

PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form ([see an example](#)) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

This paper was submitted to the JECH but declined for publication following peer review. The authors addressed the reviewers' comments and submitted the revised paper to BMJ Open. The paper was subsequently accepted for publication at BMJ Open.

ARTICLE DETAILS

TITLE (PROVISIONAL)	A trans European Union difference in the decline in trans fatty acids in popular foods - a market basket investigation.
AUTHORS	Stender, Steen ; Astrup, Arne; Dyerberg, Jørn

VERSION 1 - REVIEW

REVIEWER	S Capewell Position: Chair of Clinical Epidemiology University of Liverpool Department of Public Health
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GENERAL COMMENTS	<p>This is an excellent paper with very important messages for public health in the UK and Europe.</p> <p>I have no major criticisms, apart from: Figure 3 which is currently a histogram; it needs to be redrawn as a bar chart, to facilitate comparisons with Figure 2.</p> <p>Secondly, I do have a few suggestions to make the paper even better. Mainly by strengthening or revising specific sentences.</p> <p>These are specified below, with suggested changes IN CAPITALS.</p> <p>Also, I will endeavour to also send the comments as a Word "Track Changes" document, which may be MUCH easier to comprehend.</p>
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	<p>All numbers refer to line numbers in the pdf document submitted.</p> <p>A trans European Union difference in the decline in trans fatty acids in popular foods - a basket investigation.</p> <p>ABSTRACT</p> <p>Line 8 Objectives: Trans fatty acids (TFA) are produced when liquid vegetable oil is industrially hydrogenated to make it solid fat. A daily intake of approximately 5 g of TFA is associated with a 23% increase in the risk of CORONARY heart disease. In order to minimize the intake of TFA some countries have introduced labelling, while others have introduced legislative limits on the content of TFA in food INCLUDING AUSTRIA, DENMARK AND SWITZERLAND. HOWEVER , but most countries still rely on food producers to voluntarily reduce the TFA content in food. The objective of the present study was to investigate the efficiency of these strategies in the EU.</p> <p>13 Design: The potential consumption of TFA was assessed in a basket investigation by analysing the TFA CONTENT in popular foods in 16 EU countries in 2005 and AGAIN in 2009 USING A STANDARD METHODOLOGY.</p> <p>15 Samples: 70 servings of French fries and chicken nuggets, 90 packages of microwave popcorn, and 16 442 samples of biscuits/cakes/wafers with "partially hydrogenated vegetable fat" listed on the label</p> <p>17 high on the list of ingredients were analysed. A "high-trans menu" was DEFINED AS a large serving of French fries</p>
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	<p>18 and nuggets, 100 g of microwave popcorn, and 100 g of biscuits/wafers/cakes.</p> <p>19 Results: In 2005, a high-trans menu provided above 30 g of TFA in five EU countries in Eastern Europe (SPECIFY) and 20–30 g in eight EU countries in Western Europe (SPECIFY WHICH). In 2009 the values in Hungary, Poland, 21 and the Czech Republic REMAINED HIGH (between 10 and 20 g), whereas they were less than 2 g. in Germany, 22 France and the UK,</p> <p>Conclusion: In 2009 the content of TFA in popular foods in 1 Western European APPEARS LOW but not in Line 2 Eastern European EU countries. THESE FINDINGS suggest that millions of people in the EU still consume TFA in 3 amounts that SUBSTANTIALLY increase their risk of CORONARY heart disease. The Austrian, Danish, and Swiss experiences 4 with legally limiting TFA content in human food, demonstrate that this risk can be eliminated, with no 5 noticeable effect on the availability, price, or quality of food.</p> <p>INTRODUCTION Line 2 Trans fatty acids (TFA) in food originate from industrial hardening of oils and from ruminant sources. 3 Compared to unhydrogenated oils, fats containing industrially produced TFA are solid at room 4 temperature, have some technical advantages in food processing, and prolong the shelf life of food. HOWEVER, 5 TFA can constitute up to 60% of the fats in certain foods, whereas ruminant fat contains at most 6% 6 TFA. A meta-analysis of four large prospective studies found that an intake</p>
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of INDUSTRIAL TFA corresponding to 7 2% of the total energy intake (E %) (approximately 5 g/d) was associated with a 23% increase in the 8 risk of CORONARY heart disease¹. Several public health organisations have therefore recommended that INDUSTRIAL TFA intake 9 should be lowered as much as possible^{2–4}. In 1976, the average intake of INDUSTRIAL TFA in Western 10 Europe was 6 g/d. In 1996, this intake had dropped to 2.6 g/d (range 1.2 to 6.7 g/d), corresponding to 11 0.5–2.1 E%⁵. Approximately half of this intake was from ruminant TFA, and only about 1.3 g was from 12 industrial TFA, which constitutes a 78% decrease since 1976⁵. Despite a mean population intake of 13 approximately 1 g of industrial TFA per day in Denmark in 2001, it was still possible to consume 20–14 30 g of TFA in a SINGLE high-trans menu by eating popular food products such as wafers, microwave popcorn, 15 nuggets, and French fries⁴. Among the 5 million Danes, 10,000–50,000 people 16 consumed food from this type of menu several times each week, and got a daily intake of more than 5 g TFA⁴.

