

Taxing Junk Food to Counter Obesity

Caroline Franck, MSc, Sonia M. Grandi, MSc, and Mark J. Eisenberg, MD, MPH

We examined the advantages and disadvantages of implementing a junk food tax as an intervention to counter increasing obesity in North America.

Small excise taxes are likely to yield substantial revenue but are unlikely to affect obesity rates. High excise taxes are likely to have a direct impact on weight in at-risk populations but are less likely to be politically palatable or sustainable.

Ultimately, the effectiveness of earmarked health programs and subsidies is likely to be a key determinant of tax success in the fight against obesity. (*Am J Public Health*. 2013;103:1949–1953. doi:10.2105/AJPH.2013.301279)

IN RESPONSE TO RAPIDLY

increasing obesity in North America, health researchers and policymakers are considering novel approaches to counter the growth of this epidemic.¹ The divergence between energy intake and expenditure has widened since 1970,² with a steady increase in daily calorie intake leading scientists and researchers to suggest targeting food consumption as a means of addressing the obesity epidemic. One such approach is now gaining momentum while generating heated debates in and outside the scientific community: a tax on unhealthy foods has been proposed to help reduce their consumption. We consider the implications of implementing 2 types of junk food tax (a nutrient tax and a food and beverage category tax) and provide an overview of arguments in favor of and against their institution. Ethical concerns must be considered along with the current state of scientific evidence about obesity and the efficacy of taxes for behavior change. We have identified significant knowledge gaps that provide direction for future research.

BACKGROUND

A 2003 World Health Organization–Food and Agricultural Organization report proposed that the cost and pricing of healthy foods were key considerations in the prevention of obesity.³ The inexpensiveness of unhealthy foods relative to fresh produce⁴ is thought to be an important contributor to the overconsumption of junk food.⁵

Accordingly, by increasing the price of cheap, energy-dense foods, researchers hope that a junk food tax will prod consumers to reject unhealthy choices in favor of less energy-dense foods.⁶ In theory, a junk food tax would encourage a healthy lifestyle by diminishing the consumption of unhealthy foods (specifically snack or fast foods) and motivate manufacturers to produce healthier alternatives.⁷

Pricing Policies and Food Consumption

Taxing unhealthy foods is expected to reduce their consumption through the foods' own- and cross-price elasticity. Price elasticity reflects the magnitude of pricing on product demand and can be defined as the percentage change in the outcome (e.g., food consumption or weight) resulting from a 1% change in price.⁶ Price elasticity is critical to consider for accurate forecasting of tax impacts.⁸ With food, researchers must take into account its own-price elasticity (elasticity of demand with respect to the good's own price) and its cross-price elasticity (elasticity of demand for that good, relative to a change in price of another good). In essence, the demand for food products is a function of the price of the item and the price of other food items, purchasing power (income), and other factors that influence personal preference (e.g., advertising).⁶ Cross-price elasticity renders consumption of particular foods exceedingly difficult to predict, because it is highly interdependent on other

foods.⁹ Prediction of cross-price elasticity presents a challenge to data collection on food consumption trends and likely explains the limited literature that exists on the subject.

Existing and Repealed Food Taxes

On October 1, 2011, Denmark introduced the world's first "fat tax," with the aim of reducing cardiovascular disease. Any food item containing more than 2.3% saturated fat cost an extra 16 krone (~US\$3) per kilogram (~2.2 lb).¹⁰ However, the Danish government repealed the tax in November 2012, less than 12 months after its implementation. Danish shoppers had found ways to circumvent the controversial tax by purchasing taxed items across the border, in Germany or Sweden.¹¹ Although the Danish fat tax was too short-lived to measure its real impact on the consumption of fatty foods, its repeal highlights the challenges that may arise from a tax on unhealthy foods. Nevertheless, several countries today levy taxes on various food items with public health goals in mind. In 2011, Hungary imposed a 10-forint (US\$0.04) tax on packaged products high in fat, salt, or sugar to help cover the country's health care costs.^{12–14} France approved its first official soda tax of 1 euro cent per canned drink in December 2011, as part of a bill to reduce the public health care deficit and combat obesity.¹³ To date, these tax experiments are too recently implemented to provide longitudinal information on their effect on obesity.

