ARTICLE

Trans fat policy as pathfinder to curb noncommunicable disease: a review in Philippine perspective

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ABSTRACT

Globalization brings tremendous industrial and economic progress. However, its impact to population health includes dietary transition, satisfying appetite for processed foods of which some contain trans fatty acids (TFA). Intake of TFA has been linked to increased prevalence of cardiovascular diseases and is contributory to other noncommunicable diseases (NCDs). This article provides context on the role TFA in the development and burden of NCDs. The authors reviewed health effects of regulations of selected countries, and possible alternative policy actions. Search of related records was conducted from various sources including grey literature given the limited published articles on TFA in the Philippines. Selection criteria of the review included topic relevance, year of publication, and related contents. In total, 61 records were used in the review. In the Philippines, NCDs are estimated to contribute to 67% of mortality, with cardiovascular diseases (CVDs) as the leading cause. In another study, estimated annual number of coronary heart disease deaths due to high TFA intake was at 3,067. Partially hydrogenated oils are the major source of industrially-produced TFA. The World Health Organization sets global leadership on its elimination by 2023 through the REPLACE package launched in 2018. Therein, interest of governments gradually transitioned to commitment, taking legislative actions of varying scope to curb increasing TFA intake, with different levels of regulation. In the span of two years, 33 countries adopted mandatory limits of TFA. In the Philippines, the Department of Health has taken strides in advancing TFA regulation through Administrative Order (AO) 2021-0039. There is a need to 1) promote TFA literacy; 2) ensure accessibility, technical competence, and affordability of laboratories nationwide for TFA content analysis; and 3) provide assistance to small- to medium-scale food manufacturers including but not limited to financial and technical resources to comply with the set regulations. These may be achieved through: 1) creation of a technical working group, convening experts in drafting of a Republic Act; 2) funding and conduct of more research on current TFA intake as baseline economic valuation and health effects of proposed bans on TFA; and others.

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BACKGROUND

The dynamic and transitional market of the food and beverage industry paved the way for more product development that feeds the hunger of consumers. However, as the dietary preference of the population leans toward processed foods, increased nutritional and health risks have been noted. This contributes to a transition in the epidemiology of noncommunicable diseases, which the World Health Organization (WHO) reported in 2018 as the cause of 71% of deaths globally, with 37% from low-income countries to as high as 88% in developed countries (WHO 2020a). Cardiovascular diseases remain to be the top cause of mortality wherein approximately 540,000 deaths yearly were attributed to the intake of industrially-produced trans-fatty acid (TFA). Further, avoiding artificial TFA may prevent as much as 10,000 to 20,000 coronary events and 3,000 to 7,000 coronary heart disease deaths each year in the USA (WHO 2020b). In 2018, the WHO launched the campaign for a global ban of industrially-produced TFA by 2023 with the REPLACE action package as comprehensive guide for the adoption of member states, contextualized to local settings.

METHODS

A literature search of randomized controlled trials and observational studies on adult and children was performed across Medline/PubMed, Embase, and Web of Science during the period 1 July 2019 to 1 July 2021 using the search terms, "trans-fatty acid," "trans-fat," and "partially hydrogenated vegetable oils." The initial search with this first group of keywords resulted in 10,495 articles. These terms were paired with the following terms: "hypercholesterolemia," yielding 87 articles; "cardiovascular disease," with 1,122 articles; "myocardial infarction," with 92 results; "diabetes mellitus," with 407 results; "obesity" with 969 results; and "malignancy" or "cancer" with 547 results. Records were selected based on relevance of titles and abstracts, year of publication, and full text. Final tally of articles included 20 for hypercholesterolemia, cardiovascular disease, and myocardial infarction; six articles for diabetes mellitus; and two articles for malignancy or cancer. Online search for "trans-fatty acid", together with "policy" yielded 388 titles. An evaluation of the titles and abstracts by the reviewers led to the inclusion of nine reviews included in the study. Online search for "trans-fatty acid", together with "burden of disease" resulted to 14 titles in which nine records were used. With the addition of grey literature search in relevant websites, additional six articles were used. Relevant websites such as those of the WHO, Philippine Statistics Authority, Institute for Health Metrics and Evaluation, and government agencies of countries, were searched.

