WORLD HEALTH ORGANIZATION
EUROPE

What is known about the effectiveness of economic instruments to reduce consumption of foods high in saturated fats and other energy-dense foods for preventing and treating obesity?

July 2006

HEN Health Evidence Network
EVIDENCE FOR DECISION-MAKERS

ABSTRACT

This is a Health Evidence Network (HEN) synthesis report summarizing the available evidence concerning the effectiveness of economic instruments (including taxes, price policies and incentives) in containing or reducing food consumption, particularly of foods high in saturated fats and other energy-dense foods. Available evidence suggests – but does not demonstrate – that introduction of policy-related economic instruments, particularly in the form of taxes and price policies, could reduce food consumption, including of high saturated fat and other energy-dense foods, and increase the purchasing of healthful foods.

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When referencing this report, please use the following attribution:
Goodman C, Anise A (2006) *What is known about the effectiveness of economic instruments to reduce consumption of foods high in saturated fats and other energy-dense foods for preventing and treating obesity?* Copenhagen, WHO Regional Office for Europe (Health Evidence Network report; http://www.euro.who.int/document/e88909.pdf, accessed 13 July 2006).

Keywords

OBESITY – prevention and control
COSTS AND COST ANALYSIS
FOOD – economics
TAXES – economics
DIETARY FA TS
ENERGY INTAKE
HEALTH PROMOTION
META-ANALYSIS
EUROPE

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Summary

The issue

Overweight and obesity are increasingly prevalent in Europe. In the European Region, the growing prevalence of overweight – a body mass index (BMI) over 25 kg/m^2 – ranges from about 25% to 75% of the adult population. Up to a third of the adult population, about 130 million people, are obese – with a BMI over 30 kg/m^2. Overweight and obesity are also increasingly prevalent among children. This synthesis summarizes the available evidence concerning the effectiveness of economic instruments (including taxes, price policies and incentives) in containing or reducing food consumption, particularly of foods high in saturated fats and other energy-dense foods.

Findings

This review found no direct scientific evidence of a causal relationship between policy-related economic instruments and food consumption, including foods high in saturated fats. Indirect evidence suggests that such a causal relationship is plausible, though it remains to be demonstrated by rigorous studies in community settings. The evidence includes a large longitudinal study conducted in China – under conditions substantially different than those in Europe - that found that increases in the prices of unhealthful foods were associated with decreased consumption of those foods. Another longitudinal study in the US found an association between differences in food prices and BMI of young children. These studies comprise indirect evidence for effects of price differences on food consumption or weight in large-scale community settings, but there are important limitations to the generalizability of their findings.

Modelling analyses drawing upon actual market data to track how food purchasing responds to changes in prices suggest that a combination of increased prices (in the form of taxes) for such nutrients as fat, saturated fat and sugar and subsidies on fibres could reduce consumption of the taxed nutrients as well as total energy intake. However, the findings of modelling studies do not comprise empirical evidence.

Studies of tax and price policies applied to tobacco and alcohol products in many countries provide persuasive evidence of their impact on decreasing consumption of those products. These policy interventions may serve as models for similar approaches for lowering consumption of highly saturated fats or other energy-dense foods. However, critical differences among these types of interventions may limit their generalizability to food consumption.

A small body of evidence indicates that reducing the price of fruits, vegetables and other healthy snacks at the point of purchase (vending machines, cafeterias) increases their consumption. Another small body of evidence that includes several RCTs shows that financial incentives may result in temporary weight change.

Considerations for policy and research

Evidence of food price elasticity (i.e., how much demand for food responds to changes in price) is limited. Food price inelasticity may dampen the effect of economic instruments, as many people – including those in the lower-income brackets – will neither reduce consumption of foods high in saturated fats at higher prices nor consume more healthful foods at lower prices. Any policies that raise prices of certain foods without complementary intervention, such as subsidies for healthful foods, may be viewed as inequitable.

Taxation and pricing policies have contributed to tobacco prevention and control. However, taxing and pricing policies for foods, most of which are not controlled substances or subjected to special restrictions for certain age groups, may be more difficult to implement. Tax revenues generated from

the sale of foods high in saturated fats could be used to subsidize the cost of healthful foods or health promotion programmes. As in the instances of alcohol and tobacco control, the most effective approaches for preventing and managing the complex, multifactorial problem of obesity may involve a number of concurrent interventions.

Type of evidence used in this review

This synthesis is based on evidence from the main databases of biomedical and health economic literature through May 2006 as well as a small number of unpublished monographs of direct relevance to the synthesis question.

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Introduction

The estimated global prevalence of overweight adults is 1 billion, including at least 300 million who are obese *(1)*. In the European Region, the growing prevalence of overweight (BMI over 25 kg/m^2) ranges from about 25% to 75% of the adult population, with up to a third of the adult population – about 130 million people – being obese (BMI over 30 kg/m^2).[1] The average BMI in the European Region is estimated to be nearly 26.5 kg/m^2. Overweight and obesity are also increasingly prevalent among children. An estimated 10–30% of children and 8–25% of adolescents in Europe are overweight or obese *(2)*.

Overweight and obesity result from an imbalance of food intake and energy expended, usually brought on by dietary habits and lack of exercise. Overweight and obesity are associated with many severe comorbidities (related illnesses), including cardiovascular disease, diabetes, gallbladder disease and cancers (including colon, endometrial, gallbladder, breast, kidney, and prostate) *(1)*. Overweight and obesity account for an estimated 27 000 male and 45 000 female cancer cases each year in Europe, approximately 36 000 of which could be avoided by reducing the prevalence of overweight and obesity *(3)*.

Overweight and obesity place an enormous burden on society. In the EU, for example, 1–8% of health care costs are being spent on these conditions *(1,2)*. Conditions related to overweight and obesity contribute to high indirect costs of absenteeism and disability pensions and the personal costs of discrimination and poorer physical functioning *(4,5)*.

The increased prevalence, health consequences and associated costs of overweight and obesity necessitate the identification of effective interventions to contain these conditions (*6*). Although many interventions for obesity and overweight have been proposed, the effectiveness of economic instruments, including price policies, taxes and incentives, has not been well studied. These types of interventions have been partially successful at reducing the prevalence of other public health phenomena such as smoking and tobacco use in the EU *(7)*.

This synthesis summarizes the available evidence concerning the effectiveness of economic instruments in containing or reducing food consumption, particularly of foods high in saturated fats. This synthesis also covers indirect evidence pertaining to this relationship, including the impact of economic instruments on outcomes that may affect or result from changes in food consumption. These include purchasing less energy-dense or more healthful foods and weight loss.

