Blanco *et al.* Published 27th May 2022 in Public Health Nutrition. https://doi.org/10.1017/S136898002200132X

Associations of ultra-processed food intake with maternal weight change and cardiometabolic health and infant growth. Cummings *et al.* Published 26th May 2022 in International Journal of Behavioral Nutrition and Physical Activity. https://doi.org/10.1186/s12966-022-01298-w

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

Impacts of Consumption of Ultra-Processed Foods on the Maternal-Child Health: A Systematic Review. Gomes de Oliveira *et al.* Published 13th May 2022 in Frontiers in Nutrition. https://doi.org/10.3389/fnut.2022.821657

Score of ultra-processed food consumption and its association with sociodemographic factors in the Brazilian National Health Survey, 2019. Dos Santos Costa *et al.* Published 6th May 2022 in Cadernos de Saúde Pública. doi: 10.1590/0102-311X00119421

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

Ultra-processed foods and risk of all-cause mortality in renal transplant recipients. Osté *et al.* Published 26th April 2022 in The American Journal of Clinical Nutrition. 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. https://doi.org/10.3389/fnut.2022.858089

Acculturation and Associations with Ultra-processed Food Consumption among Asian Americans: NHANES, 2011–2018. Pachipala *et al*. Published 7th April 2022 in The Journal of Nutrition. https://doi.org/10.1093/jn/nxac082

Ultra-processed food intake and eating disorders: Cross-sectional associations among French adults. Figueiredo *et al.* Published 4th April 2022 in Journal of Behavioral Addictions. https://doi.org/10.1556/2006.2022.00009

Ultraprocessed food consumption and kidney function decline in a population-based cohort in the Netherlands. Cai *et al.* Published 28th March 2022 in The American Journal of Clinical Nutrition. 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

Public Health Response to the SARS-CoV-2 Pandemic: Concern about Ultra-Processed Food Consumption. De Nucci *et al.* Published 25th March 2022 in Foods. https://www.mdpi.com/2304-8158/11/7/950

Ultra-processed food consumption and the risk of subclinical thyroid dysfunction: a prospective cohort study. Zhang *et al.* Published 21st March 2022 in Food & Function. https://doi.org/10.1039/D1FO03279H

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

Texture-based differences in eating rate influence energy intake for minimally processed and ultra-processed meals. Teo *et al.* Published 14th March 2022 in The American Journal of Clinical Nutrition. https://doi.org/10.1093/ajcn/nqac068

The Effects of Price, Income, and Household Characteristics on Ultra-Processed Food Consumption In Jakarta, Indonesia. Syatira and Ekaria. Published 13th March 2022 in Journal of Statistical Application and Computational Statistics. https://doi.org/10.34123/jurnalasks.v14i1.386

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

Association Between Ultra-Processed Food Intake and All-Cause Mortality: A Systematic Review and Meta-Analysis. Taneri *et al*. Published 1st March 2022 in American Journal of Epidemiology. https://doi.org/10.1093/aje/kwac039

Food insecurity and ultra-processed food consumption: the modifying role of participation in the Supplemental Nutrition Assistance Program (SNAP) Leung *et al.* Published 24th February 2022 in The American Journal of Clinical Nutrition. https://doi.org/10.1093/ajcn/nqac049

Ultra-processed food intake and diet carbon and water footprints: a national study in Brazil. Fellegger Garzillo *et al.* Published 18th February 2022 in Revista de Saúde Pública. https://doi.org/10.11606/s1518-8787.2022056004551

Representations of Ultra-Processed Foods: A Global Analysis of How Dietary Guidelines Refer to Levels of Food Processing. Koios *et al.* Published 16th February 2022 in International Journal of Health Policy and Management. 10.34172/IJHPM.2022.6443

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

Ultra-processed food consumption and NCD-related dietary nutrient profile in a national sample of French children and adolescents. Calixto Andrade *et al.* Published 4th February 2022 in Journal of Public Health. https://doi.org/10.1007/s10389-022-01693-4

