

# EvidenceSynthesis

IMPACT OF ECONOMIC INCENTIVES ON SALES AND CONSUMPTION OF HEALTHIER FOODS, AND BODY WEIGHT STATUS

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#### **OVERVIEW**

Currently, over half of adults and over a quarter of children and adolescents are classified as overweight or obese in Canada (1). The causes of and contributors to obesity are complex and multifaceted. They include not only individual choices, but also environmental, social, and economic determinants that shape people's ability to make healthier choices (1). In recent years, increasing attention has been given to the use of economic incentives to modify dietary behavior at both the individual and population level in Canada (2). To inform policy action in this area, the aim of this synthesis is to summarize evidence on the impact of economic incentives on the sale and consumption of healthier foods, as well as BMI or body weight outcomes.

In the literature, sources tend to differ in their explanation of economic incentives. However, for the purposes of this synthesis, they are defined in terms of either enabling behaviour or reinforcing behaviour by decreasing cost to the consumer. Subsidies in the form of price discounts and vouchers for healthy food purchases are well-known examples of economic incentives.

#### **METHODS**

Review of Evidence. This synthesis report involved the collection of review articles from two databases (Ovid Medline, CINAHL) and a web search (the Rudd Center for Policy and Obesity and Google Scholar). Additional studies were provided by the research team and an iterative search of PubMed related references was conducted. Lastly, a review of cited references from key articles was conducted. To be included in this synthesis report, reviews had to meet the following criteria: (1) English and French language reviews; (2) published after 2003; (3) comprehensive or systematic in nature; (4) focused on policies or policy relevant interventions; and (5) examined the impact of economic incentives on sales or consumption of healthier food, and/or BMI or weight outcomes. The first round of screening involved reviewing titles and abstracts to remove irrelevant studies. The second-level screening consisted of a full-review of remaining articles to ascertain relevance in relation to the inclusion criteria.



#### SYNTHESIS OF EVIDENCE

Characteristics of systematic reviews. Eleven reviews met the criteria to be included in this synthesis report. All reviews evaluated the effects of economic incentives on either consumption of healthier foods [2-12], sales of healthier foods (2-6, 7, 9, 12), and/or BMI or body weight outcomes (5, 8-9, 11-12). Only one study (11) looked at specific policy measures, while the remaining reviews, including the one previously stated, looked at programs, simulation experiments, and interventions designed in an effort to inform future policy directives (2-12). Two reviews (2, 5) included studies that looked at the effect of economic incentives as stand-alone intervention strategies, while all others looked at their effectiveness as a component of multi-component intervention strategies. For characteristics of reviews, refer to Table 1.

The AMSTAR appraisal tool (14, 15) was used to appraise the strength of evidence of systematic reviews included in this synthesis report. In accordance, the reviews were assigned a rating of low (0-4), moderate (5-8), or high quality (9-11). One of the reviews (7) was judged to be of high quality, receiving 9 out of a possible 11 points. Two reviews (3, 5) were deemed to be of moderate quality, both scoring 6 out of 11 possible points. The remaining 8 reviews (2, 4, 6, 8-12) were judged to be of low quality, receiving from 1 to 4 out of a possible 11 points.

# IMPACT OF ECONOMIC INCENTIVES ON SALES AND CONSUMPTION OF HEALTHIER FOOD, AND BMI OR BODY WEIGHT OUTCOMES

**Overall.** The results of the eleven reviews included in this synthesis indicate that economic incentives targeting healthier food items can result in positive outcomes related to sales, consumption, and body weight outcomes. Overall, however, the strength of evidence pertaining to the impact of economic incentives was limited by gaps in evidence for certain settings and amongst certain populations, as well as by the inability of economic incentives to be extracted from broad multi-component strategies. A need for more long-term and rigorously designed studies was also identified.

