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COST EFFECTIVENESS ANALYSIS OF ELIMINATING INDUSTRIAL AND ALL TRANS FATS IN ENGLAND AND WALES: MODELLING STUDY

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Contributors: JPS, SC and MoF conceived the idea of the study. SC and JC developed the original IMPACT CHD model. JPS and WH led the analysis supervised by MoF and JC, and generated the results. JPS drafted and finalised the paper with input from WH, MGC, HM, MC, SC, MoF and JC. All authors contributed to the analysis, intellectual content, critical revisions to the drafts of the paper and approved the final version. SC is the guarantor and affirms that the manuscript is an honest, accurate and transparent account of the study being reported.

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Abstract

Introduction

Coronary Heart Disease (CHD) remains a leading cause of UK mortality. Dietary trans fats (TFA) represent a powerful CHD risk factor. However, UK efforts to reduce intake have been less successful than other nations. We modelled the potential health and economic effects of eliminating industrial and all TFA up to 2020.

Methods

We extended the previously validated **IMPACTsec** model, to estimate the potential effects on health and economic outcomes of mandatory reformulation or a complete ban on dietary TFA in England and Wales from 2011-2020. We modelled two policy scenarios:

1) elimination of industrial TFA consumption, from 0.8%-0.4% daily energy
2) elimination of all TFA consumption, from 0.8%-0%

Results

Elimination of industrial-TFA across the England and Wales population could result in approximately 1,600 fewer deaths per year, with some 4,000 fewer hospital admissions; gaining approximately 14,000 additional life years. Health inequalities would be substantially reduced in both scenarios.

Elimination of industrial-TFA would be cost saving. This would include approximately £100m saved in direct healthcare costs. Elimination of all TFA would double the health and economic gains.

Conclusions

Eliminating industrial or all UK dietary intake of TFA could substantially reduce CHD mortality and inequalities, whilst resulting in substantial annual savings.

Introduction

Cardiovascular disease (CVD) (coronary heart disease (CHD) and stroke), continues to be a major cause of mortality and morbidity in the UK, and globally. Mortality rates for CVD have halved over the past two decades[1], but despite this, approximately 35% of total UK deaths remain attributable to CVD. CVD is estimated to cost the UK economy £30bn annually[2] with some £14bn of this spent on healthcare. CHD costs have increased from £1.75bn in 1999, to £2bn in 2005[3], with the statin bill alone exceeding £840m in 2006[4], whilst statin prescriptions had increased by almost 50% by 2012[5]. These costs are expected to continue to increase in the coming decades. Major risk factors for CHD are diet, smoking, alcohol excess and physical inactivity[6]. Within diet, key factors include suboptimal fruit and vegetable intake, excess salt, sugar, saturated fats, and trans fatty acids (TFA). TFA are more harmful to CHD than any other macronutrient.

TFA consumption comprises industrial TFA (approximately 0.8% daily energy intake in the UK), and ruminant TFA (approximately 0.4% daily energy intake). **Industrial TFA** are unsaturated fatty acids with at least one double bond in the trans configuration, formed during the partial hydrogenation of vegetable oils. This process is utilised in the production of margarines, commercial cooking and food manufacturing processes. The partial hydrogenation process converts the vegetable oil into a solid fat with stability during packing, enhanced palatability and longer shelf life, hence profitability. The major sources of dietary TFA in the UK are bakery products, spreads, packaged snack foods and deep-fried fast foods. Naturally occurring ruminant TFA, such as in meats, dairy and other ruminant products are produced by the action of bacteria in the ruminant stomach. The role of ruminant TFA upon CHD risk is much less well characterised than industrial TFA; initially thought to be relatively harmless, it now appears this may have been under-estiamted owing to low intake levels[7].

Industrial TFA substantially increase CHD risk by raising LDL-cholesterol (bad cholesterol), reducing HDL-cholesterol (good cholesterol), causing systemic inflammation and adversely affecting endothelial cell function[8]. TFA increase CHD risk more than any other macronutrient[7], whereby every 1% increase in daily energy obtained from TFA raises CHD mortality by 12%[8]. Consumption of TFA has fallen across the developed world over the past decade, reaching approximately 0.8% (2 grammes)[10] of daily energy intake in the UK. This reduction has only been achieved by sustained pressure from the UK Food Standards Agency, reformulation efforts by some companies and voluntary content labelling[11]. The effectiveness of these voluntary measures appears to be decreasing given the decline in the rate of TFA intake reduction since 2007[12]. Labelling is probably not the answer - being slow, bureaucratic and of limited effectiveness[13].

