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The feasibility of multisectoral policy options aimed at reducing trans fats and encouraging its replacement with healthier oils in India

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Introduction The World Health Organization recommends replacement of trans fat with polyunsaturated fat to reduce cardiovascular disease risk. Although several high-income countries have been successful in reducing trans fat in the food supply, low- and middle-income countries such as India may face additional contextual challenges such as the large informal sector, lack of consumer awareness, less enforcement capacity and low availability and affordability of healthier unsaturated fats. The objective of this study was to examine the feasibility and acceptability of multisectoral policy options aimed at supporting trans fat reduction and its replacement with polyunsaturated fats in India.

Methods Multisectoral policy options examined in this study were identified using food supply chain analysis. Semi-structured interviews ($n = 17$) were conducted with key informants from agriculture, trade, finance, retail, industry, food standards, non-governmental organizations and the health professions to gain their views on the feasibility and acceptability of the policy options. Purposive sampling was used to identify key informants. Data were coded and organized based on key themes.

Results There was support for policies aimed at improving the quality of seeds, supporting farmer co-operatives and developing affordable farming equipment suited to smallholders to improve the production of healthier oils. Increasing the role of the private sector to improve links among producers, processors and retailers may help to streamline the fats supply chain in India. Blending healthier oils with oils high in saturated fat, which are currently readily available, could help to improve the quality of fat in the short term. Improving consumer awareness through mass media campaigns and improved labelling may help increase consumer demand for healthier products.

Conclusions Reorienting agricultural policies to support production of healthier oils will help increase their uptake by industry. Policy coherence across sectors will be critical to reduce trans fat intakes and could be improved by increasing engagement among researchers, the private sector and government.

Keywords Trans fat, multisectoral policy, food policy

KEY MESSAGES

- The lack of consensus among decision makers regarding the definition of healthy replacement oils for trans fat will create challenges in terms of pursuing policies aimed at increasing use of oils high in polyunsaturated rather than saturated fat.
- The political will for market-oriented interventions is lacking. However, intervening at the state level may be more feasible and politically acceptable.
- Increasing the role of the private sector will likely be key in streamlining supply chains and improving knowledge translation (agricultural extension) to farmers.
- Better policy coherence across sectors is needed in order to drive support for multisectoral policy options aimed at improving the quality of fat in India. India should adopt a national nutrition plan, detailing actions that should be made by different sectors in order to achieve a common goal of improved diet quality.

Introduction

The consumption of industrially produced trans fat is associated with an increased risk of cardiovascular disease (Krisetherton 1995; Willett 2006, Teegala *et al*. 2009, Micha and Mozaffarian 2008, Mozaffarian *et al*. 2006). In response to the negative health consequences associated with its consumption, the World Health Organization (WHO) has called for the removal of trans fat from the global food supply and has included the 'adoption of national policies that limit saturated fatty acids and virtually eliminate partially hydrogenated vegetable oils in the food supply' as an indicator in the global monitoring framework for the prevention and control of non-communicable diseases (NCDs) (WHO 2012). The WHO recommends the replacement of both trans and saturated fat with polyunsaturated fats given that maximum health benefits will be achieved through this substitution (Mozaffarian *et al*. 2010; WHO 2004; Siri-Tarino *et al*. 2010).

Trans fat reduction has been achieved in several high-income countries through a combination of mandated trans fat labelling, public education campaigns, engagement with industry to reformulate products and national and local trans fat bans (Leth *et al*. 2006, Perez-Ferrer *et al*. 2010). Trans fat bans have led to the most significant reductions in the levels of trans fat in the food supply; however, only a handful of countries (Denmark, Austria, Switzerland, Iceland), cities and states have enacted them worldwide (Downs *et al*. 2013a). Key factors that have led to the success of trans fat regulation, and bans in particular, have been high consumer and political awareness regarding the health implications of trans fat consumption and champions in government and consumer organizations (Perez-Ferrer *et al*. 2010; Mello 2009).

Although there is some evidence to suggest that trans fat intakes might be higher in low and middle-income countries (LMICs) (Butt and Sultan 2009), they will likely face additional challenges to their reduction given the more informal manufacturing and retail sectors, less capacity for enforcement, lack of co-ordination among sectors, competing priorities and lack of awareness regarding trans fat (Downs *et al*. 2013b; Perez-Ferrer *et al*. 2010; Colón-Ramos *et al*. 2007; Colón-Ramos *et al*. 2013). However, there has been some success in reducing trans fat levels in LMICs, particularly in Latin America. Costa Rica was able to significantly reduce intakes after active engagement between public health and the oil industry to voluntarily reduce trans fat levels in partially hydrogenated vegetable oils (PHVOs) after they were identified as the main source of trans fat in the diet (Colón-Ramos *et al*. 2006, 2007). In Argentina, the health, agriculture and oil sectors worked closely together to reduce the availability of trans fat in the food supply, substantially increasing their supply of affordable high-oleic sunflower oils, making it a feasible healthier option for product reformulation to reduce trans fat (L'Abbe *et al*. 2009).

In India, the main source of trans fat are PHVOs such as *vanaspati* (L'Abbe *et al*. 2009; Ghafoorunissa 2008, Agrawal *et al*. 2008). *Vanaspati* is a vegetable ghee, which is primarily used in foods sold by street vendors, bakery products, fried snacks and as a cooking oil in the northern Indian states (L'Abbe *et al*. 2009; Agrawal *et al*. 2008; Ghafoorunissa 2008). Although the quantity of trans fat present in *vanaspati* depends on the brand, levels range from 4 to 65% of total fat content (L'Abbe *et al*. 2009). In response to the high levels of trans fat in *vanaspati*, the Food Safety and Standards Authority of India (FSSAI) proposed regulation to limit its intake. The regulation sets an upper limit of 10% trans fat in PHVOs—which is significantly higher than the 2% limit in Denmark—and requires mandatory labelling of saturated and trans fats (FSSAI 2010). The regulation was published on June 27th 2013, but is not yet actively enforced (FSSAI 2013).

Policies aimed at supporting trans fat reduction and replacing it with healthier oils involve various sectors along the food supply chain. Given that many of the policies that could support trans fat reduction sit outside of health it is important to assess both their feasibility [the likelihood of the policy being fully implemented and gaining the necessary political and public support without significant opponents (Snowdon *et al*. 2010a)] and acceptability among key stakeholders from various sectors. Thus, the objective of this study was to examine the feasibility and acceptability of multisectoral policy options aimed at supporting trans fat reduction and its replacement with polyunsaturated fats in India.