Sales of healthier foods. Eight of the eleven reviews included in this synthesis examined the impact of economic incentives on sales of healthier food items (2-6, 7, 9, 12). Review findings support the notion that offering economic incentives to customers will encourage the purchase of healthier food items, both when they are applied on their own, or in combination with other measures. An et al. (2), for example, found that a combination of economic incentives, labelling, and increased availability of healthier food items was effective in increasing sales, while education alone was not. Findings from the reviews also suggest that interventions including economic incentives are most effective in the short term, and for simple, well-defined, finite outcomes. However, further clarity is needed to determine the characteristics of incentives required to sustain long-term behavior modification. For example, Black and



colleagues (3) found that a 12.5% discount on healthy food items in supermarkets led to an 11% increase in sales of targeted items from baseline. Six months after the intervention, increased purchases of healthier food items persisted, but the effect of the intervention appeared attenuated (3).

Consumption of healthier foods. All eleven reviews discussed the impact of economic incentives on consumption of healthier foods (2-12), and all but one of these reviews (4) reported increases in consumption of healthier foods as a response to economic incentives (2, 3, 5-12). This was the case for both primary interventions, where an economic incentive, such as a subsidy, was provided alone, as well as in multi-component interventions, where an economic incentive was paired with a tax, sales/promotional strategy, or education component. For example, one review found that subsidizing fruits and vegetables by 20% increased consumption by 10% (8).

BMI or Weight Outcomes. Review findings related to the impact of economic incentives on BMI or weight-related outcomes were promising, yet limited. Taken together, five reviews (5, 8, 9, 11, 12) looked at the impact of economic incentives on improvements to body weight status through measures such as body weight (5, 8, 9, 11, 12), body mass index (BMI) (5, 11, 12), skinfolds (12), waist-hip ratio (12), and obesity prevalence (5, 11). In regards to interventions where economic incentives were the only measure applied, in most cases there were too few studies (and no moderate or high quality studies) to pool the findings for any subsidy regimens or disease outcomes, but available findings do suggest a positive contribution to improved health and reduction in obesity (8, 9, 11, 12). In terms of multi-component interventions, the reviews found evidence to support the implementation of economic incentive policies, such as subsidies, in combination with economic disincentive policies, such as taxes. Results of these interventions were found to be most significant when both components—subsidies and taxes—were quite large (8, 11). For example, while findings and recommendations varied across individual studies, two studies (16, 17) in the Thow et al. review (11) proposed a tax of 25% on unhealthy foods, while another recommended a healthy grain subsidy of 50% (18).

# ADDITIONAL CONSIDERATIONS

Findings from a number of reviews indicated an important relationship regarding the effects of economic incentives on those of lower socioeconomic status (3, 5, 8, 12). There are substantial inequalities in nutrition-related health outcomes, with some ethnic and socioeconomic groups bearing a disproportionate burden of disease (13). For those on low incomes in high income countries, the cost of healthier food is considered a significant barrier to improving the quality of dietary intake. In this context, health promotion and education alone may have little impact on disadvantaged families. Further, structural/ecological interventions, such as food pricing strategies, may have a greater impact on health behaviours than individual interventions alone (3). The review by Powell and colleagues (8), for example, focused on the effect of economic incentives to promote fruit and vegetable consumption,



as well as improved body weight outcomes. Findings indicated that lowering fruit and vegetable prices had a more pronounced effect in the body weight of low income individuals. Similar findings were reported by Eyles et al. (5), with pricing policies displaying a pronounced effect on sales and consumption of healthier food items and physical health benefits for lower socioeconomic groups. However, reviews also noted that caution should be taken when using economic incentives in combination with other pricing policies, such as food taxes (5, 11, 12). On populations of lower socioeconomic status, taxes on unhealthy foods have proven to be regressive in nature, as a larger proportion of their income is spent on food. Although further research is required, these findings suggest that the use of economic incentives to reduce the cost of healthier food items may have positive effects in reducing obesity amongst lower socioeconomic populations, thus reducing inequities and improving overall health.