RESULTS AND DISCUSSION

TFA in our diet

The World Health Organization (WHO) and the Food and Agriculture Organization (FAO) recommended an upper limit for both ruminant and industrially-produced trans fat at <1% of the total energy intake (Vannice and Rasmussen 2014). Hence, for a total of 2,000 daily calorie intake, the consumption of TFA should be less than 2.2 grams. A systematic analysis on global consumption levels of dietary fats and oils in 2010 showed that the global mean TFA intake for adults ≥20 years old was 1.40% (95% CI: 1.36% to 1.44%) of total energy intake, with Egypt having the highest consumption of 6.5%. Mean intake for Southeast Asian countries was 0.9% while the Philippines was 0.75% to 0.99% of the total intake (Micha et al. 2014). A more recent systematic review in 2017, showed that among the 29 countries (mostly in developed region), total TFA intake was 0.3 to 4.2% of total energy intake, with six countries exceeding the WHO recommendation (Wanders et al. 2017).

As of the time of this literature review, there was no published data or direct assessment of TFA intake among Filipinos. However, the DOST-FNRI estimated daily dietary exposure of Filipinos to TFA-based commonly consumed foods in the 2013 Philippine National Nutrition Survey was 0.10g (0.05%) for all subjects in the general population (both TFA consumers and non-consumers), 0.35g (0.16%) for average TFA consumers, and 0.81g (0.36%) for high-level risk consumers (95th percentile). As for children (<6 years old), it is alarming that while mean intake for all subjects was 0.09 (0.06%), those in high level risks had 2.24g (1.5%) which exceeds the WHO recommended <1% of total daily energy intake (Nacionales 2019). Major contributor was 'pork and other porcines' for the general population (30%) and for women of child bearing age (24%), while 'cakes, cookies, and pies' were for children aged <6 years. It is interesting to note that 'follow-up formula' or food items for children one year old and above (e.g., milk and chocolate milk powders) constituted up to 16% of TFA sources, similar to processed meats.

TFA and non-communicable diseases (NCDs)

The Institute of Medicine / National Academy of Science recognizes that "trans fatty acids are not essential and provide no known benefit to human health." Various reports also indicated a positive relationship between TFA, LDL-C concentration, and heart disease (IOM 2022; Bendsen et al. 2011; Mozaffarian et al. 2009; Skeaff and Miller 2009).

Controlled dietary intervention studies (range: 3 to 6 weeks) showed that high TFA (range: 2.4 to 10.9 % of energy intake) diets were positively correlated with significantly higher LDL-C levels versus diets consisting of cis-PUFA or cis-MUFA (Mensink and Katan 1990; Vega-Lopez et al. 2006; Louheranta et al. 1999). A meta-analysis of 39 studies determining the effects of industrially produced TFA, ruminant TFA, or conjugated linoleic acid on LDL and HDL cholesterol showed the greatest increase of LDL:HDL ratio at 0.0555 (95% CI: 0.044 to 0.066) for each percent of dietary energy from industrial TFA replacing cis-MUFA. It was followed by conjugated linoleic acid at 0.043 (95% CI: 0.012 to 0.074) and ruminant TFA 0.038 (95% CI: 0.012 to 0.065) (Brouwer et al. 2010).

TFA-mediated pro-inflammatory effects and endothelial dysfunction are also thought to contribute to cardiovascular diseases (Mozaffarian et al. 2006; Abbey and Nestel 1994; Libby et al. 2009; Barter et al. 2015). A three-week dietary intervention study in 27 males given diets rich in elaidic acid, which is the predominant TFA in the Western diet (including margarine, partially dehydrogenated vegetable oils, others) showed higher activity in plasma cholesteryl ester transfer protein (CETP) (23.95% ± 1.26%) versus diet enriched with oleic acid, which is common in olive, palm, peanut, and sunflower oils (19.61% ± 0.89%) (Katan et al. 1995). Inhibition of CETP is theorized to be antiatherogenic, or protective against the formation of plaques in the arteries (Mozzaffarian et al. 2004). A crossover design dietary intervention study (5 weeks) among healthy Malaysian adults (n=41) showed a significant increase in high sensitivity C-reactive protein (CRP) in the group with partially hydrogenated soybean oil (PHSO) versus high oleic palm oil (HOPO) diet (32%) and palm stearin (PST) diet (23%). No significant differences were seen in interleukin-6 (IL-6), IL1B, and tumor necrosis factor-a (TNF-a) between groups. The PHSO diet significantly decreased IL-8 versus PST by 12% (Teng et al. 2010). These markers are present in the atherosclerotic plaque and are predictive of cardiovascular heart disease. In a cross-sectional study from the Nurses' Health Study