Materials and methods

Data collection

We conducted a qualitative study to examine the feasibility of multisectoral policies to improve the availability and affordability of healthier fat in India. Seventeen semi-structured interviews were conducted with key government informants from agriculture, oil processing, food standards, commerce and

trade. In addition, key informants from industry (oil production and processing industry), industry trade organizations (agriculture, trade, finance) and non-governmental organizations (NGOs) representing retail and the health professions were interviewed. Interviews took place in Delhi and Mumbai between May and July 2012. We initially approached key stakeholders from industry ($n=2$), government ($n=2$), nutrition ($n=2$) and food processing and retail organizations ($n=3$) based on our previous work [Downs *et al*., 2013b]. Snowball sampling was then used to identify additional interviewees (Bell 2010) from trade, industry, oil processing and agriculture sectors. Interviewees were key decision makers in their related departments and sectors.

Prior to contacting potential interviewees by telephone to seek their participation, introductory emails were sent to possible participants outlining the details of the study. Written informed consent was obtained from all study participants. Interviews were mainly conducted face-to-face; however, two interviews were completed by telephone. Interviews were audio-recorded and transcribed verbatim. All interviews were conducted by [Downs *et al*., 2013b] and took an average of one hour to complete. Interviews continued to the point of theoretical saturation, when no additional relevant information was obtained from interviews (Quine 1998; Bertaux 1981).

Identification of policy options

We identified policy options through participatory food supply chain analysis and problem and solution trees (Hawkes *et al*., in press). Consumption-oriented food supply chain analysis, a conceptual framework developed by Hawkes (2009), was used to comprehensively map the characteristics affecting the availability, price and marketing of oils and trans fat at each step of the Indian food supply chain. After completing a comprehensive map of the food supply chain, problem areas were identified in the chain by examining the characteristics, incentives and disincentives and their effect on the availability, price and marketing of oils/trans fat. Problem areas in the food supply chain were found where existing characteristics, incentives or disincentives had a detrimental effect on trans fat availability, price and marketing. A combination of problem/solution trees and logic models was then used to identify potential policy solutions based on the work of Snowdon *et al*. (2008, 2010a, 2010b). A detailed description of the identification and analysis of the 24 policy options are reported in detail elsewhere [Downs *et al*., 2014a] and are summarized in Table 1. Given the time constraints faced by key decision-makers and stakeholders, we asked all interviewees about the feasibility of the seven 'core' policy areas. The 'core' policy areas were identified to address the key problem areas—based on food supply chain analysis—to reducing trans fat in the Indian food supply and supporting its replacement with healthier oils and were not selected based on their technical feasibility. In addition, we sought sector specific (with overlap from other sectors) information about the feasibility of specific policy options. For example, although we asked stakeholders from each sector about the feasibility of policies aimed at improving inputs into agriculture we asked interviewees from agriculture, trade and industry about the feasibility of specific irrigation, seed and access to credit policies.

Table 1 identifies the core policy areas, the corresponding policy options and a rationale for those options. Interviewees were asked to comment on the technical, economic and trade-related legal feasibility as well as the political and cultural acceptability of the identified policy options based on the work of Snowdon *et al*. (2010a).

Analysis

All interview data were coded by [blinded for review; SMD] and organized based on key themes (identified through thematic analysis) using NVivo software (version 8; QSR International, Doncaster, Victoria, Australia). Policy specific key themes are reported in addition to several overarching common themes that cut across the different policy options. The key factors influencing the feasibility of the core policy areas were examined based on a policy analysis framework developed by Walt and Gilson which examines the policy *context, content, process* and *actors* (Walt and Gilson 1994). Ethics approval for this study was obtained from the University of Sydney Human Research Ethics Review Committee and from the Institutional Ethics Committee at the Public Health Foundation of India.

Results

Overarching themes

There were several key overarching themes related to the feasibility of policy options to support trans fat reduction and its replacement with polyunsaturated oils: the need to find an alternative to palm oil that is comparable in price, the inability to define oils as being more or less healthy, the preference for consumer-facing policies aimed at providing nutritional information to consumers rather than market interventions, the importance of keeping prices low and inflation stabilized, the need to increase the role of the private sector, the importance of political will and the difficulties in the implementation and enforcement of policies in India. Key factors influencing the feasibility of the policy areas are discussed below and described in Table 2 based on the policy analysis framework developed by Walt and Gilson (Walt and Gilson 1994).

The feasibility of agricultural policies

The agricultural policies that were examined focused on improving inputs into agriculture (increasing credit access, greater use of irrigation, improved seed quality and support for cluster farming and farming equipment) and agricultural production such as mandatory intercropping (growing crops in close proximity) of oilseeds with legumes, support for cluster farming and incentives for shifting production towards healthier oils [increasing minimum support prices (MSPs) for healthier oils and investing in domestic production of healthier oils rather than palm oil]. Overall there was support by interviewees for agricultural policies aimed at improving production of healthier oils; however, a key challenge identified was the role of the states in terms of policy implementation and enforcement, leading to a lack of consistency in agricultural policies throughout the country.

Concerning increasing credit access for farmers, interviewees indicated that because agriculture is a priority-lending sector

Table 1. The general and specific multisectoral policy options examined in this study and their rationale