High rates of obesity and diabetes are found among the lower-income groups in many industrialized nations. Socioeconomic status affects food choice and contributes to consumption of energy-dense, nutrient-deficient foods such as refined grains, added sugars and fats *(8–11)*. These are generally inexpensive, convenient, and taste good. Further, their cost per energy unit is low. In contrast, more nutrient-dense lean meats, fish, fresh vegetables, and fruit are generally more costly *(12)*. Indeed, information about food prices and buying patterns and some modelling analyses indicate that low-income and unemployed populations subject to cost constraints are more likely to consume low-cost, nutrient-deficient foods *(11,13)*.

Sources for this review

The search for evidence pertaining to the synthesis question excluded articles that did not involve economic instruments or economic changes. However, we did use other types of articles to provide information for background and discussion related to this issue. We searched the literature for reports

[1] Body mass index (BMI) is used to define overweight and obesity. BMI is calculated by dividing weight in kilograms by height in meters squared (kg/m^2). According to the WHO, BMI >25 kg/m^2 is considered overweight, and BMI >30 kg/m^2 is considered obese.

of systematic reviews, RCTs, other interventional studies, prospective and retrospective observational studies (e.g., longitudinal and cross-sectional studies) and modelling analyses. We excluded other types of review articles, editorials, and case/anecdotal studies. This search initially focused on peer-reviewed sources for desired types of reports, which are more likely to have been subject to scrutiny for research quality. Given the limited number of studies of direct relevance to the question, the search was expanded to include sources of grey literature.

Our literature sources included: Medline/PubMed, the Cochrane Library (Cochrane Systematic Reviews and the DARE, HTA, and NHS EED databases), CINAHL, Allied and Alternative Medicine, EMBASE, the WHO website, reference lists of relevant articles and selective searches for grey literature using Internet search engines. Depending on the requirements of particular literature sources, the searches used various combinations of the following MeSH terms: obesity; diet; diet, fat-restricted; nutrition; health promotion; economics; food/economics; taxes; and text words: obes*; diet*; econom*; fat*; incentive*; tax*; pric*; polic*. The search also used terminology to identify reports (publication types) using study designs of particular types, for example, review literature, clinical trial; randomized controlled trial; meta-analysis; and systematic review.

Findings

Organization of evidence

The literature on the impact of economic instruments on food consumption is organized into two main categories:

- policy-related economic instruments: taxes, prices, subsidies enacted by governments in nations or other "macroenvironments";
- local or site-specific economic instruments: prices, incentives, etc., implemented in "microenvironments" such as schools, worksites, restaurants, cafeterias, and food markets.

Evidence on policy-related economic instruments may be direct or indirect. Direct evidence would derive from studies demonstrating a causal relationship between economic instruments (involving purposeful interventions) and patterns of food consumption, particularly of foods high in saturated fats. Other types of studies may provide indirect evidence for the relationship between economic instruments and patterns of food consumption, that is, evidence of:

- a causal effect of economic instruments on food purchasing and therefore presumably consumption of less energy-dense or more healthful foods or on weight loss possibly resulting from changes in food consumption;
- an association between economic changes (based on observational studies of market prices or taxes, not purposeful interventions of these) and food consumption, or behaviours that might influence food consumption (e.g. purchasing healthful foods), or weight changes that might have resulted from changes in food consumption.

Modelling studies are quantitative simulations that project what could happen under various scenarios, such as imposition of price increases, taxes or subsidies. Although modelling studies often draw in part on actual market data, their results do not constitute empirical evidence. Still, they may provide insights regarding the plausible impact of certain proposed interventions.

Policy-related economic instruments

We identified no direct evidence of a causal relationship between policy-related economic instruments and consumption of saturated fats or other energy-dense foods. Indirect evidence suggests that such a causal relationship is plausible, though it remains to be demonstrated by rigorous studies in

community settings. Modelling analyses based in part on actual market data tracking how food purchasing appears to respond to changes in food prices suggest that economic instruments could diminish purchasing of these foods to the advantage of purchasing of certain more healthful foods.

Direct Evidence

There were no systematic reviews, RCTs or other interventional studies that yielded direct evidence of a causal relationship between policy-related economic interventions and consumption of foods high in saturated fats or other energy-dense foods.

Indirect Evidence

No systematic reviews addressed this topic. Therefore, it was necessary to identify and summarize here the primary relevant studies. Two large longitudinal studies examined the association between changes or differences in food prices and food consumption or weight gain. These are not purposeful experimental interventions, but observational studies tracking the relationship between prices (and other market factors) and food consumption or BMI (which is likely to be linked to consumption) over time.

Association with food consumption

Guo et al. analyzed longitudinal data from China's health and nutrition survey on food prices and the consumption habits of 6667 people in urban areas and rural villages from 1989 to 1993 *(14)*. The study measured the impact of price changes in six food groups (rice, wheat flour, coarse grains, pork, eggs and edible oils) on their consumption and three macronutrients (energy, protein and fat) according to socioeconomic groups. Wherever possible, the investigators used free market food prices. When these foods were not sold on the free market, the investigators used state store prices. Food consumption data were collected by public health workers using detailed home surveys. The analysis found large and significant responses in food consumption to changes in food prices, i.e., price elasticities.[2] Significant reductions in the probability of consuming food and amount of food consumed within the food groups were observed when the price of the group was increased.[3] Also, increases in the price of certain foods had substantial effects on consumption of their substitute foods and their complementary foods. Increases in the price of rice raised consumption of wheat flour and coarse grains. Increases in the price of pork led to increases in consumption of wheat flour, coarse grains and edible oils, but decreases in consumption of eggs and rice, in particular.[4] Only increases in the price of pork resulted in lower protein intake. There were differential effects of price changes on the poor and the rich, particularly for rice, pork and eggs. Fat intake was most responsive to increased pork prices,

[2] Price elasticity measures the percentage change in quantity of a food consumed in response to a 1% change in the price of that food. For example, if a 10% increase in the price of a food results in a 5% decrease in consumption of that food, then the *own-price elasticity* of pork is -0.5. *Cross-price elasticities* reflect how the change in the price of a food affects the consumption of *another* food, such as a substitute food (e.g., margarine for butter) or a complementary food, i.e., a food that is often consumed with the one being studied (e.g., ready-to-eat cereal and milk).

