PAN AMERICAN JOURNAL OF PUBLIC HEALTH 100 YEARS

Original research

Industrially produced trans fat and saturated fat content of food products in Jamaica

Rasheed Perry,[1] Fitzroy J. Henry,[1] and Dwyte Bremmer[2]

Suggested citation Perry R, Henry FJ, Bremmer D. Industrially produced trans fat and saturated fat content of food products in Jamaica. Rev Panam Salud Publica. 2023;47:e45. https://doi.org/10.26633/RPSP.2023.45

ABSTRACT

Objective. To estimate industrially produced trans and saturated fatty acid levels in foods within the Jamaican food system.

Methods. A total of 308 commonly consumed foods were selected for analysis based on their potential to contain trans fatty acids. Samples were collected from supermarkets, convenience stores, and fast-food restaurants. Official methods of gas chromatography for the analysis of fats were used. The results were expressed as grams of fatty acid per 100 g of food sample and percentage of total fatty acids.

Results. Total fat was found to exceed United Kingdom National Health Service (NHS) limits in 27.3% (n = 84/308) of food samples. About one-third (33.8%; n = 104/308) of commonly consumed foods in Jamaica contained varying levels of industrially produced trans fatty acids, while 7.8% exceeded the Pan American Health Organization limit of 2% of total fat. Industrially produced trans fatty acids were found in food categories such as canned meats, baked goods, cooking oils, condiments, breakfast cereals, desserts, dairy, spreads, snacks, and confectionery. The subcategories coconut oils and burgers had the highest mean content. Canned food, infant food, and pasta categories had no trans fat present. Saturated fats were found in almost all foods. Importantly, 32.5% (n = 100/308) of the foods had saturated fat concentrations higher than the NHS limit of 5 g per 100 g of food. Most of the food items with high levels of industrially produced trans fatty acids also contained high levels of saturated fats.

Conclusions. Food products in Jamaica contain varying levels of fats that exceeded recommendations which support healthy consumption. Further exploration and reformulation efforts are needed to ensure that nutritional qualities are improved.

Keywords Noncommunicable diseases; dietary fats; trans fatty acids; diet, food, and nutrition; nutrition policy; Jamaica.

Almost four in five persons in Jamaica die prematurely each year from the complications of noncommunicable diseases (NCDs), and the cost of treating those living with NCDs places a large burden on the national health budget (1). The main contributors to NCDs are diet related and are preventable. Dietary preferences and consumption are quite diverse across populations but are critical to public health. The high fat, sugar, and sodium content of foods increases palatability and habit-forming consumption patterns. Of these nutrients, saturated and industrially produced trans fatty acids (IP-TFA) are of major concern due to their role in the development of NCDs. IP-TFA consumption has been increasing in the Caribbean (2). Although fats can make an important contribution to a healthy diet, the type and quantity are the causes of concern.

Culinary ingredients including oils, shortening, and margarine, and ultra-processed foods including cakes, cookies, crackers, animal products, fried potatoes, potato chips, and popcorn are major sources of saturated and trans fats (3). Due to relatively cheap costs and high accessibility, it is quite easy for them to be obtained within the diet. However, high

[1] University of Technology Jamaica, Kingston, Jamaica ✉ Fitzroy Henry, Fitzroy.Henry@utech.edu.jm

[2] Bureau of Standards Jamaica, Kingston, Jamaica

consumption of trans fats has been associated with increased rates of cardiovascular diseases, obesity, diabetes, and colon cancers (4). Studies have shown that saturated fats pose a greater risk to cardiovascular health and when combined with trans fats that risk increases cumulatively (5).

In 2019, the Pan American Health Organization (PAHO) with the countries of the Americas signed an action plan to eliminate IP-TFA from foods (5). One key regulation speaks to the elimination of partially hydrogenated oils and to limit IP-TFA to less than 2% of total fat in all food products. This study sought to estimate IP-TFA and saturated fatty acid levels in foods within the Jamaican food system.

MATERIALS AND METHODS

The World Health Organization global protocol (6) for the measurement of fatty acids was utilized in developing the sampling plan and method of analysis. A total of 308 commonly consumed foods were selected for analysis based on their potential to contain IP-TFA. Samples were collected from four supermarkets, four convenience stores, and seven fast-food restaurants. The sites selected were located in two large cities, provided the widest selection of samples, and were easily accessible. Samples were collected between September and December 2019. Packaged foods, oils, and fats were collected from supermarkets and convenience stores, while fast foods were collected from restaurants. Once the outlets were identified, the number of samples was determined, and the most popular samples chosen based on interviews with merchandising staff and on foods with the most shelf space. Food samples were then randomly selected from the shelving. Preference was given to samples that were made with partially hydrogenated vegetable oils in the ingredients list. At least 100 g of sample from each brand was collected and placed in containers. The brand and product name, label information (ingredients, nutrition information), place of collection, and date of collection were recorded.

These containers were subsequently coded and stored. Beverages, condiments, confectionery, cooking oils, dairy, desserts, snacks, and spreads were stored at 4 °C, and ready to eat samples were stored at –17 °C. The containers only contained food samples of a single brand. Samples of different foods were not mixed to form a composite sample. However, samples of the same product, name, and brand were mixed to form a composite sample.