I cohort, TFA intake was positively associated with plasma CRP (73% higher in the highest quintile versus the lowest quintile), interleukin-6 (17% higher), soluble TFA receptor 2 (5% higher), E-selectin (20% higher), soluble cell adhesion molecules sICAM-1 (10% higher), and sVCAM-1 (10% higher) (Lopez-Garcia et al. 2005).

However, studies that aim to link TFA intake health outcomes were conflicting. One 18-year follow-up study of 3,686 Danes, aged 30-71 years, showed no association between ruminant TFA intake and incidence of CHD events (Jacobsen et al. 2008). On the other hand, several shorter and epidemiologic studies found strong positive association between the TFA intake and the risk for CHD (Ascherio et al. 1994). In a study among 85,095 women with no previous diagnosis of CHD, stroke, diabetes, or hypercholesterolemia who were followed up after eight years for development of non-fatal myocardial infarction or death from CHD, the relative risk (RR) of developing CHD for highest quintile of trans fatty acid intake as percentage of total energy per day versus lowest quintile was 1.5 (95% CI: 0.12 to 2.0; p=0.001) (Willett et al. 1993). A cohort of Finnish males aged 50-69 years (n=21,930) initially free of cardiovascular disease were followed-up after 6.1 years. Comparing the top quintile (median 6.2g/ day) versus lowest quintile (median=1.3g/ day) of TFA intake, the relative risk for coronary death was 1.39 (95% CI: 1.09 to 1.78; p=0.004) (Pietienen et al. 1997). A 2001 ten-year prospective cohort study followed 667 males aged 64-84 years with no coronary heart disease at baseline. Despite the average decrease on the TFA intake (4.3 % to 1.9%), adjustments for age, body mass index, smoking and dietary covariates, there was still a positive association for coronary heart disease (RR=1.28; 95% CI: 1.01 to 1.61) (Oomen et al. 2001).

A meta-analysis showed that total TFA intake was positively associated with CHD mortality (RR=1.28; 95% CI: 1.09 to 1.50) and with incidence of CHD (RR=1.21; 95% CI: 1.10 to 1.33). Furthermore, a 2% increase in energy from TFA was associated with 35% increased risk for CHD and 31% increase in CHD mortality (de Souza et al. 2015). This is similar to another review where the pooled RR from six studies comparing extreme quintiles of total TFA intake (intake increments of appr. 2.8 to ~10g/day) was 1.22 (95% CI: 1.08 to 1.38; p=0.002), conferring a 22% increased risk for CHD. Sub-analysis differentiating industrial- and ruminant-TFA showed that industrial TFA displayed a significant trend towards higher relative risk for causing CHD events. No significant associations were calculated for ruminant-TFA (Bendsen et al. 2011). A meta-analysis showed an increase for myocardial infarction (MI) or CHD death for every 2% increase in TFA isocaloric replacement of carbohydrate (24%), saturated fatty acid (20%), cis-MUFA (27%), or cis-PUFA (32%) (Mozaffarian et al. 2009).

A retrospective observational study was conducted on MI and stroke admissions in New York where TFA limits were imposed in eateries and restaurants in 2007. This showed a statistically significant lower MI admissions (-7.8%; 95% CI: -12.7% to -2.8%; p=0.002) in counties where TFA restriction was imposed compared to counties that did not have the limits three years after the ban. A similar trend was also seen for stroke admissions but not statistically significant (Brandt et al. 2017). A prospective study followed up 17,107 men and women after seven years and concluded that among males, a 2g/day increase of TFA intake was associated with a 14% increased risk for any stroke (HR=1.14; 95% CI: 1.02 to 1.28). This, however, was not seen in females (HR=0.93; 95% CI: 0.79 to 1.11) (Sarnyai et al. 2019). A meta-analysis (pooled n=190,284) showed no association between intake of TFA and incidence of ischemic stroke (de Souza et al. 2015).