Sector	General policy areas	Specific policy options	Rationale for supporting trans fat reduction and its replacement with healthier oils
Agriculture	Would policies aimed at general agriculture inputs be feasible?	• Mandatory rain harvesting for government buildings to be used for irrigation • Subsidise high quality seeds for healthier oils • Guaranteed access to (low interest) credit for farmers • Subsidize farm equipment	• Low yields and productivity due to insufficient inputs into production leading to low availability of healthier oils for use in product reformulation
	Would policies aimed at improving farming methods be feasible?	• Mandatory intercropping of oilseeds with legumes (natural fertilizer) • Government support for cluster farming	• Low yields and productivity due to lack of economies of scale leading to low availability of healthier oils for use in product reformulation
	Would policies aimed at shifting production to healthier oils be feasible?	• Increasing minimum support prices for healthier oils • Shift government incentives for domestic palm production to healthier oils	• Current production of palm oil (high in saturated fat) which could lead to uptake by industry for use in product reformulation
Streamlining the Supply Chain	Would policies aimed at streamlining the supply chain be feasible?	• Remove government regulated mandis (markets) (repeal Agriculture Produce Market Committee Act) • Removing small-scale reservations on oilseeds • Establish mega food parks for oilseeds	• Wastage due to fragmented supply chain (from farm-to-fork) which increases the price and reduces the availability of healthier oils for use in product reformulation
Trade, taxation and investment	Would policies aimed at making palm oil more expensive than healthier oils be feasible?	• Increasing import or excise tax on palm oil • Reduce domestic investment in palm oil production	• Low cost of palm oil as compared with healthier oils which incentivises its use by industry in product reformulation
	Would policies aimed at providing incentives for technology investment for product reformulation be feasible?	• Subsidies for investment in technology for product reformulation using 'healthier oils' • Tax incentives for companies using healthier oils in product reformulation • Removing small scale reservation policy for oilseed processing	• Lack of capacity of small-scale processors and low likelihood of using healthier oils in product reformulation
Retail	Would a policy aimed at building capacity of street vendors be feasible?	• Mandatory discard of oil every 12 hours • Government training to street vendors about use of healthier oils • Subsidise healthier oils and tax palm oil	• Vendors use oils for an extended period of time decreasing the quality of oil. Vendors also use fats high in trans and saturated fat. Improving vendor knowledge and ensuring that healthier oils are available at an affordable price could increase uptake by vendors
Promotion and Labelling	Would policies aimed at improved nutrition labelling be feasible?	• Establish and maintain a food composition database • Mandate easy to understand front-of-pack labelling (traffic lights) • Increase stringency of scientific evidence required for health claims	• Lack of consumer awareness regarding trans and saturated fat. By improving the accuracy of labelling, monitoring trans fat levels in foods and by mandating easy to understand labelling, this may lead to product reformulation by industry to reduce the trans and saturated fat in products
	Would policies aimed at decreasing the promotion of unhealthy foods be feasible?	• Ban advertising of energy dense (low nutritional quality) foods to children • Government mass media public education campaign to create trans fat awareness	• Promotion of processed foods that could be high in trans and saturated fat. Reducing advertisement of these foods, along with improving consumer awareness regarding unhealthy fats, could increase consumer demand for products with healthier oils

Table 2. Key factors influencing the feasibility of multisectoral policy options to improve the availability and affordability of healthier fat in India based on a policy analysis framework (Walt and Gilson 1994)

Point of intervention	Policy content	Policy context	Policy process	Policy actors
Agriculture	• Potential unintended consequences • Limited impact on farmers	• Cultural and political will • Farmer remuneration	• Policy implementation at the state level	• Knowledge translation from research institutes to farmers (agricultural extension)
Streamlining the supply Chain	• Need for parallel private and public markets • Limited impact on availability and affordability of oils	• Changing environment due to foreign direct investment policies	• Preference for reliance on private sector rather than public policy	• Power of traders
Trade, taxation and investment	• Difficulty defining healthier oils	• Need to keep price low given high inflation	• More likely at state level	• Support for smaller manufacturers
Retail	• Preference for improving awareness rather than limiting availability of unhealthy oils	• Need for security of space for street vendors • Emphasis on quantity rather than quality	• Policy enforcement difficulties due to informal sector	• Price conscious vendors • Potential role for private sector in knowledge translation
Promotion and labelling	• Achieving the right balance of information	• Existing labelling inaccuracies • Belief of individual/parental responsibility	• Preference for downstream policies	• Role of informal sector (no labels on products)

for the government, there are already measures in place to increase access to credit; however, interviewees indicated that many farmers continue to use private moneylenders that offer 'exorbitant' interest rates. Although providing greater access to credit in theory may be possible, it is likely that farmers will still prefer to use private money lenders because they don't need collateral, it is informal and the money lent can be used on whatever the farmers see fit rather than agriculture-specific expenses, which is a requirement of the public lending sector. For example, one interviewee from agriculture noted: 'You see the reasons of poverty, one of the reasons is that they spend sometimes very heavily on marriages, on other rituals, on occasions, so, in government one cannot promote these kind of expenditures' (key government informant, agriculture). One interviewee noted that there have been attempts in a few states to incorporate private lenders into the formal banking sector but that they have not been very effective.

Interviewees generally agreed that greater use of irrigation would result in higher yields and that rainwater harvesting and better river management were potential ways to do this. In fact, one interviewee mentioned that a recent irrigation project in Rajasthan had been successful in improving yields. However, interviewees from agriculture highlighted that one of the potential unintended consequences of improving access to irrigation was that farmers would potentially shift to growing more lucrative crops such as basmati rice that often involve 'environmentally unsustainable' farming practices: 'If you look at the trend in past 30–40 years, you will see that in the irrigated area, the farmers tend to move to rice, wheat, which are more remunerative' (key government informant, agriculture).

Policies aimed at improving the quality of seeds generated significant support from interviewees. One interviewee even noted that the government had already begun planning policies aimed at improving seed quality including creating a mission for certified hybrid seeds, improving transfer of technology, providing subsidies for nursery development and promoting intercropping. Many interviewees noted that high quality seeds already exist and that the main problem is a lack of knowledge translation from research institutes and the private sector to farmers: 'So what happens is all that research done by the universities, it is confined to the universities it's not translated on the ground. They might have published the paper that it is high yielding variety but there is no means for them to take it to the farmers' (key industry trade organization informant). A few interviewees mentioned that the government's policy restricting use of genetically modified (GM) seeds made the process of developing high yielding seeds slow.

Interviewees were supportive of cluster farming (a farmer co-operative) as a means of increasing economies of scale and subsequent productivity. As one interviewee noted: 'It will definitely play a critical role in improving yields but it's again a very politically sensitive issue' (key industry trade organization informant). A few interviewees noted that contract farming (when companies contract farmers to produce specific products) could play a role, although it is technically currently not permitted under the Agriculture Produce Market Committee (APMC) Act, but that it is best suited for 'specialized commodities' rather than cash crops such as oilseeds.

There were conflicting views about the importance of agricultural subsidies with some interviewees suggesting they were beneficial and others saying that the government should not intervene and should rely on market forces. Interviewees indicated that price is the determining factor for farmers—they will grow the most remunerative crops. Therefore, it is unlikely that farmers will shift production to oilseeds unless they see

'financial viability'. Interviewees were generally not supportive of providing further subsidies for farm equipment given the number of existing subsidy schemes. As one interviewee noted: 'rather than giving the subsidies they should come out with some research for some sort of a mechanization which small farmers can afford . . . and make farmers realize that adopting those methods will save his expense and save his wastage' (key industry informant, oil processing).