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

Relationship Between Ultraprocessed Food Intake and Cardiovascular Health Among U.S. Adolescents: Results From the National Health and Nutrition Examination Survey 2007–2018. Zhang *et al.* Published 1st February 2022 in Journal of Adolescent Health. https://doi.org/10.1016/j.jadohealth.2021.09.031

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

The Relationship between Corner Stores and the Ultra-processed Food and Beverage Industry in Guatemala: Stocking, Advertising, and Trust. Chew *et al.* Published 18th January 2022 in Journal of Hunger & Environmental Nutrition. https://doi.org/10.1080/19320248.2021.2002748

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 EASL–Lancet Liver Commission: protecting the next generation of Europeans against liver disease complications and premature mortality. Karlsen *et al.* Published 1st January 2022 in The Lancet. https://doi.org/10.1016/S0140-6736(21)01701-3

What Makes Ultra-Processed Food Appealing? A critical scan and conceptual model. Vignola *et al.* Published 31st December 2021 in World Nutrition. https://doi.org/10.26596/wn.202112483-135

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

'Warning: ultra-processed' — A call for warnings on foods that aren't really foods. Cotter *et al.* Published 21st December2021 in BMJ Global Health. http://dx.doi.org/10.1136/bmjgh-2021-007240

Ultra-processed food and risk of type 2 diabetes: a systematic review and meta-analysis of longitudinal studies. Mendes Delpino *et al.* Published 14th December 2021 in International Journal of Epidemiology. https://doi.org/10.1093/ije/dyab247

Ultraprocessed food consumption and dietary nutrient profiles associated with obesity: A multicountry study of children and adolescents. Neri *et al.* Published 9th December 2021 in Obesity Reviews. https://doi.org/10.1111/obr.13387

Portion Sizes of Ultra-Processed Foods in the United States, 2002 to 2021. Young and Nestle. Published 8th December 2021 in American Journal of Public Health. https://doi.org/10.2105/AJPH.2021.306513

Ultra-processed food consumption in adults across Europe. Mertens *et al.* Published 3rd December 2021 in European Journal of Nutrition. https://doi.org/10.1007/s00394-021-02733-7

Ultra-processed food intake and all-cause and cause-specific mortality in individuals with cardiovascular disease: the Moli-sani Study. Bonaccio *et al.* Published 30th November 2021 in European Heart Journal. https://doi.org/10.1093/eurheartj/ehab783

Level of understanding and consumption of ultra-processed food in a Mediterranean population: A cross-sectional study. Pedro-Botet *et al.* Published 23rd November 2021 in Nutrition, Metabolism and Cardiovascular Diseases. https://doi.org/10.1016/j.numecd.2021.11.002

Food Processing and Phthalate Exposure: The Nutrition and Health Survey in Taiwan (1993–1996 and 2005–2008). Huang *et al.* Published 17th November 2021 in Frontiers in Nutrition. https://doi.org/10.3389/fnut.2021.766992

Ultra-processed food intake is associated with grip strength decline in middle-aged and older adults: a prospective analysis of the TCLSIH study. Zhang *et al.* Published 17th November 2021 in European Journal of Nutrition. https://doi.org/10.1007/s00394-021-02737-3

Greenhouse gas emissions, water footprint, and ecological footprint of food purchases according to their degree of processing in Brazilian metropolitan areas: a time-series study from 1987 to 2018. Tereza da Silva *et al.* Published 10th November 2021 in The Lancet Planetary Health. https://doi.org/10.1016/S2542-5196(21)00254-0

Consumption of Ultraprocessed Foods and Diet Quality Among U.S. Children and Adults. Liu *et al.* Published 6th November 2021 in American Journal of Preventive Medicine. https://doi.org/10.1016/j.amepre.2021.08.014

Consumption of Ultra-Processed Food and Blood Pressure in Korean Adults. Young Shim *et al.* Published 1st November 2021 in Korean Circulation Journal. https://doi.org/10.4070/kcj.2021.0228

---

[i] Elizabeth, L., *et al.* (2020). Ultra-Processed Foods and Health Outcomes: A Narrative Review. Nutrients, 12(7), 1955. https://doi.org/10.3390/nu12071955