Trans fatty acid intake may also play a role in the incidence of diabetes mellitus. An in vitro study comparing elaidate (18:1 trans-Δ9), vaccenate (18:1 trans-Δ11), palmitate (16:0), and oleate (18:1 cis-Δ9) showed similar mild effects on endoplasmic reticulum (ER) stress, apoptosis, and autophagy at higher concentrations in the rat insulinoma cells. However, the incorporation of TFAs was more pronounced in ceramides and diglycerides versus oleate (Sarnyai et al. 2019). Among persons with pre-existing insulin resistance, greater adiposity or lower physical activity levels, increased TFA consumption may worsen insulin resistance (Kavanagh et al. 2007). Sixteen obese non-insulin-dependent diabetes mellitus participants who were given six weeks of trans-MUFA diet increased post-prandial insulin secretion and probably increased peripheral insulin resistance compared to baseline (Christiansen et al. 1997). Overweight but otherwise healthy volunteers (n=7) who underwent high TFA diet had shown a trend for decreased insulin sensitivity (11% drop) compared to those who underwent a high MUFA diet. Lean volunteers did not exhibit any changes in insulin sensitivity (Lovejoy et al. 2002). A similar study on mostly non-overweight young women (n=14) did not have significant changes in fasting blood sugar (FBS) and insulin levels after high intake of TFA and MUFA diets compared to baseline (Louheranta et al. 1999). In a cohort of otherwise healthy 84,941 nurses who were followed up for 16 years, 3,300 new cases of diabetes mellitus were diagnosed (Hu et al. 2001). Stratified according to TFA intake, the nurses with the highest intake of TFA were at the higher risk of developing diabetes compared to those with lowest risk. However, a meta-analysis (pooled n=230,135) showed no association between TFA and incidence of diabetes mellitus (Kiage et al. 2014).

Certain malignancies are also being linked to increased TFA consumption. Increased TFA intake has been associated with distal colon cancer (OR=1.45; 95% CI: 1.04 to 2.03) among Caucasians (n=1,516) (Vinikoor et al. 2010). Among women (n=19,934), an increased risk for breast cancer was associated with increasing serum levels of trans-MUFA palmitoleic acid and elaidic acid (highest quintile vs. lowest: OR=1.75; 95% CI; 1.08 to 2.83) (Chajes et al. 2008). However, the World Cancer Fund Panel found insufficient evidence to implicate TFA to any specific cancers (World Cancer Research Fund 2018).

Burden of diseases linked to TFA

Wang et al. (2016) estimated that intake of n-6 PUFA would lead to the highest number of CHD deaths per year worldwide, with 711,800 deaths (95% CI: 680,700 to 745,000), followed by TFA with 537,200 deaths (95% CI: 517,600 to 557,000), then saturated fats with 250,900 deaths (95% CI: 236,900 to 265,800). Similar association was observed in a Kiage et al. (2013) study using prospective cohort data of 18,513 USA participants (white and black race from both sexes) with 1,572 deaths. Further, the population attributable risk due to TFA intake was estimated to be 7% (95% CI: 5% to 8%).

For the Philippines, the estimated annual number of coronary heart disease deaths due to high intake of trans fatty acids was at 3,067 persons with a ranking of 22nd by number of CHD deaths (Wang et al. 2016). Moreover, 2019 data of the Philippine Statistics Authority shows that the top 1 leading cause of mortality in the country for both sexes is 'ischemic heart disease', while 'hypertensive disease' was at top 6, and 'other heart diseases' at top 8 (PSA 2017). From the global analysis of the Institute for Health Metrics and Evaluation (IHME), ischemic heart disease in the Philippines increased by 38.0% from 2007-2017 while a more alarming increase of 77.6% was noted for

hypertensive heart disease. Further, in the 2019 IHME data, diabetes mellitus increased by 47.2% and stroke cases increased by 27.8% (IHME 2019). Trends on nutritional status among adult Filipinos (20 years old and above) showed consistent rise for overweight and obesity since 1993 to 2018, with 20.6% increase (FNRI 2019). These trends are consistent with the WHO report for the Philippines non-communicable disease profile, wherein cardiovascular diseases contributed to 35% proportional mortality of NCD-related deaths. Note that NCDs are estimated to be 67% of the total deaths (WHO 2018). This trend follows the global top mortality cause which remains to be the cardiovascular diseases group of disorders. This includes coronary heart disease and cerebrovascular disease with hypertension and hyperlipidemia as risk factors.