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18

In 2003, Canada introduced the mandatory labelling of the TFA content in pre-19 packaged food. In the same year, Denmark introduced a legislative limit of 2% 20 industrial TFA in fat used for foods. The European Commission initially opposed this legislation but in MARCH 2007 21 dropped its infringement proceedings against Denmark because of increased

scientific evidence on the dangers of trans fats⁶. The US introduced mandatory labelling of pre-packaged food in 2006, followed by legislative limits on TFA in the food served in restaurants in New York City in 2008 and in 2010-11 in the state of California. In 2009, Austria and Switzerland introduced a legislative ban similar to the Danish⁷ TO BE FOLLOWED IN 2011 BY ICELAND AND SWEDEN. Of the EU's approximately 500 million inhabitants who consume food that still may contain high amounts of trans fat, Denmark's and Austria's populations, representing approximately 14 million people, are the exceptions. In 2005, we assessed by a basket investigation the availability of a high-trans menu (large servings of French fries and nuggets, 100 g of microwave popcorn and 100 g of biscuits/wafers/cakes) in 15 EU countries, and found that, in spite of a low mean intake, high concentrations of industrial TFA were still present in many popular foods. Thus, subgroups of the populations could have an intake that is considerably higher than the recommended upper limit for intake of TFA⁷. TFA in foods from international fast food providers was an important contributor to the high intake in these subpopulations⁸. Still in 2009, EU countries (with the exception of Austria and Denmark) rely on food producers to voluntarily reduce the amounts of TFA in foods. The present study assesses the efficiency of

	<p>13 that strategy in three Eastern European countries, Hungary, Poland, and the Czech Republic, and in</p> <p>14 three Western European countries, Germany, France, and the UK.</p> <p>METHODS</p> <p>In July 2009 to September 2009, the capitals of Poland, the Czech Republic, Hungary, Germany, France, and the UK were revisited and the same procedures for the purchase of food items WERE FOLLOWED. If possible, the same stores were revisited and the same brands were bought. Altogether, 602 samples of food in EU countries were purchased</p> <p>Calculation</p> <p>18 For comparison, the amounts of TFA in the French fries and the chicken nuggets were expressed as the amounts in a serving size equivalent to a large serving from McDonald's in the US: . The serving sizes were 171 g of French fries and 160 g of chicken nuggets.</p> <p>RESULTS</p> <p>Line 2</p> <p>Biscuits, cakes, and wafers</p> <p>3 Figure 1 presents data from the products bought in the six EU countries in 2005 and 2009. The products are ranked according to TFA content and the combined values for the three Eastern EU countries and for the three Western EU countries are given separately.</p> <p>IN 2005, THE highest TFA contents (10–15 g) in single 100 g servings were found in Hungary, Poland, and the Czech Republic. In 2005 in France, Germany, and the UK, the TFA contents were</p>
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	<p>lower but still considerable (4–7 g). AVERAGING 5G EXCLUDING ONE OUTLIER</p> <p>8 In 2009 biscuits, cakes, and wafers in the three Eastern EU countries contained a smaller, but still</p> <p>9 substantial, amount of TFA (4–6 g in Figure 3). In contrast, the TFA content</p> <p>10 in products in the three Western EU countries was minimal (< 1 g). The same pattern was observed in each of the countries.</p> <p>Fast food</p> <p>Line 13</p> <p>In 2005, the TFA content of the McDonald’s servings in EU varied from less</p> <p>14 than 1 g in Copenhagen to 7 g in London, UK. For KFC servings, there were even larger differences</p> <p>15 between the countries, ranging from less than 1 g in Germany to 24 g in Hungary. 15 percent of the</p> <p>16 54 fast food servings contained more than 10 g per serving, and 50% contained between 5 and 10</p> <p>17 g8. (Figure 2)</p> <p>18 In 2009, each of the 12 fast food menus, which were collected FRANCE, GERMANY AND THE UK in the same locations as in 2005,</p> <p>19 contained less than 1 g of TFA per serving (Figure 3).</p> <p>20</p> <p>Popcorn</p> <p>Line 21 The highest TFA content in a single 100 g serving of microwave oven popcorn bought in each country IN 2005</p> <p>22 is presented in the data given for the TFA content in the high-trans menu for that country (Fig. 2), 6-12g</p> <p>In 2009, the microwave oven popcorn samples with the highest 1 amounts of TFA,</p>
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which were from
2 Hungary, Poland and the Czech Republic, contained the
same similar amounts
of TFA as the popcorn that we
3 analysed in 2005, 8-16g. In contrast, the TFA in popcorn
from Germany,
France, and UK in 2005 (10-13g) was negligible by 2009
(Fig. 3).
5
6.

A high-trans menu
Line 7 In 2001, the potential consumption of TFA by eating
a high-trans menu
was 37 g in Denmark, but by
8 2005, this potential consumption level was reduced to
less than 1 g (Fig.
2). In 2005, by contrast, the
9 potential consumption level via a high-trans menu
exceeded 20 g in 13 out of
the 16 EU-countries,
10 from which foods were investigated. Hungary, the Czech
Republic, and Poland
ranked among the
11 highest, with values being around 40 g per menu. A
considerable amount of
the TFA in the menus was
12 derived from the fast food meal.
13 Figure 3 demonstrates the time trends for TFA in the
high-trans menu in
Hungary, the Czech Republic,
14 Poland, Germany, France, and the UK. In all of the
countries, the
contribution values obtained from
15 McDonald's and KFC meals (NUGGETS AND FRIES) in
2009 were negligible
compared to the values obtained in 2005.
16 In 2009, biscuits, cakes, wafers, and microwave oven
popcorn were still
high in TFA in Eastern EU
17 countries. In contrast, only small amounts of TFA in
THESE SAME products
obtained in Western EU countries
18 were found.

