



# Eliminating *trans* fats in Europe

A policy brief



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# Abstract

This policy brief presents an analysis of the policy options available for eliminating or reducing *trans* fats in the food-supply chain. It explores how such policies could contribute to decreasing the disease burden caused by intake of industrially produced *trans* fats in the WHO European Region.

## Keywords

CHRONIC DISEASE  
CORONARY HEART DISEASE  
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# Summary

There is now an overwhelming evidence base on the adverse health effects of consuming *trans* fats, and this, along with growing public awareness, has increased the pressure on European food producers and manufacturers to decrease their use in products.

Guidance to minimize *trans*-fat intake is based predominantly on evidence that *trans* fat consumption significantly increases the risk of coronary heart disease (CHD), with no known dietary requirements for *trans*-fatty acids. The 2003 WHO/FAO technical report series 916 stated that intake of *trans* fats should be as low as possible (<1% of total energy intake).

Some food companies have already voluntarily reformulated their products to reduce *trans*-fat content, and average intake of *trans* fats in many European countries is now relatively low. However, information on *trans*-fat intake in several countries of the WHO European Region is still very limited.

As the majority of the European countries still do not limit the content of *trans* fats in food, a large number of products containing high levels of *trans* fat are still available on the European market. Consequently, despite a decline in average intake of *trans* fats, it is estimated that millions of Europeans still consume *trans* fats at levels that significantly increase their risk for CHD.

Several policy options exist to reduce *trans*-fat intake, including legislative limits on *trans*-fat content in consumable fat, voluntary reductions by food industry actors in the use of *trans* fat, and mandatory labelling of *trans* fat.

When evaluating the potential effectiveness of policy options in meeting the public health objective of reducing *trans*-fat intake for all population groups, policy makers may consider how well the policy achieves the following objectives:

- effective in targeting all products containing *trans* fat that are available on the market, and specifically in ensuring that low-cost foods do not go unaffected;
- effective in targeting all socio-economic groups (so as to not contribute to increasing health inequalities);
- low-cost (to governments and industry) and uncomplicated implementation and monitoring

Establishing a legal limit for the content of *trans*-fats in all foods is likely to be the most effective option for decreasing population mean intake of artificial *trans* fats and potentially the only option available that reduces the risks associated with *trans* fats faced by all consumers.

It is unlikely that legally limiting *trans*-fat content in food would have any major negative consequences, and doing so may contribute to reducing inequalities. Such a policy is unique in its combination of efficacy, cost-effectiveness and low potential for negative impact. Removing *trans* fats from the food supply is possibly one of the most straightforward public health interventions for reducing CVD risk and improving nutritional quality of diets.

# Purpose

The development of policies for eliminating *trans* fats from the European food supply is highlighted as a priority in the *European Food and Nutrition Action Plan 2015-2020* (1). The aim of this policy brief is to present an analysis of available policy options that could contribute to decreasing the European disease burden by reducing intake of industrially produced *trans* fats. Given the evidence on current consumption patterns, this paper focuses on the policy options most likely to be effective in reducing both the overall intake of *trans* fats and consumption-related inequalities across socioeconomic groups (2-5). The potential impact of each policy option on reducing the availability of *trans* fats in the food supply has been evaluated on the basis of this evidence; in addition other considerations such as the cost of implementation have been examined where evidence was available. An overview of the methodology is provided in Annex 1.

## What are *trans* fats?

*Trans* fats are a type of unsaturated fatty acids and can be classified as naturally occurring or industrially produced. Naturally occurring *trans* fats – or ruminant *trans*-fatty acids (rTFAs) - are produced by the gut bacteria of ruminant animals and found in small amounts in the food products from these animals (for example, the meat and milk products from cattle, sheep and goats). Industrially produced *trans* fats are formed when fats and oils are modified by the use of industrial processing techniques (6,7). The process of partial hydrogenation is the primary mechanism used in the industrial production of *trans* fats; during the process, oil is hardened, which improves its commercial appeal by enhancing its sensory profile and texture and increasing its shelf life and tolerance to repeated heating (7,8). In oils that initially have a low content of *trans* fats, repeatedly heating them (e.g. in cooking) can generate additional *trans* fats. The proportions of industrially

produced *trans* fats in food are generally much higher than those of naturally occurring *trans* fats and, in most European countries, they are the main dietary source of *trans* fats. Some examples of foods commonly containing high amounts of *trans* fats are presented in Table 1.

