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Steele EM, Batis C, Cediel G, et al. The burden of excessive saturated fatty acid intake attributed to ultra-processed food consumption: a study conducted with nationally representative cross-sectional studies from eight countries. *Journal of Nutritional Sciences*. 2021;10:e43.

What We Know, Think We Know, or Are Starting to Know

The past half-century has seen seismic shifts in the food environment, both in terms of the food supply itself, the wider environment in which foods are consumed, and the composition of the diets consumed in the population. Because trends in certain conditions like type-2 diabetes and obesity have increased, it is easy to assume that *everything* has gotten worse, and no improvements have been made with regard to any outcome.

It is easy to forget, for example, that cardiovascular disease [CVD] killed over 50% more people in 1962 than it does today, despite CVD remaining the leading cause of mortality [1].

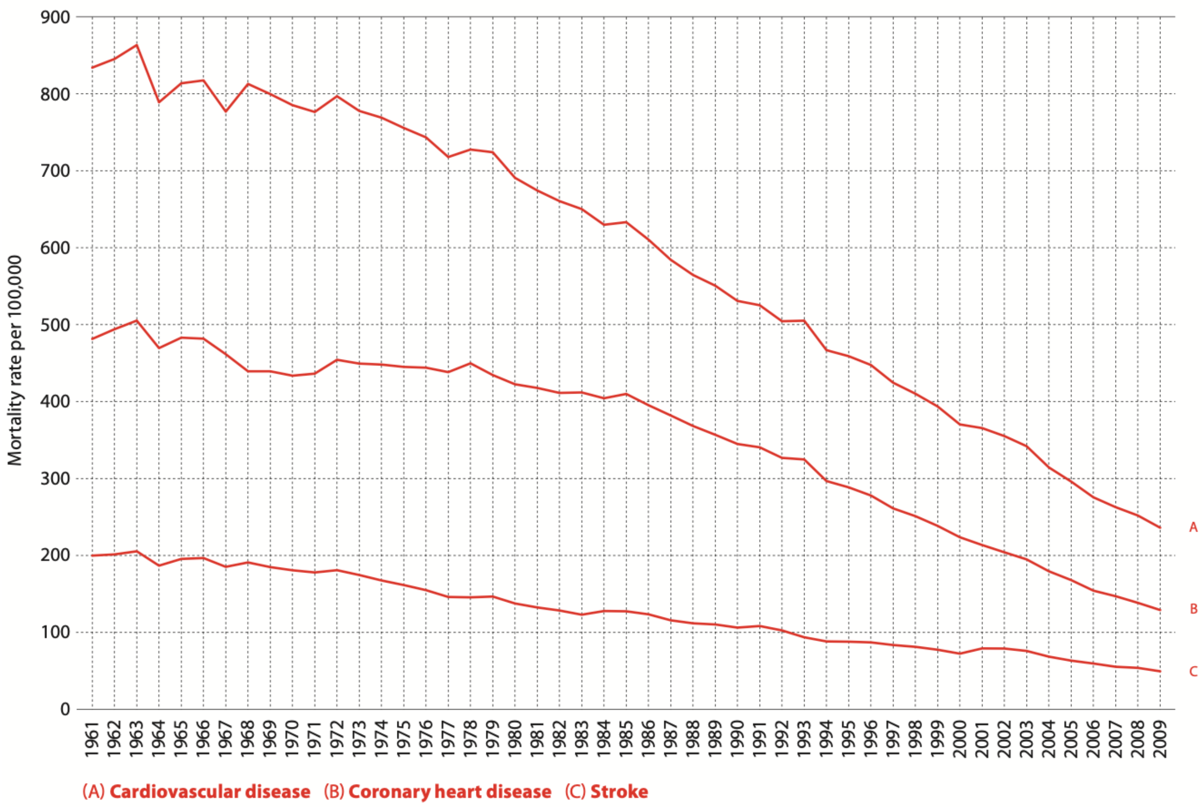


***Figure** indicating time trends in cardiovascular disease [**top line, A**], coronary heart disease [**middle line, B**], and stroke [**bottom line, C**] in men in the UK population from 1961 to 2009. The trends are similar in women, with the exception that the line for coronary heart disease [CHD] is flatter because the mortality rate per 100,000 for this disease were nearly double in men in 1961.*

Numerous factors have underpinned the reduction in CVD, CHD, and stroke, in this period, including population-wide reductions in cigarette smoking, the beginning of the statin era in the late 1980's and continued improvement in available drugs and surgery, as well as changes in diet [(1)].

