Ultra-processed foods linked to poor health outcomes

The detrimental impact of ultra-processed food and drink (UPF) intake on health came under the spotlight on both sides of the Atlantic in July this year. Review of more than 5 million person-years in the Nurses Health Studies 1 and 2 and the Health Professional Follow-up Study, published in *Diabetes Care*, concluded that the highest quintile of total UPF intake, as classified by the NOVA system, was associated with a 46% higher risk of type 2 diabetes compared with the lowest quintile. However, intakes of some food groups classified as UPFs by NOVA, such as dark and wholegrain breads, fruit-based products, and yogurt and dairy-based desserts, were associated with a lower, rather than higher, type 2 diabetes risk. Meanwhile, in its position statement on (ultra-) processed foods and health, the Scientific Advisory Committee on Nutrition (SACN) assessed that the NOVA classification could be applied to the UK population, although assumptions made in correlating NOVA to National Diet and Nutrition Survey data mean the estimation that 51–68% of total UK dietary energy intake comes from UPFs needs further validation. Nonetheless, SACN expressed concern that consumption of (ultra-) processed foods appears to be consistently associated with increased risks of overweight and obesity, mortality, chronic conditions such as type 2 diabetes, cardiovascular disease, depression, and detrimental maternal and child health outcomes in observational studies. The Committee calls for more research to clarify the impact of UPF consumption and whether detrimental health effects may be accounted for by the higher energy density and high fat, salt and sugar content of these foods, rather than their degree of processing specifically.

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The importance of exploring the degree of processing as well as the nutritional value of foods when considering their impact on health was raised 14 years ago by Carlos Monteiro at the University of São Paulo (Monteiro, 2009). Most food and drink is processed in some way, and there are benefits to this, such as making food edible and safer (e.g. with cooking and pasteurisation), increasing shelf-life and retention of nutrients (e.g. with freezing), or improving nutrient composition and bioavailability. Ultra-processed foods (UPFs), however, are defined as industrial formulations made mostly or entirely with substances extracted from foods, often chemically modified, with additives, and with very little (if any) whole foods added (Monteiro et al, 2019). They include sugar-sweetened and artificially sweetened beverages.

In recent years, potential detrimental effects of UPFs on weight and obesity, mortality, cardiovascular disease, type 2 diabetes and other chronic conditions have been explored in observational studies, with strong associations consistently observed (Poti et al, 2017; Pagliai et al, 2021; Yuan et al, 2023).

The NOVA classification system uses descriptive criteria to assign foods to one of four groups depending on the amount of processing used in their production, and it has been applied extensively, along with other measures of nutritional quality, in studies across the world. The NOVA classification is summarised in *Table 1* (overleaf). Traditional healthy diets (e.g. the Mediterranean diet) include foods from groups 1, 2 and 3.

Since to date there have been no prospective cohort studies examining the relationship

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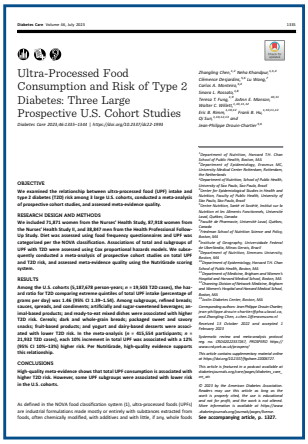
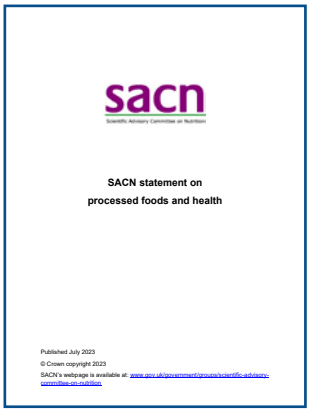
Table 1. NOVA classification (Monteiro et al, 2019).