[ii] Hall, K.D., *et al.* (2019). Ultra-Processed Diets Cause Excess Calorie Intake and Weight Gain: An Inpatient Randomized Controlled Trial of Ad Libitum Food Intake. Cell Metabolism, 30(1), 67-77.e3. https://doi.org/10.1016/j.cmet.2019.05.008

[iii] Harb, A.A. *et al.* (2022). Ultra-processed foods and the development of obesity in adults. European Journal of Clinical Nutrition 2022. DOI: 10.1038/s41430-022-01225-z

[iv] Konieczna, J. *et al.* (2022). Does Consumption of Ultra-Processed Foods Matter for Liver Health? Prospective Analysis among Older Adults with Metabolic Syndrome. Nutrients 2022, 14(19), 4142. https://doi.org/10.3390/nu14194142

[v] Mazloomi, S.N. *et al.* (2022). The association of ultra-processed food consumption with adult mental health disorders: a systematic review and dose-response meta-analysis of 260,385 participants. Nutritional Neuroscience. https://doi.org/10.1080/1028415X.2022.2110188

[vi] Debras, C. *et al.* (2022). Artificial sweeteners and risk of cardiovascular diseases: results from the prospective NutriNet-Santé cohort. BMJ 2022; 378. https://doi.org/10.1136/bmj-2022-071204

[vii] Bonaccio, M. *et al.* (2022). Joint association of food nutritional profile by Nutri-Score front-of-pack label and ultra-processed food intake with mortality: Moli-sani prospective cohort study. BMJ 2022; 378. https://doi.org/10.1136/bmj-2022-070688

[viii] Chen, X. *et al.* (2022). Associations of ultra-processed food consumption with cardiovascular disease and all-cause mortality: UK Biobank. European Journal of Public Health, Volume 32, Issue 5, October 2022, Pages 779–785. https://doi.org/10.1093/eurpub/ckac104

[ix] Zhou, L. *et al*. (2022) Impact of ultra-processed food intake on the risk of COVID-19: a prospective cohort study. European Journal of Nutrition (2022). https://doi.org/10.1007/s00394-022-02982-0

[x] Li, H. *et al.* (2022). Association of Ultraprocessed Food Consumption With Risk of Dementia: A Prospective Cohort. Neurology. 2022 Jul 27. DOI: 10.1212/WNL.0000000000200871

[xi] Wang, M. *et al.* (2022). Ultra-Processed Foods Consumption Increases the Risk of Hypertension in Adults: A Systematic Review and Meta-Analysis. American Journal of Hypertension, Volume 35, Issue 10, October 2022, Pages 892–901. https://doi.org/10.1093/ajh/hpac069

[xii] Du, S. *et al*. (2022). Association Between Ultraprocessed Food Consumption and Risk of Incident CKD: A Prospective Cohort Study. American Journal of Kidney Diseases, Volume 80, Issue 5, November 2022, Pages 589-598.e1. https://doi.org/10.1053/j.ajkd.2022.03.016

[xiii] Cai, Q *et al*. (2022) Ultraprocessed food consumption and kidney function decline in a population-based cohort in the Netherlands. The American Journal of Clinical Nutrition, Volume 116, Issue 1, July 2022, Pages 263–273. https://doi.org/10.1093/ajcn/nqac073

[xiv] Chen, J. *et al*. (2022). Intake of ultra-processed foods is associated with an increased risk of Crohn's disease: a cross-sectional and prospective analysis of 187,154 participants in the UK Biobank. Journal of Crohn's and Colitis, 2022;, jjac167. https://doi.org/10.1093/ecco-jcc/jjac167

[xv] Li, M. & Shi, Z (2022). Association between Ultra-Processed Food Consumption and Diabetes in Chinese Adults—Results from the China Health and Nutrition Survey. Nutrients 2022, 14(20), 4241. https://doi.org/10.3390/nu14204241