However, teasing out the effects of diet is challenging when the current context clearly indicates that the habitual 'Western' dietary pattern is a driver of cardio-metabolic disease [(2)]. In numerous Western industrialised countries, foods that make significant contributions to daily energy intake is comprised of foods categorised as 'ultra-processed' by the NOVA categorisation* [see ***Geek Box,** below]. Ultra-processed foods [UPF] are foods comprised predominantly of refined starches and/or added sugars, added fats and oils, and added salt. What contribution do UPF make to daily saturated fat intakes and meeting the target of <10% intake?

*Geek Box: NOVA Classification

Most food classification systems have historically focused on broad food-group characteristics [e.g., "cereals and grains"], or definitions related to specific nutrients in each food [e.g., "calcium-rich"]. However, these systems do not account for the processing techniques used in the manufacture of foods. And the term 'processing' is itself meaningless unless more refined definitions are used to characterise the type and extent of processing, and the nutritional composition of the food that is ultimately produced.

The NOVA classification system was developed to provide specific, clear, and workable definitions to food processing. NOVA in fact is not an acronym [oddly], just a name. NOVA groups foods according to the type, extent, and purpose of industrial processing that they have undergone. 'Food processing' in this context is defined as the physical, chemical, and biological processes used on a food after it has been separated from nature, and before consumption by consumers. There are four NOVA categories:

1. *unprocessed/minimally processed foods;*
2. *processed culinary ingredients;*
3. *processed foods;*
4. *ultra-processed foods.*

Group 1 foods - minimally processed - are the edible parts of plants or animals once they are separated from nature, i.e., a chicken breast or pumpkin seeds. Group 2 includes ingredients like, for example, olive oil or butter, sugar or salt, which are derived from Group 1 foods by processes like churning, milling, pressing, refining, or drying. Group 2 foods are not usually consumed by themselves, but rather in the preparation of fresh meals or as condiments to meals or snacks.

Group 3 - processed foods - includes bottled or canned foods, cheeses, or baked goods like breads. Group 3 foods are recognisable as modified versions of Group 1 foods, for example cheese is recognised as derived from milk and the processing techniques applied to produce bread or cheese involve the addition of Group 2 to Group 1 foods, e.g., flour, eggs, water, salt or milk, rennet, salt. Finally, Group 4 - ultra-processed foods - are not modified versions of Group 1 foods, but rather industrial formulations made with little, if any, intact recognisable Group 1 foods.

Ultra-processed foods may be produced predominantly with Group 2 foods - fats, oils, sugars, salt - but contain additional ingredients which are not typically available household ingredients, including additives, preservatives, antioxidants, stabilising gums, and often use ingredients which themselves have been industrially processed, e.g., hydrogenation [of oils] or hydrolysation [of proteins]. Group 4 foods may include packaged foods and snacks, sugar-sweetened beverages, reconstituted meat products, pre-prepared frozen meals, etc.

The NOVA classification system, like any food classification, has strengths and weaknesses. It may be too broad to make nuanced dietary recommendations, and often the high watermark of recommendations derived from NOVA is simply "avoid Group 4". However, as a system that reflects the realities of the current food supply and habitually consumed foods at the population level, NOVA captures the characteristics of these foods better than, for example, the food pyramid or 'MyPlate'.