From the Health Expenditures by Disease Group of the Philippine Statistics Authority, cardiovascular diseases accounted for 8.1% of the total health expenditures in 2019. This translated to PhP 64,230,000,000 compared to PhP 44,056,000,000 in 2015. Highest increase of 17% in expenditures was noted from 2017 to 2018 (PSA 2019).

Prioritization of policy actions

In policy development, status quo and policy alternatives should be meticulously assessed using the hierarchy of evidence. Policy actors affect the policy process, content, and context. As stakeholders come with wide ranges of interests and influences, assessing the policy actions through the intervention ladder could aid in prioritization of policy actions. This ladder shows the degree of interference or intrusiveness to the liberty of the target population wherein the higher the interference, the stronger should the justification be, for stakeholders to accept (Nuffield Council on Bioethics 2007). Hence, the controllability and capacity for compliance by target stakeholders must be examined. Interference could either be towards negative (restriction elimination of choices) or positive (guidance to self-empowerment). Policy actions can be stand alone or in complementation with others such as information campaign and enabling choices.
In adopting the intervention ladder, possible TFA policy alternatives using varying degree of interference are shown in Figure 1. Remaining to be in the status quo, uncontrolled presence of TFA in the market would worsen NCD burden. This will lead to increased strain in the national health care system for medical costs from hospitalizations and health maintenance, as well as affecting the quality of life of the affected population.

Within the positive interference policy, at the "Inform" intervention, TFA literacy campaign can be used to educate the public; intervention to "Enable Choice: such as mandatory TFA labelling on all foods, would increase informed decision making for the intended beneficiaries. Providing incentives and disincentives such as price controls on TFA-free foods or higher taxation of TFA foods, should entail assessing the cost-benefit ratio and impact to the food industry and consumers.
Going farther to negative interference, mandatory limit of TFA content will be effective to reduce TFA intake. The critical decision is the scope of the 2%TFA limit: if it should be adopted in the *total amount of fats in all foods* or be more lenient to apply only in fats and oils. Logically, stricter policy is expected to generate greater impact on health outcomes but this goes parallel with the challenges in technical, financial, and human competence for policy compliance and monitoring. Testing laboratories with affordable fees for TFA content analysis must be secured given the anticipated surge of demand. Product reformulation would weigh heavier on small- to medium-scale producers (e.g. bakeries, restaurants), since generally, they do not have food labels and are constrained by financial and technical resources. Hence, needed resources by suppliers and middle consumers must be adequately provided in the policy transition. Last consideration is the elimination of choice through mandatory banning of PHOs, pushing manufacturers to find alternatives and to reformulate processed and pre-packed foods to products free from industrial TFA.

Regulatory initiatives on trans fats

The experience of Canada in legislating PHO ban demonstrates a good example of ladderized intervention. In 2007, voluntary lowering of trans fat level was implemented, followed by mandatory limit for restaurants in 2008. In 2016, there was a call to action to ban PHOs in which the Health Minister committed to first seek feedback from stakeholders. After 15 years of persistent and growing initiatives from different sectors, banning PHOs was finally legislated in 2018 (Rousy 2018).
Reasonable transition time must be provided, either for banning PHOs or limiting TFA content. According to the WHO, effective date after the legal measure is recommended at 6-18 months (WHO 2020b). Transition period greatly hinges on the magnitude and scope of TFA regulation and the readiness and commitment of the stakeholders, from the policy makers to implementers down streaming to the awareness and informed decision making of consumers. This includes clearing the market of products that were already released before the policy approval. Major consideration is the expiry of common food products such as margarine and other spreads, baked goods, and pizzas, among others. For total ban of PHOs, a longer period (of 36 months) was adopted by the United States compared to Canada (12 months) and Thailand (6 months).