## *Trans* fats in the European context

Evidence on the effects of industrially produced *trans* fats has been increasing over the past three decades. The 2003 WHO/FAO technical report series 916 stated that intake of *trans* fats should be as low as possible (<1% of total energy intake, which equates to no more than 2 g of *trans* fats per day for a person requiring 2000 kcal) (9). This guidance is mirrored by several other prominent bodies, including the European Commission (EC) and the United States Department of Agriculture (2,3,10).

Guidance to minimize *trans*-fat intake is based predominantly on evidence that *trans*-fat consumption significantly increases the risk of coronary heart disease (CHD) (11). The evidence suggests that *trans* fats increase the risk of CHD more than any other dietary source of energy (11). In terms of magnitude, an increase of 2% in total energy derived from *trans* fat is shown to be associated with an increase in risk of death from CHD or myocardial infarction of 23% (12,13). In addition, there is evidence to suggest that *trans*-fat intake is associated with the development of other cardiovascular diseases (CVD), central adiposity, diabetes, Alzheimer's disease, breast cancer, impaired fertility, endometriosis and cholelithiasis (11,14-16). Research has failed to identify any positive nutritional role of industrially produced *trans* fats beyond being a potential source of energy. Replacing *trans* fats in the diet with alternative

**Table 1. Examples of foods likely to contain variable amounts of *trans* fat**

<b>Trans-fat type</b>	<b>Dietary source</b>
Industrially produced <i>trans</i> fats (can comprise up to 60% of a product's fat content (6))	<i>Fast food</i> : baked goods (e.g. pies, biscuits, pastries and sweet rolls); biscuits; fried foods (e.g. French fries, hash browns, chicken nuggets, some kebabs) Supermarket products: ready-to-microwave popcorn; some biscuits, wafers and baked goods, including tacos and tortillas Fats and oils: shortening; partially hydrogenated oils; some margarines (notably of an industrial nature) Bakery products: pies; biscuits; sweet rolls; pastries; buns; cakes
Naturally occurring <i>trans</i> -fatty acids (can comprise up to 6% of a product's fat content (6))	Ruminant animal products: meat- and milk-based products from, for example, cattle, sheep, goats, buffalo, deer, elk, giraffes and camels

sources of fat reduces the risk of CHD, the greatest improvements being associated with using mono-unsaturated fatty acids (MUFAs) or poly-unsaturated fatty acids (PUFAs) instead. All of this evidence suggests that eliminating *trans* fats from the food supply has positive health effects (17).

The overwhelming evidence base on, and growing public awareness of, the adverse effects of consuming *trans* fats has increased the pressure on European food producers and manufacturers to decrease their use. Consequently, many have voluntarily reformulated their products to this end. As a result, the average intake of *trans* fats in many European countries is now relatively low (17). However, information on *trans*-fat intake in several countries is still limited, highlighting the need for systematic, standardized data collection. As the majority of the European countries still do not limit the content of *trans* fats in food, a large number of products containing high levels of *trans* fat are still available on the European market (18-20) (Fig. 1). Consequently, despite a decline in average intake of *trans* fats, it is estimated that millions of Europeans still consume *trans* fats at levels that significantly increase their risk for CHD. Across some countries in eastern Europe and the Balkan region in particular, high amounts of industrially produced *trans* fats are present in many popular foods (2,3,19,21). Specific populations at risk of consuming high levels of *trans* fats include adolescent males, university students, and customers of certain ethnic-food outlets and fast-food restaurants (22-24).