The Study

The study was a cross-sectional analysis of data from eight countries investigating the proportion of excessive saturated fat [SFA >10% energy] intake attributable to UPF consumption, and what proportion of SFA would be avoided if intakes of UPF were reduced to levels similar to the lowest category of UPF intake in that population.

The investigators calculated the percentage of energy from UPF in each country's diet and divided this percentage intake into quintiles [fifths]. The average population intake of SFA was calculated as a percentage of energy, and the percentage of SFA intakes in excess of 10% energy.

The primary analysis tested the associations between UPF intake and percentages of SFA in the diets

Results: Average intakes of UPF ranged from 15.9% [95% CI 15.3 to 16.5%] in Colombia to 56.7% [95% CI 56.2 to 57.1%] in the UK. Columbia and UK both exhibited the lowest and highest average intakes of SFA at 8.6% and 12.1%, respectively; 31.4% and 74.0% of the Columbian and UK populations, respectively, consumed in excess of 10% SFA in the diets.

- ***SFA Intakes Across Quintiles of UPF*:** There was a significant linear relationship between average SFA intake and intakes of UPF as a percentage of total energy intake. As the contribution of UPF to total energy intake increase, the percentage of energy from SFA increased.

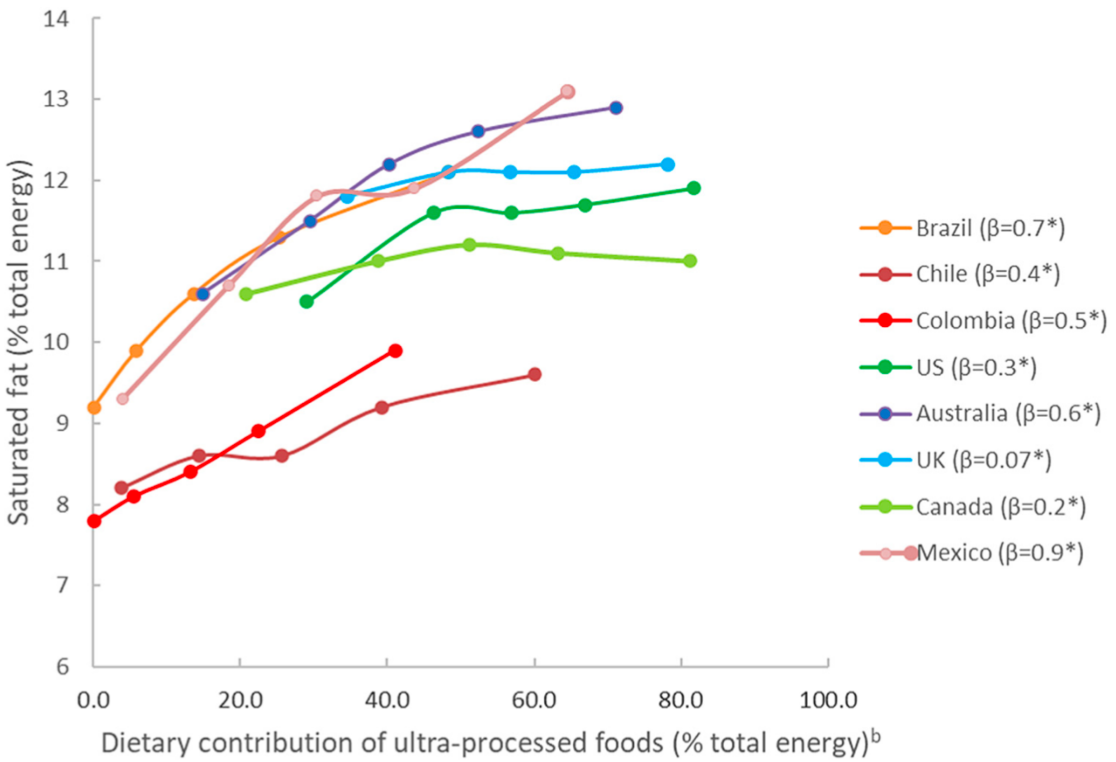


__Figure__ from the paper illustrating [__bottom X-axis; left to right__] the contribution of UPF to total daily energy intake in each country, and [__left Y-axis; bottom to top__] the average SFA intake in each quintile of UPF intake. Even in countries with SFA intake <10%, higher UPF intakes correlated with higher average SFA intakes.