Samples were then transported in temperature-controlled containers to the laboratory for analysis. Ready-to-eat samples were brought to the lab within 48 hours of purchase and all other samples within two weeks of purchase date.

Official methods for the analysis of trans fatty acids were used (7, 8). A subsample was taken from each homogenized food sample to yield approximately 300 mg of fat. An internal standard (C11:0 TAG) was added to each sample and fat extraction carried out by acid hydrolysis followed by extraction with ether–diethyl ether (50:50 v/v %). Fatty acids attached to lipids were transformed into fatty acid methyl esters (FAMEs) by direct transesterification of the dried extracts using methanolic boron trifluoride (7%). Margarine and other spreads were extracted with hexane prior to methylation, and cooking oil samples were used directly in the methylation step. FAMEs were further extracted with hexane and analyzed using a gas chromatograph equipped with a flame-ionization detector. Separation of the FAMEs was achieved with a SP-2560 capillary GLC column and identification done by comparison with the retention times of pure FAMEs analytical standards. Quantification of fatty acids was done relative to C11:0 FAME as internal standard and to instrument response factors (determined separately using calibration standards mixture). The results were expressed as grams of fatty acid per 100 g of food sample and percentage of total fatty acids. The following classification was used: high total fat ≥17.5 g per 100 g of total sample (9); and high saturated fat ≥5 g per 100 g of total sample (9).

RESULTS

A total of 308 individual samples across 16 different categories of processed food products were collected and analyzed. The results below relate to the samples tested and do not necessarily reflect all the food products on the market. Of the 308 samples, 277 were obtained from grocery stores, with mean (SD) total fat 17.1 g (23.1), saturated fat 6.22 g (11.99), and trans fat 0.36 g (0.88). The remaining 31 samples were obtained from restaurants, with mean (SD) total fat 11.62 g (4.75), saturated fat 4.01 g (2.60), and trans fat 1.67 g (2.05).

Total fat

Table 1 shows that all food products contained fat; however, in 27.3% (n = 84/308) the total fat content was greater than or equal to the United Kingdom National Health Service (NHS) limit of 17.5 g per 100 g. The highest proportions of total fat above this limit were found in cooking oils (100%, n = 10/10) with a mean of 91.19 g per 100 g of sample. These products are primarily made from a variety of plant oils including sunflower, palm, coconut, and soybean. Other samples including spreads (60.0%, n = 9/15) and condiments (52.2%, n = 12/23) also had high proportions of total fat above the limit. Breakfast cereals, beverages, desserts, pasta, and other canned foods had fat content below the NHS limit.

IP-TFA

Table 2 shows that 33.8% (n = 104/308) of surveyed products contained varying levels of IP-TFA, with a mean 1.63 g/100 g fat. Among the samples, 7.8% (n = 24/308) were found to contain above the PAHO limit of 2% IP-TFA per 100 g of total fat. Dairy products were found to have the highest proportion of samples above the limit. The highest mean IP-TFA content per 100 g of fat was found in canned meats (12.25 g), baked goods (1.70 g), and cooking oils (1.15 g). Infant foods, beverages, other canned foods, and pastas did not contain IP-TFA.

Saturated fat

Table 3 shows that all food products contained saturated fat; however, 32.5% (n = 100/308) had values above the NHS limit of 5 g per 100 g of food. The highest proportions of saturated fat content above the NHS limit by food category were found in cooking oils (100%, n = 10/10), spreads (73.3%, n = 11/15), condiments (52.2%, n = 12/23), and snacks (38.5%, n = 30/78). The lowest mean saturated fat content was found in pastas, other canned foods, and breakfast cereals.

TABLE 1. Total fat content of commonly consumed foods in Jamaica

Food category	Number of samples	Mean (SD)[a] total fat content (g) per 100 g of food	Number (%) of samples with total fat >17.5 g per 100 g of food[b]
Cooking oils	**10**	**91.19 (13.40)**	**10 (100.0%)**
Spreads	**15**	**42.28 (33.38)**	**9 (60.0%)**
Condiments	**23**	**33.50 (34.62)**	**12 (52.2%)**
Salad dressings	2	38.93 (3.00)	2 (8.7%)
Mayonnaise	4	68.98 (7.33)	4 (17.4%)
Margarine (hard)/shortening	3	86.64 (11.48)	3 (13.0%)
Cooking sauces	10	0.48 (0.75)	0
Coconut powder	4	38.02 (21.48)	3 (13.0%)
Snacks	**78**	**15.91 (10.11)**	**31 (39.7%)**
Infant food	**7**	**12.47 (11.50)**	**3 (42.9%)**
Canned meat/fish	**26**	**12.09 (10.77)**	**5 (19.2%)**
Fast food	**35**	**11.16 (4.99)**	**3 (8.6%)**
Confectionery	**18**	**9.62 (5.24)**	**3 (16.7%)**
Dairy	**35**	**9.61 (11.89)**	**7 (20.0%)**
Butter	2	44.10 (15.41)	2 (5.7%)
Cheeses	12	11.99 (9.70)	4 (11.4%)
Frozen desserts	10	6.10 (6.20)	1 (2.9%)
Milk	9	2.74 (3.34)	0
Soy based	2	9.30 (9.90)	0
Desserts	**10**	**8.10 (8.10)**	**0**
Baked goods	**16**	**6.96 (6.31)**	**1 (6.3%)**
Beverages	**7**	**4.89 (5.78)**	**0**
Hot drinks	2	0.51 (0.13)	0
Sugar-sweetened beverages	5	6.64 (6.06)	0
Breakfast cereals	**11**	**2.69 (1.60)**	**0**
Canned foods	**9**	**1.85 (2.92)**	**0**
Canned legumes	7	2.69 (0.21)	0
Canned fruit	2	6.98 (0.57)	0
Pastas	**8**	**0.86 (0.74)**	**0**
Total	**308**	**16.51 (21.99)**	**84 (27.3%)**