Group	Description
Group 1	Unprocessed and minimally processed: Fresh food such as fruit, vegetables, nuts and seeds. Can include freezing, pasteurisation and cooking
Group 2	Processed culinary ingredients: Obtained from group 1 foods or nature. Can include pressing, refining and extracting. Includes fats, oils, spices, sugar and salt
Group 3	Processed foods: Adding substances found in Group 2 to Group 1 foods, increasing durability and taste. Includes breads and cheeses. Processes include canning and bottling
Group 4	Ultra-processed foods: Processing includes several steps and is on an industrial scale; additives including sugars, modified oils and fats, hydrolysed proteins, emulsifiers, synthetic flavours and colours. Includes sugar-sweetened or artificially sweetened drinks, packaged snacks, confectionary, ice cream, cakes and biscuits, instant soups and ready-meals


Ultra-Processed Food Consumption and Risk of Type 2 Diabetes: Three Large Prospective U.S. Cohort Studies

Click here to read the study by Chen et al in full



Click here to read the SACN position statement in full

between UPF consumption and type 2 diabetes risk in US populations, Chen and colleagues evaluated the association between total and subgroup intakes of UPFs and the risk of type 2 diabetes in three large cohorts (more than 5 million person-years) from the Nurses' Health Studies 1 and 2 and the Health Professional Follow-up Study, in which regular food frequency questionnaires were used to log food and beverage intakes over 30 years of follow-up. The authors then carried out a meta-analysis of previously published studies, including these three cohorts.

Across more than 19 500 type 2 diabetes diagnoses in the three US cohorts, the highest quintile of overall UPF consumption was associated with a hazard ratio of 1.46 for type 2 diabetes compared with the lowest quintile. Importantly, however, intakes of some UPF subgroups were associated with lower rather than higher diabetes risk, suggesting that not all UPFs may have the same impact on health outcomes; this group included cereals, dark and wholegrain breads, packaged sweet and savoury snacks, fruit-based products, and yogurt and dairy-based desserts.

In the wider meta-analysis, there was a consistent linear association between UPF intake and type 2 diabetes risk. The authors concluded that these findings support public health policies to try to limit UPF consumption overall, and particularly those found here to be associated with higher diabetes risk.

Over the last 30 years, UPFs accounted for 36.1% of energy intake in the three US cohorts, while intake was lower in the UK Biobank study over 2 decades, at 22% (Levy et al, 2021). However, more recently, much higher percentages have been identified in the UK in studies reviewed by the Scientific Advisory Committee on Nutrition (SACN). In 2022, SACN was tasked with evaluating processed food classifications and reported that the NOVA classification could be applied to the UK population. In reviewing the evidence in which the NOVA classification was applied to data from the UK National Diet and Nutrition Survey (NDNS), SACN analysed 12 studies and estimated that UPF contributed to 51–68% of UK energy intake, depending on age group. However, the authors highlighted that these intakes are based on assumptions and need to be validated. Changes to the NDNS methodology to better capture and clarify intake of UPF in the UK will likely be needed going forward.

Reviewing the available evidence on associations between processed food consumption and health outcomes, SACN expressed concern that increased UPF consumption appeared to be associated with greater risk of overweight and obesity, chronic diseases such as type 2 diabetes, hypertension, cardiovascular disease, diseases of the gastrointestinal tract, depression, mortality, and adverse maternal and child health outcomes.

However, SACN identified, as did Chen and colleagues, that NOVA uses broad categories and groups together foods with different nutritional attributes. In addition, SACN flagged that, since most evidence was observational, confounding factors or other important variables such as energy intake, BMI, smoking and socioeconomic status may not have been adequately taken into account. It therefore urges caution at this stage in interpreting health outcome associations with UPFs, and calls for more research to clarify the impact of UPF consumption and whether detrimental health effects may be accounted for by the higher energy density and high fat, salt and sugar content of these foods, rather than their degree of processing specifically. ■

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