	<p>19</p> <p>Implications</p> <p>7 An intake of above 5 g of TFA daily is associated with a health risk that can be eliminated more easily</p> <p>8 than many other diet-associated health risks. This issue is particularly relevant to low-income groups</p> <p>9 such as taxi and truck drivers AND MANUAL LABOURERS who, due to other lifestyle factors, already have an increased risk of CORONARY HEART DISEASE</p> <p>10 and who may also more frequently eat foods with a high TFA content.</p> <p>11 In 2011, EU countries, with the exception of Austria and Denmark, legally allow foods with the</p> <p>12 maximum concentration of TFA in the fat (i.e. 60%) to be sold without any notice as long as the food is</p> <p>13 unpackaged (as is the case for restaurants and fast food outlets). If the food is pre-packaged, then the</p> <p>14 law requires the presence of TFA to be noted only by the term "partially hydrogenated fat" in the list of</p> <p>15 ingredients. MOST CONSUMERS DO NOT APPRECIATE THE HAZARD CONCEALED THEREIN. (REF)</p> <p>16 Societal pressure on food producers has undoubtedly resulted in a reduction in the population-level</p> <p>17 mean intake of TFA from 2005 to 2009, especially in Western EU countries. (ref)</p> <p>18 However, this study demonstrated that a high intake of TFA is still possible in Eastern EU countries.</p> <p>19 This problem will continue as long as popular foods with a high concentration of TFA are available.</p> <p>20 Even though labelling foods with TFA contents may further reduce the mean</p>
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intake of TFA, such
21 labelling still allows the intake of high amounts of these fatty acids,
first because fast food is not
22 labelled and second because consumers might not pay attention to the labelling OR UNDERSTAND.
A further advantage of a legislative limit on TFA content is that it does 1
not require the population to
2 learn about the health risks of TFA or to pay attention to the labelling of
food products. It is also MUCH easier
3 and cheaper to monitor the presence of TFA in foods than it is to monitor
the actual intake of TFA in
4 at-risk population subgroups.
5 Austria and Denmark have shown that the health risk that a high intake of
industrially produced trans
6 fatty acids causes can be eliminated for the entire population without any
noticeable side effects for
7 consumers.
THIS HAS THE ADDED ADVANTAGE OF CREATING A "LEVEL PLAYING FIELD" FOR
SUPPLIERS. ALL ARE EQUALLY CHALLENGED. ALL CAN PROFIT FROM EXPERIENCE OF
SUCCESSFUL AND RAPID ADAPTATION AS IN DENMARK.
(refs) It remains to be
investigated to what extent the difference of availability of TFA in popular
8 foods between and Eastern and Western EU countries contributes to the much
higher CHD mortality
9 in CENTRAL EUROPE, than in Western EU-countries (Fig. 4) 10.
10
11 What this paper adds box
12 WHAT IS ALREADY KNOWN ON THIS TOPIC
13 A daily intake of approximately 5 g of industrially produced trans fatty
acids (TFA) is associated with
14 a 23% increase in the risk of CORONARY heart disease.