Products high in industrially produced *trans* fats also tend to cost less and are, therefore, more likely to be consumed by people with lower socioeconomic status (19,25). Thus, the health risks associated with a high consumption of industrially produced

*trans* fats need to be considered from the perspective of health inequality. Policies that contribute to reducing the content of *trans* fat in foods commonly consumed by low-income groups, thereby positively influencing the overall nutritional quality of their diets, can also contribute to reducing their risk of disease and may help to close the gap in terms of health inequality.

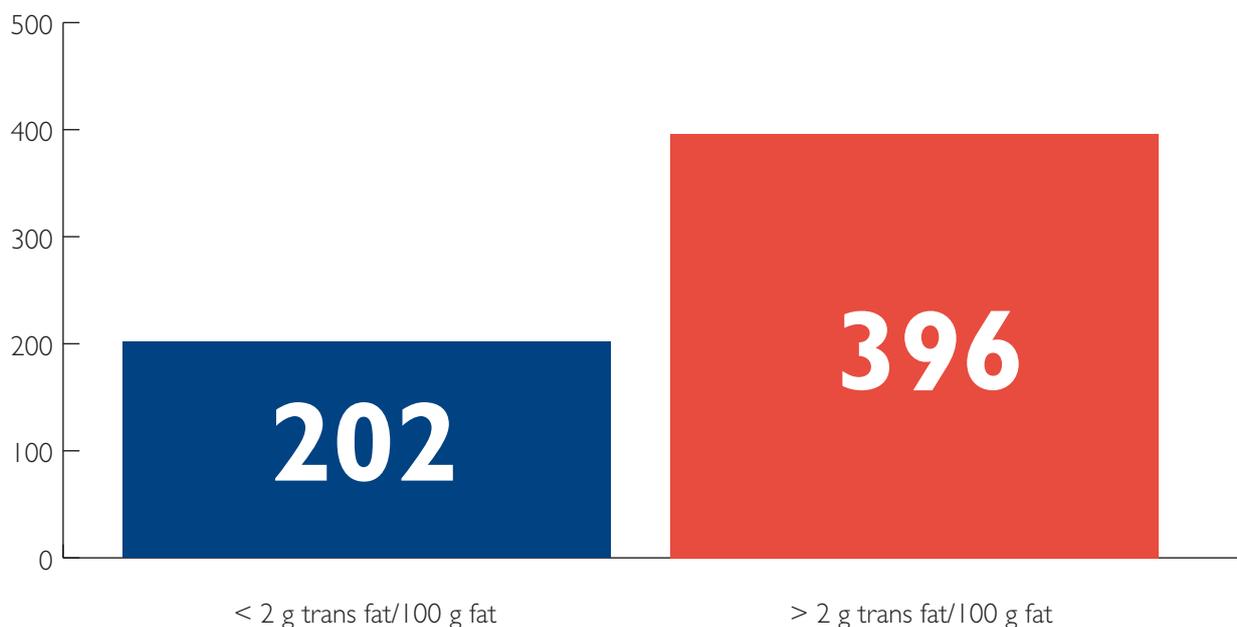
## Policy options identified in literature

### Legislative limits on *trans*-fat content in consumable fat

This policy option, often referred to as a *trans*-fat ban, involves the introduction of legislation limiting the amount of industrially produced *trans* fat in any consumable fat. There are many European examples of *trans*-fat bans (Table 2).

The first country in the world to introduce a policy on *trans* fats was Denmark in 2003. (Details of the Danish experience are presented below.) The Danish legislation sets an upper limit of 2 g of industrially produced *trans* fats per 100 g of fat or oil (26). This was followed by the introduction of legislation setting the same limits in Switzerland (2008) (27,28), Austria (2009) (29), Iceland (2011) (30), Hungary (2014) (31) and Norway (2014) (32). The Swedish Parliament passed legislation to limit *trans*-fat content in foods in 2011, but the national cabinet opted to await the release of a forthcoming EC report on *trans* fat, before implementing it (33,34). While Europe is clearly leading the world in relation to this form of *trans*-fat policy, “bans” also exist elsewhere.