# LIMITATIONS OF REVIEWS

While these findings do offer support for the use of economic incentives to improve healthy eating and improve body weight outcomes, the strength of evidence pertaining to their exact impact remains somewhat unknown. One commonly addressed limitation among the reviews is the small, and thus unrepresentative, sample sizes offered within studies (9, 12). Furthermore, the breadth of settings and populations discussed within studies makes it difficult to determine the context in which these interventions may be most useful. Some studies, for example, looked at the impact of healthy food vouchers on pregnant women (3), while others looked at school vending machine purchases (6, 12) and low-income or racial/ethnic minority populations (4). This is additionally limiting, given the large number of intervention groups in most studies, making it difficult to examine whether there were differential effects of incentive-based interventions on dietary behavior in population subgroups (12). In many cases, economic incentives have been included with other fiscal policy schemes (for example food taxes), making it difficult to draw conclusions about the magnitude or effectiveness of the economic incentives per se in these studies (6).

Reviews identified a number of limitations specific to their included studies. Some of these included their methods of randomization, allocation concealment, blinding and delivery of interventions, and blinding of data collection/analysis (9, 12). As in most studies which address diet and patterns of food consumption, there is also the potential for measurement bias, as what one research group deems to be a "healthier" option may differ from others (9). Furthermore, where self-reporting is the primary method of data extraction, there is a high risk of reporting bias by participants (9). An additional limitation concerns the lack of long-term and rigorous studies presented within the literature, paired with high levels of attrition (9, 12). Many studies signaled to the likelihood of reversion to baseline weight or health behaviors after incentives were removed (9), yet few reviews allowed for the assessment of this factor.



Last, reviews outlined distinct limitations related to the use of study findings to inform policy and practice, as they only estimate correlations rather than describe actual behavior in response to the implementation of real policies, which may be influenced by a number of mediating factors. While findings illustrate the effectiveness of economic incentives to promote healthier eating and decrease obesity, health practitioners and policy makers should continue to evaluate their influence in actual practice (9, 11).

## **FUTURE RESEARCH**

The reviews included in this synthesis highlight a number of research gaps. First, there is a clear need for more rigorous studies to measure the effectiveness of pricing strategies, particularly for socioeconomically disadvantaged and ethnically diverse populations, who typically experience higher rates of nutrition-related diseases. Future studies should explicitly assess the cost effectiveness of incentive-based interventions and should be of sufficient size and duration to assess adoption and maintenance of healthier dietary behaviors in different contexts (9). Trials assessing the effects of varying levels of economic incentives applied to healthy food choices additionally merit further attention (12). Furthermore, it is imperative to extrapolate the combination of policies/interventions which are most motivating, on what schedule, at what level, for what populations, and for which set of behavioral outcomes. Results from these types of studies could provide health practitioners and policymakers with valuable information on how best to counsel clients based on their stated preferences and their actual behaviors (9).

## **CONCLUSIONS**

This synthesis of evidence indicates that economic incentives are likely to contribute to increased sales and consumption of healthier foods and improved body weight outcomes. In the majority of reviews, this is the case both when the economic incentive is applied on its own, or in combination with other policy/intervention components. Evidence of the effectiveness of these policy measures and interventions in the long-term is limited, as are findings indicating the combination of methods that are most motivating, on what schedule, at what level, for what population subgroups, and for which set of behavioral outcomes. Findings additionally signal to a potential for economic incentives to greatly benefit those of lower socioeconomic status. Ultimately, while future research is required to fully understand the impact of economic incentives, there is a sufficient body of evidence to support policy action in this area.



**Table 1.** Characteristics of reviews evaluating the impact of economic incentives on sales and consumption of healthier food, and BMI or body weight outcomes

Author	Years	Study design	Total Studies / Articles (n¹/n²)	Types of studies included <sup>1</sup>	Location of Studies	Relevant Outcomes (outcome measures)	AMSTAR ranking
An (2012)	1990- 2012	A review of field experiments	20/24	Randomized controlled trial Pre-post test Cohort	USA (n=14); Germany (n=1); France (n=1); New Zealand (n=1); Netherlands (n=1); South Africa (n=1);	Increased sales of healthier food Increased consumption of healthier food	3/11
Black et al. (2012)	1980- 2010	Systematic review	14/16	Controlled before and after study RCT Interrupted time series	USA (n=12); UK (n=2);	Increased sales of healthier food Increased consumption of healthier food (self- reported)	6/11
Escaron et al. (2013)	1978- 2012	Systematic review	33/58	Prospective measurement with comparison group Multiple measurement, no comparison group Single group, same point in time	USA (n=22); Canada (n=4); Netherlands (n=2); New Zealand (n=1); Australia (n=1); Republic of the Marshall Islands (n=1); Japan (n=1);	Increased sales of healthier food Increased consumption of healthier food	1/11
Eyles et al. (2012)	1990- 2011	Systematic review	321	Mathematical modelling studies	France (n=2); Norway (n=1); Denmark (n=2); Finland (n=1);	Increased sales of healthier food Increased consumption of healthier food Improved weight/BMI outcomes	6/11