There was little support for shifting government incentives from supporting palm oil development to focusing on investment in healthier oils. The potential that palm oil has for obtaining higher yields—which would help bridge the gap between supply and demand—was the main reason for the emphasis on increasing palm oil development rather than other, potentially healthier, oils. Moreover, many interviewees did not think it was possible to define oils as being healthier (i.e. oils high in unsaturated fats) vs less healthy (i.e. oils high in saturated fat) and that it was premature to make this distinction given their perceived lack of conclusive evidence regarding its associated negative health consequences. 'All I can say is I don't think at this point in time the government is conscious about the healthier oils and non-healthier oils: they are just conscious about the price, keeping the price low, that's it' (key industry trade organization informant). Several interviewees said that in terms of defining polyunsaturated oils as being healthier mixed messages were received from the government, scientists and industry. Interviewees from government and industry highlighted the 'natural antioxidants' in palm oil as a reason to promote its consumption and define it as healthy oil.

There were mixed views from interviewees about whether or not increasing MSPs would be feasible. Interviewees indicated that changing MSPs to promote healthier oils would not work: 'MSPs don't work but demand works' (key government informant, commerce). Another interviewee stated: 'The minimum support price is a good intention and it is aimed at increasing the farmers' income, the unfortunate thing in the whole context is that the government announces the minimum support price and they have no mechanism to enforce that . . . take the oilseeds and other crops, you have a minimum support price [but] there is nobody to buy, nobody to guarantee that they would procure from them so its actually non existent. So there is no meaning for the MSP' (key industry trade organization informant, agriculture).

The feasibility of policies aimed at streamlining the supply chain

Removing government regulated mandis, where farmers are required to sell their products (they are currently not permitted to sell directly to consumers), removing the small scale reservations on mustard and groundnut oils and establishing mega food parks for oilseeds were examined as policy options aimed at streamlining supply chains (improving links between farmers, processors and retailers in order to reduce inefficiencies in supply chains). Involving the private sector to improve the links among producers, processors and retailers and provide farmers with a choice as to where they sell their products was a key theme related to streamlining the supply chain. Because completely removing mandis was deemed 'controversial' many interviewees suggested the need for parallel markets led by the private sector: 'Give the private sector an opportunity to play a role in mandis' (key industry trade organization informant, agriculture). One of the foreseeable challenges associated with making changes to the existing mandi structure was resistance

Box 1. Case study—increasing the role of the private sector to streamline the supply chain

An interviewee from the oil processing industry spoke about how their processing company was able to engage with farmers in a meaningful way to increase profits and productivity for both the farmers in the region and the company. The processing company was failing 'because it didn't have the local raw material' so it worked with farmers in the area surrounding the processing facility to encourage them to start growing soybean crops. They partnered with a university to develop the best seeds for the local area. After doing field-tests and research in collaboration with the university 'over a period farmers got a choice of high yielding variety' which doubled their yields. They also worked with the university to develop a seed that suited the farming equipment used by the farmers. Although the company engaged with farmers in a similar way to contract farming there were no contracts involved: 'our attempt had been whenever he goes out to sell we should be his first choice so either in terms of pricing or in terms of testing or in terms of buying transparent procedures or in terms of timely payment or in terms of treatment and taking care of the harvested crop [to] ensure that there is least wastage. So that a small farmer ultimately perceives the benefit of selling it to us.' They worked closely with farmers by providing them with bags that could be used to store harvests and reduce spillage and wastage taking a 'nominal deposit' from the farmers to entice them to bring their final product to their processing facility. The interviewee emphasized the importance of building a strong relationship based on patience and trust with farmers and: '[the] relationship with the farmers doesn't come by overnight. They observe you for one year 2 years 3 years and depending upon our dealings with them, how we treat them, and how genuinely we see that his earnings are maximized, then once it is established then of course the relationship becomes stronger. To tell you frankly as a initial reaction of the farmer was a kind of suspicion kind of reaction.' The relationship that was built with the farmers led the company to consider the farm as a whole leading them to liaise with other companies: 'slowly we shifted our focus from soybean rather as a commodity to the farm . . . to the farmer who grows that crop. In the sense a soybean farmer grows soybean during [the] rainy season but he grows also other things during the rest of the season . . . so we thought that let us help in marketability of that second crop also we may not process it but let us help.' Because the company had built strong relationships with the farmers they were able to liaise with other companies to ensure that farmers had buyers for their secondary products.

from the traders given the power that they hold: 'The government are in the grip of traders. Traders lobby very strong and they don't want that parallel market to come up . . . traders can form a cartel and pull down the prices . . . they take advantage of the ignorance and weakness of the farmers. It may [be a] delay in the payment, there are so many ways in which a farmer can feel helpless at the hands of the traders. Now by providing an alternative market, see they will change their behavior' (key industry informant). Interestingly, one interviewee indicated that the mandis 'ha[ve] become the stepping stone towards a political career' (key industry informant), with the traders testing their popularity among voters, since they have to be elected, before entering larger-scale politics. Once these traders enter politics they do not want to 'antagonise' the remaining traders so they continue to support the existence of mandis.

In addition to the proposed private sector role in mandis, interviewees suggested that with the opening of foreign direct investment (FDI) in multi-brand retailing in India, the private sector would play a pivotal role in improving backward linkages, strengthening supply chains and removing the middlemen. However, they noted that the Indian government has many clauses as part of their FDI in multi-brand retailing policy, which may deter companies from entering the retail sector in the country.

Interviewees did not think that the small scale reservations (the limiting of oil processing to small scale processors) on mustard and groundnut oil were adversely affecting production of these oils and did not think it was necessary to make changes to the existing policy in an effort to streamline the food supply. Moreover, interviewees thought it was unlikely that mega food parks (Ministry of Food Processing Industries supported hubs where farmers work directly with processor) for oilseeds would be supported by the government; however, one interviewee from the private sector provided an example of how their company is working directly with farmers to streamline the supply chain (Case study, Box 1).

The feasibility of trade, taxation and investment policies

Policy options aimed at increasing the price of palm oil as compared with healthier oils (increased import and excise tax) and incentives for product reformulation with healthier oils (subsidies for investment in technology, incentives for using healthier oils) were examined. There was little to no support for trade policies aimed at decreasing imports of palm oil and increasing imports of healthier oils high in unsaturated fat. As one interviewee noted: 'the government's first measure is to ensure that the price is as low as possible for political reasons, they can't be in a politically wrong situation where [the] price of oil is going up by 20% a month and then they are an absolute mess. So they remove[d] all the trade policy measures like duties on palm oil' (key industry trade organization informant). Nearly all interviewees did not think it would be feasible to change the duty structure to try to promote uptake of healthier oil; however, one interviewee from agriculture noted that the Planning Commission had advocated for increases in duty for imports in an effort to protect domestic farmers.