Several other policies, ranging in efficacy, have been utilised to successfully reduce dietary TFA in countries across the globe. These include voluntary self regulation, and local or national legislation[14]. TFA bans in restaurant food in New York City eventually led to national-wide reformulation and a halving of population TFA levels in the USA[12], however can have inequitable effects[14].

The most effective policies have been national legislative bans, such as those seen in Denmark, Iceland, Austria and Switzerland. Moreover, we recently quantified the potential health effects upon the England and Wales population of reductions in TFA intake by 0.5% and 1% of daily energy intake respectively. This demonstrated substantial potential health benefits of a reduction in TFA intake by 1%, including saving approximately 10,000 hospital admissions annually[15]. This also demonstrated large potential reductions in pre-existing inequalities within the CHD burden[16].

With scarce resources, the economic potential of prevention policies is increasingly important. We therefore aimed to quantify the potential health effects, costs and benefits of two potential UK-wide policies: elimination of industrial TFA only, or complete elimination (industrial and natural) of dietary intake of TFA, to better inform policy makers.

Methods

IMPACTecon Model

We modelled the potential health and economic effects of elimination of all TFA, industrial and ruminant(reducing intake to 0%) and elimination of industrial TFA (achieving intake of 0.4% daily energy) from 2011-2020 in the UK. Outputs include Deaths Prevented or Postponed(DPPs), Life Years Gained(LYGs), hospital admissions, and a societal economic perspective inclusive of direct healthcare and informal care costs and averted productivity loss. Industry costs are also estimated and modelled, whilst state costs in implementing and monitoring such policies are also accounted for. Outputs are stratified by age, gender and socio-economic circumstance(SEC). To create the IMPACTecon model, we extended the recently described IMPACTtfa model[15] calibrated for the English and Welsh population, to estimate the economic costs and benefits of both scenarios. Briefly, the IMPACTtfa model projects the expected number of deaths in 2011-2020 and then estimates the DPPs for a given reduction in TFA intake across the population. The effect size of TFA upon CHD mortality was taken from Mozaffarian et al[8]. Using the calculated DPPs, we calculated a reduction in hospital admissions and LYGs by multiplying DPPs by age, gender and CHD sub-group specific median surivials. Sub-group specific median survival estimates were obtained from previous analysis[17,21,22,23] and updated with more recent data[24]**.**

The resulting number of surviving patients in each scenario was calculated from the mortality reduction percentage of each given reduction in TFA intake and existing incidence numbers by disease group. The relative distribution and ratios of patients across the disease groups within the underlying burden remained consistent from 2007[16]. We conservatively assumed a negligible effect upon case fatality itself, hence negligible effect upon underlying community prevalence.

Data Sources for the IMPACTecon Model

The population was stratified into three age groups(<55, 55-74, 75+), gender and SEC (5 quintiles based on Index of Multiple Deprivation(IMD) scores, SEC 1 most affluent, SEC 5 most deprived). Mortality and demographic data for the IMPACT model was obtained from the ONS. Patient numbers were estimated for three mutually exclusive patient groups: acute myocardial infarction(AMI), unstable angina(UA), and heart failure(HF) admissions. CHD Prevalence was not included. We used Hospital Episodes Statistics, Myocardial Ischaemia National Audit Project and the General Practice Research Database. Intake levels of TFA were taken from the National Diet & Nutrition Survey[10] and Low Income Diet and Nutrition Survey[19]. We also used specific mortality reductions for a given reduction in TFA intake [8] stratified into age and sex specific mortality reductions[9]. Further details on IMPACT data sources and methodology can be obtained from Bajekal et al[20] and S1 file.

We modelled four scenarios outlined in table 1.