Many US states levy taxes on specific foods to generate revenue, although none with the intent of curbing food consumption,⁷ or affecting nutritional content.¹⁵ This is the case of the sales tax (called a value-added tax in Europe and Canada), which targets food but cannot be considered a food tax per se.⁷ In Canada and in many US states (40 as of 2009),¹⁶ such taxes are imposed on soft drinks, sweets, and snack foods but not on basic groceries.¹⁵ This practice distinguishes wants from needs and has been implemented in Belgium, Germany, Ireland, Italy, and the United Kingdom. The true effect of sales taxes on food consumption remains unclear.

Some researchers argue that sales taxes are inefficient, relative to excise taxes, in curbing demand.¹⁶ By contrast to sales taxes, which constitute a percentage of the retail price, excise taxes are levied at a fixed cost per unit of measure. Although consumers can save on sales tax when buying items in bulk, excise taxes are built into the retail price, thereby encouraging consumers to buy less of the product.^{15,17,18} A common example is US state excise taxes applied to cigarettes, which as of January 1, 2012, averaged US \$1.46 per pack.¹⁹ However, sales taxes can still affect health outcomes: as of 2003, US states without sales taxes on soft drinks or snack foods were 4 times as likely as states with a tax to have a relative increase in the prevalence of obesity.²⁰ Similar results were found in states that had repealed an existing soft drink or snack food tax, making them 13 times as likely as other states to have an increase in obesity (>75th percentile).⁶ Positive health outcomes resulting from taxes not targeted toward health outcomes could be a promising sign for taxes

implemented within a public health agenda.

The imposition of a value-added tax (in Europe and Canada) and sales taxes (in the United States) on food has shown with certainty that even small taxes can generate very high revenue. Researchers estimate that a national excise tax of 1 cent per 12-ounce soft drink could amount to US\$1.5 billion per year.²¹ Nevertheless, many recent tax propositions have been voted down or repealed, including New York Governor David Patterson's 2010 plan for a sugary soft drink tax and California Assemblyman Bill Monning's proposed US\$0.01-per-ounce soda tax. Support from within the food and beverage industries will be difficult to secure regardless of the promise of public health revenue, because powerful stakeholders and lobbyists have a vested interest in keeping product consumption high.

JUNK FOOD TAX PROPOSALS

By and large, tax propositions fall into 2 camps: taxes on specific nutrients and taxes on predefined food and beverage categories. Both face important practical challenges resulting from an attempt to classify foods that are often complex combinations of various ingredients in varying quantities. We consider the feasibility of each proposal, outlining their strengths and weaknesses in turn.

Taxing nutrients

The rationale for targeting nutrients in tax policies is that some sources of energy have little nutritional value and have been identified as key contributors to the prevalence of global overweight and obesity.^{15,22} A 2001

report released by the UK National Audit Office on tackling obesity in England pointed out that fat has a higher energy density than other nutrients.²³ Furthermore, meals are increasingly being consumed outside the home, and these meals tend to be higher in fat.²³ A literal fat tax, like the one repealed in Denmark, theoretically would encourage individuals to opt for low-fat or nonfat alternatives. Another approach might be to tax unhealthy foods according to composition; for instance, any food composed of more than 30% fat or 40% sugar.¹ In theory, both methods would target a wide variety of problem foods and food distributors. Similarly, an ingredient tax (e.g., on high-fructose corn syrup) could encourage manufacturers to use fewer unhealthy additives and produce healthier, tax-exempt products.¹ However, taxing nutrients or ingredients is highly challenging: not all fats are unhealthy, and taxing foods according to fat content would lead to items such as nuts incurring very high taxes.¹⁵ This is problematic not only for consumers but also for specialty food retailers (e.g., cheese vendors) whose limited variety of products would be disproportionately taxed as was the case in Denmark.¹¹ Because manufacturers regularly update and modify the production processes of certain foods, this approach would also entail a perpetual game of governmental catch-up, reevaluating and altering tax rates in an attempt to keep up with production changes.¹⁵