**Fig. 1. *Trans* fat content of 598 samples of biscuits, cakes and wafers with “partially hydrogenated vegetable fat” or a similar term high on the list of the ingredients in 20 European countries**



Source: Stender S, Dyerberg J, Bysted A, Leth T, Astrup A. *A trans world journey* (20).

**Table 2. Legislative limits on *trans* fat in European countries**

Country	Dates	Limits	Other notable elements
Denmark (26)	In force: 31 March 2003 Transition period: Until 1 January 2004 Amended: 14 December 2006 and 26 March 2010	2g per 100g of fat or oil	rTFAs excluded  During the transition period, 5g per 100g of fat or oil for foods which also contain other ingredients than fat or oil (expired 31 December 2003)
Switzerland (27,28)	Passed: 7 March 2008 In force: 1 April 2008	2g per 100g of vegetable fat or vegetable oil	Applies only to vegetable oils
Austria (29)	Passed/in force: 1 September 2009 Amended: 3 November 2010	2g per 100g of fat or oil	rTFAs excluded (after amendment) 4 g per 100g if fat content is <20% of total weight 10g per 100g if fat content is <3% of total weight
Iceland (30)	Passed: 21 December 2010 In force: 1 August 2011	2g per 100g of fat or oil	rTFAs excluded
Norway (32)	In force: 16 January 2014	2g per 100g of fat or oil	rTFAs excluded so that regulation does not apply to the naturally occurring content of <i>trans</i> -fatty acids in animal fats Products specifically regulated by other legislation are exempt
Hungary (31)	Passed: 20 November 2013 In force: 18 February 2014	2g per 100g of fat or oil	rTFAs excluded 4 g per 100g if fat content is <20% of total weight 10g per 100g if fat content is <3% of total weight
Sweden (33) (yet to be implemented)	Passed: 17 March 2011 Entry into force: Government awaiting release of EC Commission report on <i>trans</i> fat before implementing the legislation	2g per 100g of fat or oil	Not available

Prominent examples include those from the USA, such as the local law affecting restaurants in New York City (2007), and the state law affecting unpackaged foods in California (2010) (35,36). In addition, the US Food and Drug Administration has issued a Federal Register Notice determining that industrially produced *trans* fats are no longer “generally regarded as safe” (GRAS). If fully implemented, as foreseen for June 2018, it would mean that industrially produced *trans* fats would become an unapproved food additive and food products containing them could not be legally sold (37). The successful implementation of such policies demonstrates that the reduction of *trans* fat in foods is feasible through legislative limits.

### Voluntary reduction in the use of *trans* fat

Several countries in the European Region have implemented strategies aimed at reducing the national consumption of *trans* fat based on voluntary collaboration between industry and government. Common features of voluntary *trans*-fat-reduction policies include the production and use of voluntary goals for product reformulation, the collaborative development of alternative foodstuffs with low *trans*-fat content, the production

of standardized voluntary labelling for products with low *trans*-fat content, and industry-supported public education about the health impact of *trans* fats. Some examples of programmes to decrease the use of *trans* fat are presented in Table 3.

### Mandatory labelling

Policy on mandatory labelling involves the introduction of a legal requirement that the *trans*-fat content in packaged food be accurately displayed. This type of policy has no direct impact on unpackaged or restaurant food. Mandatory labelling of *trans*-fat content (including amount) is not currently implemented in any of the WHO European Member States. *Regulation (EC) No. 1169/2011* on the provision of food information to consumers requires the listing of food-product ingredients across the European Union (EU) and establishes the rules for nutrition information provided. This Regulation requests that ‘fully’ or ‘partly’ hydrogenated oil be indicated in the ingredients list, together with the specific vegetable origin of the oil or fat. For pre-packaged foods, consumers can determine from the ingredient list whether partially hydrogenated oils have been used to manufacture the products. However, the amount of *trans* fat present in the product cannot be assumed by