[xvi] Wang, L. *et al*. (2022) Association of ultra-processed food consumption with colorectal cancer risk among men and women: results from three prospective US cohort studies. BMJ 2022; 378. https://doi.org/10.1136/bmj-2021-068921

[xvii] Hao, J. *et al*. (2022). Association between Ultra-Processed Food Consumption and Frailty in American Elder People: Evidence from a Cross-Sectional Study. Journal of Nutrition, Health & Aging 26, 688–697 (2022). https://doi.org/10.1007/s12603-022-1824-6

[xviii] Figueiredo, N. *et al.* (2022). Ultra-processed food intake and eating disorders: Cross-sectional associations among French adults. Journal of Behavioral Addictions. Volume 11: Issue 2. https://doi.org/10.1556/2006.2022.00009.

[xix] Zhang, J. *et al*. (2022). Ultra-processed food consumption and the risk of subclinical thyroid dysfunction: a prospective cohort study. Food & Function. Issue 6, 2022. https://doi.org/10.1039/D1FO03279H.

[xx] Dicken, S.J. & Batterham, R.L. (2021). 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. Nutrients 2022, 14(1), 23. https://doi.org/10.3390/nu14010023

[xxi] Chantal, J. *et al*. (2022). Respective contribution of ultra-processing and nutritional quality of foods to the overall diet quality: results from the NutriNet-Santé study. European Journal of Nutrition (2022). https://doi.org/10.1007/s00394-022-02970-4

[xxii] Rodríguez-Cano, A.M. *et al.* (2022). Ultra-Processed Food Consumption during Pregnancy and Its Association with Maternal Oxidative Stress Markers. Antioxidants 2022, 11(7), 1415. https://doi.org/10.3390/antiox11071415.

[xxiii] Smit, A.J.P. *et al*. (2022). A high periconceptional maternal ultra-processed food consumption impairs embryonic growth: The Rotterdam periconceptional cohort. Clinical Nutrition, Volume 41, Issue 8, p1667-1675. https://doi.org/10.1016/j.clnu.2022.06.006

[xxiv] Puig-Vallverdú, J. *et al.* (2022). The association between maternal ultra-processed food consumption during pregnancy and child neuropsychological development: A population-based birth cohort study. Clinical Nutrition, 41(10):2275-2283. doi: 10.1016/j.clnu.2022.08.005.

[xxv] Wang, Y. *et al.* (2022). Maternal consumption of ultra-processed foods and subsequent risk of offspring overweight or obesity: results from three prospective cohort studies. BMJ 2022; 379. https://doi.org/10.1136/bmj-2022-071767

[xxvi] Martins Soares, M. *et al.* (2022). Maternal and child characteristics correlated with frequency of consuming ultra-processed food by children aged 6 to 24 months old. Revista Brasileira de Saúde Materno Infantil, 22 (2) Apr-Jun 2022. https://doi.org/10.1590/1806-9304202200020010

[xxvii] Dos Santos Costa, C. *et al*. (2022). Consumption of ultra-processed foods and growth outcomes in early childhood: 2015 Pelotas Birth Cohort. British Journal of Nutrition. 2022 Sep 12;1-8. doi: 10.1017/S0007114522002926.

[xxviii] Morales Cascaes, A. *et al.* (2022). Ultra-processed food consumption and dental caries in children and adolescents: a systematic review and meta-analysis. British Journal of Nutrition, 1-10. doi:10.1017/S0007114522002409.

[xxix] Madruga, M. *et al.* (2022). Trends in food consumption according to the degree of food processing among the UK population over 11 years. British Journal of Nutrition, 1-8. doi:10.1017/S0007114522003361.

[xxx] Colombet, Z *et al.* (2022). OP12 Social inequalities in ultra-processed food intakes in the United Kingdom: A time trend analysis (2008–2018). Journal of Epidemiological & Community Health 2022;76:A6-A7. https://jech.bmj.com/content/76/Suppl_1/A6.2

[xxxi] Parnham, J.C. *et al*. (2022). The Ultra-Processed Food Content of School Meals and Packed Lunches in the United Kingdom. Nutrients 2022, 14(14), 2961. https://doi.org/10.3390/nu14142961.