Taxing Snack Foods

Taxing food categories has been proposed as a method to bypass many of the problems inherent in nutrient taxes.⁷ Its pragmatism is rooted in the understanding that

some foods do not constitute basic needs.^{7,24} Some researchers suggest that a snack tax is most legislatively feasible.⁸ It could also be the most effective because the majority of the increase in caloric intake since the 1980s is thought to result from snack consumption.²⁵ Snack foods are often processed and energy dense, which leads many tax proponents to advocate the inclusion of such foods in policy recommendations.⁷

However, available evidence suggests that a snack tax alone might be ineffective in addressing the obesity epidemic.²⁰ A 20% tax on potato chips would theoretically result in a nonsignificant 830-calorie reduction per capita, less than a quarter of a pound per year.⁸ Snack foods also present categorization gray areas. A 2008 review identified products commonly characterized at the state level as snack foods, including candy, chewing gum, chips, pretzels, ice cream, popsicles, milkshakes, and baked goods.²⁶ The question arises: Is a tax-free breakfast bar fundamentally healthier than a taxed candy bar?²⁷ Food categorization has inherent difficulties, regardless of how inclusive the categories may be.

Taxing Sugar-Sweetened Beverages

Sugar-sweetened beverages (SSBs) may be the single most important driver of the obesity epidemic.¹⁶ In the past decade alone, per capita intake of calories derived from carbonated drinks and SSBs has increased by approximately 30%.¹⁶ Moreover, beverages are thought to account for 10% to 15% of calorie intake for children and adolescents.¹⁶ Recent research has found that individuals who are genetically predisposed to adiposity are more

susceptible to the adverse health consequences of SSB consumption.²⁸ A SSB tax could also yield measurable results: one study found that a decrease of just one quarter of the calories obtained from SSBs would lead to an estimated reduction of 8000 calories per capita, which translates to just over 2 pounds per year for the average individual.¹⁶ This reduction would substantially reduce the risk of obesity, diabetes, heart disease, and related conditions.¹⁶ Other estimated impacts of a SSB tax on obesity are more modest, including one study's projected decrease of 0.06 body mass index points resulting from a high (20%) soft drink tax.²⁴ These estimates must be considered in the context of certain limitations, such as the validity of body mass index as a surrogate measure of obesity. In addition, the extent of the effect is likely to vary among demographic groups.

A SSB tax might also constitute the largest source of tax revenues to be obtained from a snack tax. A penny-per-ounce SSB tax could generate an estimated US \$78.9 billion over a 5-year period, or almost US \$118 billion in a broader soft drink tax that would include diet varieties.²⁹ Thus, although only hefty taxes would significantly reduce SSB consumption,¹⁶ small taxes would still generate substantial revenue, which could be earmarked to subsidize healthy foods. Estimates suggest that a 55% tax rate would decrease the proportion of overweight and obese individuals by 0.7%.³⁰ Such a weight reduction is projected to have an impact over time but would not reverse obesity trends by itself.³⁰ Inevitably, weight outcomes will depend on which product substitutions, if any, consumers choose to make.^{16,31,32}

THE TAX DEBATE

Junk food tax proposals lend themselves to considerable ethical scrutiny. Arguments range from consumer-level considerations to a more general discussion on the role of government in industry.

Regressive Excise Taxes

As in the case of any excise tax, low-income populations would spend a greater relative percentage of their annual income on an unhealthy food tax than would higher-income individuals.⁷ The argument has been raised that such a tax is unethical because food (as opposed to cigarettes or alcohol) is an essential need.⁶ However, low-income populations consume more junk food than do high-income ones,³³ and they are generally at higher risk of obesity and chronic diseases.²⁰ It follows that low-income individuals might be more likely to change their consumption behaviors and experience long-term health benefits.⁹ In addition, revenue generated from such a tax, if used for healthy food subsidies and educational programs, could help offset the costs that are borne by low-income consumers.³² In light of such compensations, regressivity becomes a significantly less compelling argument. However, a real concern would be to ensure access to subsidized foods, or populations living in so-called food deserts might be doubly disadvantaged by price increases and travel costs to faraway supermarkets.