	<p>15 In the EU Austria and Denmark have shown that a high intake of TFA can be eliminated by a</p> <p>16 legislative ban, without any noticeable side effects for consumers.</p> <p>17</p> <p>18 WHAT THIS STUDY ADDS</p> <p>19</p> <p>A DECLINE SINCE 2005 IN THE AMOUNTS TFA IN POPULAR FOODS IN WESTERN EU COUNTRIES IS OBSERVED.</p> <p>23 IN EASTERN EU COUNTRIES, HOWEVER, THE AMOUNT OF TFA IN THESE PRODUCTS IS STILL HIGH</p> <p>A low average intake TFA at the population level does not preclude a very high intake among some</p> <p>20 subgroups.</p> <p>21 Most EU countries rely on food producers to voluntarily reduce the amounts TFA in foods, WITH VARIABLE RESULTS.</p> <p>22</p> <p>However, legislation is eminently feasible, and offers a more effective, rapid and equitable approach.</p> <p>Fig 1</p> <p>Line 32 Grams of industrially produced trans fatty acids in 100 g of product</p> <p>We need some figures for 2009</p> <p>Figure 3</p> <p>HISTOGRAM LOOKS ODD. IT NEEDS TO BE CHANGED INTO A BAR CHART, TO FACILITATE COMPARISON WITH FIGURE 2</p> <p>Figure 4</p> <p>HUNGARY TRENDS LOOK ODD. MORTALITY FALLS ARE NOW OCCURRING THERE TOO.</p>
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REVIEWER	<p>Andrew Odegaard PhD, MPH Position: Research Associate University of Minnesota Division of Epidemiology and Community Health</p>
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GENERAL COMMENTS	<p>The authors have carried out what appears to be a case study that aims to examine the efficiency of relying on producers to voluntarily reduce TFA in foods with historically high TFA content. Indeed, the authors have an extensive and noteworthy background on this public health area.</p> <p>They found major fast food corporations seem to be self-regulating overall in Europe, biscuits/crackers makers to an extent in Eastern and certainly in Western Europe, where microwave popcorn is self-regulated in Western, but not Eastern Europe. Essentially, 4.5 of the possible 6 areas of possible TFA reduction occurred with self-regulation. (those 1.5 areas being only a partial reduction in TFA in biscuits/crackers and no evident change in popcorn in Eastern EU).</p> <p>They also report that legislation worked in Denmark to essentially eliminate TFA.</p> <p>This work is certainly original in that it provides a snapshot, to some extent, on TFA in foods with traditional high levels of TFA, and is probably most relevant to policy makers, since that is what the author's are arguing for.</p> <p>That said, there are a number of points that could be sharpened to improve this as a scientific research article as it currently reads as more of a hybrid of original research and advocacy paper or editorial.</p> <p>I've provided general and specific comments below that I</p>
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	<p>hope are helpful.</p> <p>General The focus should emphasize “industrial” TFA throughout the paper.</p> <p>Some readers may quibble with the use of “ischemic” instead of Coronary Heart Disease, but this is immaterial if defined specifically using and ICD code for example.</p> <p>Given the study design and approach- was the follow up assessment in 2009 planned in 2004/5 or was this opportunistic use of data? Either way, it provides interesting results from a number of perspectives.</p> <p>I think the title may be misleading – the aim seems to have been to assess a high-TFA menu based on items from three different avenues of processed foods that are likely widely available. There is no evidence provided that these are actually popular items or the per capita consumption is high.</p> <p>As well, the abstract conclusion could use more nuance- the fast food reported in Eastern EU was self regulated according to your results.</p> <p>Introduction:</p> <p>-The sentence beginning in line 5 needs a reference for the values provided. We have provided the following reference: Wahle KWJ, James WPT. Isomeric fatty acids and human health. Eur J Clin Nutr 1993; 47: 828-39.</p> <p>-An estimate of 0.2-1.0% of the Danish population eats this way according to data provided. Is this a public health issue if similar percentages of these</p>
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	<p>other countries are doing the same? An approach aiming to show this would strengthen the article for the audience. This also relates to the title (popular foods).</p> <p>-Are readers going to be confused on what a "basket investigation" is? If there is an actual definition- this essentially seems to be a case study</p> <p>Pg 5 line 11- Earlier it was noted that Switzerland also had introduced a legislative ban on TFA, which one is it?</p> <p>Methods</p> <p>How were the countries chosen- at random or based on available data?</p> <p>Is there any estimate to the prevalence of said "high density" TFA foods in the supermarkets, for example, what % of microwave popcorn was in this range?</p> <p>Is there any data on the frequency of consumption of these popular products?</p> <p>Results</p> <p>Were fewer products purchased in Western Europe due to availability? Or what was the reason there is the large sample difference?</p> <p>Limits</p> <p>Line 4, pg 10- the selective pattern of purchasing could also have led to an overestimate of amounts of TFA in subgroups</p> <p>Implications</p> <p>A reference should be provided on the point related to "low income groups", and</p>
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	<p>other lifestyle factors.</p> <p>Same with the statement regarding regulation of TFA in the EU.</p> <p>Again, with the statement beginning with "societal pressure on....".</p> <p>Again, citing the effectiveness or how non-effective labeling actually is for the consumer.</p> <p>.</p> <p>The ecological data from Denmark on overall IHD(CHD) rates strengthen this discussion and paper, but mention of other factors that may play into this decrease is appropriate. As well, if similar data is available from Austria.</p> <p>Certainly, providing data from all the countries noted in this study would be best, as well as discussion of the potential "ecological fallacy".</p> <p>Overall, I think more balance could be added to this discussion- this paper reads more like an advocacy paper or editorial with some general data. Further discussion on other reasons that self-regulation by producers works in some instances, but not all and reasons why different sectors of food producers are slower to change in the Eastern EU, and so on. Essentially, the authors would much better persuade the audience of the need for legislation in Eastern EU (and globally?) by using this approach, in this reviewers mind.</p>
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VERSION 1 – AUTHOR RESPONSE

Reviewer 1 Comments...

Name: S Capewell

Position: Chair of Clinical Epidemiology

This is an excellent paper with very important messages for public health in the UK and Europe.

I have no major criticisms, apart from: Figure 3 which is currently a histogram; it needs to be redrawn as a bar chart, to facilitate comparisons with Figure 2.

[A new figure 3 has been made according to the reviewer's suggestion](#)

Secondly, I do have a few suggestions to make the paper even better. Mainly by strengthening or revising specific sentences.

These are specified below, with suggested changes IN CAPITALS.

Also, I will endeavour to also send the comments as a Word "Track Changes" document, which may be MUCH easier to comprehend.

All numbers refer to line numbers in the pdf document submitted.

A trans European Union difference in the decline in trans fatty acids in popular foods - a basket investigation.

ABSTRACT

Line 8 Objectives: Trans fatty acids (TFA) are produced when liquid vegetable oil is industrially hydrogenated to make it solid fat. A daily intake of approximately 5 g of TFA is associated with a 23%
9 increase in the risk of CORONARY heart disease. In order to minimize the intake of TFA some countries
10 have introduced labelling, while others have introduced legislative limits on the content of TFA in
11 food INCLUDING AUSTRIA, DENMARK AND SWITZERLAND. HOWEVER , but most countries still rely on food producers to voluntarily reduce the TFA content in food. The
12 objective of the present study was to investigate the efficiency of these strategies in the EU.
13 Design: The potential consumption of TFA was assessed in a basket investigation by analysing the TFA CONTENT in popular