**Table 3. Examples of voluntary policy programmes aimed at decreasing use of trans fats**

Country	Campaign	Features
Belgium, Czech Republic, France, Netherlands, Poland (38-40)	Choices labelling programmes	A voluntary labelling system for products meeting a range of nutritional criteria set by national government in collaboration with The Choices Programme One of the multiple requirements for the Choices label is “Trans-fatty acid (TFA) content <1.3% of total energy”
Germany (41)	Joint initiative of the German food industry and the Federal Ministry of Food, Agriculture and Consumer Protection to develop guidelines on minimizing TFA in foods	Education of and collaboration with industry to encourage the use of TFA alternatives.
Netherlands (42)	Task Force on Fatty Acid Composition	Multiple interventions implemented including: research on and development of TFA and saturated fatty acid (SFA) alternatives; education of industry about TFA and SFA alternatives; public education on the effects of TFA and SFA and alternatives to these; follow-up monitoring and evaluation of effects.
United Kingdom (43)	Public Health Responsibility Deal	A broad set of public health goals, which food companies can voluntarily pledge to achieve, the 3rd Food goal being to remove artificial trans fats from all foods

this information and *trans* fat does not appear in the mandatory nutrition declaration (34). In this sense consumers are not provided with information on levels of *trans*-fats content in products. Thus, *mandatory* labelling of the amount of *trans* fat is not permitted under current EU legislation and, unless this is amended or new legislation introduced, it is not a viable option in the EU (3). There are prominent examples of labelling laws in Canada and the USA whereby *trans*-fat content must be indicated in grams per serving on package labels if it exceeds 0.2 g and 0.5 g, respectively (44, 45).

## Evaluation of policy options

Governments may consider identifying the following regulatory objectives when exploring interventions to reduce the consumption of *trans* fats, in order to meet the public health objective of reducing *trans*-fat intake for all population groups at the same time as considering other relevant policy implementation factors:

- effectiveness in targeting all products containing *trans* fat available on the market, and specifically in ensuring that low-cost foods do not go unaffected;
- effective in targeting all socio-economic groups (so as to not contribute to increasing health inequalities);
- low-cost (to governments and industry) and uncomplicated implementation and monitoring;

The policies discussed below were evaluated bearing these objectives in mind.

### Impact on food supply

#### Legislated limit

Of the policies analysed, limiting the *trans*-fat content in foods through legislation has been shown to generate the greatest reduction of *trans* fat in the food supply (46-48). It is also the only option effective in reducing the intake of all population groups, including the high-risk groups mentioned above. It is estimated that the New York City *trans*-fat ban prevents 12 deaths from CVD for every 100 000 people covered by the policy. This is considered to be equivalent to saving US\$ 3 million per 100 000 people. It is important to note that this ban applies only to food sold in restaurants in New York City (35,49). It could be expected that the economic benefits of the ban and its impact on the disease burden would be significantly greater if it also applied to packaged food. A study from New York City also examined socio-economic differences following implementation of the ban, reporting similar effects in more and less affluent neighbourhoods (46).

#### Voluntary reformulation

Collaboration with industry is only effective for foods produced by companies that have agreed to collaborate and for food products they have agreed to reformulate. Ensuring the participation of a critical mass of manufacturers and retailers could be challenging, especially in the case of the small- and medium-sized enterprises, which dominate the food sector. Companies choosing not to participate are not accountable for their use of *trans* fats, so that consumers of goods from these companies may continue to have a high intake of *trans* fat. Evidence suggests that some companies offer *trans* fat free products while continuing to

sell alternative products with high levels of *trans* fat content, and that these *trans* fat free products tend to be costlier (46).