- ***Excess SFA Intakes Comparing Quintiles of UPF*:** Comparing the lowest to highest quintiles of UPF, there was a significant linear increase in the proportion of the population consuming excessive SFA intakes in the highest UPF intake group.

For example, in Chile 22.5% of the population in the lowest quintile of UPF intake consumed >10% SFA, while 46.2% in the highest quintile consumed >10% SFA; thus, the proportion of the population consuming >10% SFA doubled between the lowest and highest quintiles of SFA [see **figure**, below].

In the UK, the difference from lowest to highest was 65.5% to 80.1%, respectively, while in the U.S. these differences were 53.8% to 71.9%, respectively.

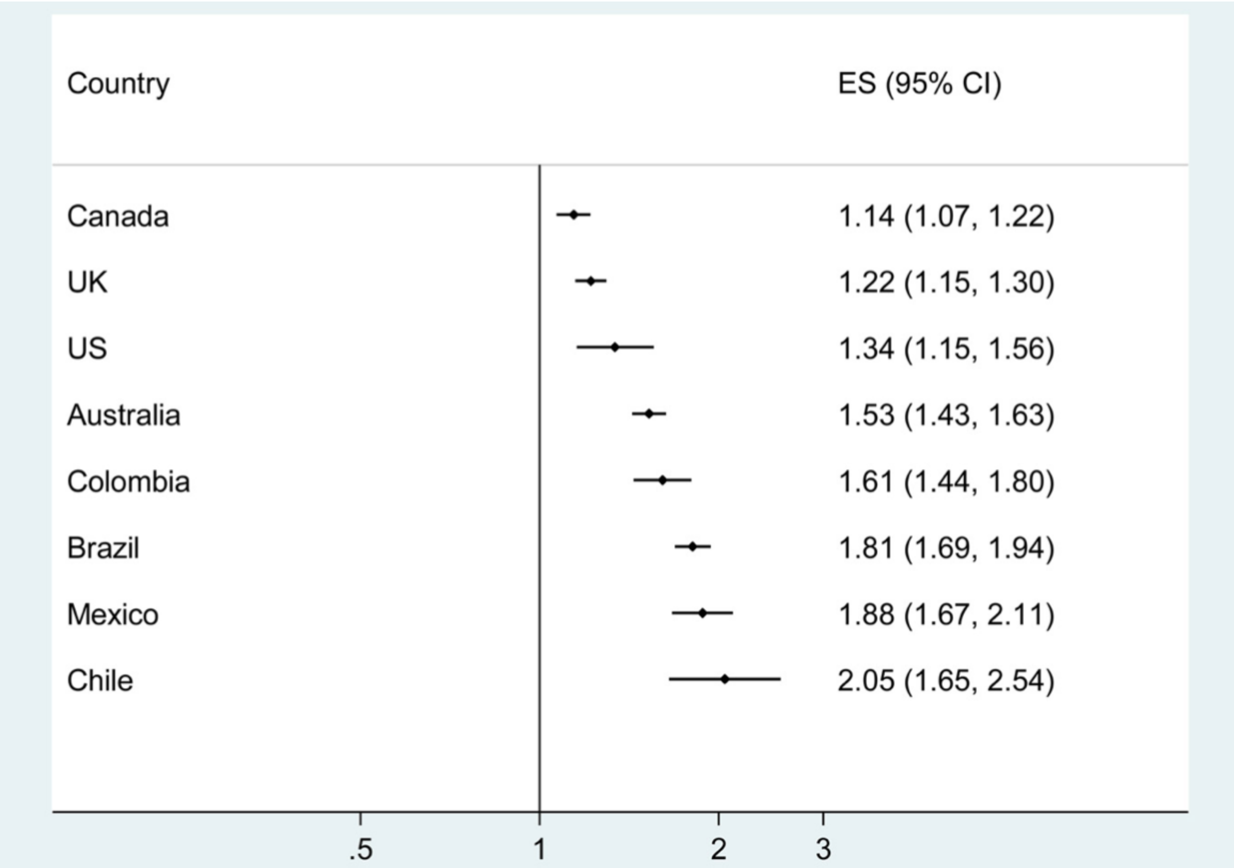


***Figure** from the paper illustrating the ratio between lowest to highest quintile of UPF and proportion of the population consuming SFA in excess of 10% energy. The effect was strongest in middle-income countries, with a less pronounced gradient in high-income countries.