[3] For example, the own-price elasticities for the *probability* of consuming foods were: -2.0 for rice, -1.2 for wheat flour, -1.3 for pork and -1.6 for edible oils. The own-price elasticities for the *amount* of foods consumed were: -0.12 for rice, -0.16 for wheat flour, -0.38 for pork and -0.30 for edible oils. The *overall* own price elasticities, accounting for *both* probability and amount of foods consumed, were: -0.38 for rice, -0.36 for wheat flour, -0.48 for pork and -0.25 for edible oils.

[4] For example, the overall cross-price elasticities with respect to rice for consuming foods were: 0.37 for coarse grains and 0.26 for wheat flour. The overall cross-price elasticities with respect to pork for consuming foods were: 0.21 for wheat flour, 0.36 for coarse grains and 0.33 for edible oils; however, they were: -0.93 for rice and -0.32 for eggs.

particularly among the poor, though changes in protein intake for both the poor and the rich were small and comparable.[5] The authors noted that one goal of price policy would be to reduce the fat intake of the rich but not adversely affect protein intake of the poor. Although this study revealed associations between prices and food consumption, it was not a study of the impact of a pricing or tax policy intervention.

As noted by the authors, the study was conducted at a time of transition in China, including improvements in food supply and consumption in many regions, accompanied by more high-fat foods, processed foods and emerging problems of dietary excess. At the same time, many poor people in China still experienced food insecurity and under nutrition. Thus, while the study added to the base of evidence concerning how food consumption patterns respond to price changes, the conditions under which it was conducted limit the relevance of its findings for present-day Europe.

Association with weight gain

The RAND Corporation conducted a prospective four-year observational study that investigated the association between differences in food prices and children's BMI, and between the density of food outlets (restaurants, grocery and convenience stores) in communities and children's BMI. The study was based on a nationally representative sample of children in kindergarten in the United States, with data collection one year and three years later. The analysis controlled for baseline BMI, age, real family income and sociodemographic characteristics. Investigators found that lower prices for fruits and vegetables predicted a significantly lower increase in BMI for children between kindergarten and third grade, with half of the effect occurring in the first year.[6] Lower meat prices had an opposite, though smaller, effect that became insignificant at three years. There were no significant associations between prices of dairy foods or fast food, or density of food outlets and change in BMI. Data were not collected on food consumption, so the study could not confirm a causal pathway from food prices to food consumption to changes in BMI. The authors concluded that geographic variation in fruit and vegetable prices is large enough to explain a meaningful amount of the differential gain in BMI among elementary school children across metropolitan areas *(15)*.

Modelling studies

Four modelling studies simulated how certain economic instrument scenarios involving taxes and/or subsidies might affect food consumption, including of foods high in saturated fats. Three of these models used existing market data on the association between food prices and food purchasing as inputs. Only one of the models was reported in the peer-reviewed literature. The first two models summarized here examined the effect of taxes and subsidies on food consumption, drawing upon data of approximately 2000 households from a representative panel of Danish food consumers. These two studies helped to distinguish the effects of focusing policies on particular types of foods as opposed to particular types of nutrients.

The first model applied two main types of scenarios intended to decrease the consumption of saturated animal-based fat, increase consumption of fibre and decrease consumption of sugar. The first set of scenarios applied changes in the value-added tax (VAT) according to food type: an increase in VAT from 25% to 31% (i.e., a 4.8% net price increase) on beef, fatty meats, butter and cheese and a decrease in VAT from 25% to 22% (i.e., a 2.4% net price decrease) on fresh fruit and vegetables,

[5] Overall own-price elasticities of foods for poor and rich, respectively, were: -0.54 and -0.25 for rice, -0.54 and -0.35 for wheat flour, -0.09 and -0.03 for coarse grains, -0.96 and -0.33 for pork, -0.03 and -0.40 for eggs, and -0.39 and -0.47 for edible oils. Overall elasticities of fat intake with respect to pork prices were -1.10 for the poor and -0.49 for the rich. The greatest elasticities of protein intake were those with respect to pork prices for both the poor (-0.26) and the rich (-0.18).

[6] A decrease in fruit and vegetable prices by one standard deviation across the nationally representative range of fruit and vegetable prices would decrease BMI by 0.114 BMI units by third grade, half of which (a decrease of 0.054 BMI units) would occur between kindergarten and the first grade.

potatoes and grain-based products. The second set of interventions imposed taxes and subsidies according to nutrient type: tax on saturated fats (DKr 7.89 [US$ 1.35]/kg), subsidies on fibres (DKr 18 [US$ 3.07]/kg) and tax on sugar (DKr 10.30 [US$ 1.76]/kg). Results indicated that both general approaches would reduce total energy intake, although the effect of the nutrient approach would be much greater. Raising the VAT on fatty meats, fats and cheeses would decrease consumption of saturated fat by 5.7%. Imposing the tax on saturated fat content (rather than on particular foods themselves) would decrease consumption of saturated fat by 9%. Similarly, fibre consumption would increase more due to the subsidy on foods according to their fibre content than lowering the VAT on the particular food items of fruit, vegetables, potatoes and grain products. Without the tax on sugar, in which instances sugar consumption would drop by 17% or more, all other scenarios would result in unwanted increases in sugar consumption. The authors concluded that applying VAT to the nutrients (saturated fats, fibres and sugar) would be more effective than applying VAT to particular types of foods (beef, fatty meats, butter, fruits and potatoes) *(16)*.

The second study modelled the impact on different socioeconomic groups of four scenarios: a tax on all fats, a tax on saturated fats, a tax on added sugar and subsidies on fibres. For most consumers, a tax on fats (whether all fats or saturated fats) would reduce total energy intake and its share of fats (including saturated fat), but would increase the share of sugar. Conversely, a tax on sugar would reduce the share of sugar and increase the share of fats in total energy intake. A subsidy on fibres would have a small or negligible effect on the shares of fat and sugar in total energy intake. According to these simulations, the sugar tax would have the largest effect on the younger and older consumers and on lower socioeconomic groups and rural residents. Similarly, taxes on fats would tend to increase the share of sugar in total energy intake particularly for younger consumers, consumers in lower socioeconomic classes, and those in rural areas. The authors concluded that general taxes or subsidies on particular types of nutrients cannot solve the problems of nutrition and obesity across all groups of consumers, but that these might be used to complement other types of regulation or information campaigns *(17)*.