	TFA Intake	TFA intake reduction	SEC
Scenario 1 (Elimination of all TFA, equal)	0.8%	0.8%	Equal intake
Scenario 2 (Elimination of all TFA, unequal)	0.8%	0.8%	Unequal intake
Scenario 3 (Elimination of industrial TFA, equal)	0.8%	0.4%	Equal intake
Scenario 4 (Elimination of industrial TFA, unequal)	0.8%	0.4%	Unequal intake

Table 1. Scenario 1, 2, 3 and 4 modelling elimination of all TFA and elimination of industrial TFA, including baseline TFA intake (0.8%[10]) and TFA intake reduction, both as a % of daily energy intake. Scenario 1 and 3

models equal TFA intake by SEC, scenarios 2 and 4 models unequal SEC quintile intake. Unequal SEC TFA intake is outlined in table 9.

Cost Effective Analysis

The monetary analysis takes a societal perspective, considering the state, industry, healthcare and wider economy monetary costs and benefits of the scenarios modelled.

State costs

We used costs relating to state monitoring of salt content as a best estimate. This was £2.4 million annually, comprising monitoring label contents and urine analysis of salt content[25]. For initial costs we used a range with best estimate of £3m (minimum-£100,000 and maximum-£5m).

Industry costs

The UK Food Standard Agency's Impact Assessment 2009 for the voluntary reformulation strategy suggests £25,000 reformualtion cost per product (British Retail Consortium). Reformulation of TFA would affect 8,000 product lines[26]. However, experience of TFAs regulation in other nations, suggests that reformulation costs to industry are likely to be negligible[27]. We therefore modelled:

- Worst case - Reformulation of 8,000 product lines at £25,000/product.
- Best case - Negligible reformulation cost (phased implementation hence absorbed into product's natural reformulation cycle).

An estimated ongoing annual cost of £2million(1% maximum total capital spend) to (conservatively) account for reduced industry profits was included(table 8).

Direct Healthcare Savings

Costs were assigned to each treatment using data from the Department of Health reference costs 2010/11 and The Unit Costs of Health and Social Care 2011[28]. Observed treatment uptake rates were then used to calculate the unit cost for each patient group.

Productivity loss averted

This was calculated using frictional unemployment theory described by Liu[29]. This estimates the period of employees' absence from work before being replaced –90 days in the UK[29], with mean hourly wage[30], hours worked, and the reduction in hospital admissions for each given year to calculate the potential reduction in lost productivity over the period.

Informal Care costs

CHD informal care costs were estimated by using the informal care costs in the British Heart Foundation CVD report of £1.9bn[4] as a baseline. We reduced this sum by the corresponding proportional reduction of CHD incidence observed.

Outcomes were discounted at 3.5% as per NICE guidelines[31].

Outcomes

Outcome measures included cost per LYG, and Quality Adjusted Life Years (QALYs). The cost denominator was state costs(not including savings) only. Health state utility values used to calculate QALYS are outlined in table 2.

Table 2. Health State Utility Values. Reference: NICE guidelines [32]

CHD subtype	**Health State Utility Values**
Acute Myocardial Infarction	0.88
Unstable Angina	0.80

Heart Failure	0.71

Baseline scenario for comparison over this 10 year period was no legislative action on TFA, assuming that CHD mortality would continue to reduce at the rate from 1999 -2007[16].

Uncertainty Analysis

We conducted a probabilistic sensitivity analysis for parameter uncertainty with 10,000 Monte-Carlo simulation iterations. This is outlined in S1 file.

Results

Health outcomes

Elimination of all TFA resulted in the largest mortality and life years gained, with slightly larger gains when modelling unequal baseline TFA by SEC. CHD SEC inequalities had larger reductions assuming unequal baseline intake.

Scenario 1 (Elimination of all TFA, equal TFA intake)

Eliminating all TFA could prevent approximately 3,200 deaths per year ((95% confidence interval (CI): 3,042-3,427), gaining approximately 27,000 life years (24,578-29,953). Further, approximately 8,000 (2,800-13,024) hospital admissions could be averted each year (Table 3). Total hospital admissions averted over the 10 year period would be approximately 68,000.

Scenario 2 (Elimination of all TFA, unequal intake)

This scenario could prevent approximately 3,300 deaths per year (3,141-3,540), gaining approximately 29,000 life years (26,257-31,903). This could also result in approximately 8,400 fewer hospital admissions (3,258-13,439) (Table 3). Total hospital admissions averted over the period would be approximately 72,000.

Scenario 3 (Elimination of industrial TFA, equal intake)

This scenario could prevent approximately 1,600 deaths per year (1,521-1,714), gaining approximately 14,000 life years (12,291-14,984). This could also result in approximately 4,000 fewer hospital admissions (-1,355-9,215)(Table 3). Total hospital admissions averted would be approximately 34,000.