Notes:
[a] The food categories are ordered by their decreasing mean total fat content (g/100 g food).
[b] United Kingdom National Health Service (NHS) threshold for high total fat content in foods, set at 17.5 g/100 g of food.
Source: Prepared by the authors from the study data.

Figure 1 shows that, apart from canned foods and pastas, most foods contained both IP-TFA and saturated fats above the recommended limits. Beverages, infant foods, and spreads did not have IP-TFA above the limit but contained saturated fat above the limit.

DISCUSSION

This study assessed total fat, saturated fat, and IP-TFA in the Jamaican food supply by analyzing 308 packaged and restaurant foods. The study found 27.3% of the samples analyzed had a total fat content exceeding the NHS threshold for high fat, with cooking oils, spreads, and condiments contributing the highest proportions of samples. These high proportions can be attributed to the presence of plant oils such as soybean and sunflower oils in the manufacturing process which increases the overall total fat. Mayonnaise was found to be a major contributor of total fat; this was similarly noted in a study of the fatty acid profile of lipid rich food in Paraguay, which found mayonnaise contributed the highest percentage of total fat (10). The proliferation of foods considered high in fat is a major cause for concern, as these foods have been linked to the rise in NCDs facing many Jamaicans today (11).

Of note, 7.8% of samples analyzed exceeded the PAHO limit for IP-TFA of 2% per 100 g of total fat. This percentage exceeds the 2.5% (n = 6/240) of prepackaged foods included in the Food Safety Authority of Ireland survey in 2016 (12). Similar food categories were evaluated in the Ireland survey, which included breakfast cereals, spreads, snacks, and confectionery. On comparison, breakfast cereals (mean = 0.76 g), snacks (mean = 0.90 g), and spreads (mean = 0.37 g) (12) were found to have higher means compared to the Ireland survey categories: <0.01 g, 0.30 g, and 0.17 g, respectively. However, confectionery (mean = 0.06 g) was found to be less than the mean of 0.33 g observed in the Ireland survey. This highlights the need for targeting specific categories in reducing IP-TFA levels, especially in prepackaged convenience foods. The push for the establishment of trans fat limits in the European Union over the years has led to reduction of IP-TFA in foods. As observed in the Ireland survey, the percentage of local foods containing less than

TABLE 2. Industrially produced trans fatty acids (IP-TFA) in commonly consumed foods in Jamaica

Food category	Number of samples	Number of samples containing IP-TFA	Mean (SD)[a,b] IP-TFA content (g) per 100 g fat	Number (%)[c] of samples with IP-TFA >2% total fat
Canned meat/fish	**26**	**4**	**12.25 (12.22)**	**3 (11.5%)**
Baked goods	**16**	**2**	**1.70 (2.31)**	**1 (6.3%)**
Sweet and raisin breads	11	1	0.06	0
Leavened breads	5	1	3.33	1 (6.3%)
Cooking oils	**10**	**6**	**1.15 (2.39)**	**1 (10.0%)**
Vegetable oils	7	4	0.21 (0.05)	0
Coconut oils	3	2	3.06 (3.09)	1 (10.0%)
Condiments	**23**	**9**	**0.69 (1.19)**	**1 (4.3%)**
Salad dressings	2	2	0.83 (0.17)	0
Mayonnaise	4	4	1.07 (1.80)	1 (4.3%)
Margarine (hard)	1	1	0.09 (0.06)	0
Cooking sauces	10	0	0	0
Coconut powder	4	0	0	0
Breakfast cereals	**11**	**3**	**0.76 (1.10)**	**1 (9.1%)**
Sweetened	9	3	0.76 (1.10)	1 (9.1%)
Unsweetened	2	0	0	0
Desserts	**10**	**4**	**0.06 (0.06)**	**1 (10.0%)**
Dairy	**35**	**10**	**0.42 (0.42)**	**7 (20.0%)**
Spreads	**15**	**5**	**0.37 (0.31)**	**0**
Fast food	**35**	**10**	**1.67 (2.05)**	**4 (11.4%)**
Chicken products	4	1	0.88	1 (2.9%)
Burgers	5	2	2.60 (0.75)	2 (5.7%)
Sides	21	5	0.32 (0.12)	0
Patties	3	1	0.25	1 (2.9%)
Other	2	1	0.36	0
Snacks	**78**	**35**	**0.90 (1.46)**	**4 (5.1%)**
Cookies/sweet biscuits	25	11	0.10 (0.10)	1 (1.3%)
Crackers/savory biscuits	14	7	0.91 (0.81)	1 (1.3%)
Nuts, seeds, and kernels	7	4	0.39 (0.25)	1 (1.3%)
Potato, vegetable, grains, and banana chips	14	8	0.87 (0.94)	1 (1.3%)
Extruded snacks	6	3	0.02 (0.01)	0
Other	12	2	0.20 (0.11)	0
Confectionery	**18**	**16**	**0.06 (0.06)**	**1 (5.6%)**
Beverages	**7**	**0**	**0**	**0**
Canned foods	**9**	**0**	**0**	**0**
Infant food	**7**	**0**	**0**	**0**
Pastas	**8**	**0**	**0**	**0**
Total	**308**	**104 (33.8%)**	**1.63 (3.40)**	**24 (7.8%)**