An unpublished paper from the Institute for Fiscal Studies reported on results of simulations of the potential impact of a "fat tax" in the United Kingdom. This simulation addressed the potential differential effects the tax would have on food purchasing (not consumption) by families of different income levels. The hypothetical fat tax was applied, regardless of family income, according to the levels of each four nutrients in food: 1p/kg on saturated fat, 1p/kg on monounsaturated fat, 1p/g on sodium (from salt) and 1p/g on cholesterol. The simulation was based on food purchasing patterns of 8000 households in the 2000 National Food Survey (NFS), whose data suggested that purchasing of fat, sodium and cholesterol differs little across the income spectrum *(18)*. Results suggested that the amount of these four nutrients purchased would change very little across the range of family income, although lower-income people might purchase slightly less fat and cholesterol. Because purchasing patterns would be only minimally affected by the taxes, the fat tax would be regressive, as lower-income people would pay a greater share of their total income on the tax than higher-income people. The effect ranged from 0.7% of the poorest household incomes (defined as less than £36 per week) to about 0.25% of median household income (£140 per week) to less than 0.1% of the richest household incomes (more than £519 per week). Simulation of a calorie tax of 1p/1000 kcal, also based on NFS data, resulted in a similarly regressive effect, ranging from 0.5% of income for poor people to 0.1% for median household income to 0.05% for the richest household income. The authors concluded that the regressivity of a fat tax is likely to persist regardless of whether it is applied to fat content, calories or particular rates of certain foods (*19*).

Another model projected the effect of extending the VAT (17.5%) to leading sources of dietary saturated fat in the United Kingdom. Noting the lack of data on price elasticities of demand for the specific foods of interest, the author assumed that foods that have near substitutes have a high price elasticity of demand, that is, small changes in the relative prices of near substitutes can result in large changes in consumption patterns. Foods with perfect substitutes have price elasticities of -1.0., and foods with acceptable yet imperfect substitutes (for example, margarine for butter) have price

elasticities of less magnitude. The author then simulated the application of the VAT to selected foods with price elasticities that he termed "reasonable", though not based on empirical evidence: whole milk -0.1, cheese -0.5, butter -0.7 and biscuits, buns, cakes, pastries, puddings and ice cream (all of which may be replaced with lower saturated fat versions) -1.0. With these assumptions, the model derived reductions in dietary calories from saturated fats, serum cholesterol and ischemic heart disease. The author noted that the health benefits of such a tax are likely to be progressive, but that the tax is likely to be regressive *(20)*. Aside from the model not being based on empirical evidence of consumer response to taxes, some observers have contended that the author's price elasticity estimates for these foods were severely overestimated, leading to overestimation of the potential effects *(21)*.

Tax and price policies for tobacco and alcohol

Studies of tax and price policies applied to tobacco and alcohol products in many countries provide persuasive evidence of their decreasing consumption of these products. These policies may serve as a model for lowering consumption of foods high in saturated fats and other energy-dense foods. Even so, there are some differences in these products that may limit generalizability to food consumption.

The most successful interventions in reducing smoking rates have involved combinations of policies, including price increases, advertising restrictions, smoking site restrictions, consumer education and smoking cessation therapies *(22)*. A review published in 2004 examined the effects of a range of smoking reduction interventions, including tax and price policies, media campaigns, telephone support hotlines, advertising bans, health warnings, school education, limits on retail sales and others. Among these, the evidence of reduced smoking rates was strongest for the combination of substantially higher cigarette taxes and laws that ban indoor smoking in public places. Based on relatively consistent evidence from many studies across a number of countries, the review found that a 25% price increase yields a 7–13% decrease in smoking, with increasing effects over time, and greater effects on youth and low-income smokers. The magnitude of the effect depends on the initial price and the size of the tax increase *(23,24)*. A comprehensive international review of a similar body of literature found that a price increase of 10% decreases consumption by about 8% in low- and middle-income countries *(25)* and by about 4% in high-income countries *(26)*. A World Bank fact sheet that draws from these reviews places higher taxes at the top of its list of cost-effective interventions *(26)*.

There is extensive evidence based on population-based market analyses that increases in the full price of alcoholic beverages influences consumption, as well as alcohol-related health and social problems. Also effective are stricter controls on availability of alcohol, including via minimum legal purchasing age, government monopoly on retail sales, and restrictions on sales times and distribution outlets *(22)*. The sensitivity of consumption to prices is dependent on the type of alcoholic product. An extensive review of the economic literature on population-based alcohol demand concluded that price elasticities of demand for beer, wine and distilled spirits are -0.3, -1.0 and -1.5, respectively, in other words, consumption of beer is least sensitive to price changes and consumption of distilled spirits is more sensitive *(27)*. Analyses of Swedish price and sales data 1984–1994 showed that consumers responded to price increases by changing their total consumption and by varying their choice of alcoholic product brands. Although significant reductions in sales were observed in response to price increases, the effects were mitigated by significant substitutions between quality classes. These findings suggest that the net impacts of purposeful price policies to reduce alcohol consumption will depend on how they affect the range of prices across brands of alcoholic products *(28)*. A recent extensive review found that the majority of the economic research examining the relationships between prices and consumption of alcoholic beverages supports the view that increases in prices significantly reduce alcohol consumption. These effects vary by such factors as age group, socioeconomic status, baseline consumption (light versus heavy drinkers) and type of alcoholic beverage *(29)*. The effects of alcohol control measures, including price increases, vary among nations and are subject to prevailing alcohol culture and public support of controls *(26)*.

In the case of tobacco and alcohol control, the effectiveness of economic instruments is mediated by social and cultural factors. For both tobacco and alcohol control, evidence suggests that the most effective approaches comprise multiple concurrent interventions, including price increases and other market restrictions and measures *(26,30).*

Local or site-specific economic instruments

In contrast to broader policy-related interventions, local or site-specific economic instruments refer to prices, incentives, etc., implemented in "microenvironments" such as schools, worksites, restaurants, cafeterias, and food markets. The evidence summarized here addresses the effect of such instruments primarily on food purchasing and weight loss. While food purchasing and weight loss are not the same as food consumption, they may be surrogate markers of, or otherwise causally related to it. In this literature, economic instruments include not only prices, but coupons for price reductions, provision of foods at no or reduced cost and other incentives such as rewards or prizes.

While there are systematic reviews that include some of this literature, they do not present findings specific to the synthesis question. A small body of evidence comprising mostly time series studies in schools and worksites provides evidence that reducing the price of fruits, vegetables and other healthy snacks at the point of sale (vending machines, cafeterias) increases purchasing of these foods. Most of the studies in a small body of literature on financial incentives for weight change are RCTs. Although some of these resulted in short-term weight losses for the intervention groups, on the whole they provide little evidence of achieving weight loss, and there is no evidence that losses can be sustained following the interventions.