Scenario 4 (Elimination of industrial TFA alone, unequal intake)

This scenario could prevent approximately 1,700 deaths per year (1,619-1,825), gaining approximately 15,000 life years (13,952-16,934). This could also result in approximately 4,400 fewer hospital admissions (-873-9,623 (Table 3). Total hospital admissions averted would be approximately 38,000.

Socio-economic inequalities

The above potential health gains resulting from elimination of all TFA could reduce existing health inequalities. Conservatively estimating assuming equal intake of TFA, approximately 40% more DPPs and 80% more LYGs would be gained in the most deprived compared with the most affluent. When modelling a more realistic scenario (unequal intake), up to six times more DPPs(figure 4 S1 File) and hospital admissions could be averted and seven fold more LYGs could be gained in the most deprived vs. most affluent quintile. Similar proportional improvement in inequalities could be observed under the scenario of elimination of industrial TFA only.

Table 3. Deaths Prevented or Postponed, Life Years Gained and hospital admissions averted in scenarios 1, 2, 3 and 4. The lower (lci) and upper (uci) confidence intervals are derived from 5% and 95% centiles of 10,000 Monte Carlo simulations. Since many input variables are not normally distributed the CI may not be symmetrical. Mean estimates are rounded. All figures above are per annum for the year 2020.

	DPP			**LYG**			**Hospital**		

							admissions averted		
Scenario	**Mean**	**lci**	**uci**	**Mean**	**lci**	**uci**	**Mean**	**lci**	**uci**
Scenario 1	3,200	3,042	3,427	27,200	24,578	29,953	8,000	2,800	13,024
Scenario 2	3,300	3,141	3,540	29,000	26,257	31,903	8,400	3,258	13,439
Scenario 3	1,600	1,521	1,714	13,600	12,291	14,984	4,000	-1,355	9,215
Scenario 4	1,700	1,619	1,826	15,400	13,952	16,934	4,400	-873	9,623

Costs

Total state costs could range from £22million to £27.2million over the ten year period, with initial legislative costs ranging from £100,000 to £5million(table 4). Table 5 demonstrates that between approximately £95 million (95% CI: £64m - £125m) to £201 million(£139m - £262m) could be saved in direct healthcare costs as a result of reduced hospital admissions 2011-2020. However, financial savings to the wider economy could be substantially larger. Between approximately £368 million(£249m-£481m) and £727 million(£598m-£880m) could be saved in informal care costs(table 6), whilst the averted productivity loss to the UK economy would be between approximately £292 million(£197m - £381m) and £613 million(£424m - £801m)(table 7).

Table 4. Estimated legislative, annual monitoring, and total period discounted costs for scenario 1, 2,3 and 4 of reformulation or a ban on industrial TFA. Results are rounded to nearest £100,000.

	Legislative	**Annual Monitoring**	**Total (discounted)**
Minimum	£100,000		£22,000,000
Maximum	£5,000,000		£27,200,000

Best	£3,000,000	£2,400,000	£25,200,000

Table 5. Estimated discounted direct healthcare savings over the 13 year (2007-2020) period for scenario 1, 2 and 3. The lower (lci) and upper confidence (uci) intervals are derived from 5% and 95% centiles of 10,000 Monte Carlo simulations. Since many input variables are not normally distributed the CI may not be symmetrical. Results are rounded to nearest £1,000,000

Healthcare Savings	**Mean**	**lci**	**uci**
Scenario 1	£191,000,000	£155,000,000	£228,000,000
Scenario 2	£201,000,000	£139,000,000	£262,000,000
Scenario 3	£95,000,000	£64,000,000	£125,000,000
Scenario 4	£105,000,000	£72,000,000	£137,000,000

Table 6. Estimated discounted informal care savings over the 13 year (2007-2020) period for scenario 1, 2, 3 and 4. The lower (lci) and upper confidence (uci) intervals are derived from 5% and 95% centiles of 10,000 Monte Carlo simulations. Since many input variables are not normally distributed the CI may not be symmetrical. Results are rounded to nearest £1,000,000.