Notes:
[a] The total IP-TFA content in samples was calculated as the sum of elaidic acid.
[b] The food categories are ordered by their decreasing mean total IP-TFA content (g/100 g fat).
[c] Threshold is set at 2 g/100 g of total fat.
Source: Prepared by the authors from the study data.

2% trans fatty acids increased from 80% in 2008 to 97.5% in 2016 (12). It did note, however, that there were food samples with content above 2% and the need for more work to reduce these levels. In Australia, 14% of food samples analyzed were found to exceed the 2% limit for IP-TFA (13). However, the food categories analyzed were different than in this current study. Prepared pastry, popcorn, custard baked goods, and meat pies were found to have the highest median IP-TFA of the samples analyzed (13). The common trend observed is that most IP-TFA was found in prepackaged and convenience foods that were similar to the foods sampled in this study.

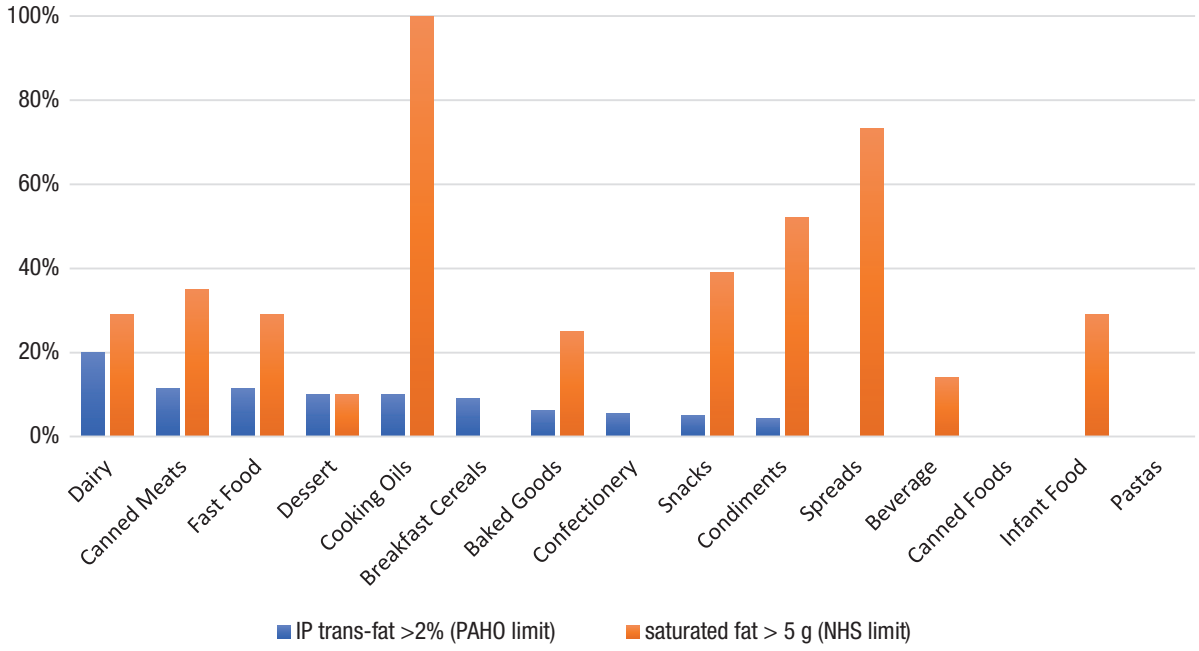
In comparison, the Food Safety and Standards Authority of India 2021 survey found that 3.14% of foods contained IP-TFA exceeding the 2% limit (14). However, the categories analyzed were different than in this study, with oils, vanaspati, shortenings, and margarine having the highest percentage of IP-TFA (14). It should be noted that India has a mandate for the eventual elimination of IP-TFA by 2022 and thus would have instituted changes to lower the availability of IP-TFA in the food supply. Many other countries have put legislation in place to regulate trans fats in the food industry. In Canada, legislation has yielded success in reducing the proportion of foods with above