Systematic reviews

The role of local or site-specific economic instruments for preventing or managing obesity is not well represented in systematic reviews. We identified only four comprehensive systematic reviews that included, but did not focus on, local and site-specific economic instruments for influencing food consumption or related behaviours. As described below, some of the reviews covered studies of economic incentives for health conditions in addition to obesity, while others covered studies of various types of interventions, including economic, for obesity. However, none of them presents specific findings about a set of studies of the impact of economic interventions for obesity. Other systematic reviews focus on interventions to prevent and manage obesity, but do not include studies of economic interventions.

The United States Agency for Healthcare Research and Quality (AHRQ) published a systematic review in 2004 of economic incentives for preventive health care (not only for obesity), prepared by one of its Evidence-Based Practice Centers *(31)*. This review identified a variety of local, site-specific, or other consumer-oriented economic incentives, including cash payments, lotteries, coupons for free or reduced-price goods and services, gifts, free or reduced medical services and opportunities to avoid disincentives. It included 47 studies of consumer incentives for preventive care, including 7 pertaining to obesity and weight loss (all of which are included in this synthesis.) Of all of the studies on consumer incentives, only four assessed long-term results (none involving weight loss), none of which retained their attained short-term improvements. The AHRQ systematic review concluded that consumer economic incentives can be effective in the short term for simple preventive care if they have distinct, well-defined behavioural goals. However, the review found insufficient evidence to conclude that economic incentives are effective for promoting long-term lifestyle changes. It also noted that there is a possible dose-response behaviour for consumer incentives, and that the threshold for influencing consumer behaviour response appears to be low. However, the review reached no specific conclusions for evidence pertaining to economic incentives for obesity and weight loss.

A systematic review by Jain *(32)* of a wide range of interventions for preventing and reducing obesity included a small set of articles addressing weight loss in the workplace, including several studies that

used financial incentives. This review apparently relied primarily on one by Katz et al. *(33)*, of studies on interventions to control obesity in schools and workplaces. The Katz review cited four studies involving financial incentives to promote aerobic exercise, attend group meetings and attain weight loss goals, for example. (The relevant studies among these are cited in the present document.) However, neither systematic review drew any conclusions about the impact of these financial incentives on weight loss. Further, neither review included any studies of financial incentives for changing food consumption or purchasing patterns.

A Cochrane systematic review on psychological interventions for obesity, last amended in 2005, identified 36 relevant studies of behavioural and cognitive-behavioural interventions. These included three studies involving local or site-specific economic incentives for weight reduction, all of which are cited in this synthesis. However, the review did not provide findings for the studies on economic incentives in particular, but grouped them with studies of behavioural interventions. The review found that behavioural interventions and cognitive-behavioural interventions are predominately useful when combined with dietary and exercise strategies *(34)*.

Another Cochrane systematic review of interventions for preventing obesity in children, last amended in 2005, identified 22 studies that tested a variety of dietary, exercise and behavioural interventions. In general, they did not prove effective in preventing weight gain, though some were effective in promoting healthy diet and increased physical activity. None of the interventions covered in the review were economic in nature *(35)*. Similarly, a technology assessment by the Institute for Clinical Systems Improvement examined a variety of dietary, exercise and behavioural interventions, none of which involved an economic intervention *(36)*. A comprehensive systematic review of prevention and treatment of obesity conducted by the Swedish Council on Technology Assessment in Health Care, published in 2004, did not involve economic interventions *(6)*.

A systematic review released in 2001 by New Zealand Health Technology Assessment covered 75 studies environmental interventions (mostly in restaurants, supermarkets, schools and worksites) to reduce energy intake or energy density, or affect certain other measures of dietary habits. It excluded studies of policy-related interventions such as taxation or pricing policies. The authors noted that the quality of the available literature on environmental interventions was generally poor. Although the inclusion criteria for this review allowed for studies on pricing interventions, the small number of pricing studies identified in the literature search were excluded because they did not assess change in energy intake or density as an outcome *(37)*. These studies *(38-40)* are included in this synthesis.

An AHRQ Evidence-based Practice Center published a systematic review of screening and therapeutic interventions for obesity, which included studies of counselling and behavioural therapy, pharmacotherapy and surgery, but did not include studies of economic instruments *(41)*.

Our search also identified several relevant literature reviews *(42-46)* that are not systematic. This synthesis does include the relevant primary studies cited in them.

As the available systematic reviews did not focus or report on the studies relevant to this synthesis topic as a group, it was necessary to identify and summarize the available relevant primary studies here.

Price changes and food purchasing

Price reductions (including coupons) have been studied in such local settings as vending machines, restaurants, school cafeterias and markets, where they resulted in increased purchasing of fruits, vegetables and low-fat snacks. The effects of economic instruments, including price policies and coupons, on purchasing of healthful foods were studied in one RCT, one non-randomized controlled trial, and six prospective time series or uncontrolled studies.

A RCT conducted over 12 months studied the impact of different levels of price reduction on the sales of low fat snacks in 55 vending machines in 12 secondary schools and 12 workplaces in the United States. When vending machines were stocked with low fat snacks discounted by 10%, 25% and 50% relative to higher fat snacks, sales of the low-fat group increased by 9%, 39% and 93%, respectively. The investigators also reported that once the cost of healthful foods returned to pre-intervention prices, their sales decreased to baseline levels *(47)*. In a time series study (baseline, intervention, return to baseline) conducted in the United States, an intervention of 50% price reductions for low-fat snacks in nine vending machines for three weeks resulted in a 45.8% proportion of low-fat snacks purchased, compared to pre- and post-intervention low-fat snack purchase proportions of 25.7% and 22.8%, respectively. Total snack purchases did not vary by period *(48)*.

In a non-randomized controlled trial of price reductions, educational health messages and interventions conducted over four months in an American restaurant, the price reductions alone led to an increase in the purchase of some of the healthy food *(49)*. In a time series study conducted in an American cafeteria, temporary 50% reductions in the price of fruit and salad resulted in a three-fold increase in their purchase *(39)*. In another time series study conducted in two secondary school cafeterias in the United States, 50% reductions in the price of fresh fruits and baby carrots resulted in a four-fold increase in the sale of the former and a two-fold increase for the latter *(38)*. In another time series study in American secondary school cafeterias, 10% increases in the price of high-fat foods and 25% decreases in the price of healthier foods resulted in low-fat food averaging approximately 13% of total sales. Based on sensitivity analyses, the authors concluded that sales of low-fat foods would have averaged 9% without the intervention *(50)*.