Informal care saving	**Mean**	**lci**	**uci**
Scenario 1	£727,000,000	£598,000,000	£880,000,000
Scenario 2	£557,000,000	£386,000,000	£728,000,000
Scenario 3	£368,000,000	£249,000,000	£481,000,000
Scenario 4	£409,000,000	£280,000,000	£531,000,000

Table 7. Estimated discounted averted productivity loss over the 13 year (2007-2020) period for scenario 1, 2, 3 and 4. The lower (lci) and upper confidence (uci) intervals are derived from 5% and 95% centiles of 10,000 Monte Carlo simulations. Since many input variables are not normally distributed the CI may not be symmetrical. Results are rounded to nearest £1,000,000.

Productivity loss averted	Mean	lci	Uci
Scenario 1	£583,000,000	£473,000,000	£697,000,000
Scenario 2	£613,000,000	£424,000,000	£801,000,000
Scenario 3	£292,000,000	£197,000,000	£381,000,000
Scenario 4	£322,000,000	£220,000,000	£418,000,000

Industry Costs

The maximum discounted cost to industry over this period could be approximately £140million, whilst the minimum whereby reformulation was absorbed into the natural product reformulation cycle would be £0(table 8).

Table 8. Minimum and maximum industry costs in year 1, and discounted over the 10 year period. Results are rounded to nearest £1,000,000.

	Initial reformulation	Period cost	Ongoing annual cost	Period Cost
Minimum	£0	£0	£0	£0
Maximum	£200,000,000	£142,000,000	£2,000,000	£14,000,000

Cost effectiveness

Cost per LYG ranged across the four scenarios (S1 file table 10, figure 1) from approximately £1,400 (£1,424-£1,469) in scenario 2 (to approximately £3,100 (£3,071-£3,162) in scenario 3. In aggregate form, the intervention was most cost effective in middle aged men (55-74) at approximately £900/LYG; whilst it was the least cost effective in young women aged<55 at approximately £6,600 (figure 2).

The cost per LYG also varies substantially across SEC. Unsurprisingly; the policy was most cost effective in the most deprived quintile with an aggregate cost per LYG of approximately £1,200 (£1,148-£1,218), compared with £2,100 (£2,004-£2,133) per LYG in the most affluent in scenario 1 (elimination of al TFA, equal intake). As expected, this difference is even larger in scenario 2 (elimination of all TFA, unequal intake)(figure 1, S1 file table 10). The cost effectiveness plane(figure 3) demonstrates each scenario to be both cost saving, and gain life years in each iteration of the uncertainty analysis. Further, this policy could generate between approximately 8,900(scenario 3) and 19,300(scenario 2) QALYS over the 10 year period. As these policies are cost saving, this is the dominating policy against the baseline.

Discussion

Main finding

A UK wide elimination of all TFA could result in substantial health gains, and NHS savings. While mortality gains would be greatest in the elderly, a large number of life years would be gained in the younger age groups.

All TFA policies modelled would be cost effective, however elimination of all TFA could be 'extremely cost effective' (a WHO definition for policies costing less than per capita GDP). This model suggests that elimination of all TFA would be more effective than the baseline (no ban) and cost saving, hence the dominant scenario. A comparison of TFA cost effectiveness with statins as a primary prevention might further inform policy makers. Fidan et al[17] found statins to be 'reasonably cost effective' for secondary prevention, but 'much less cost effective' for primary prevention with an aggregate cost per LYG of £27,828. This compares with an aggregate cost of between approximately £1,400 and £3,100 per LYG in the four scenarios we have modelled. NICE lipid lowering guidelines[31] when taking a 10 year view (as in our study) estimates cost effectiveness of statins varied from £36,000-£286,000 per QALY for those aged 45, increasing to £53,000-£367,000 per QALY for those aged 85. Even in the conservative scenario of calculating cost per QALY using costs only, each QALY would only cost £1,300 (scenario 2) to £2,800 (scenario 3).

Socio-economic inequalities

The effect upon CHD inequalities could be substantial, with five times greater reduction in deaths and LYG in the most deprived groups, than the most affluent. This policy would be most cost effective in the least affluent groups. Furthermore, the individual economic benefits, such as less time out of the workforce, and lower rates of early retirement due to ill health are not modelled here but would likely be substantial.