14 foods in 16 EU countries in 2005 and AGAIN in 2009 USING A STANDARD METHODOLOGY.
15 Samples: 70 servings of French fries and chicken nuggets, 90 packages of microwave popcorn, and
16 442 samples of biscuits/cakes/wafers with "partially hydrogenated vegetable fat" listed on the label
17 high on the list of ingredients were analysed. A "high-trans menu" was DEFINED AS a large serving of French fries
18 and nuggets, 100 g of microwave popcorn, and 100 g of biscuits/wafers/cakes.
19 Results: In 2005, a high-trans menu provided above 30 g of TFA in five EU countries in Eastern
20 Europe (SPECIFY) and 20–30 g in eight EU countries in Western Europe (SPECIFY WHICH). In 2009 the values in Hungary, Poland,
21 and the Czech Republic REMAINED HIGH (between 10 and 20 g), whereas they were less than 2 g. in Germany,
22 France and the UK,

Conclusion:

In 2009 the content of TFA in popular foods in 1 Western European APPEARS LOW but not in
Line 2 Eastern European EU countries. THESE FINDINGS suggest that millions of people in the EU still consume TFA in
3 amounts that SUBSTANTIALLY increase their risk of CORONARY heart disease. The Austrian, Danish, and Swiss experiences
4 with legally limiting TFA content in human food, demonstrate that this risk can be eliminated, with no
5 noticeable effect on the availability, price, or quality of food.

INTRODUCTION

Line 2 Trans fatty acids (TFA) in food originate from industrial hardening of oils and from ruminant sources.
3 Compared to unhydrogenated oils, fats containing industrially produced TFA are solid at room
4 temperature, have some technical advantages in food processing, and prolong the shelf life of food. HOWEVER,
5 TFA can constitute up to 60% of the fats in certain foods, whereas ruminant fat contains at most 6%
6 TFA. A meta-analysis of four large prospective studies found that an intake of INDUSTRIAL TFA corresponding to
7 2% of the total energy intake (E %) (approximately 5 g/d) was associated with a 23% increase in the
8 risk of CORONARY heart disease¹. Several public health organisations have therefore recommended that INDUSTRIAL TFA intake
9 should be lowered as much as possible^{2–4}. In 1976, the average intake of

INDUSTRIAL TFA in Western

10 Europe was 6 g/d. In 1996, this intake had dropped to 2.6 g/d (range 1.2 to 6.7 g/d), corresponding to

11 0.5–2.1 E%5. Approximately half of this intake was from ruminant TFA, and only about 1.3 g was from

12 industrial TFA, which constitutes a 78% decrease since 19765. Despite a mean population intake of

13 approximately 1 g of industrial TFA per day in Denmark in 2001, it was still possible to consume 20–

14 30 g of TFA in a SINGLE high-trans menu by eating popular food products such as wafers, microwave popcorn,

15 nuggets, and French fries4. Among the 5 million Danes, 10,000–50,000 people consumed food from

16 this type of menu several times each week, and got a daily intake of more than 5 g TFA4.

17

18

In 2003, Canada introduced the mandatory labelling of the TFA content in pre-packaged food. In the

19 same year, Denmark introduced a legislative limit of 2% industrial TFA in fat used for foods. The

20 European Commission initially opposed this legislation but in MARCH 2007 dropped its infringement

21 proceedings against Denmark because of increased scientific evidence on the dangers of trans fats6.The

22 US introduced mandatory labelling of pre-packaged food in 2006, followed by legislative limits on

23 TFA in the food served in restaurants in New York City in 2008 and in 2010-11 in the state of

California. In 2009, Austria and Switzerland introduced a legislative ban

similar 1 to the Danish' TO BE FOLLOWED IN 2011 BY ICELAND AND SWEDEN. Of the 2 EU's approximately 500 million inhabitants who consume food that still may contain high amounts of

3 trans fat, Denmark's and Austria's populations, representing approximately

14 million people, are the

4 exceptions.

5 In 2005, we assessed by a basket investigation the availability of a high-trans menu (large servings of

6 French fries and nuggets, 100 g of microwave popcorn and 100 g of biscuits/wafers/cakes) in 15 EU

7 countries. , and found that, i In spite of a low mean intake, high

concentrations of industrial TFA were still

8 present in many popular foods. Thus, subgroups of the populations could have an intake that is 9 considerably higher than the recommended upper limit for intake of TFA⁷. TFA in foods from 10 international fast food providers was an important contributor to the high intake in these sub¹¹ populations⁸. Still in 2009, EU countries (with the exception of Austria and Denmark) rely on food 12 producers to voluntarily reduce the amounts of TFA in foods. The present study assess the efficiency of 13 that strategy in three Eastern European countries, Hungary, Poland, and the Czech Republic, and in 14 three Western European countries, Germany, France, and the UK.

METHODS

In July 2009 to September 2009, the capitals of Poland, the Czech Republic, Hungary, Germany, Line 7 France, and the UK were revisited and the same procedures for the purchase of food items WERE FOLLOWED. If 8 possible, the same stores were revisited and the same brands were bought. Altogether, 602 samples of 9 food in EU countries were purchased

Calculation

18 For comparison, the amounts of TFA in the French fries and the chicken nuggets were expressed as the 19 amounts in a serving size equivalent to a large serving from McDonald's in the US: . The serving sizes were 171 g of French fries and 160 g of chicken nuggets.