In the Philippines, early initiatives are focused on monitoring TFA related diseases and nutrition labelling, such as the mandatory declaration of TFA amounts on nutrition labels of products sold in the country. The campaign for TFA regulation, took the form of House Bill 7200 in the 2019 Congress. This further progressed to DOH issuing Administrative Order (AO) 2021-0039 (National Policy on the Elimination of Industrially-Produced Trans-Fatty Acids for the Prevention and Control of Non-Communicable Diseases), which includes a transitory period of 24 months for the total ban of PHOs.

Denmark was the first country to regulate the content of industrial TFA (January 2004). A mandatory compositional restriction on TFAs in fats and oils to less than 2% of the total fatty acids was enacted (L'Abbe et al. 2009). Meanwhile, inclusion of TFA levels in nutrition labels were first required in Canada in 2002. Incentivizing through tax bonus was applied by Argentina to encourage reformulation of certain products to have less than 1% of energy from trans fatty acid. The systematic use of mass media to encourage lower intake of trans fat has led to a spillover effect to neighboring South American countries Brazil, Paraguay, and Uruguay by 2007 (Uauy et al. 2009).

Government initiatives across the globe continue to spread. A partial ban on trans fats, particularly industrially produced trans fatty acids, were enforced in Switzerland (2008), Austria (2009), Hungary, and Norway (2014) (WHO 2018b).

The USFDA ruled in 2015 that partially hydrogenated oils (PHOs) are no longer "generally recognized as safe." Furthermore, it banned the addition of PHOs in food in 2018. As of January 2020, all products in the market should no longer have added PHOs. In Southeast Asia, Thailand banned partially hydrogenated oils (PHOs) and food products containing PHOs in 2019. For adequate transition time in the food market and industry, the Thai FDA gave 180-day grace period that began on 09 January 2019 to clear the market of food containing PHOs.

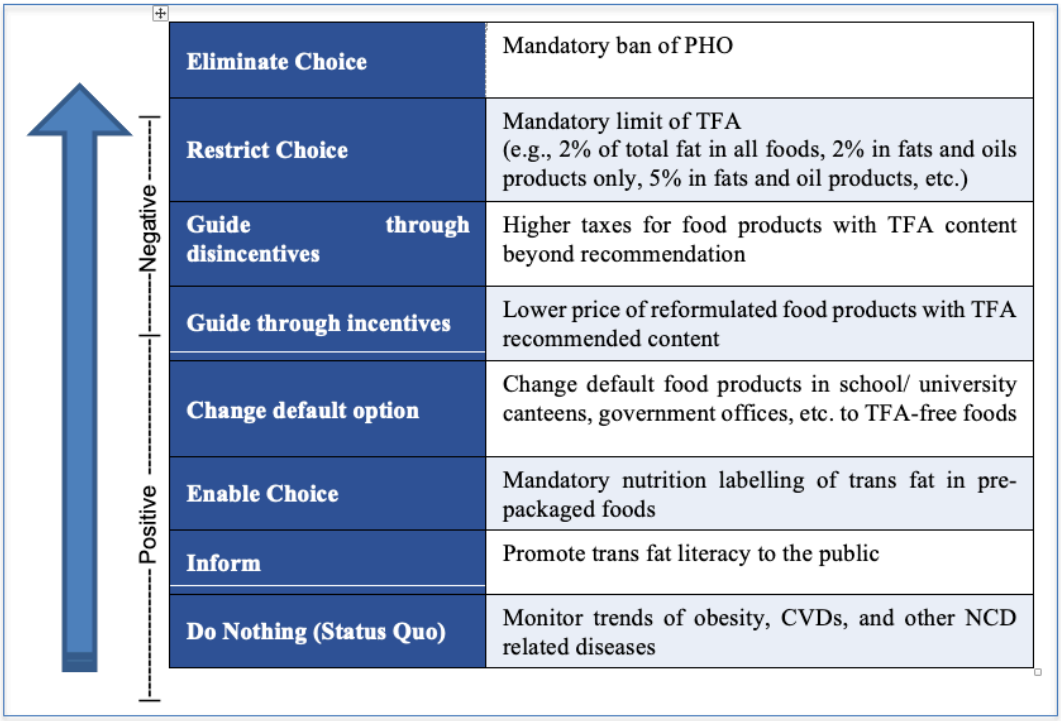

Figure 1: Intervention ladder for policy actions in regulating TFA in foods.