*

- ***Effect on SFA Intakes of Lowering UPF*:** Modelling the effects of lowering UPF to the levels in the lowest quintile, there would be a 10% [95% CI 6.2 to 13.6%] reduction in the Canadian population consuming >10%, while there would be a 35% [95% CI 28,7 to 40.8%] reduction in the Mexican population [more under ***Interesting Finding***, below].

The Critical Breakdown

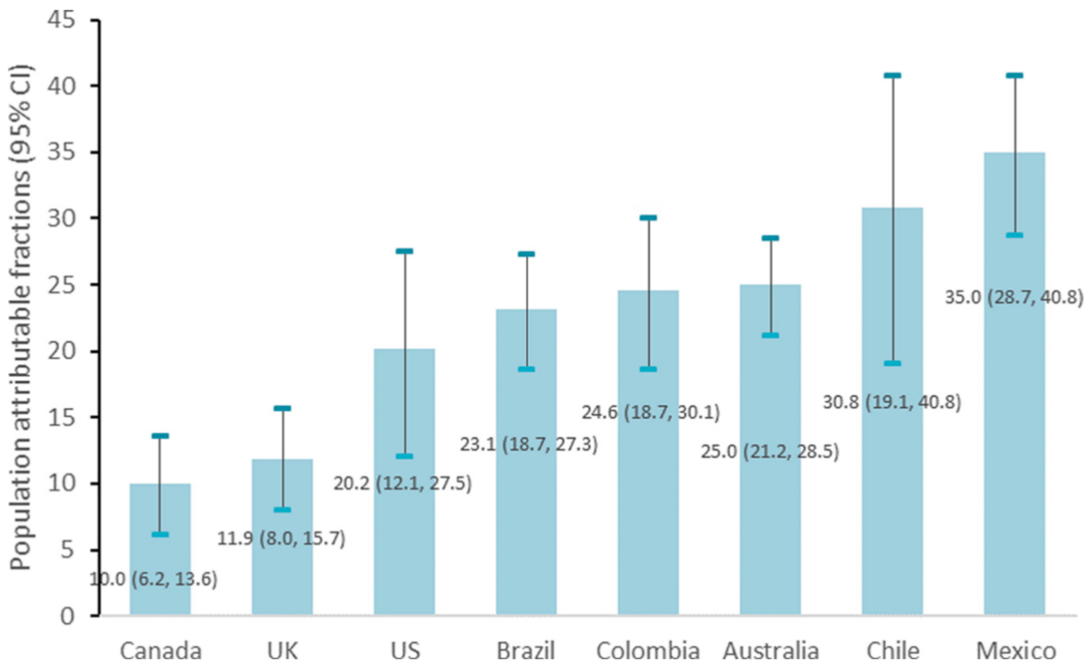
Pros: The analysis included both middle- and high-income populations across different regions, and with varying levels of both UPF and SFA in the diets. The use of the NOVA categorisation in this context provided a uniform classification for foods in these different populations. The statistical models adjusted for relevant potential factors such as age, education, income, and rural/urban centres within a country.