RESULTS

Line 2

Biscuits, cakes, and wafers

3 Figure 1 presents data from the products bought in the six EU countries in 2005 and 2009. The 4 products are ranked according to TFA content and the combined values for the three Eastern EU 5 countries and for the three Western EU countries are given separately. IN 2005, THE highest TFA contents (10– 6 15 g) in single 100 g servings were found in Hungary, Poland, and the Czech Republic. In 2005 in 7 France, Germany, and the UK, the TFA contents were lower but still considerable (4–7 g). AVERAGING 5G EXCLUDING ONE OUTLIER 8 In 2009 biscuits, cakes, and wafers in the three Eastern EU countries

contained a smaller, but still
9 substantial, amount of TFA (4–6 g in Figure 3). In contrast, the TFA content
in products in the three Western EU
10 countries was minimal (< 1 g). The same pattern was observed in each of the
countries.

Fast food

Line 13

In 2005, the TFA content of the McDonald's servings in EU varied from less
than 1 g in Copenhagen
14 to 7 g in London, UK. For KFC servings, there were even larger differences
between the countries,
15 ranging from less than 1 g in Germany to 24 g in Hungary. 15 percent of the
54 fast food servings
16 contained more than 10 g per serving, and 50% contained between 5 and 10
g8. (Figure 2)

17 In 2009, each of the 12 fast food menus, which were collected FRANCE,
GERMANY AND THE UK in the same locations as in 2005,
18 contained less than 1 g of TFA per serving (Figure 3).

19

20

Popcorn

Line 21 The highest TFA content in a single 100 g serving of microwave oven
popcorn bought in each country IN 2005
22 is presented in the data given for the TFA content in the high-trans menu
for that country (Fig. 2), 6-12g

In 2009, the microwave oven popcorn samples with the highest 1 amounts of TFA,
which were from

2 Hungary, Poland and the Czech Republic, contained the same similar amounts
of TFA as the popcorn that we
3 analysed in 2005, 8-16g. In contrast, the TFA in popcorn from Germany,
France, and UK in 2005 (10-13g) was negligible by 2009 (Fig. 3).

5

6.

A high-trans menu

Line 7 In 2001, the potential consumption of TFA by eating a high-trans menu
was 37 g in Denmark, but by

8 2005, this potential consumption level was reduced to less than 1 g (Fig.

2). In 2005, by contrast, the

9 potential consumption level via a high-trans menu exceeded 20 g in 13 out of
the 16 EU-countries,

10 from which foods were investigated. Hungary, the Czech Republic, and Poland ranked among the

11 highest, with values being around 40 g per menu. A considerable amount of the TFA in the menus was

12 derived from the fast food meal.

13 Figure 3 demonstrates the time trends for TFA in the high-trans menu in Hungary, the Czech Republic,

14 Poland, Germany, France, and the UK. In all of the countries, the contribution values obtained from

15 McDonald's and KFC meals (NUGGETS AND FRIES) in 2009 were negligible compared to the values obtained in 2005.

16 In 2009, biscuits, cakes, wafers, and microwave oven popcorn were still high in TFA in Eastern EU

17 countries. In contrast, only small amounts of TFA in THESE SAME products obtained in Western EU countries

18 were found.

19

Implications

7 An intake of above 5 g of TFA daily is associated with a health risk that can be eliminated more easily

8 than many other diet-associated health risks. This issue is particularly relevant to low-income groups

9 such as taxi and truck drivers AND MANUAL LABOURERS who, due to other lifestyle factors, already have an increased risk of CORONARY HEART DISEASE 10 and who may also more frequently eat foods with a high TFA content.

11 In 2011, EU countries, with the exception of Austria and Denmark, legally allow foods with the

12 maximum concentration of TFA in the fat (i.e. 60%) to be sold without any notice as long as the food is

13 unpackaged (as is the case for restaurants and fast food outlets). If the food is pre-packaged, then the

14 law requires the presence of TFA to be noted only by the term "partially hydrogenated fat" in the list of

15 ingredients. MOST CONSUMERS DO NOT APPRECIATE THE HAZARD CONCEALED THEREIN. (REF)

16 Societal pressure on food producers has undoubtedly resulted in a reduction in the population-level

17 mean intake of TFA from 2005 to 2009, especially in Western EU countries. (ref)

18 However, this study demonstrated that a high intake of TFA is still possible in Eastern EU countries.

19 This problem will continue as long as popular foods with a high concentration of TFA are available.

20 Even though labelling foods with TFA contents may further reduce the mean intake of TFA, such

21 labelling still allows the intake of high amounts of these fatty acids, first because fast food is not

22 labelled and second because consumers might not pay attention to the labelling OR UNDERSTAND.

A further advantage of a legislative limit on TFA content is that it does 1 not require the population to

2 learn about the health risks of TFA or to pay attention to the labelling of food products. It is also MUCH easier

3 and cheaper to monitor the presence of TFA in foods than it is to monitor the actual intake of TFA in

4 at-risk population subgroups.

5 Austria and Denmark have shown that the health risk that a high intake of industrially produced trans

6 fatty acids causes can be eliminated for the entire population without any noticeable side effects for

7 consumers.

THIS HAS THE ADDED ADVANTAGE OF CREATING A "LEVEL PLAYING FIELD" FOR SUPPLIERS. ALL ARE EQUALLY CHALLENGED. ALL CAN PROFIT FROM EXPERIENCE OF SUCCESSFUL AND RAPID ADAPTATION AS IN DENMARK. (refs) It remains to be

investigated to what extent the difference of availability of TFA in popular

8 foods between and Eastern and Western EU countries contributes to the much higher CHD mortality

9 in CENTRAL EUROPE, than in Western EU-countries (Fig. 4) 10.