What is already known on this topic

Our health and cost effectiveness outcomes results are consistent with previous studies. Mozaffarian et al[33] analysed TFA consumption in Iran. Baseline intake of trans fats was 5-6 times above effective elimination, than in the UK, whilst baseline CHD mortality rates were also higher. This study suggested that elimination of industrial TFA could prevent 5,600-27,300 CHD deaths. These modelling results are also consistent with the large(50%) reductions in CHD mortality observed in Denmark where TFA intake has been reduced from 6g per day to 1g per day[9] as well as estimates made in the NICE guidelines of a potential 4,500-7000 lives saved by reducing TFA in the UK[34]. Barton et al[18] proposed that a 0.5% reduction in TFA intake (as a percentage of daily energy intake) might save approximately 2,700 deaths and £235million annually and gain 754,000 QALYS over a decade. However, this analysis did not take into account costs incurred in introducing and monitoring a policy, nor any industry costs.

What this study adds

Our study has implications for policy and future research. Firstly, the policy could save lives, money and reduce CHD inequalities. Importantly, cost effectiveness can be compared with healthcare policies across several countries due to reporting in PPP dollars.

Strengths and Limitations

This modelling study has several strengths. The modelling uses large data sets which cover the entire England and Wales adult population of 35 million. Data quality is generally very good[20,35,36,37]. Further, this study includes a wide range of potential cost sources including government and industry costs, whilst also accounting for cost savings in healthcare, informal care, and productivity, as well as reporting several cost effectiveness measures. The datasets used are representative of the SEC distribution of the English and Welsh population.

This study also has several limitations. We used an area level categorisation of SEC (IMD). This might therefore be considered sub-optimal for analysing trends within individuals but generally correlates well with measures of individual socioeconomic position[20]. Further, this model assumes immediate health benefits. However, rapid improvements might reasonably be expected[38]. Whilst the scenarios eliminating industrial TFA only (3 and 4) model an elimination of industrial TFA, scenarios 1 and 2 model a total elimination of TFA, including ruminant TFA. The harmful effects of ruminant TFA are less well documented than industrial TFA, however this is now less clear[7]. We assume equal mortality gains from ruminant elimination as industrial. This scenario is useful to quantify the total disease burden, however is a politically idealistic target, more feasible in vegan populations than the general population. Reformulation cost estimates range greatly, whilst the Danish Veterinary and Food Administration understood the reformulation costs to the industry to be negligible[27]. We therefore modelled best and worst case scenarios for these cost estimates.

Conclusions

This study provides quantitative health and economic measures, to better inform policy makers. Population based prevention policies such as eliminating industrial TFA may generate substantial health and inequalities gains, as well as economic savings. The case for primary prevention policies has never been stronger.

Figures

Figure 1. Cost per Life Year Gained in scenario 1, 2,3 and 4 over the period 2011-2020. Life Years Gained stratified by Socio-economic quintile. *Data source: Hospital Episode Statistics*

Figure 2a. Cost per Life Year Gained in scenario 1 (TFA intake equal at 0.8% across Socio-economic circumstance quintiles), of eliminating all TFA, achieving TFA intake of 0% daily energy in males. Life Years Gained stratified by age, and Socio-economic quintile over the period 2011-2020. *Data source: Hospital Episode Statistics*

Figure 2b. Cost per Life Year Gained in scenario 1 (TFA intake equal at 0.8% across Socio-economic circumstance quintiles), of eliminating all TFA, achieving TFA intake of 0% daily energy in females. Life Years Gained stratified by age, and Socio-economic quintile over the period 2011-2020. *Data source: Hospital Episode Statistics*

Figure 3. Cost effectiveness plane. Outputs from 10,000 iterations of Probabilistic Sensitivity Analysis of Life Years Gained plotted against incremental cost (state costs and direct healthcare savings only) of policy for scenarios 1, 2, 3 and 4.

Tables

Table 9 – TFA intake (as a % of daily energy) by socio-economic circumstance (SEC) quintile. Figures used in scenarios 2 and 4, whereas scenarios 1 and 3 assume equal TFA intake by SEC. Data Source: Adapted from National Diet and nutrition survey [10] and Low Income Dietary survey [19]

	SEC 1	**SEC 2**	**SEC 3**	**SEC 4**	**SEC 5**
Trans fats intake	0.4%	0.6%	0.8%	1%	1.2%

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S1 File

Supporting Information

Strobe Statement

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