Cons: Although dietary recalls may be suitable for cross-sectional population studies, the numbers of dietary recalls available for the included countries differed and, in some cases [Chile, Columbia, Mexico], was primarily based on a single 24 h recall, i.e., introducing possibility for error in estimating UPF and SFA intakes. Some of the data was over a decade old and may not necessarily reflect current consumption patterns of UPF in the respective countries , particularly as this analysis was cross-sectional and thus not prospective over time.

Key Characteristic

The modelling undertaken in the present study provided some interesting insights into the relationships between UPF and SFA intakes. Two aspects to this analysis are noteworthy; the first is the assessment of the proportion of the population consuming SFA >10%, and the second is the modelling of how much of a reduction in SFA intake would be achieved in each country by consuming UPF at levels in accordance with the lowest quintile of intake in that population.

This meant that the analysis was modelled in the context of the population in which such a reduction in UPF would be applied. More importantly, it highlights the relationship between the actual levels of intake in the population and the expected effect on SFA [more under ***Interesting Finding***, below]. This analysis clearly showed that the magnitude of benefit would differ based on the population studied and its levels of UPF intake. As can be seen from the **figure**, below, the effect of lowering UPF to the lowest levels observed in that population could bring excessive SFA intakes down by as much as a quarter [Columbia, Australia, Brazil] to 30-35% [Chile, Mexico].



Interesting Finding

Let's develop this point about the expected reduction in SFA relative to the lowest levels of UPF in the population. This is obviously population specific, and therefore the magnitude of reduction in SFA reflects what constitutes "low" in that population.

For example, the estimate in the **figure** illustrated under ***Key Characteristic***, above, is that there would be an 11% reduction in the UK population consuming >10% SFA. Why so low, given they have the highest average population SFA intake at 12.1%?

Because the lowest quintile of UPF intake in the UK population was still consuming a whopping 34.6% of daily energy from UPF. The next was the U.S. at 29.1%. In contrast, the lowest quintiles in Mexico and Chile were 4.8% and 3.1%, respectively.

Mexico and Chile respectively showed the greatest reduction in excess SFA intakes of 35.0% and 30.8% if UPF was lowered to those respective levels of energy. Thus, the magnitude of any benefit to lowering UPF intakes would be relative to the specific population in question.

Relevance

This is the first study to look specifically at this question of the relationship between UPF and population SFA intakes. While reductions in saturated fat from higher intakes of 19-23% in countries like the US, UK, and other Northern European countries in the 1960's have been achieved to ~11-13% energy, these reductions have been achieved through changes in intakes of foods like butter, lard, and meats [1,3,4]. Thus, this analysis indicates that the UPF may be main contributor to population SFA intakes.