10

11 What this paper adds box

12 WHAT IS ALREADY KNOWN ON THIS TOPIC

13 A daily intake of approximately 5 g of industrially produced trans fatty acids (TFA) is associated with

14 a 23% increase in the risk of CORONARY heart disease.

15 In the EU Austria and Denmark have shown that a high intake of TFA can be eliminated by a

16 legislative ban, without any noticeable side effects for consumers.

17

18 WHAT THIS STUDY ADDS

19

A DECLINE SINCE 2005 IN THE AMOUNTS TFA IN POPULAR FOODS IN WESTERN EU COUNTRIES IS OBSERVED.

23 IN EASTERN EU COUNTRIES, HOWEVER, THE AMOUNT OF TFA IN THESE PRODUCTS IS

STILL HIGH

A low average intake TFA at the population level does not preclude a very

high intake among some
20 subgroups.

21 Most EU countries rely on food producers to voluntarily reduce the amounts
TFA in foods, WITH VARIABLE RESULTS.

22

However, legislation is eminently feasible, and offers a more effective, rapid
and equitable approach.

Fig 1

Line 32 Grams of industrially produced trans fatty acids in 100 g of
product

We need some figures for 2009

Figure 3

HISTOGRAM LOOKS ODD. IT NEEDS TO BE CHANGED INTO A BAR CHART, TO
FACILITATE
COMPARISON WITH FIGURE 2

[The figure has been changed as suggested](#)

Figure 4

HUNGARY TRENDS LOOK ODD. MORTALITY FALLS ARE NOW OCCURRING THERE TOO.

[We have added the new available figures for 2007, 2008, and 2009](#)

[In conclusion we have followed all of the suggestions from this reviewer and we
appreciate his thorough work with our manuscript](#)

[Reviewer 2 Comments...](#)

Name: Andrew Odegaard PhD, MPH

Position: Research Associate

COMMENTS FOR THE AUTHOR

The authors have carried out what appears to be a case study that aims to
examine the efficiency of relying on producers to voluntarily reduce TFA in
foods with historically high TFA content. Indeed, the authors have an extensive
and noteworthy background on this public health area.

They found major fast food corporations seem to be self-regulating overall in Europe, biscuits/crackers makers to an extent in Eastern and certainly in Western Europe, where microwave popcorn is self-regulated in Western, but not Eastern Europe. Essentially, 4.5 of the possible 6 areas of possible TFA reduction occurred with self-regulation. (those 1.5 areas being only a partial reduction in TFA in biscuits/crackers and no evident change in popcorn in Eastern EU).

They also report that legislation worked in Denmark to essentially eliminate TFA.

This work is certainly original in that it provides a snap shot, to some extent, on TFA in foods with traditional high levels of TFA, and is probably most relevant to policy makers, since that is what the author's are arguing for.

That said, there are a number of points that could be sharpened to improve this as a scientific research article as it currently reads as more of a hybrid of original research and advocacy paper or editorial.

I've provided general and specific comments below that I hope are helpful.

General

The focus should emphasize "industrial" TFA throughout the paper.

Some readers may quibble with the use of "ischemic" instead of Coronary Heart Disease, but this is immaterial if defined specifically using and ICD code for example.

[We have replaced the word ischemic with coronary heart disease as also suggested by reviewer 1](#)

Given the study design and approach- was the follow up assessment in 2009 planned in 2004/5 or was this opportunistic use of data? Either way, it provides interesting results from a number of perspectives.

I think the title may be misleading – the aim seems to have been to assess a high-TFA menu based on items from three different avenues of processed foods that are likely widely available. There is no evidence provided that these are actually popular items or the per capita consumption is high.

[We assume the popularity of these products because they were stocked at the supermarkets. They are only stocked there because they are sold in considerable amounts. This is mentioned in the manuscript.](#)

[The competition between food producers of having their products on the shelves in large supermarkets is fierce. Only products with a sufficient turnover are allowed to be there.](#)

The popularity of foods from McDonald and KFC in large cities is inferred from the same argumentation.

As well, the abstract conclusion could use more nuance- the fast food reported in Eastern EU was self regulated according to your results.

We have modified the conclusion by adding the sentence "in spite of some reduction" (in Eastern Europe)

Introduction:

-The sentence beginning in line 5 needs a reference for the values provided.

We have provided the following reference: Wahle KWJ, James WPT. Isomeric fatty acids and human health.

Eur J Clin Nutr 1993; 47: 828-39.

-An estimate of 0.2-1.0% of the Danish population eats this way according to data provided. Is this a public health issue if similar percentages of these other countries are doing the same? An approach aiming to show this would strengthen the article for the audience. This also relates to the title (popular foods).

We have in line17 page 4 added the sentence: "Generalizing to the population in the EU, this corresponds to 1-5 million people"

-Are readers going to be confused on what a "basket investigation" is? If there is an actual definition- this essentially seems to be a case study

We have now replaced the word basket with the words "market basket" In PubMed.com the search term "market basket" generates 20 titles using the term in the title and 155 papers using the term in the text. Most of the papers deal with the content of toxic components in foods.

Reviewer 2 finds the study to be a case study. We report however 600 cases, which are the number of foods, analysed for TFA

Pg 5 line 11- Earlier it was noted that Switzerland also had introduced a legislative ban on TFA, which one is it?