Healthy Food Subsidies and Health Education Programs

Controversy surrounds the justification of a junk food tax on the basis of revenue. This approach arguably fails to address the real problem: the promotion and consumption of unhealthy foods.⁷

Health campaigns funded from tax revenue could not hope to compete with fast-food and junk food industry marketing dollar for dollar.⁷ The theoretical double whammy effect of a tax that decreases unhealthy food consumption while generating high revenue to fund educational programs is idealistic, because a tax that successfully reduces consumption of a product cannot be relied on for sustained revenue.⁶ However, the combined effects of an excise tax and subsidies might be greater than either effect alone. A small tax would be unlikely to measurably decrease consumption but would raise significant revenue. Consequently, the effect of a tax on population weight feasibly could arise from subsidies funded by this tax.

Government Intervention

One of the most common arguments opposing a tax on unhealthy foods is its impingement on individual freedom. However, the costs of obesity arising from individuals' poor nutritional choices are borne by society as a whole through taxes, lost productivity, and an overburdened health care system.¹⁵ In 2008, the medical costs associated with obesity and obesity-related illnesses totaled US \$147 billion in the United States.³⁴ Obesity costs also affect the workplace, where decreased productivity and increased absenteeism affect the large-scale functioning of society.¹⁶ Proponents of government intervention liken it to a form of stewardship, designed to help bring about changes that individuals on their own cannot.³⁵ Stewardship is not well received when it attempts to protect individuals from harming themselves.³⁵ The question must be asked, however, whether people are equipped with sufficient

knowledge to make informed decisions about food consumption. Accordingly, economists suggest that government-mandated excise taxes are typically appropriate to correct market failures.^{36,37} With respect to food, this translates to factors that influence consumers to make suboptimal nutrition choices, such as information failures (the extent to which consumers are fully informed about the immediate and long-term health implications of their food choices) and the failure to consider external costs (for the health care system and workplace) when consumers choose what to eat.³⁶ Regulation may constitute a middle road between a state that prohibits all risky activities and one that leaves people's health to themselves and to the hidden hand of the market.³⁵

This hidden hand may be overriding individuals' will because increasing evidence shows that junk food may be addictive.¹¹⁷ Palatable foods activate brain reward circuitry in a similar fashion to many addictive drugs, and soaring obesity rates may be correlated to the increased availability of and exposure to highly reinforcing comfort foods.³⁸ Brain-imaging studies show that reductions in dopamine D₂ receptors in obese individuals are similar in magnitude to those of drug addicts and might play a modulating role in conferring a particular vulnerability to compulsive eating behaviors.³⁹ These findings support the belief that people often want to lose weight and be healthier but find it exceedingly difficult to do so. In light of the potential for addiction, it would be reasonable for governments to consider as a model regulations that have been implemented for similarly addictive activities and products (casino gambling, cigarettes,

alcohol, prescription drugs),¹ without expecting any single intervention to remedy the state of obesity in North America on its own.

Impact and Acceptability of a Junk Food Tax

Individual characteristics, including current weight and motivation to lose weight,⁴⁰ must be taken into account to estimate the effects of a tax on various populations. For instance, obese individuals find food more reinforcing than do leaner people and would be unlikely to respond to a small price increase.⁴¹ An important consideration for preventive health, however, is that demand for unhealthy foods is somewhat elastic for nonobese individuals.⁴¹ In the endeavor of reversing growing obesity trends, prevention is paramount. Therefore, monitoring and evaluation of the effectiveness of a junk food tax (should one be implemented) must incorporate the preventive impact of such a tax on families, particularly on children, whose early eating habits are largely formed at home. Other demographic characteristics that influence price elasticity of demand are age and socioeconomic status. One study found that children in low-income households and children at risk for overweight were 50% and 39%, respectively, more price sensitive than higher-income and lower-risk children.⁴² This evidence suggests that pricing strategies could help combat the obesity epidemic, particularly among populations with low socioeconomic status and high consumption of junk food.²⁰ It is important not to conflate the price elasticity of foods of children and adolescents with that of adults. Tobacco price elasticity, for instance, is several times as large for youths as for adults, in part because of the

greater proportion of disposable income children and adolescents spend on such products.⁸