TABLE 3. Total saturated fat content in commonly consumed foods in Jamaica

Food category[a]	Number of samples	Mean (SD)[b] total saturated fat content (g) per 100 g of food	Number (%) of samples with saturated fat >5 g per 100 g of food[c]
Cooking oils	**10**	**39.34 (32.01)**	**10 (100.0%)**
Condiments	**23**	**13.23 (17.95)**	**12 (52.2%)**
Salad dressings	2	9.57 (3.12)	2 (8.7%)
Mayonnaise	4	10.33 (0.23)	4 (17.4%)
Margarine (hard)	1	42.17 (9.32)	3 (13.0%)
Cooking sauces	10	0.10 (0.10)	0
Coconut powder	4	29.07 (23.12)	3 (13.0%)
Spreads	**15**	**13.32 (83.62)**	**11 (73.3%)**
Snacks	**78**	**4.56 (3.70)**	**30 (38.5%)**
Dairy	**35**	**4.27 (5.76)**	**10 (28.6%)**
Butter	2	20.55 (1.49)	2 (5.7%)
Cheeses	12	5.47 (5.73)	5 (14.3%)
Frozen desserts	10	2.97 (2.82)	2 (5.7%)
Milk	9	1.20 (1.60)	1 (2.9%)
Soy	2	1.18 (0.98)	0
Fast food	**35**	**4.33 (4.52)**	**10 (28.6%)**
Chicken products	4	7.55 (11.92)	1 (2.9%)
Burgers	5	4.35 (2.21)	2 (5.7%)
Sides	21	3.77 (2.52)	6 (17.1%)
Patties	3	6.34 (3.94)	2 (5.7%)
Other	2	0.63 (0.44)	0
Canned meat/fish	**26**	**3.61 (3.05)**	**9 (34.6%)**
Canned sausage	4	1.69 (0.62)	0
Canned corned beef	7	16.48 (17.37)	6 (23.1%)
Canned luncheon meat	3	5.56 (5.17)	1 (3.8%)
Canned tuna	5	3.55 (3.18)	2 (7.7%)
Canned mackerel	4	2.09 (1.35)	0
Canned sardines	2	2.52 (0.91)	0
Canned salted cod	1	0.15	0
Infant food	**7**	**3.17 (4.31)**	**2 (28.6%)**
Infant formula	2	9.36 (1.07)	2 (28.6%)
Infant cereal	2	0.59 (0.38)	0
Fruit cups	2	0.10 (0.20)	0
Extruded snacks	1	2.10	0
Beverages	**7**	**2.69 (4.86)**	**1 (14.3%)**
Hot drinks	5	3.59 (5.64)	1 (14.3%)
Sugar-sweetened beverages	2	0.43 (0.11)	0
Baked goods	**16**	**2.64 (2.91)**	**4 (25.0%)**
Sweet and raisin breads	11	3.31 (3.20)	4 (25.0%)
Leavened breads	5	0.38 (0.31)	0
Desserts	**10**	**1.97 (1.73)**	**1 (10.0%)**
Confectionery	**18**	**1.11 (0.79)**	**0**
Breakfast cereals	**11**	**0.81 (0.60)**	**0**
Canned foods	**9**	**0.64 (1.11)**	**0**
Canned legumes	7	0.08 (0.04)	0
Canned fruit	2	2.59 (0.24)	0
Pastas	**8**	**0.18 (0.18)**	**0**
Total	**308**	**6.00 (11.42)**	**100 (32.5%)**

Notes:
[a] Some food categories expanded based on high variability.
[b] The food categories are ordered by their decreasing mean total saturated fat (g/100 g food).
[c] Threshold is set at 5 g/100 g of total sample.
Source: Prepared by the authors from the study data.

FIGURE 1. Percentage of samples with industrially produced trans fatty acids (IP-TFA) >2% per 100 g of fat and saturated fat >5 g per 100 g of food



Note: IP, industrially produced; PAHO, Pan American Health Organization; NHS, United Kingdom National Health Service.
Source: Prepared by the authors from the study data.

the 2% IP-TFA limit (15). Between 2009 and 2011, the proportion of foods below the limit increased from 75% to 97% through reformulation and substitution with unsaturated fats in many food products (15).

Most food samples were found to contain both saturated fats and IP-TFA above the respective limits. The saturated fat content was significantly higher. This observation was also noted in the trans fatty acid analysis of the Canadian food supply (15). Foods such as cookies, brownies and squares, cakes with puddings, dessert toppings, lard, and shortening were found to have the highest proportion (15). However, in this study, cooking oils, spreads, condiments, and snacks had the highest proportions of saturated fat above the NHS limit. The proportion of saturated fat was significantly higher in some foods with lower levels of IP-TFA: these are cooking oils, condiments, and snacks. This was also observed in another study where snacks and condiments had higher saturated fat with lower amounts of IP-TFA (15).

The existence of saturated fat and IP-TFA in the food system compounds the public health problem faced by many countries, as both are major dietary risk factors for NCDs. Front-of-package warning labeling and marketing restrictions are interventions that have been used to help in spurring reformulation efforts. However, in a nonexperimental prospective study of Chilean food labeling laws and advertising, only one food category had a decrease in the total saturated fat content for those foods categorized as "high" (16). But this provides a guide regarding the efforts needed to obtain widespread reductions across food categories.