The sentence in the paper reads: "Still in 2009, EU countries (with the exception of Austria and Denmark) rely on food producers to voluntarily reduce the amounts of I-TFA in foods."

Switzerland is not an EU country.

The legislative ban in Switzerland is similar to the legislative ban in Denmark and is mentioned in the text.

Methods

How were the countries chosen- at random or based on available data?

As mentioned in the text: "The cities included were partly determined by visits taken by the authors and their colleagues for other purposes, and these visits were supplemented by arranged visits by two of the authors (SS, JD)."

In 2005 (fig 2) we intended to include as many EU countries as economically feasible. In 2009 we revisited the 3 eastern EU-countries that had the highest values for the high *trans*-menu: Czech Republic, Poland and Hungary and decided to compare with 3 large western EU countries: Germany, France, and UK.

Is there any estimate to the prevalence of said "high density" TFA foods in the supermarkets, for example, what % of microwave popcorn was in this range?

We did not count the total number of different brands of micro wave popcorn or of biscuits. We used the inclusion criteria as given in the text: "Microwave oven popcorn and biscuits/cakes/wafers were bought if "partially hydrogenated fat" or a similar term was listed among the first three ingredients and if the food label indicated that the fat content exceeded 15 g of fat per 100 g."

Is there any data on the frequency of consumption of these popular products?

Not to our knowledge. As already mentioned we rely on the assumption that when the products are present in large supermarkets, they have a considerable turnover. We have considered using the term "availability of food with high content of trans fatty acids".

However this term does not reflect that the foods were bought only in large supermarkets.

Results

Were fewer products purchased in Western Europe due to availability? Or what was the reason there is the large sample difference?

In Western Europe we were in 2009 not able to find the same number of foods that fulfilled the inclusion criteria: "Microwave oven popcorn and biscuits/cakes/wafers were bought if "partially hydrogenated fat" or a similar term was listed among the first three

ingredients and if the food label indicated that the fat content exceeded 15 g of fat per 100 g.”

The number of different brands was probably more or less the same, but in Western Europe most of them were in 2009 not any longer labelled with the term “partially hydrogenated fat” or a similar and when they were, the products contained only small amounts of trans fat.

In the legend to fig 1 we have added the following sentences: “Products were only bought if “partially hydrogenated fat” or a similar term was listed among the first three ingredients and if the food label indicated that the fat content exceeded 15 g of fat per 100 g”. Fewer products in Western EU countries fulfilled in 2009 the inclusion criteria compared with the situation in Eastern EU-countries.

Limits

Line 4, pg 10- the selective pattern of purchasing could also have led to an overestimate of amounts of TFA in subgroups

Our argumentation supports an underestimation.

Implications

A reference should be provided on the point related to “low income groups”, and other lifestyle factors.

We wrote: low-income groups.. who due to other lifestyle factors, already have an increased risk of coronary heart disease and who may also more frequently eat foods with a high I-TFA content

We have added the following reference: Gill PE and Wijk K Case study of a healthy eating intervention for Swedish lorry drivers Health Education Research 2004 vol. 19 no.3:306-315

Same with the statement regarding regulation of TFA in the EU.

We have added the following reference: Legislation relating to the level of industrially produced trans fatty acids in food p45-49 in: The influence of trans fatty acids on health-fourth edition 2004, WWW.meraadet.dk

Again, with the statement beginning with “societal pressure on....”.

We have added the following reference: Katan MB Regulation of trans fats: The Gap, the Polder, and McDonald’s French fries. Atherosclerosis Supplements 7 (2006) 69-71

Again, citing the effectiveness or how non-effective labeling actually is for the consumer.

We have added 2 references

Consumers find food labelling confusing:

<http://www.guardian.co.uk/money/2009/may/07/food-drink-health-labels>

Borra S. Consumer perspectives on food labels. *Am J Clin Nutr.* 2006 May;83(5):1235S.

The ecological data from Denmark on overall IHD(CHD) rates strengthen this discussion and paper, but mention of other factors that may play into this decrease is appropriate. As well, if similar data is available from Austria. Certainly, providing data from all the countries noted in this study would be best, as well as discussion of the potential "ecological fallacy".

With our last sentence in the paper we mention that Trans fatty acids may play a role in the difference in mortality. Our study does not deal with other and more conventional risk factors such as smoking , hypertension.

By only depicting Hungary and Denmark and the mean for all OECD countries we find the figure much less complicated compared with a figure that have values for all 6 countries.

Due to space constraint we have not dealt with ecological inference fallacy

Overall, I think more balance could be added to this discussion- this paper reads more like an advocacy paper or editorial with some general data. Further discussion on other reasons that self-regulation by producers works in some instances, but not all and reasons why different sectors of food producers are slower to change in the Eastern EU, and so on. Essentially, the authors would much better persuade the audience of the need for legislation in Eastern EU (and globally?) by using this approach, in this reviewers mind.

PRIVATE COMMENTS FOR THE EDITOR:

I'm not real sure what to think of this paper. The authors have provided some interesting data, which actually could be interpreted that self-regulation works in some instances, yet the focus, and it seems a bit hasty, doesn't seem to actualize this and the paper doesn't provide the necessary details, or nuance to make this seem like a scientific study. Would an observational study that provided this level of opaqueness even be reviewed? These comments are coming from a researcher who ardently believes reducing and eliminating TFA from the food supply and reducing intake of the foods it is historically common in is a significant public health issue.