Public acceptance of a junk food tax is likely to vary within and between interest groups. Objections on behalf of the food and beverage industry are to be expected. Although efforts to offset consumption by means of pricing policies have been effective in the case of tobacco products,^{43,44} taxing food is considerably more challenging, because pitting problem foods against desirable ones is arguably an arbitrary practice. Lessons learned in overcoming opposition to the tobacco tax might help inform legislators and policymakers about how best to address similar controversy over junk food taxes. Several polls have indicated that public support depends on the use of tax revenue.⁷ Moderate public acceptance was documented for small taxes on soft drinks and snack foods, provided the revenues would be used to fund obesity prevention and health education programs.⁷ A 2012 telephone survey of US citizens found that a significant minority of respondents (36% of 592 individuals) favored a hefty excise tax (20%) on prepackaged SSBs.⁴⁵ Small taxes targeting key groups (e.g., children) are most likely to obtain public support, although by themselves they are unlikely to have any measurable effect on obesity rates.⁷ The more intrusive the policy measure (or the higher the tax), the less public support can be expected; conversely, the more emphasis that is placed on public awareness and education, the more support such measures are likely to garner.³⁵

Our understanding of the effects of pricing on food remains limited. This is largely attributable to the difficulty of predicting the

impact of food prices among a wealth of other factors that influence body weight.⁴⁶ Increasing consumption of healthy foods without reducing consumption of energy-dense fast foods would have little to no measurable effect on obesity. Thus, not only must we consider that desirable weight outcomes are likely to be achieved only if taxed foods are not substituted with nontaxed isocaloric foods and beverages,¹⁸ but we must also acknowledge the potential of an overall increase in total energy intake resulting from consuming more low-calorie items.²⁰ These last points form the crux of today's debate surrounding the tax: although experimental studies have shed some light on consumers' food substitution choices, little evidence is available to forecast the effect of cross-price elasticity in uncontrolled settings.⁴⁷ This uncertainty helps explain why the literature does not unanimously favor a tax on unhealthy foods.

CONCLUSIONS

In light of these findings, a junk food consumption deterrent in the form of a modest tax on selected nutrients, snacks, or SSBs would yield substantial revenues to governments, but is unlikely to affect obesity rates.⁶ Several studies suggest that high taxes ($\geq 20\%$) may lead to measurable decreases in obesity on a population level, particularly if combined with additional interventions (e.g., healthy food subsidies, health education).^{6,32,46,48} These considerations are important and may be especially relevant for obesity prevention in high-risk populations. Although unwilling politicians may oppose them, high taxes would have the greatest impact on adolescents, persons of low

socioeconomic status, and populations at risk for obesity.^{6,32}

Ultimately, much of the evidence against or in favor of a tax on unhealthy food is derived from incomplete information. Pilot pricing interventions in specific closed settings should be considered as an approach to further our understanding of the true effects of a tax on obesity at the population level. ■

About the Authors

The authors are with the Division of Clinical Epidemiology, Lady Davis Institute for Medical Research, Jewish General Hospital, Montreal, Quebec. Mark J. Eisenberg is also with Department of Epidemiology, Biostatistics and Occupational Health, McGill University, Montreal, Quebec.

Correspondence should be sent to Mark J. Eisenberg, MD, MPH, Professor of Medicine, Divisions of Cardiology and Clinical Epidemiology, Jewish General Hospital/McGill University, 3755 Cote Ste-Catherine Rd, Suite H421.1, Montreal, Québec, Canada, H3T 1E2 (e-mail: mark.eisenberg@mcgill.ca). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

This article was accepted February 10, 2013.

Contributors

All authors contributed equally to this article.

Human Participant Protection

No protocol approval was needed because no human participants were involved.

References

1. Pomeranz JL, Teret SP, Sugarman SD, Rutkow L, Brownell KD. Innovative legal approaches to address obesity. *Milbank Q*. 2009;87(1):185–213.
2. US Dept of Agriculture. Agriculture Fact Book (2001–2002). Available at: <http://www.usda.gov/factbook/2002factbook.pdf>. Accessed February 1, 2013.
3. World Health Organization, Food and Agricultural Organization. Diet, nutrition and the prevention of chronic diseases. 2003. Available at: http://whqlibdoc.who.int/trs/WHO_TRS_916.pdf. Accessed February 1, 2013.
4. Drewnowski A, Darmon N. The economics of obesity: dietary energy density and energy cost. *Am J Clin Nutr*. 2005;82(1 suppl):265S–273S.