Although modifying trade policies seemed infeasible in this study, there were interviewees who agreed that influencing trade policy was feasible in other contexts. An interviewee from health noted that although other countries had used trade policy to reduce imports of palm oil, these policy measures were not feasible in large countries such as India with such 'porous borders'. Moreover, an interviewee representing a food-processing organization mentioned that there were other circumstances where they have lobbied the government to make changes to policies based, in part, on health. For example, in a recent free trade agreement an industry body provided feedback to the government that olive oil should be added to the list of allowable foods based on it being 'healthy oil' that is not produced domestically.

Interviewees were more supportive of the use of a domestic tax as compared with an import tax but its use was still deemed unlikely. Although interviewees thought it would be effective, the large unorganized retail sector would limit its overall impact. Interestingly, interviewees from health and nutrition were not supportive of the use of tax policy and suggested that education is more important: 'It's important to educate choices . . . it is not a good practice to restrict choices' (key informant, nutrition).

There were mixed views concerning the potential use of subsidies to support companies using healthier oils. One interviewee said 'that's not the driving factor anymore, you know if it was a very high taxed industry then we could have said . . . it requires that kind of incentive' (key industry informant). Nevertheless, there were also interviewees who supported subsidies for investment in new technology particularly if they were aimed at smaller manufacturers. One of the challenges identified by interviewees in terms of developing new technology was the lengthy process of approval of new technologies.

The feasibility of retail policies

The feasibility of mandatory discard of oil every twelve hours by street vendors, reducing the price of healthier oils and increasing vendor awareness were examined. Two key themes relating to the use of cooking oil by street vendors was their price sensitivity and their need for cooking oils that remain stable after repeated heating. In order for shifts in use of oils to occur, finding an alternative that was low cost and stable would be required. Blending of oils was one of the solutions suggested by interviewees from health, industry and oil technologists to overcome the debate about how to define oils and to improve the fatty acid profile of oils used by street vendors in the short term. It was suggested that as healthier oils become more widely available the ratio of unsaturated fats in the blended oil could be increased.

Interviewees were more supportive of strategies aimed at improving street vendor awareness rather than regulatory policies aimed at curtailing the re-use of oil. A representative of street vendors said the re-use of oil was 'not an issue for the street vendors' and denied that it was a common practice. Their view was that vendors needed 'security of space' and infrastructure, and once they had this they could invest in higher quality ingredients: 'You know when you are not secured you don't improve upon the quality. For you quantity is important, you want to sell more, you want to earn more you know. Once

you have secured [space] then you start improving upon the quality and the reputation and everything. So I think first step has to be security of space' (key NGO informant, retail).

The feasibility of promotion and labelling

The feasibility of policies aimed at improving nutrition labelling (front-of-pack labels, increased stringency of health claims), improving nutrition surveillance and consumer awareness and reducing marketing of energy-dense foods to children were examined. Interviewees were generally supportive of policies aimed at improving food labelling with one interviewee from food standards stating they were 'open to suggestions' about how best to present nutrition information on the labels. Importantly, interviewees noted the problems with labelling inaccuracies in the country and the need to ensure that consumers were not 'overloaded' by the information on the labels. As one interviewee stated: 'it's a question of how much information and what is the relevant information' (key industry informant). There was a concern that using traffic light labelling would not target the foods with the highest quantities of trans fat: '... they are not likely to take a high trans fatty acid containing material for household consumption. The issue is eating out and eating out is now becoming very very popular' (key informant, nutrition).

Most interviewees were supportive of nutrition surveillance and increasing consumer awareness. Interviewees indicated that developing a nutrition composition database to monitor its availability in the food supply would be feasible but that it would need to include the informal sector, which may prove difficult. As one interviewee from nutrition suggested, 'the trans fatty acid story, I think it should be controlled by many more factors' (key informant, nutrition). Although there were interviewees who thought a mass media campaign to promote trans fat awareness would be feasible, others thought the government would be unwilling to do it because 'there are [a] number of things which are required to be done'. One nutritionist suggested the need for 'a compendium of research evidence' that can be referred to in terms of identifying the nutritional quality of a given oil as a first step before embarking on a nutrition composition database: 'I think we need to create evidence base on every fat source and then talk about advantages and disadvantages' (key informant, nutrition).

There was strong support for advertising policies aimed at addressing false health claims and the FSSAI has even started fining companies who were falsely advertising; however, there was no support for broader use of advertising policies aimed at decreasing sales of unhealthy products. There was a consensus among interviewees that 'there is no unhealthy food or healthy food in this world' (key industry informant) and that unless a food is unsafe or falsely advertised, there should be no restrictions on its intake. A few interviewees indicated that it was the role of the parent to monitor their children's food intake and that the focus should be on education rather than restricting advertising of specific foods/groups. One interviewee stated: 'it depends on the level of awareness of the mother and father, the level of love and affection by the mother and father to the children ... it is not the job of the government' (Key industry informant). Overall, interviewees did not think that having advertising restrictions would be effective as one interviewee stated: 'it's easy to make policies but it takes something more than that. It's not that simple' (key NGO informant, nutrition). One health professional indicated that policies aimed at restrictions wouldn't be effective and outright bans would be the only way to use advertising policy to curtail intakes of unhealthy foods.

Discussion

Cardiovascular disease is the leading cause of death in India, creating a large burden for the health system and reducing productivity (Prabhakaran and Yusuf 2010). It has been estimated that India will lose $US237 billion in lost income between 2005 and 2015 due to NCDs (Mahal *et al.* 2010). Given the economic impact of NCDs in the country, population level prevention is needed. India has recently set an upper allowable limit of 10% trans fat in PHVOs and mandated trans and saturated fat labelling; however, the upper allowable limit far exceeds public health recommendations (and the limit set in other countries worldwide) and the regulation is not actively enforced. It is clear that a broader approach to improving the quality of fat in the Indian food supply is needed. Multisectoral policies aimed at improving diet quality have the potential to reduce the risk of NCDs. Policies that increase agricultural production of healthier oils, make healthier oils more affordable for use by manufacturers and retailers, increase consumer awareness and engagement among researcher, industry and government have the potential to improve the quality of the fat supply in India.