The importance and implications of these findings are reflected by the negative metabolic effects of saturated fats and IP-TFA on health. High trans fat intake significantly increases the risk of death from any cause by 34% and the risk of coronary heart disease by 28% (17). Trans fat also increases low-density lipoprotein (LDL) cholesterol levels, the most harmful type, while lowering beneficial high-density lipoprotein (HDL) cholesterol levels—to an even greater extent than saturated fats (18). Regular and prolonged consumption of these commonly consumed foods therefore creates a major barrier to the goal of healthy eating and consequently to the control of NCDs.

The findings of this study highlight the need for effective information programs and campaigns to make the public aware of the dangers of IP-TFA and saturated fats. To support and sustain the concept of healthy eating, however, a framework needs to be put in place that goes beyond just education. The PAHO report (5) indicates that voluntary measures alone are not sufficient. The high prevalence of these fats further suggests the need for regulation, including legislation (19–21), to ensure that healthier alternatives are widely available and accessible so that consumers willing to eat healthy products can do so. In Denmark, it was observed that legislative efforts mandating the reduction of IP-TFA below limits have led to a reduction and or elimination of IP-TFA from foods that originally had a high IP-TFA content (22). These mandates subsequently led to a decrease in the cardiovascular disease mortality rates (23). Other studies suggest that removing IP-TFA from the food system in Jamaica will reduce premature mortality from cardiovascular disease, which is the main cause of death (24). Mandating that all food packages for sale are labeled with easily understood information is essential. The development of standards through public–private collaboration is another critical step. Policies that allow for periodic monitoring are also important in the framework.

The limitations of this study were that the selection was based on the potential of containing IP-TFA. A much larger and randomly selected sample would provide rates that would be applicable to the overall food supply. The major strength of this study is that it is a first for Jamaica and provides a starting point for future monitoring and evaluation efforts in the eventual elimination and reduction of key nutrients linked to the onset of NCDs. This study enabled insight into the content of total fat, saturated fat, and IP-TFA in the Jamaican food supply.

Conclusion

The main conclusions of this study are that one-third of these commonly consumed food products contained IP-TFA, with 7.8% exceeding the PAHO limit, and 32.5% contained saturated fat exceeding the NHS limit. These key findings can serve as a basis for further exploration of the ultra-processed and processed food environments as well as a starting point for developing a targeted education strategy that will enable consumers to make healthy food choices and eating practices. In addition, in those categories with large proportions of food items that exceeded limits, reformulation must be introduced to ensure that the nutrition quality of these food products is improved. IP-TFA should be banned in foodstuffs based on the evidence of a reduction in the risk factors associated with the development of NCDs (18).

Author contributions. RP managed the process, wrote the paper, and reviewed it. FJH conceived the idea, planned the analysis, and co-authored the paper. DB analyzed the samples and helped with the interpretation of the results. All authors reviewed and approved the final version.

Conflict of interest. None declared.

Funding. Funding for this study was provided by the International Development Research Centre (IDRC) Food and Nutrition (FaN) Project titled Improving Household Nutrition Security and Public Health in the CARICOM; the "Resolve to Save Lives" project; the University of Technology, Jamaica; and the National Health Fund, Jamaica.

Disclaimer. Authors hold sole responsibility for the views expressed in the manuscript, which may not necessarily reflect the opinion or policy of the *RPSP/PAJPH* and/or PAHO.