An interrupted time series study conducted in an American supermarket examined the effects of a multipart intervention consisting of prompting, product sampling and price reduction (store coupons) on low-fat milk, salad dressings, and frozen desserts. Results showed low-to-moderate increases in purchases of all three food types, with the greatest effect on frozen desserts. The study did not appear to isolate the effects of price reductions alone on changes in purchasing behaviour *(40)*. An uncontrolled intervention in which low-income elders, assumed to be at nutritional risk, were given coupons for fresh produce at farmers' markets in the United States, resulted in high levels of coupon use and an increase of 20 000 new shoppers per year at the farmers markets over 5 years *(51)*.

Food provision

Another economic instrument is provision of food of specific types and portions. There is a small body of evidence supporting the use of this direct approach to promoting weight loss, including a few RCTs conducted by the same American research team.

One RCT randomized 202 men and women into five treatment groups: no treatment, standard behavioural treatment (SBT), SBT plus food provision, SBT plus incentives, and SBT plus food provision and incentives. At 6, 12 and 18 months, weight losses in the two groups receiving food provision were significantly greater than in the two groups without food provision. The incentives did not affect weight loss *(52)*. A follow-up assessment of 177 of the 202 people found that all treated groups gained weight, maintained only slightly better weight losses than a no-treatment control group, and did not differ from each other. Those who did experience weight loss during active treatment and maintenance were more likely to have increased exercise, decreased percentage of energy from fat, increased nutrition knowledge and decreased perceived barriers to adherence *(53)*.

A subsequent study by the same investigators randomized 163 overweight women into four treatment groups: SBT with weekly meetings for six months, SBT plus structured meal plans and grocery lists, SBT plus meal plans plus food provision with subjects sharing the cost, and SBT plus meal plans plus free food provision. After 6 and 12 months, findings showed that providing structured meal plans and grocery lists improved outcome in SBT for weight loss, but no further benefit was seen to actually giving food to patients *(54)*. Thus, while food provision appears to result in short-term weight loss, the

effect may derive more from the structure of meals that is also achievable through structured meal plans, and the weight loss is difficult to maintain after the intervention ceases.

Incentives for weight change

The search for studies of the impact of local economic instruments on weight loss yielded seven RCTs and one non-randomized controlled trial. All addressed particular types of economic incentives in schools and worksites, including no-cost weight loss programmes (participants pay a deposit that is refunded based on success in the programme), payroll deductions that are returned if weight loss goals are achieved and monetary rewards for achieving weight loss goals.

In a RCT to test incentives for weight loss goals, a population of 131 university employees was randomized into four weight loss protocols involving group versus individual instruction and required versus optional attendance. Participants chose their weight-loss goals as well as the incentives to be deducted from their pay checks, which would be returned if weight loss goals were achieved. At the six month follow-up, participants had lost an average of 12.2 lbs [5.5 kg]. However, because weight loss goals and payroll deductions were chosen and not assigned at random, it was not possible to discern the independent impact of the financial incentives on weight loss *(55)*. In a similar study of workplace weight control using payroll-based incentives, 36 employees were randomized into either early treatment or delayed treatment of a self-motivation program. Both groups chose their weight-loss goals. At the six month follow-up, mean weight loss across both groups was 12.3 lbs [5.6 kg] and those in the delayed treatment group lost more weight than those in the early treatment group. As weight loss goals were chosen and not assigned at random, it was not possible to discern the independent impact of the payroll deduction on weight loss *(56)*. In another RCT 222 participants were randomized into five groups including no treatment, standard behavioural treatment (SBT), SBT and food provision, SBT and incentives and SBT, food provision and incentives. The incentives did not affect weight loss *(52)*. In an 18-month RCT conducted by the same investigators, 177 participants were assigned to behavioural interventions in combination with financial incentives, and the financial incentives did not lead to better weight loss outcomes during the trial *(53)*. In a large RCT of interventions for smoking cessation and weight control, 32 workplaces were randomized to receive either health education classes plus payroll-based incentives with self-selected weight loss goals or no intervention for two years. Among the 2041 participants in the weight loss group who did lose weight, the loss averaged 4.8 lbs [2.2 kg]; however, there was no significant treatment effect for weight across all of those participants *(57)*.

A multi-group RCT tested individual and group monetary incentives of various sizes that were contingent upon weight loss among 89 males 35–57 years old who were more than 30 lbs [13.6 kg] overweight at baseline. All participants forfeited money that was returned to them at a rate of US$ 1, US$ 5 or US$ 10 per pound [0.45 kg] lost, up to 30 lbs [13.6 kg]. Three groups were incentivized as individuals and three groups were incentivized as a group. All groups received written material on self-monitoring, diet and exercise, self-motivation and other aspects. The interventions lasted 15 weeks, and weight changes were assessed after one year. All six groups maintained an average weight loss after one year, with the slightly greater weight losses among the groups with group contingent incentives *(58)*. A Cochrane review that included this study noted that it had been subject to selection bias *(34)*.

An RCT compared four workplace interventions to reduce the risk of cardiovascular disease: health risk assessment, risk factor education, behavioural counselling and behavioural counselling plus financial incentives (various levels of lottery draws and cash prizes). After a 12-month follow-up period, there was a modest, yet significant, combined increase in BMI across the four groups, although the slight average increase in BMI in the two behavioural interventions was significantly less than the average increase in the other two groups. Although the two behavioural interventions resulted in an average early significant decrease in body fat, there were no significant changes in percentage of body fat for any of the groups after 12 months *(59)*.

In the non-randomized controlled trial, 1304 participants chose to take part in either a six-month weight loss correspondence program costing US$ 5 or the same program requiring a deposit of US$ 60, to be returned based on success in programme. The average weight losses for the respective groups were 4 lbs [1.8 kg] and 8 lbs [3.6 kg] (*60*).

The studies on weight loss noted above are related indirectly to the matter of food consumption. It is likely that individuals who lost weight also changed their food consumption, exercise patterns or both. The evidence from these studies as a group, indicates that financial incentives do not substantially affect weight loss. Most of the studies used financial incentives in conjunction with other programmes, such as correspondence, behaviour therapy and food provision, making it difficult to attribute any weight changes to the financial incentives.

Other incentives

In an RCT testing non-financial incentives, 210 students were randomized into one of two groups with different levels of academic rewards (bonus points on examinations and course grades) for participating in a voluntary exercise program intended to decrease body fat percentage. At a 12-week follow-up, the group receiving the higher rewards showed greater adherence to exercise and had lost more body fat than the other group *(61)*.