[xxxii] Zhang, Z. *et al*. (2022). Relationship Between Ultraprocessed Food Intake and Cardiovascular Health Among U.S. Adolescents: Results From the National Health and Nutrition Examination Survey 2007–2018. Journal of Adolescent Health, VOLUME 70, ISSUE 2, P249-257. DOI: https://doi.org/10.1016/j.jadohealth.2021.09.031.
[xxxiii] Handakas, E. *et al.* (2022). Metabolic profiles of ultra-processed food consumption and their role in obesity risk in British children. Clinical Nutrition, VOLUME 41, ISSUE 11, P2537-2548. https://doi.org/10.1016/j.clnu.2022.09.002
[xxxiv] Kelly, A.L. *et al*. (2022). The impact of caloric availability on eating behavior and ultra-processed food reward. Appetite, Nov 1;178:106274. doi: 10.1016/j.appet.2022.106274.
[xxxv] Contreras-Rodriguez, O. *et al*. (2022). Dissecting ultra-processed foods and drinks: Do they have a potential to impact the brain? Reviews in Endocrine and Metabolic Disorders 23, 697–717 (2022). https://doi.org/10.1007/s11154-022-09711-2
[xxxvi] Kelly, A.L. *et al*. (2022). The impact of caloric availability on eating behavior and ultra-processed food reward. Appetite, Nov 1;178:106274. doi: 10.1016/j.appet.2022.106274.
[xxxvii] Karl, J.P *et al.* (2022). The fecal metabolome links diet composition, food processing and the gut microbiota to gastrointestinal health in a randomized trial of adults consuming a processed diet. Journal of Nutrition, 2022 Jul 26; nxac161. doi: 10.1093/jn/nxac161
[xxxviii] Suez, J. *et al.* (2022). Personalized microbiome-driven effects of non-nutritive sweeteners on human glucose tolerance. Cell, VOLUME 185, ISSUE 18, P3307-3328.E19. https://doi.org/10.1016/j.cell.2022.07.016.
[xxxix] Vignola. E.F. *et al*. (2021). What Makes Ultra-Processed Food Appealing? A critical scan and conceptual model. World Nutrition, Vol 12 No 4 (2021). https://doi.org/10.26596/wn.202112483-135.
[xl] Anastasiou, K. *et al.* (2022). A conceptual framework for understanding the environmental impacts of ultra-processed foods and implications for sustainable food systems. Journal of Cleaner Production, Volume 368, 25 September 2022, 133155. https://doi.org/10.1016/j.jclepro.2022.133155.
[xli] Tereza da Silva, J. *et al.* (2021). Greenhouse gas emissions, water footprint, and ecological footprint of food purchases according to their degree of processing in Brazilian metropolitan areas: a time-series study from 1987 to 2018. The Lancet Planetary Health, Volume 5, Issue 11, November 2021, Pages e775-e785. https://doi.org/10.1016/S2542-5196(21)00254-0.
[xlii] Marrocos Leite, F.H. *et al.* (2022). Ultra-processed foods should be central to global food systems dialogue and action on biodiversity. BMJ Global Health, Volume 7, Issue 3. http://dx.doi.org/10.1136/bmjgh-2021-008269.
[xliii] Cotter, T. *et al.* (2021). 'Warning: ultra-processed' — A call for warnings on foods that aren't really foods. BMJ Global Health, 2021; 6:e007240. doi:10.1136/bmjgh-2021-007240.
[xliv] Astrup, A. & Monteiro, C.A. (2022). Does the concept of "ultra-processed foods" help inform dietary guidelines, beyond conventional classification systems? Debate consensus. The American Journal of Clinical Nutrition, nqac230. https://doi.org/10.1093/ajcn/nqac230.
[xlv] Scrinis, G. & Monteiro, C. (2022). From ultra-processed foods to ultra-processed dietary patterns. Nature Food, VOL 3, September 2022, 671–673. https://doi.org/10.1038/s43016-022-00599-4.