### **Mandatory labelling**

Mandatory labelling does not apply to unpackaged foods. Consumers of large amounts of restaurant foods or foods bought from small producers and the informal sector (for example, food stalls and independent bakeries) are likely to continue to be at high risk (46). Furthermore, consumers with low socioeconomic status may be less knowledgeable about nutrition and the health risks associated with *trans*-fat intake. Labelling products “*trans*-fat free”, which is in fact a nutrition claim, may be providing them with a health halo whereby consumers inadvertently increase their intake of these products in the belief that they are making healthy choices (50). Since these products can often contain small (possibly permissible) amounts of industrially produced *trans*-fatty acids (ITFAs), the *trans*-fat intake of people consuming multiple servings could exceed the recommended limits. Moreover, under EU nutrition and health claims law, “*trans*-fat free” is not currently a nutrition claim that has been approved for use. Therefore it cannot be used in EU Member States. Evidence from the USA, where labelling is typically provided per portion, also suggests that in order to meet the *trans*-fat free labelling criteria, manufacturers are resizing rather than reformulating products labelled “*trans*-fat free” (51). Furthermore significant public education may be required for labelling policies to be effective, particularly if worsening inequalities are to be avoided (51).

### **Cost of implementation**

An analysis of the costs of implementing *trans*-fat policy includes any direct costs, as well as monitoring and evaluation costs. Monitoring the outcome of a *trans*-fat policy to evaluate its effects in a local context is a necessary part of an intervention.

### **Legislated limit**

The costs specific to introducing a legal limit have been described as miniscule on a national scale (52). An analysis of the likely costs of implementing a national *trans*-fat limit in the USA suggests that they would be well under the commonly accepted thresholds of cost-effectiveness (52). It has also been suggested that the costs of monitoring the effects of a *trans*-fat ban are lower than those required for voluntary reformulation or labelling policy since monitoring a ban occurs at the level of product analysis as opposed to that of population intake (23).

### **Voluntary reformulation**

The implementation of industry collaboration entails variable cost to government, and the amount of funds allocated for this intervention is dependent on government priorities. The costs of monitoring a voluntary reformulation policy could also be greater than those for monitoring a *trans*-fat ban as the former requires the relatively complex measurement of population *trans*-fat intake (23).

### **Mandatory labelling**

Mandatory labelling incurs costs for analysing the *trans*-fat content of products and altering existing packaging. A labelling intervention would likely act as an incentive for industry to reduce or remove

*trans* fats from their products. However, for this intervention to have the maximum effect, it should be accompanied by a public-education programme, which requires additional funding. The cost of monitoring and evaluating a labelling policy includes costs associated with product and population-intake analyses. A labelling policy is likely the most costly to implement effectively. Moreover, if it leads to an increase in the price of *trans*-fat-free products, it might also increase inequalities as a consequence (51). One Canadian study indicates that declaring *trans*-fat content on labels may affect price. If this is broadly the case, doing so would risk exacerbating socioeconomic inequalities, particularly if there already are underlying differences in consumption due to insufficient knowledge about nutrition or to food-purchasing patterns (51).

### **Potential negative reaction**

#### **Legislated limit**

In the past, proposals to limit the content of *trans* fat in foods have generated negative reactions from industry in many countries. Common concerns include the high cost of reformulating product compositions and reductions in sales due to altered product properties. These concerns appear to contradict the experience gained in countries that have implemented *trans*-fat bans where industry representatives have declared that the financial impact of the ban is minimal (11,47,48,54,55). In addition, the development of suitable, cost-effective alternatives to foodstuffs containing *trans* fat has progressed over the last 30 years and options for reformulation continue to increase (56-60). Evidence suggests that existing national bans have already driven product reformulation at the international level (60).

#### **Voluntary reformulation**

As this type of policy is voluntary, it is unlikely to generate a negative reaction. However, it is plausible that some producers would actually favour legislation on reformulation as it would guarantee industry-wide compliance and secure a level playing field. For example, small producers may be reluctant to commit to voluntary reformulation if their market competitors do not sign up as well. Voluntary standards may also be opposed by industry actors since the existence of the standard (albeit voluntary) implies that current industry practices may need to be changed (61). Furthermore, the effective oversight of voluntary reformulation would require some form of monitoring. If a “name and shame” approach were to be used, whereby companies not taking action were explicitly identified, it could be unpopular.