Jensen et al. (2011)	1990- 2011	Systematic review	28/30	Baseline intervention plus follow-up Price simulation experiment RCT Four-stage RCT RCT and 12 month follow-up Pilot study Laboratory experiments with time representative of user cost Cross-sectional Quasi experimental	USA (n=17); Norway (n=3); Ireland (n=1); Australia (n=1); UK (n=1); Not identified (n=5)	Increased sales of healthier food (as an indicator of consumption) Increased consumption of healthier food	3/11
Liberato (2014)	1982-2014	Systematic review	321	RCT Controlled before and after studies Interrupted time series	USA (n=26); Australia (n=1); Netherlands (n=1); Canada (n=1); New Zealand (n=1); South Africa (n=1); Not identified (n=1)	Increased sales of healthier food Increased consumption of healthier food	9/11
Powell et al. (2013)	2007-2012	Systematic review	N/R	Rotterdam model (two specifications) Rotterdam and AIDS model AIDS model Cross-sectional Demand system Longitudinal Cross-sectional and longitudinal Translog demand system Linear, semi-log, Rotterdam, and AIDS model	USA (n=36)	Increased consumption of healthier food Improved weight/BMI outcomes	2/11
Purnell et al. (2014)	2006- 2012	Systematic review	N/R	Observational study Quasi-experimental study Randomized study Randomized controlled trial	USA (n=12)	Increased sales of healthier food Increased consumption of healthier food Improved weight/BMI outcomes	4/11



Thow et al. (2010)	Not included in review	Systematic review	241	Not included in review	All but one study was set in a high income country	Increased consumption of healthier food Improved weight/BMI outcomes	3/11
Thow et al. (2014)	2009- 2012	Systematic review	38/43	RCT Survey	New Zealand (n=1); USA (n=19); France (n=5); Brazil (n=1); Norway (n=1); Finland (n=1); Sweden (n=1); UK (n=2); Australia (n=1); The Netherlands (n=5)	Increased consumption of healthier food	4/11
Wall et al. (2006)	1993- 2001	Review of Randomized Controlled Trials	4/5	RCT	USA (n=4)	Increased sales of healthier food Increased consumption of healthier food Improved weight/BMI outcomes	2/11

<sup>1</sup> Only studies were reported for this article



**Table 2.** Overview of findings of reviews evaluating the impact of economic incentives on sales and consumption of healthier food, and BMI or body weight outcomes

Author	Relevant Intervention Outcomes	Outcomes on sales of healthier food	Outcomes on consumption of healthier foods	Outcomes on improved body weight status/BMI	Overall Conclusions / Considerations
An (2012)	- Price discount - Voucher	Economic incentives (vouchers) effective in increasing sales of healthy food items, both on their own and in combination with increased availability of healthy foods and food sampling. Education ineffective.	- Economic incentives (price discounts) effective in increasing consumption of healthy food items, both on their own and in combination with increased availability of healthy foods, product sampling, healthy food promotions, passive marketing and food labelling. Promotional signage marginally effective, and health messages ineffective Economic incentives (vouchers) effective in increasing consumption of healthy food items, both on their own and in combination with stimulation messages and dietary advice. Combination of vouchers and education effective in fruit/vegetable consumption, but not in fruit juice consumption.	N/R	- All but one study found subsidies on healthier foods to significantly increase the purchase and consumption of promoted products.  - Existing evidence is compromised due to various study limitations: small and convenience samples of the interventions obscure the generalizability of study results; the absence of overall diet assessment questions the effectiveness in reducing total energy intake; the short intervention and follow-up durations do not allow assessment of long-term impact; and the lack of costeffectiveness analysis precludes comparison across competing policy scenarios.