Production of healthier oils

Agricultural policies have the potential to improve the quality of the food supply (Nugent 2004; Jacoby and Hawkes 2008). Improving the quality of seeds, supporting farmer co-operatives and developing affordable farming equipment suited to smallholders could improve the production of healthier oils, and ensure that farmers get a good price for it, in India. In order to accomplish this, there needs to be greater co-operation among researchers, the private sector and farmers. Policies that enable and encourage the private sector to invest in India's supply chains will likely have a large impact on the availability of food in the country (Reardon and Minten 2011). There is likely a role for the private sector in terms of increasing knowledge translation to farmers, developing affordable farming equipment marketed towards smallholder farmers and streamlining the supply chain by improving the links between farmers, processors and retailers. Although high quality seeds do exist in India – with the potential to generate high yields – they are not making their way to farmers. By increasing knowledge translation to farmers by either involving the private sector or by ensuring that agricultural research institutes disseminate their findings to farmers, yields within the country could be greatly improved.

There are examples where industry has had a role in improving the quality of fat available in the food supply. In response to mandatory trans fat labelling regulation in the United States, Dow chemicals developed and launched high yielding canola and sunflower seeds used in cooking oils that had a longer shelf life, were more stable and better suitable for frying (Pfitzer *et al.* 2011). Not only did these oilseeds become

one of their bestsellers, it led to their uptake by manufacturers in product reformulation and the removal of 600 million tons of trans and saturated fat from the US diet (Pfitzer *et al.* 2011). In this study, linking farmers with processors was identified as a way to improve production of healthier oils. There is a clear role for the private sector in working with farmers to ensure that they are using high quality seeds, have the farming equipment required and have a buyer for their products.

Improving the availability and affordability of healthier oils

In the United States, Canada and Argentina the large supply and low cost of oils high in unsaturated fats such as canola, soybean and sunflower oil enabled industry to use them as replacement oils in many products when the trans fat were removed (Unnevehr and Jagmanaite 2008; Eckel *et al*. 2008; L'Abbe *et al*. 2009). Ensuring that healthier oils are more available and affordable for uptake by manufacturers and retailers will likely improve the quality of fat consumed in India. Given that palm oil is the most available and affordable oil it is likely to be the replacement oil of choice for product reformulation (Downs *et al.* 2013c). Making palm oil more expensive as compared with healthier oils by use of import and excise tax could incentivise uptake of healthier oils. A recent modelling study examining the impact of a 20% palm oil tax in India found that it would modestly reduce cardiovascular mortality but could have the unintended consequence of increasing food insecurity (Basu *et al*. 2013). However, this type of policy approach was not deemed feasible in this study, it is clear that more innovative approaches are needed.

One potential way to improve the fatty acid profile of replacement oils, with a limited supply of healthier oils, would be to blend oils. Over time, as the supply of mono and polyunsaturated oils increases the proportion of healthier oils in the blend could increase. In Singapore, an innovative initiative to improve the quality of oil used by its street vendors was recently implemented. The Healthier Hawker Program aims to reduce the saturated fat content of cooking oils used by street vendors in hawker centres (large, open-air food courts housing street vendors) (Health Promotion Board 2013). In order to ensure that there was an affordable supply of healthier oils, the Health Promotion Board worked with local manufacturing companies to increase the supply of blended oils containing 25% less saturated fat (Health Promotion Board 2013; Hawkes *et al*., 2014). It has been projected that switching to the lower saturated fat oil by a third of hawkers in the hawker centres would reduce patrons' intake of saturated fat by approximately 10% (Hawkes *et al*., 2014). A similar approach could be taken in India to improve the quality of oils produced by manufacturing, and used by vendors, to improve the quality of street vendor foods. The Indian Ministry of Food Processing Industries already has schemes for research and development (R&D) in food processing technology and 'up gradation of quality of street food' (Ministry of Food Processing Industries 2009, 2013a, 2013b). Providing support to small-scale processors to support adoption of new technology to assist with product reformulation could fit underneath the existing R&D scheme. Moreover, under the scheme aimed at improving the quality of street food, there could be a component to increase the quality of oils used. Given that the government has already highlighted street vendor quality as an area for improvement, it may be possible to link in with existing initiatives run under the Ministry to promote the use of healthier oils. In fact, the manufacturers in Singapore's Healthy Hawker Program were able to access non-health related government funding through the Standards, Productivity and Innovation Board (SPRING Singapore) that supports projects focused on improving productivity in the food service sector (Hawkes *et al*., 2014). A similar approach could be taken in India.

Improving consumer awareness and increasing demand for healthier oils

Lack of consumer awareness has been identified as a challenge to implementing trans fat policies in other LMICs worldwide (Colón-Ramos *et al.* 2013). Increasing awareness is important in terms of changing behaviour, particularly if supplemented by more upstream interventions, pricing strategies and/or regulation (Hawkes 2013; Capacci *et al*. 2012). Consumers in many high-income countries have begun demanding products containing healthier fats (Scott-Thomas 2011). In India, a lack of consumer awareness regarding trans and saturated fat has contributed to less demand for these products (Downs *et al.* 2013b). Consumer education in addition to the monitoring and surveillance of trans fat content in foods and its consumption are needed in LMICs to limit trans fat intakes (Colón-Ramos *et al*. 2013). We found that improved labelling and using mass media campaigns to improve consumer awareness were deemed feasible. These strategies, in conjunction with upstream policies aimed at increasing production of healthier oils and making them more affordable, could be effective in terms of changing consumer behaviour (Capacci *et al*. 2012).

Although we found support for improved nutrition labelling it would need to apply to food vendors, both in the formal and informal sector, in order to target the foods highest in trans fat. In an effort to increase the quality of the oils used by street vendors, and to provide consumers with more information about the foods they are purchasing, the government could provide incentives for vendors to use healthier oils. For example, the Singapore Healthy Hawkers Program allows vendors to put up a sign to indicate use of healthier ingredients if trans fat levels are less than 0.5 g/100 g and saturated fat levels are less than 38 g/100 g (Health Promotion Board 2014). A similar approach could be used in India; however, additional capacity in terms of enforcement and monitoring will be necessary.