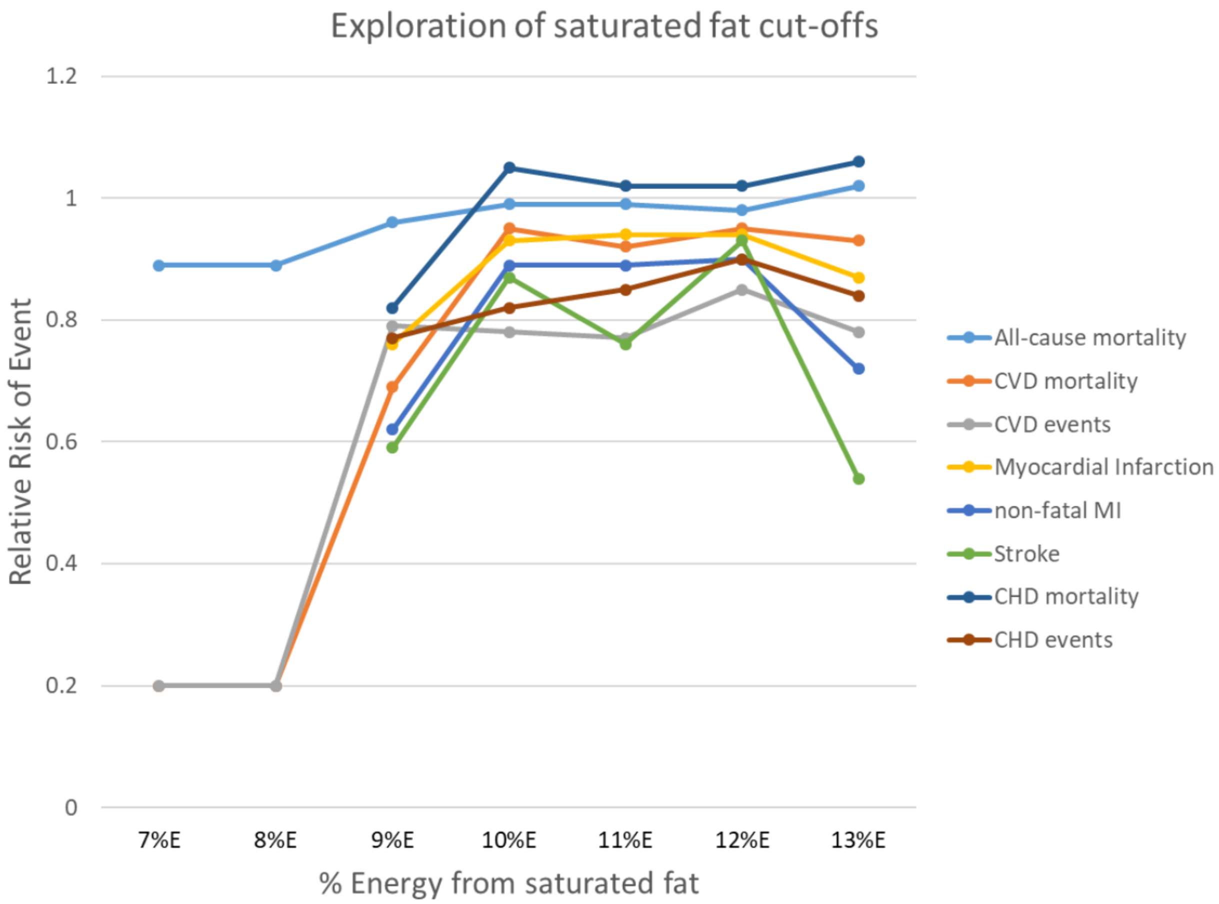
However, it is important to appropriately contextualise this analysis relative to the NOVA classification, which is designed to characterise a *food*, rather than emphasise isolated nutrients. Lowering SFA would not necessarily be the main reason to lower UPF; the foods themselves are problematic as an exposure at multiple levels that may relate to the increased risk of CVD with high intakes of these foods [5].

There is also an open question over whether, in context, the current levels of SFA intake in the population are still a focus of concern. For example, the UK average SFA intake of 12.1% stands against an average UPF intake of 56.7%; which do we think would yield a greater magnitude of benefit, shifting SFA down to ~8% or shifting UPF down to <20%?

This is the new conundrum for public health nutrition, and ultimately this analysis suggests that the emphasis on UPF reduction would yield a net reduction in SFA anyway. For a country with UPF intakes as high as the UK, there are plenty of reasons for public health interventions to target reductions in UPF and worry about the nutrient changes secondary to that primary aim.

Application to Practice

Just your friendly reminder that the target of achieving <10% energy from SFA is not some random arbitrary target licked off 1960's epidemiology, but supported by the evidence from intervention trials, as evident in the figure below from the updated 2020 meta-analysis by Hooper *et al.* [6]. What this indicates is that the 10% threshold is where we see – really when SFA goes <9% - the greatest reduction in total CVD events [the **grey** line].



While this is a prudent target for your clients, recognising the role that UPF play in increasing cardio-metabolic disease risk does go beyond isolated nutrients; in people consuming high levels of daily energy from UPF, SFA may be become a secondary consideration to improving diet through some basic nutritional best practices, i.e., increasing fruit and vegetable intake, wholegrains, etc.

References

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