In a non-randomized controlled trial, two inner-city London primary schools with a total of 749 students were given either no intervention or one that included videos of heroic peers (the "Food Dudes") who ate fruits and vegetables and small rewards consisting of a prize and a sticker for eating fruits and vegetables. This study found significantly higher consumption of fruits and vegetables during the intervention, during follow-up and while students were at home *(62)*. A prospective observational study of 402 students in three primary schools in England and Wales using the same intervention also found significantly increased consumption of fruits and vegetables *(63)*.

Discussion

Available studies on policy-related economic instruments and local or site-specific economic instruments provide only tenuous support for a cause-and-effect relationship between such interventions and changes in the consumption of foods high in saturated fats and other foods. Some of the limitations concern internal validity – the ability to demonstrate such a causal relationship – while others concern external validity, the ability to generalize the findings from one or a group of studies to national or regional environments in Europe.

Policy-related economic instruments

We identified no direct evidence in the form of RCTs or other prospective interventional studies of a causal relationship between policy-related economic instruments and food consumption (including of foods high in saturated fats). There is indirect evidence suggesting that such a causal relationship is plausible, including two large longitudinal studies that examined the association between changes or differences in food prices and food consumption or BMI, which is mediated by energy intake and expenditure. These studies comprise the best available evidence for effects of price differences on food consumption or weight in large-scale community settings or "macroenvironments." However, they have limitations in internal and external validity. Rather than being studies of purposeful economic interventions, these observational studies track the association over time between prices (and other market factors) and food consumption or BMI. The studies' designs make it difficult to control for factors other than price changes that may have affected changes in food consumption or BMI. This diminishes the ability to make conclusions about cause-and-effect relationships between prices and consumption of foods high in saturated fats or other foods.

There are also other characteristics that limit generalizing the findings of these studies to Europe. One was conducted in China, whose prevalence and risks of obesity, eating habits, socioeconomic composition and other market factors differ considerably from those of Europe. The other study was conducted in the United States, which has higher prevalence and risks of obesity than Europe, and a different socioeconomic profile and market factors. Furthermore, that study involved only children enrolled in kindergarten through the third grade, whose experience may not be applicable to other age groups; indeed, half of the BMI effect in that study occurred during kindergarten.

Four modelling studies suggest that economic instruments, including taxes, prices and subsidies, could diminish purchasing of foods high in saturated fats and other energy-dense foods in favour of purchasing certain healthful foods. Although such models can provide useful guidance, they do not generate empirical evidence. Their strength as a group is that three of them drew directly on actual data tracking the association between market changes in prices and food purchasing, and that all examined alternative scenarios to gain insights regarding the projected sensitivity of food purchasing to changes in the economic instruments. A key potential shortcoming in such analyses is that they modelled causal policy interventions based on non-interventional observational data, which assumes that consumer behaviour will respond to tax, price or subsidy interventions in a way that is comparable to their response to typical market changes in prices. These models did not appear to address the costs that would be incurred in implementing the interventions involving taxes, prices or subsidies. As the four modelling studies were European-based (two in Denmark and two in the United Kingdom, including three that drew directly on actual market data), they are likely to be more generalizable to Europe than otherwise.

The literature reports that while some jurisdictions have imposed special taxes on snack foods, soft drinks and chewing gum, the tax rates may be too small to affect purchases. However, they can generate enough revenue to fund health promotion programmes and perhaps subsidize the cost of healthful foods *(64,65)*.

Tax and price policies have contributed to prevention and control of tobacco use, and there is considerable data supporting the relationship between pricing and taxing of alcohol products and their consumption. The main point of relevance to the question of the impact of these policies is that large-scale interventions on taxes and prices can prompt desired changes in consumer behaviour. Even so, there are differences among the products and consumer behaviours involved that are likely to limit the external validity of the tobacco and alcohol experience to the consumption of energy-dense foods. Among these differences, evidence of price elasticity of foods is far more limited than that of tobacco and alcohol. Also, pricing policies for foods or particular nutrients may be more complex to implement *(65)*. As suggested by market data and modelling analyses, there may be greater potential in applying tax and price policies to nutrients than to particular types of foods; however, defining, identifying, and assessing special taxes and prices on them may be difficult and costly to implement. In contrast to tobacco and alcohol prevention efforts, efforts to limit consumption of foods high in saturated fats and other energy-dense foods do not involve products that are already widely restricted (though certainly not inaccessible) for youth. These differences mean that it is likely to be more difficult to identify specific food and beverage products on which to impose or lower taxes *(66)*. Another consideration is the role that addiction has in dampening the effect of economic instruments on consumption *(29)*. The clinical nature and epidemiology of tobacco addiction differ from those of alcohol addiction, and both differ from any related habitual behaviour associated with consumption of foods high in saturated fats and other energy-dense foods.

There is some evidence that providing subsidies to agricultural producers and consumers can increase consumption of healthful foods *(67)*. Developing such policies – particularly insofar as they might affect farm subsidies for meat, dairy, and sugar producers – is subject to considerable political and economic pressure.

Local or site-specific economic instruments

There is mixed evidence for the effects of local or site-specific economic instruments (price changes, financial incentives, food provision, etc.) on food purchasing (less fatty foods, more fruits and vegetables) and weight changes. This, too, is indirect evidence in that these outcomes are not the same as, but are likely associated with, consumption of foods high in saturated fats. That is, food purchasing patterns are likely to influence food consumption, and changes in consumption of certain foods is likely to contribute to changes in weight.

We identified 20 studies involving local and site-specific economic instruments, including 11 RCTs, three non-randomized controlled trials, and six time series or other studies without concurrent controls. Eight of the RCTs investigated the impact of combinations of educational and other interventions, including financial, on weight loss. Although a few resulted in temporary weight loss, the studies were unable to show that financial incentives resulted in greater weight loss than in their control groups, and weight losses that did occur were not sustained or followed long enough to determine if they could be sustained. Some of these studies were designed in ways that precluded discerning the independent effect of financial incentives on weight loss. Among eight studies of the impact of price reductions on food purchasing (primarily in vending machines and cafeterias), there was only one RCT, one non-randomized controlled trial, and six time series or other studies without concurrent controls. Most of these studies showed that reducing the price of healthy food increased the purchasing of that food.