#### **Mandatory labelling**

Labelling could potentially elicit a negative reaction from manufacturers of packaged goods. As a consequence of labelling policy, companies would be faced with the costs of redesigning packaging, and sales of products containing high levels of *trans* fat would likely decrease. It is also plausible that manufacturers would face an increase in costs associated with reformulating their products to reduce *trans*-fat content. In addition, this policy could be seen as unfairly targeting the manufacturers of packaged goods as opposed to the producers

# The Danish experience

Denmark was the first country in the world to impose a national limit on the content of artificial *trans* fat in all oils and fats intended for human consumption. The trigger for this legislation is considered to be a 1993 publication in the Lancet on the results of a study to examine the impact of *trans*-fat intake on female risk for CHD (46,62,63). The results encouraged the Danish Nutrition Council to produce a series of reports on the health impact of *trans* fats in Denmark (63,64). The Council's 2001 report estimated that 50 000 Danes were at high risk for CVD as a direct result of their intake of *trans* fat. The Council suggested that, to reduce this number, the Government introduce legislation limiting *trans*-fat content in foods (63,64). The report received widespread media attention (47,64).

The Council's suggestion to limit *trans*-fat content in foods through legislation received the support of the Danish population and the Danish Minister of Health. The Danish margarine industry, which was already developing products with low *trans*-fat content following the Lancet publication (62), was also in favour of the proposal.

Legislation to limit the content of *trans* fat in Danish food was presented to Parliament in 2003 and quickly approved. It set the upper limit for artificial *trans* fats at 2 g per 100 g of fat (2% of total fat). Following a 6-month transition period, during which the limit for some foods was slightly less strict, the 2% *trans*-fat limit was applied to all food (26). As the legislation also included internationally produced foods sold in Denmark, in 2004 the

EC claimed that it contravened EU free-trade agreements and initiated steps to prosecute the Danish Government. The EC withdrew its case in 2007 when it accepted the Danish argument that the measure was justified in the interest of public health (26).

Studies on the efficacy of this legislation illustrate that artificial *trans* fats are now "virtually eliminated" from Danish food (46-48). The data show that the decline in CHD mortality rates in Denmark for the period 1980-2009 was the largest in EU (70%). The decline was especially high between 2000 and 2009 compared with other EU countries, although it has not been possible to determine to which degree this can be attributed to the *trans*-fat legislation (65).

Product sampling has shown that *trans* fats have been replaced mainly by SFAs – including the less harmful coconut oil – in about two thirds of products. In the remaining third, they have been replaced by MUFAs or PUFAs, both of which are more favourable in terms of health outcome.

The costs of, and sales losses caused by, product reformulation have not been studied in quantitative terms, but multiple reports have concluded that the economic impact of this *trans*-fat legislation on Danish industry has been limited. The Ministry of Food, Agriculture and Fisheries of Denmark has reported no complaints following its implementation (47,48).

of unpackaged food. Consumers would be unlikely to react poorly to mandatory labelling unless it impacted the cost of existing products; if this were the case, existing inequalities could be exacerbated (51).

## Considering the effects of substitution

For interventions aimed at reducing the use of *trans* fats, it is important to consider which type of fat is to be used to replace them in reformulating products. The best replacements from a health perspective are PUFAs or MUFAs. The other alternative, SFAs, increases CHD risk, albeit to a lesser degree than *trans* fats. Unfortunately, the best replacement from an industry perspective is often SFAs as their properties are similar to those of *trans* fats. However, reformulation data from locations where bans have been introduced show that the content of *trans* fats and SFAs in food is decreasing in general (66-70). The use of

MUFAs and PUFAs tends to be increasing and the evidence suggests that MUFAs are preferred (11). In Denmark, after the introduction of the *trans*-fat ban, SFAs have been found to constitute the main replacement in 66% of products. Indeed, while unsaturated fats are normally used to replace artificial *trans* fats in reformulating fried foods, SFAs – notably palm oil – are typically used in reformulating bakery foods (23, 66-70). It is thus important to support the development of *trans* fat alternatives that both have the properties required by industry (for example, texture, taste, shelf-life) and are not associated with adverse health effects (55-58). The technology to create these products currently exists and some industry players are using it.