5. Darmon N, Ferguson E, Briand A. Do economic constraints encourage the selection of energy dense diets? *Appetite*. 2003;41(3):315–322.
6. Powell LM, Chaloupka FJ. Food prices and obesity: evidence and policy implications for taxes and subsidies. *Milbank Q*. 2009;87(1):229–257.
7. Caraher M, Cowburn G. Taxing food: implications for public health nutrition. *Public Health Nutr*. 2005;8(8):1242–1249.
8. Kuchler F, Tegene A, Harris JM. Taxing snack foods: manipulating diet quality or financing information programs? *Appl Econ Perspect Policy*. 2005;27(1):4–20.
9. Mytton O, Gray A, Rayner M, Rutter H. Could targeted food taxes improve health? *J Epidemiol Community Health*. 2007;61(8):689–694.
10. Denmark introduces world's first food fat tax. *BBC News*. October 1, 2011. Available at: <http://www.bbc.co.uk/news/world-europe-15137948>. Accessed January 29, 2013.
11. A fat chance: the Danish government rescinds its unwieldy fat tax. *Economist*. November 17, 2012. Available at: <http://www.economist.com/news/europe/21566664-danish-government-rescinds-its-unwieldy-fat-tax-fat-chance>. Accessed January 28, 2012.
12. Holt E. Hungary to introduce broad range of fat taxes. *Lancet*. 2011;378(9793):755.
13. Villanueva T. European nations launch tax attack on unhealthy foods. *CMAJ*. 2011;183(17):E1229–E1230.
14. Cheney C. Battling the couch potatoes: Hungary introduces “fat tax.” *Spiegel Online*. September 1, 2011. Available at: <http://www.spiegel.de/international/europe/battling-the-couch-potatoes-hungary-introduces-fat-tax-a-783862.html>. Accessed January 29, 2013.
15. Leicester A, Windmeijer F. The “fat tax”: economic incentives to reduce obesity. Institute for Fiscal Studies. 2004. Available at: <http://eprints.ucl.ac.uk/14931/1/14931.pdf>. Accessed January 15, 2012.
16. Brownell KD, Frieden TR. Ounces of prevention—the public policy case for taxes on sugared beverages. *N Engl J Med*. 2009;360(18):1805–1808.
17. Gearhardt AN, Bragg MA, Pearl RL, Schvey NA, Roberto CA, Brownell KD. Obesity and public policy. *Annu Rev Clin Psychol*. 2012;8:405–430.
18. Jou J, Techakehakij W. International application of sugar-sweetened beverage (SSB) taxation in obesity reduction: factors that may influence policy effectiveness in country-specific contexts. *Health Policy*. 2012;107(1):83–90.
19. American Lung Association. State cigarette excise tax. State of tobacco control. 2012. Available at: <http://www.stateoftobaccocontrol.org/state-grades/methodology/state-cigarette-excise-tax.html>. Accessed October 18, 2012.
20. Kim D, Kawachi I. Food taxation and pricing strategies to “thin out” the obesity epidemic. *Am J Prev Med*. 2006;30(5):430–437.
21. Jacobson MF, Brownell KD. Small taxes on soft drinks and snack foods to promote health. *Am J Public Health*. 2000;90(6):854–857.
22. Chouinard HH, Davis DE, LaFrance JT, Perloff JM. Fat taxes: big money for small change. *Forum Health Econ Policy*. 2007;10(2).
23. National Audit Office. Tackling obesity in England. 2001. Available at: http://www.nao.org.uk/publications/0001/tackling_obesity_in_england.aspx. Accessed February 1, 2013.
24. Pomeranz JL. Advanced policy options to regulate sugar-sweetened beverages to support public health. *J Public Health Policy*. 2012;33(1):75–88.
25. Cutler DM, Glaeser EL, Shapiro JM. Why have Americans become more obese? National Bureau of Economic Research. 2003. Available at: http://www.cib.espol.edu.ec/Digipath/D_Papers/45741.pdf. Accessed July 13, 2011.