Increasing engagement among researchers, industry and government

In Costa Rica, task forces to foster research engagement and collaboration among government, food industry and researchers were crucial in terms of the adoption of nutrition policy (Colón-Ramos *et al.* 2007). In India, this collaboration needs to take place both in terms of policy development but also in terms of examining policy implementation challenges, particularly with reference to how downstream policies such as trans fat limits and labelling affect the upstream supply of oils and vice versa. Improved policy coherence is needed to ensure that there is a co-ordinated whole-of-government approach to improving the

availability, affordability and acceptability of healthier oils. A key challenge in achieving policy coherence will be the lack of consensus surrounding what constitutes healthier oils. Although there is a global consensus that trans fat consumption is associated with negative health consequences, there has recently been some debate about the health impacts of consuming saturated fats (Malhotra 2013; Ramsden *et al*. 2013). Although the WHO recommends replacement of both trans and saturated fat with unsaturated fats and meta-analyses have shown that replacement of both of these fats with unsaturated fats generated health benefits (Mozaffarian *et al*. 2010; Mozaffarian and Clarke 2009), this study suggests that palm oil may be regarded as healthy by some decision makers. Given the lack of consensus surrounding the health benefits of replacing palm oil with oils higher in unsaturated fat in India and the current reliance on oil imports, it will be difficult to shift to healthier oils unless prices become comparable to palm oil. Indian public health professionals and researchers should more actively engage in the policy process and provide key input on the quality of different fats in order to garner increased support for policies aimed at improving access to healthier oils. This type of engagement has been key in countries such as Denmark and cities such as New York in championing strong trans fat regulation (Perez-Ferer 2010).

Limitations

One of the limitations of this research was restricting the discussion of specific policy options to sector specific stakeholders. Although we initially intended to ask all stakeholders about all the specific policy options, given the time constraints of the key informants and their hesitation to comment on areas that they perceived to be beyond their expertise, this was not possible. We attempted to overcome this limitation by ensuring that stakeholders from more than one sector answered sector specific questions (e.g. industry respondents were able to comment on policies across the supply chain) but it remains a limitation of this study. Another limitation of this study was the use of purposive sampling. Although this sampling technique employs a non-random selection of study participants, it is conducive to policy research and is useful in gaining in-depth and rich information when no sampling frame exists (Bell 2010).

Conclusions

Lack of enforcement capacity will likely remain an issue in India. For this reason it is important that supportive policies are put into place to facilitate the reduction of trans fat without relying solely on regulating limits in PHVOs. Reorienting agricultural policies to support production of healthier oils will be key in terms of ensuring their uptake by industry in product reformulation. Policy coherence across sectors could be improved by increasing engagement among researchers, the private sector and government. Improved knowledge translation from the private sector and agricultural research institutions to farmers will be essential and could have a substantial impact on yields of healthier oils. There is a clear role for the private sector in terms of improving farmers' inputs into agricultural production, the links between farmers, processors and retailers and for increasing uptake of healthier oils by manufacturers. In the short term, blending oils to improve the fatty acid composition over time may allow industry to increase use of healthier oils sooner and improve the quality as the supply of healthier oils increases. Government initiatives to improve food safety of street vendor foods should also include incentives for vendors to use healthier oils. These policies need to be supported by initiatives aimed at increasing consumer awareness, such as mass media campaigns, which will help generate more demand for healthier products.

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References

Agrawal A, Gupta R, Varma K, Mathur B. 2008. High trans fatty acid content in common Indian fast foods. *Nutrition & Food Science* **38**: 564–69.

Basu S, Babiarz KS, Ebrahim S, Vellakkal S, Stuckler D, Goldhaber-Fiebert JD. 2013. Palm oil taxes and cardiovascular disease mortality in India: economic-epidemiologic model. *BMJ* **347**: f6048.

Bell E. 2010. *Research for Health Policy*. New York, USA: Oxford University Press.

Bertaux D. (editor) (1981). From the life-history approach to the transformation of sociological practice. *In Biography and Society: The Life History Approach in the Social Sciences*. p. 37. Beverly Hills, CA: SAGE Publications.

Butt MS, Sultan MT. 2009. Levels of trans fats in diets consumed in developing economies. *J AOAC Int'l* **92**: 1277–83.

Capacci S, Mazzocchi M, Shankar B *et al.* 2012. Policies to promote healthy eating in Europe: a structured review of policies and their effectiveness. *Nutr Rev* **70**: 188–200.

Colón-Ramos U, Baylin A, Campos H. 2006. The relation between trans fatty acid levels and increased risk of myocardial infarction does not hold at lower levels of trans fatty acids in the Costa Rican food supply. *J Nutr* **136**: 2887–92.

Colón-Ramos U, Lindsay AC, Monge-Rojas R, Greaney ML, Campos H, Peterson KE. 2007. Translating research into action: a case study on trans fatty acid research and nutrition policy in Costa Rica. *Health Policy Plan* **22**: 363–74.

Colón-Ramos U, Monge-Rojas R, Campos H. 2013. Impact of WHO recommendations to eliminate industrial trans-fatty acids from the food supply in Latin America and the Caribbean. *Health Policy Plan*.

Downs SM, Thow AM, Ghosh-Jerath S, Leeder SR. 2014a. Aligning food processing policies to reduce trans fat in India. *Health Promotion Int'l*.

Downs SM, Thow AM, Ghosh-Jerath S, Leeder SR. In press. Developing interventions to reduce consumption of unhealthy fat in the food retail environment: a case study of India. *J Hunger Environ Nutr*.

Downs SM, Thow AM, Leeder SR. 2013a. The effectiveness of policies for reducing dietary trans fat: a systematic review of the evidence. *Bull World Health Organ* **91**: 262–69.

Downs SM, Thow AM, Ghosh-Jerath S, McNab J, Reddy KS, Leeder SR. 2013b. From Denmark to Delhi: the multisectoral challenge of regulating trans fats in India. *Public Health Nutr* **16**: 2273–80.

Downs SM, Gupta V, Ghosh-Jerath S, Lock K, Thow AM., Singh A. 2013c. Reformulating partially hydrogenated vegetable oils to maximise health gains in India: is it feasible and will it meet consumer demand? *BMC Public Health* **13**: 1139.

Eckel RH, Kris-Etherton P, Lichtenstein AH *et al.* 2008. Americans' awareness, knowledge and behaviors regarding fats: 2006-2007. *Circulation* **117**: 288–96.

Food Safety and Standards Authority of India (FSSAI). 2010. *Regulation of Trans Fatty Acids in Partially Hydrogenated Vegetable Oils*.

Food Safety and Standards Authority of India (FSSAI). 2013. *Notification: Food Safety and Standards (Packaging and Labelling) Regulation 2011, Amendment*.

Ghafoorunissa G. 2008. Role of trans fatty acids in health and challenges to their reduction in Indian foods. *Asia Pacific J Clin Nutr* **17**: 212–15.