The duration of the interventions covered in this review range from 3 weeks to 18 months. Thus, it is not apparent whether the effects of the economic instruments observed in these studies could be sustained for longer periods. Most of the pricing interventions were conducted over short time periods. There is little data on the long-term impact of price policies on the purchasing of healthy food. As reported in at least one of these pricing studies, once the cost of healthful foods is returned to pre-intervention prices, the purchasing of those food decreased to pre-intervention levels *(47)*.

The economic interventions showing an impact on the purchasing of healthy food were tested primarily in schools and workplaces in the United States. They show that consumers do respond favourably to price signals intended to encourage the purchase of fewer energy-dense foods and more healthful foods. However, these studies were conducted in largely self-contained environments with limited food acquisition options that may have enhanced the effectiveness of the on-site interventions. The studies did not assess whether changes in food purchasing were accompanied by any net changes in food consumption or energy intake. Once the students or employees leave those sites for community settings without those prices or other restrictions, they may revert to their typical food purchasing and consumption patterns. Therefore, the experience in these more controlled environments may not be applicable to community settings.

Though it did not conduct a formal systematic review of economic instruments for reducing consumption of high energy foods, the United States Institute of Medicine (IOM) considered the adequacy of evidence pertaining to the use of taxing and pricing policies in its 2005 policy report on preventing childhood obesity, as follows:

> The Committee on Prevention of Obesity in Children and Youth has carefully considered the issues regarding taxes on specific foods, particularly soft drinks and energy-dense snack foods, but at this time, it is the committee's judgment that there is not sufficient evidence to make a strong recommendation either for or against taxing these foods. More research is needed to determine objective methods for defining and characterizing foods based on nutritional considerations such as the quality and quantity of nutrients or the energy density…. In any case, taxation may not address the main issue, that many people will not consume greater amounts of healthful foods, even if their relative prices are lower, simply because they prefer energy-dense foods…. The committee suggests that research into the effects of taxation and pricing strategies be considered a priority to help shed light on

> the potential outcomes or more broadly applying taxation as a public health strategy for promoting improved dietary behaviours, more physical activity, and reduced sedentary behaviours. *(65)*

Some of the studies cited here on the use of economic instruments to influence food purchasing and consumption and weight loss are also cited in various nutrition guidelines. According to the Joint FAO/WHO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases, the recommended intake of fruits and vegetables could prevent several diseases or conditions, including obesity *(68)*. The WHO Global Strategy on Diet, Physical Activity and Health recommends that individuals be physically active, that energy intake from total fats and the intake of saturated fats be limited, and that consumption of fruits, vegetables and whole grains should be increased *(69)*.

Policy considerations

Available evidence suggests—but does not demonstrate—that introduction of economic instruments, particularly in the form of taxes and price policies, could reduce food consumption, including of high saturated fat foods, and increase the purchasing of healthy foods. At present, there is insufficient evidence or preparation for implementing national or regional policy-related economic instruments for the purposes. Policy considerations include:

1. Evidence for price elasticity for foods (i.e., how much demand for food changes with its price) is limited.
    a. Price inelasticity for foods may dampen the effect of economic instruments, as many people, including lower-income people, will not consume less food high in saturated fats at higher prices or more healthful foods at lower prices, because they simply prefer high-saturated fat foods. Thus, these economic instruments could be regressive *(12)*.
    b. Any policies that raise prices of these foods without some complementary intervention, such as subsidies for healthy food, may be viewed as inequitable.
2. Although taxation and pricing policies have contributed to tobacco prevention and control, pricing policies for food may be more complex to implement.
    a. Compared to tobacco and alcohol, it is more difficult to identify specific foods on which to impose taxes or other pricing policies.
    b. Influencing food consumption does not involve constraining access to products that are subject to legal restrictions, such as in the instances of tobacco and alcohol prevention efforts for youth.
3. Consumer reaction, administrative costs and commercial food industry considerations need to be evaluated before the introduction of economic instruments.
4. Implementation of educational campaigns in conjunction with taxing and subsidizing foods should be considered.
5. Implementation of rewards and other incentives for consumption of healthful foods in school settings may introduce students to healthy eating, thereby encouraging healthy eating habits at an early age.
6. Tax revenues generated from the sale of foods high in saturated fats could be used to subsidize the cost of healthful foods or health promotion programs.
7. As in the instances of alcohol and tobacco control, the most effective approaches for preventing and managing the complex, multifactorial problem of obesity may involve concurrent interventions including, but not limited to, economic instruments.

Research considerations

Findings from rigorous prospective interventional studies on the impact of targeted economic instruments on food consumption in community settings, not just more limited settings such as schools and workplaces, are needed to inform policy interventions. Observational studies of how consumption of certain foods varies with prices in the market will continue to provide policy-relevant information, but are no substitute for prospective interventional studies.

1. In order to effectively target economic instruments at particular foods, research is needed to establish definitions and characteristics of foods, especially in terms of nutrient quality and quantity and energy density.
2. To the extent that policy makers choose to implement economic instruments in the absence of rigorous studies, these interventions should be subject to prospective, ongoing evaluation.
3. Toward preventing and reducing the prevalence of obesity, economic instruments should be evaluated beyond their impact on consumption of foods high in saturated fats to include promoting other healthy dietary behaviours, more exercise, and other means of shifting the balance of energy intake and expenditure.

Conclusions

Available evidence suggests – but does not demonstrate – that introduction of policy-related economic instruments, particularly in the form of taxes and price policies, could reduce food consumption, including of high saturated fat and other energy-dense foods, and increase the purchasing of healthful foods. Some research provides indirect evidence in support of this relationship, including studies of the association between market changes in food prices and consumption of certain foods. Other studies demonstrate short-term causal relationships between economic instruments (including purposeful price changes and incentives) and food purchasing behaviour and, to a lesser extent, weight change. At present, there appears to be insufficient evidence to support widespread implementation of policy-related economic instruments intended to reduce consumption of foods high in saturated fats for preventing or reducing obesity.

Well-designed studies of particular tax or price policies, particularly as tested in regional or community settings, as well as studies of consumer acceptance of them and the logistics of implementation would help to inform policy-makers regarding whether and how to enact these interventions. Policy-makers could consider proceeding with the following:

1. supporting research and gaining consensus on definitions and characteristics of foods, especially in terms of nutrient quality and quantity and energy density, to guide development of economic instruments for changing food consumption;
2. supporting rigorously designed prospective research on the impact of selected economic instruments on consumption of energy-dense foods, including foods high in saturated fats. This research should include pilot studies of regional or community-based interventions; and
3. supporting assessments of consumer reaction, administrative costs and commercial food industry response to guide decisions regarding whether and how to implement economic instruments for changing food consumption.

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