26. Chriqui JF, Eidson SS, Bates H, Kowalczyk S, Chaloupka FJ. State sales tax rates for soft drinks and snacks sold through grocery stores and vending machines, 2007. *J Public Health Policy*. 2008;29(2):226–249.
27. Guthrie JF, Frazão E, Andrews M. Improving food choices—can food stamps do more? Economic Research Service, US Dept of Agriculture. 2007. Available at: <http://www.ers.usda.gov/AmberWaves/April07/PDF/Improving.pdf>. Accessed January 13, 2012.
28. Qi Q, Chu AY, Kang JH, et al. Sugar-sweetened beverages and genetic risk of obesity. *N Engl J Med*. 2012;367(15):1387–1396.
29. Andreyeva T, Chaloupka FJ, Brownell KD. Estimating the potential of taxes on sugar-sweetened beverages to reduce consumption and generate revenue. *Prev Med*. 2011;52(6):413–416.
30. Fletcher JM, Frisvold D, Tefft N. Can soft drink taxes reduce population weight? *Contemp Econ Policy*. 2010;28(1):23–35.
31. Edwards R. Commentary: soda taxes, obesity, and the shifty behavior of consumers. *Prev Med*. 2011;52(6):417–418.
32. Andreyeva T, Long MW, Brownell KD. The impact of food prices on consumption: a systematic review of research on the price elasticity of demand for food. *Am J Public Health*. 2010;100(2):216–222.
33. Bowman SA. Diets of individuals based on energy intakes from added sugars. *Fam Econ Nutr Rev*. 1999;12(2):31–38.
34. Finkelstein EA, Trogdon JG, Cohen JW, Dietz W. Annual medical spending attributable to obesity: payer- and service-specific estimates. *Health Aff (Millwood)*. 2009;28(5):w822–w831.
35. Jochelson K. Nanny or steward? The role of government in public health. *Public Health*. 2006;120(12):1149–1155.
36. Griffith R, O'Connell M. Public policy towards food consumption. *Fisc Stud*. 2010;31(4):481–507.
37. Steenhuis IHM, Waterlander WE, de Mul A. Consumer food choices: the role of price and pricing strategies. *Public Health Nutr*. 2011;14(12):2220–2226.
38. Volkow ND, Wise RA. How can drug addiction help us understand obesity? *Nat Neurosci*. 2005;8(5):555–560.
39. Wang GJ, Volkow ND, Logan J, et al. Brain dopamine and obesity. *Lancet*. 2001;357(9253):354–357.
40. Yaniv G, Rosin O, Tobol Y. Junk-food, home cooking, physical activity and obesity: the effect of the fat tax and the thin subsidy. *J Public Econ*. 2009;93(5–6):823–830.
41. Epstein LH, Dearing KK, Paluch RA, Roemmich JN, Cho D. Price and maternal obesity influence purchasing of low- and high-energy-dense foods. *Am J Clin Nutr*. 2007;86(4):914–922.
42. Sturm R, Datar A. Food prices and weight gain during elementary school: 5-year update. *Public Health*. 2008;122(11):1140–1143.
43. Ross H, Blecher E, Yan L, Hyland A. Do cigarette prices motivate smokers to quit? New evidence from the ITC survey. *Addiction*. 2011;106(3):609–619.
44. Hu TW, Sung HY, Keeler TE. Reducing cigarette consumption in California: tobacco taxes vs an anti-smoking media campaign. *Am J Public Health*. 1995;85(9):1218–1222.
45. Rivard C, Smith D, McCann SE, Hyland A. Taxing sugar-sweetened beverages: a survey of knowledge, attitudes and behaviours. *Public Health Nutr*. 2012;15(8):1355–1361.
46. Gordon-Larsen P, Guilkey DK, Popkin BM. An economic analysis of community-level fast food prices and individual-level fast food intake: a longitudinal study. *Health Place*. 2011;17(6):1235–1241.
47. Mhurchu CN. Food costs and healthful diets the need for solution-oriented research and policies. *Am J Clin Nutr*. 2010;92(5):1007–1008.
48. Mytton OT, Clarke D, Rayner M. Taxing unhealthy food and drinks to improve health. *BMJ*. 2012;344:e2931.