Hawkes C. 2009. Identifying innovative interventions to promote healthy eating using consumption-oriented food supply chain analysis. *J Hunger Environ Nutr* **4**: 336–56.

Hawkes C. 2013. Promoting healthy diets through nutrition education and changes in the food environment: an international review of actions and their effectiveness. http://www.fao.org/docrep/017/i3235e/i3235e.pdf, accessed November 2014.

Hawkes C, Thow AM, Downs SM *et al.* 2014. Identifying effective food systems solutions for nutrition and non-communicable diseases: creating policy coherence in the fats supply chain. *SCN News* **40**: 39–47.

Health Promotion Board, Singapore. 2013. Healthy Hawkers Program. http://www.hpb.gov.sg/HOPPortal/article?id=2784, accessed March 2014.

Jacoby E, Hawkes C. 2008. *Agriculture and food policies can promote better health and mitigate the burden of chronic non-communicable diseases in the Americas*. *5th Meeting Pan American Commission on Food Safety*. Rio de Janeiro, Brazil, June 10, 2008.

Krisetherton PM. 1995. Trans-fatty-acids and coronary heart-disease risk. *American J Clin Nutr* **62**: S651–708.

L'Abbé MR, Stender S, Skeaff CM. 2009. Approaches to removing trans fats from the food supply in industrialized and developing countries. *Eur J Clin Nutr* **63**: S50–67.

Leth T, Jensen HG, Mikkelsen AÆ, Bysted A. 2006. The effect of the regulation on trans fatty acid content in Danish food. *Atheroscl Suppl* **7**: 53–56.

Mahal A, Karan A, Engelgau M. 2010. EconomicImplicationsofNCDfor India.pdf. http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resourcs/28162-1095698140167/EconomicImplicationsofNCDforIndia.pdf, accessed February 2014.

Malhotra A. 2013. Saturated fat is not the major issue. *BMJ* **347**: f6340.

Mello MM. 2009. New York city's war on fat. *New Engl J Med* **360**: 2015–20.

Micha R, Mozaffarian D. 2008. Trans fatty acids: effects on cardiometabolic health and implications for policy. *Prostaglandins Leukotrienes Essential Fatty Acids* **79**: 147–52.

Ministry of Food Processing Industries (MOFPI), Government of India. 2009. Guidelines for the Scheme of Research and Development.

Ministry of Food Processing Industries (MOFPI), Government of India. 2013a. Strategic Plan.

Ministry of Food Processing Industries (MOFPI), Government of India. 2013b. Street Food - Upgradation of the quality of street food.

Mozaffarian D, Micha R, Wallace S. 2010. Effects on coronary heart disease of increasing polyunsaturated fat in place of saturated fat: a systematic review and meta-analysis of randomized controlled trials. *PLoS Med* **7**: e1000252.

Mozaffarian D, Clarke R. 2009. 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* **63**: S22–33.

Mozaffarian D, Katan MB, Ascherio A, Stampfer MJ, Willett WC. 2006. Trans fatty acids and cardiovascular disease. *N Engl J Med* **354**: 1601–13.

Nugent R. 2004. Food and agriculture policy: issues related to prevention of noncommunicable diseases. *Food Nutr Bull* **25**: 200–7.

Perez-Ferrer C, Lock K, Rivera JA. 2010. Learning from international policies on trans fatty acids to reduce cardiovascular disease in low- and middle-income countries, using Mexico as a case study. *Health Policy Plan* **25**: 39–49.

Pfitzer M, Bockstette V, Stamp M. 2011. Innovating for shared value. *Harvard Bus Rev*. September, 2–10.

Prabhakaran D, Yusuf S. 2010. Cardiovascular disease in India: lessons learnt & challenges ahead. *Indian J Med Res* **132**: 529–30.

Quine S. 1998. Sampling in non-numerical research. In: C Kerr, R Tayor, G Heard (eds). *In Handbook of Public Health Methods*. Sydney: McGraw-Hill, pp. 539–42.

Ramsden CE, Zamora D, Leelarthaepin B *et al.* 2013. Use of dietary linoleic acid for secondary prevention of coronary heart disease and death: evaluation of recovered data from the Sydney Diet Heart Study and updated meta-analysis. *British Medical Journal* **346**.

Reardon T, Minten B. 2011. *The Quiet Revolution in India's Food Supply Chains*. New Delhi, India: IFPRI.

Scott-Thomas C. 2011. Consumers seek healthy fats as low-fat trend fades. *FoodNavigator USA.com*. http://www.foodnavigatorusa.com/Markets/Consumers-seekhealthy-fats-as-low-fat-trend-fades, accessed 3 March 2014.

Siri-Tarino PW, Sun Q, Hu FB, Krauss RM. 2010. Saturated fatty acids and risk of coronary heart disease: modulation by replacement nutrients. *Curr Atheroscl Rep* **12**: 384–90.

Snowdon W, Potter JL, Swinburn B, Schultz J, Lawrence M. 2010a. Prioritizing policy interventions to improve diets? Will it work, can it happen, will it do harm? *Health Promot Int* **25**: 123–33.

Snowdon W, Lawrence M, Schultz J, Vivili P, Swinburn B. 2010b. Evidence-informed process to identify policies that will promote a healthy food environment in the Pacific Islands. *Public Health Nutr* **13**: 886–92.

Snowdon W, Schulz J, Swinburn B. 2008. Problem and solution trees: a practical approach for identifying potential interventions to improve population nutrition. *Health Promot Int* **23**: 345–53.

Teegala SM, Willett WC, Mozaffarian D. 2009. Consumption and health effects of trans fatty acids: a review. *J Aoac Int'l* **92**: 1250–57.

Unnevehr LJ, Jagmanaite E. 2008. Getting rid of trans fats in the US diet: Policies,incentives and progress. *Food Policy* **33**: 497–503.

Walt G, Gilson L. 1994. Reforming the health sector in developing-countries – the central role of policy analysis. *Health Policy Plan* **9**: 353–70.

Willett WC. 2006. Trans fatty acids and cardiovascular disease-epidemiological data. *Atheroscler Suppl* **7**: 5–8.

World Health Organization. 2004. *Global Strategy on Diet, Physical Activity and Health*. Geneva.

World Health Organization. 2012. *A Comprehensive Global Monitoring Framework Including Indicators and a Set of Voluntary Global Targets for the Prevention and Control of Noncommunicable Diseases*. Geneva.