REFERENCES

1. Pan American Health Organization. The Case for Investment in Prevention and Control of Noncommunicable Diseases in Jamaica: Evaluating the return on investment of selected tobacco, alcohol, diabetes, and cardiovascular disease interventions. Washington, DC: UNIAFT, UNDP, and PAHO; 2018. Available from: https://iris.paho.org/handle/10665.2/49693.
2. Wang Q, Afshin A, Yakoob MY, Singh GM, Rehm CD, Khatibzadeh S, et al. Global Burden of Diseases Nutrition and Chronic Diseases Expert Group (NutriCoDE). Impact of nonoptimal intakes of saturated, polyunsaturated, and trans-fat on global burdens of coronary heart disease. J Am Heart Assoc. 2016 Jan 20;5(1):e002891. https://doi.org/10.1161/JAHA.115.002891
3. Panth N, Abbott KA, Dias CB, Wynne K, Garg ML. Differential effects of medium- and long-chain saturated fatty acids on blood lipid profile: a systematic review and meta-analysis. Am J Clin Nutr. 2018;108(4):675–87. https://doi.org/10.1093/ajcn/nqy167
4. Dhaka, V, Gulia N, Ahlawat KS, Khatkar BS, et al. Trans fats—sources, health risks and alternative approach – A review. J Food Sci Technol. 2011;48:534–41. https://doi.org/10.1007/s13197-010-0225-8
5. Pan American Health Organization. Agreement to eliminate trans-fatty acids from industrial food production aims to prevent cardiovascular disease. Washington, DC: PAHO; 2019. Available from: https://www3.paho.org/hq/index.php?option=com_content&view=article&id=15480:agreement-to-eliminate-trans-fatty-acids-from-industrial-food-production-aims-to-prevent-cardiovascular-disease&Itemid=1926&lang=en.
6. World Health Organization. Global protocol for measuring fatty acid profiles of foods, with emphasis on monitoring trans-fatty acids originating from partially hydrogenated oils. Geneva: WHO; 2020. Available from: https://apps.who.int/iris/handle/10665/338049.
7. Mossoba MM, Kramer J, Delmonte P, Yurawecz M, Rader J. AOAC Official Method 996.06, fat (total, saturated, and unsaturated in foods), hydrolytic extraction gas chromatographic method, first action 1996, revised 2001. Urbana, IL: AOCS Press; 2003.
8. American Oil Chemists' Society. Official Methods and Recommended Practices of the AOCS. 7th Edition. Champaign, IL: AOCS; 2017. [Method Ce 1h-05, Ce 1j-75 and Ce 2b-11].
9. United Kingdom. National Health Service [Internet]. Fat: the facts. [no place]: NHS; 2020. Available from: https://www.nhs.uk/live-well/eat-well/food-types/different-fats-nutrition/.
10. Lourenço EC, Giménez-Ayala A, Radice C, Ojeda LM, Villamayor R, Ramos PM, et al. Fatty acid profile of lipid-rich food consumed in Paraguay. Rev Chil Nutr. 2021;48(6):838–51. https://doi.org/10.4067/S0717-75182021000600838
11. Ministry of Health and Wellness Jamaica. Food Based Dietary Guidelines. Kingston: MOH; 2022. Available from: https://www.moh.gov.jm/programmes-policies/food-based-dietary-guidelines/.
12. Food Safety Authority of Ireland. Survey of the trans fatty acid content in processed food products in Ireland. Dublin: FSAI; 2016. Available from: https://www.fsai.ie/WorkArea/DownloadAsset.aspx?id=16080.
13. Wu J, Downs S, Catterall E, Bloem M, Zheng M, Veerman L, et al. Levels of trans fats in the food supply and population consumption in Australia: An Expert Commentary rapid review brokered by the Sax Institute (www.saxinstitute.org.au) for The National Heart Foundation of Australia, 2017. Sydney: Sax Institute; 2017. Available from: https://www.heartfoundation.org.au/getmedia/e27233c8-73d5-4c37-9416-ad7592af593c/Expert-Commentary-Levels-of-trans-fats-in-the-food-supply-and-consumption-in-Australia.pdf.
14. Food Safety and Standards Authority of India. PAN-India Survey Results on Trans- fat in different Food categories released by FSSAI. New Delhi: FSSAI; 2021 Sep 20. Available from: https://www.fssai.gov.in/upload/press_release/2021/09/6149d70fca843Press_Release_Survey_TransFat_21_09_2021.pdf.
15. Arcand J, Scourboutakos MJ, Au JTC, L'Abbe MR. Trans Fatty acids in the Canadian food supply: an updated analysis. Am J Clin Nutr. 2014;100(4):1116–23. https://doi.org/10.3945/ajcn.114.088732
16. Reyes M, Smith Taillie L, Popkin B, Kanter R, Vandevijvere S, Corvalán C. Changes in the amount of nutrient of packaged foods and beverages after the initial implementation of the Chilean Law of Food Labelling and Advertising: A nonexperimental prospective study. PLoS Med. 2020;17(7):e1003220. https://doi.org/10.1371/journal.pmed.1003220

17. De Souza RJ, Mente A, Maroleanu A, Cozma AI, Ha V, Kishibe T, et al. Intake of saturated and trans unsaturated fatty acids and risk of all-cause mortality, cardiovascular disease, and type 2 diabetes: systematic review and meta-analysis of observational studies. BMJ. 2015;351:h3978.
18. Mozaffarian D, Clarke R. Quantitative effects on cardiovascular risk factors and coronary heart disease risk of replacing partially hydrogenated vegetable oils with other fats and oils. Eur J Clin Nutr. 2009;63(Suppl 2):S22–S33. https://doi.org/10.1038/sj.ejcn.1602976
19. Angell SA, Silver LD, Goldstein GP, Johnson CM, Deitcher DR, Frieden TR, et al. Cholesterol control beyond the clinic: New York City's trans-fat restriction. Ann Intern Med. 2009;151(2):129–34.
20. Forster-Coull L, Kendall P. BC successfully restricts use of trans fat in food service establishments. CMAJ. 2011;183(15):1753.
21. Kakisu E, Tomchinsky E, Lipps MV, Fuentes J. Analysis of the reduction of trans-fatty-acid levels in the foods of Argentina. Int J Food Sci Nutr. 2018;69:8:928–37. https://doi.org/10.1080/09637486.2018.1428537
22. Leth T, Jensen HG, Mikkelsen AA, Bysted A. The effect of the regulation on trans fatty acid content in Danish food. Atheroscler Suppl. 2006;7(2):53–6.
23. Restrepo BJ, Rieger M. Denmark's policy on artificial trans-fat and cardiovascular disease. Am J Prev Med. 2016;50(1):69–76.
24. Downs SM, Thow AM, Leeder SR. The effectiveness of policies for reducing dietary trans-fat: a systematic review of the evidence. Bull World Health Organ. 2013;91(4):262–9.