## Conclusion

Establishing a legal limit for the content of *trans*-fats in all foods is likely to be the most effective option for decreasing population mean intake of artificial *trans* fats and potentially the only option available that reduces the risks associated with *trans* fats faced by

all consumers. Mandatory labelling and voluntary reformulation may not achieve full market coverage, with unpackaged foods and products produced/used by small and medium enterprises possibly continuing to contain *trans* fats. Further, mandatory labelling is to a large extent reliant on nutritional literacy (regarding the health risks of *trans* fat), which could disadvantage low socioeconomic groups and may contribute to widening inequalities. Thus, a legal limit can help to avoid a situation where pockets of the population continue to consume foods or combinations of foods that result in an overall diet containing very high levels of *trans* fat; based on the previous evidence reviewed this could be the case for low-income groups, ethnic minorities, adolescents and young adults, and groups frequently purchasing from some fast-food outlets. Mandatory labelling and voluntary reformulation may exacerbate existing inequalities in consumption; further research on socioeconomic inequalities in *trans* fat consumption would be valuable. However, a legal limit appears as the option with the most potential to bring about decreases in the availability of *trans* fats, consumption and the disease burden attributable to *trans*-fat consumption in those European countries where average intakes are already

low. Furthermore, voluntary reformulation might not work in some settings and, for some countries, imported products with a high content of *trans* fat might counteract such an initiative.

Other advantages of a policy limiting *trans*-fat content in food include low implementation and monitoring costs, as well as low cost to industry. Apart from the possibility of being met with criticism by the food industry, it is unlikely that legally limiting *trans*-fat content in food would have any major negative consequences for the industry or consumers, and doing so may contribute to reducing inequalities. Such a policy is unique in its combination of efficacy, cost-effectiveness and low potential for negative impact. Removing *trans* fats from the food supply is possibly one of the most straightforward public health interventions for reducing CVD risk and improving nutritional quality of diets.

The experiences of countries in both Europe and North America support these conclusions and show that any unexpected consequences of this type of policy are unlikely.

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# Annex I: Overview of methodology

For the purposes of this policy brief, we identified studies for inclusion through searches in Medline (200 studies returned) and Google Scholar (first 15 pages of results). Search terms included combinations of the following “*trans-fat*”, “*trans-fatty acids*” and “reduction”, with “policy” and “effectiveness”. In addition we asked experts in the field whether they had knowledge of any systematic literature reviews or reviews. Grey literature obtained through Google searches (first 10 pages of results) and expert input was also screened.

Through our search strategy we identified two relevant published systematic reviews looking at the effectiveness of policies to reduce or eliminate *trans-fat*, with many of the same studies included in both reviews. For further in-depth understanding of the effects of different interventions, the findings of many individual studies included in the systematic reviews were analysed.

We present the information from the reviews by the measure applied (legislative limit; voluntary reformulation; mandatory labelling). We then summarise the findings in terms of the regulatory objectives. These stem from the public health objective (to achieve a change in the availability of *trans-fatty acids* in the food supply; to reduce the potential for substitution from *trans-fatty acids* to saturated fatty acids) and other practical policy considerations such as costs of implementation and potential negative reactions. These policy considerations have been discussed in the systematic literature reviews.

## The WHO Regional Office for Europe

The World Health Organization (WHO) is a specialized agency of the United Nations created in 1948 with the primary responsibility for international health matters and public health. The WHO Regional Office for Europe is one of six regional offices throughout the world, each with its own programme geared to the particular health conditions of the countries it serves.

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