Ingredients that will be checked include margarine, shortening, creamer, and whipping cream, among others (USDA 2018).
In the Philippines, further guidelines and issuances were released with the recent signing of DOH AO 2021-0039, wherein FDA plays a crucial role in ensuring compliance of food products in relation to new guidelines of banning the manufacturing, importation, and distribution of PHOs. Cascading approach on promotion and implementation would be supported by strong communication plan for LGUs, communities, and priority settings (DOH 2021).

To date, the dietary reference intake guidelines include only macronutrient (fats, carbohydrates, and protein) wherein fats are recommended at 15%-30% of total energy for adults aged ≥19 years. This includes not only readily available or visible fats and oils, but also naturally inherent fats from other foods (e.g., meats, eggs, dairy products, etc.) and alcoholic beverages which have corresponding fat exchanges (FNRI 2007). In addition, the current Philippine Food Composition Table includes fats in general as one of the listed food components (Avena 2010). With the new AO that mandates provision of technical assistance and capacity building on learning and development interventions, further TFA-specific dietary recommendations would bring forth nutrition and clinical guidelines. Thus, there is need for further research and interventions to establish robust evidence and assessment to build technical, financial, social, and political competencies among key actors.

Since the launch of REPLACE action package of the WHO in May 2018 on mandatory TFA limits, TFA policies that impose PHO partial ban or virtual elimination of industrially produced TFAs are in effect in 14 countries protecting 589 million people. Mandatory limits in TFA content are currently in effect in 33 countries (WHO 2020b).

With the recent AO of the Philippine DOH, further guidelines call for more stakeholders' discussions to gather generalizable and conclusive recommendations enjoining the market actors: food producers and middle- and direct- consumers. This seeks greater agreement among all key actors of policy implementation that warrants harmonized efforts. In any policy action, it is important to note the impact of imported products and naturally occurring TFA in foods.

CONCLUSION AND RECOMMENDATIONS

With the growing momentum across the globe on eliminating TFA in our diet to foster better food options for the population, it is an opportune time that the Philippines released new guidelines in banning PHOs in the country, with the aim to curb the growing burden of noncommunicable diseases. This also complements the aim of Universal Health Care Law, to provide holistic care and improve health outcomes, including the prevention and control of noncommunicable diseases. From the review of literature, the following are recommended:

1. Promote TFA literacy by integrating the topic of TFA in health and nutrition promotion programs and materials, even as the Philippines gears up for the Universal Health Care Law. Strategically engaging the media guided by technical content on nutrition and health is important.
2. Mandatory PHO ban has the greatest impact to population health. Systematic random sampling at the market will ensure that compliance is strictly adhered to by manufacturers.
3. Strict adherence to the 24-month transition period for manufacturers for product reformulation and other market actors should be enforced.
4. Ensure accessibility, technical competence, and affordability of laboratories nationwide for TFA content analysis.
5. Create a technical working group (TWG), convening experts in drafting a subsequent Republic Act and its Implementing Rules and Regulations to bring the DOH AO to the next step. With issuances of TWG policy statements that reflect the conclusive and consensus recommendations of all major stakeholders, generating the details of operationalization structured by technical expertise on legal, scientific, and locally contextualized policy should ensue.

6. Provide assistance to small- to medium scale food manufacturers including but not limited to financial and technical resources to comply with the set regulations.
7. Fund and conduct more research on current TFA intake as baseline for future studies, and on implementation and monitoring for the proposed ban in terms of economic valuation and health effects. This includes, among others, the following: needs and readiness assessment of the food industry, establishing baseline data (i.e., socio-demographic, economic, and cultural determinants of adopting new health intervention); health outcome-based effectivity; cost-effectiveness analysis; market analysis; and policy analysis.

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CONFLICT OF INTEREST

All authors declare no conflict of interest.

CONTRIBUTIONS OF INDIVIDUAL AUTHORS

MM Zarsuelo is the principal author. Together with ZD Zordilla, both contributed to the conceptualization of the study, acquisition and analysis of data, drafting and revising of the manuscript, and final approval of the version to be published. All authors agree to be accountable for all aspects of the work. All authors declare that the manuscript's data, figures, graphs, calculations, etc. are authentic.

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