Manuscript submitted on 20 September 2021. Revised version accepted for publication on 28 November 2022.

Contenido de ácidos grasos trans y grasas saturadas producidos industrialmente en productos alimenticios en Jamaica

RESUMEN

Objetivo. Calcular los niveles de ácidos grasos trans y grasas saturadas producidos industrialmente en alimentos del sistema alimentario de Jamaica.

Métodos. Se seleccionó un total de 308 alimentos de consumo común para su análisis en función de la posibilidad de que contuvieran ácidos grasos trans. Se recolectaron muestras de supermercados, tiendas de víveres y restaurantes de comida rápida. Para el análisis de las grasas, se utilizaron métodos oficiales de cromatografía de gases. Se expresaron los resultados en gramos por muestra de alimento y grasa total.

Resultados. Se concluyó que la grasa total excedía los límites del Servicio Nacional de Salud del Reino Unido (NHS, por su sigla en inglés) en el 27,3% (*n* = 84/308) de las muestras de alimentos. Alrededor de un tercio (33,8%; *n* = 104/308) de los alimentos de consumo común en Jamaica contenían niveles variables de grasas trans producidas industrialmente, mientras que el 7,8% excedía el límite de 2% de grasa total de la Organización Panamericana de la Salud. Se encontraron grasas trans producidas industrialmente en categorías de alimentos como carnes enlatadas, productos de repostería, aceites de cocina, condimentos, cereales para el desayuno, postres, lácteos, untables, bocadillos o *snacks* y dulces. Las subcategorías aceite de coco y hamburguesas mostraron el contenido medio más elevado. Las categorías alimentos enlatados, alimentos infantiles y pasta no presentaron grasas trans. Se encontraron grasas saturadas en casi todos los alimentos. Es importante destacar que el 32,5% (*n* = 100/308) de los alimentos mostraron concentraciones de grasas saturadas superiores al límite del NHS (5 g por cada 100 g de producto). La mayoría de los alimentos con niveles elevados de ácidos grasos trans producidos industrialmente también contenían altos niveles de grasas saturadas.

Conclusiones. Los productos alimentarios en Jamaica contienen niveles variables de grasas que excedieron las recomendaciones relativas a un consumo saludable. Es necesario incrementar los esfuerzos de exploración y reformulación para garantizar una mejora de las cualidades nutricionales.

Palabras clave Enfermedades no transmisibles; grasas de la dieta; ácidos grasos trans; nutrición, alimentación y dieta; política nutricional; Jamaica.

Teor de ácidos graxos trans de produção industrial e ácidos graxos saturados em produtos alimentícios na Jamaica

RESUMO

Objetivo. Estimar o teor de ácidos graxos trans de produção industrial e ácidos graxos saturados em produtos alimentícios consumidos no sistema alimentar jamaicano.

Métodos. Trezentos e oito gêneros alimentícios amplamente consumidos foram selecionados para análise, com base em seu potencial para conter ácidos graxos trans. As amostras foram coletadas em supermercados, lojas de conveniência e restaurantes de *fast-food*. Foram utilizados métodos oficiais para análise de ácidos graxos, à base de cromatografia gasosa. Os resultados foram expressos em gramas por gordura total e por amostra de alimento.

Resultados. Verificou-se que o teor de gordura total excedeu os limites do Serviço Nacional de Saúde do Reino Unido (NHS) em 27,3% (n = 84/308) das amostras de alimentos. Cerca de um terço (33,8%; n = 104/308) dos alimentos comumente consumidos na Jamaica continham níveis variados de ácidos graxos trans de produção industrial, enquanto 7,8% excediam o limite de 2% de gordura total recomendado pela Organização Pan-Americana da Saúde. Ácidos graxos trans de produção industrial foram encontrados em diferentes categorias de alimentos, como carnes enlatadas, pães e doces, óleos de cozinha, condimentos, cereais matinais, sobremesas, laticínios, pastas, salgadinhos e confeitos. As subcategorias "óleos de coco" e "hambúrgueres" apresentaram o maior teor médio. As categorias "alimentos enlatados", "alimentos infantis" e "massas" não continham gordura trans. Ácidos graxos saturados foram encontrados em quase todos os alimentos. Cabe notar que 32,5% (n = 100/308) dos alimentos tinham teor de gordura saturada superior ao limite preconizado pelo NHS (5 g por 100 g de alimento). A maioria dos alimentos com alto teor de ácidos graxos trans de produção industrial também continha alto teor de gorduras saturadas.

Conclusões. Os produtos alimentícios na Jamaica contêm níveis variados de gorduras, excedendo as recomendações que apoiam o consumo saudável. Mais esforços de exploração e reformulação são necessários para garantir que a qualidade nutricional dos alimentos seja melhorada.

Palavras-chave Doenças não transmissíveis; gorduras na dieta; ácidos graxos trans; alimentos, dieta e nutrição; política nutricional; Jamaica.