Black et	- Vouchers	Economic incentives (food vo	ouchers, price discounts, and	Did not include this	- Food subsidy program participants (mostly
al. (2012)	- Price discount - Food supplement + vouchers - Food packages (free food supplements)	free food supplements) effection and consumption of healthy attenuated over time.	_	outcome as they were looking to measure weight gains (in pregnant/postnatal women), not weight reductions.	pregnant or postnatal women of low income, from disadvantaged local areas or from Indigenous or ethnic minority groups) were shown to have 10–20% increased intake of targeted foods or nutrients.  - Evidence for the effectiveness of these programs for men or children was lacking.
Escaron et al. (2013)	- POP + pricing manipulations + promotion and advertising + increased availability of healthful foods - POP + price manipulation + promotion and advertising - Price manipulation + promotion and advertising POP + price manipulations	Economic incentives (price mincreasing sales of healthy for POP, promotions and advertive availability of healthy foods in the property of the	oods when combined with ising, and increased	N/R	- Findings suggest that interventions combining demand- as well as supply-side strategies have sufficient evidence to influence customers and management toward more healthful food purchases The most effective strategies should be combined and more rigorous evaluation designs should be used Authors encourage public health practitioners to use multilevel interventions, including policy and environmental change strategies, and to examine health outcomes during evaluation of these interventions.
Eyles et al. (2012)	- Subsidies - Tax + subsidy combinations	Economic incentives (subsidies) effective in increasing sales of healthy food items.	Effectiveness of economic incentives (subsidies) when combined with economic disincentives (food taxes) to promote consumption of healthy food items unclear.	- Effectiveness of economic incentives (subsidies) to promote improvements in body weight status/BMI unclear Effectiveness of economic incentives (subsidies) when combined with economic disincentives (food taxes) to promote improvements in body	- The overall finding of this review is that pricing strategies such as taxes on carbonated drinks and saturated fat and subsidies on fruits and vegetables are likely to produce beneficial dietary change, with the potential for improved health.  - Overall, health benefits for lower socioeconomic groups may be greater if food taxes are combined with other fiscal policies to counterbalance increased food costs (such as lower income tax for low-income earners and increases in welfare benefits).  - Authors highlight the need for additional



				weight status/BMI unclear.	research into possible compensatory purchasing and population health outcomes.
Jensen et al. (2011)	- Price manipulations - Free fruit/ vegetables - Raffle tickets - Nutritional education and economic incentive for teachers - Student rewards - Vouchers - School awards	Economic incentives (vouchers, rewards, awards, raffle tickets, price reductions) effective in increasing sales of healthy food items from school vending machines.  *Sales used as an indicator for consumption	Economic incentives (vouchers, rewards, awards, raffle tickets, price reductions) effective in increasing consumption of healthy food items, but magnitude of effect unknown due to combination with additional intervention schemes.	N/R	- The few studies that address price incentives in schools suggest that they are effective for altering consumption in school cafeterias or from vending machines and for increasing fruit/vegetable consumption at schools.  - Other types of economic incentives have been included in combined intervention schemes, but their inclusion with different elements makes it difficult to draw conclusions about the effectiveness of the economic incentives per se in these studies.  - Other economic incentives may be useful for promoting improved nutrition at schools, including economic incentives to facilitate schools' participation and teachers' involvement in health-promoting educational activities as well as enabling incentives to remove or reduce barriers for participation in such activities.
Liberato	- Economic	Economic incentives effective	ve in the short-term in	N/R	- Economic incentives offered to customers
(2014)	incentive alone - Nutrition education + economic incentives provided to customers - Nutrition education + economic incentives provided to customers and store-owners	increasing sales and consum when applied on their own. with additional intervention	Effectiveness when applied		in stores or supermarkets for a short-term seem promising in increasing purchase of healthier food options when the intervention is applied by itself.  - There were insufficient studies to draw clear conclusions on the effectiveness in increasing purchase and/or intake of healthier food options when any of the interventions described in this review were applied.  - There were insufficient studies that examined mediating factors that might effect primary outcomes of relevance This review suggests that there is a gap in good



	- Nutrition education + enhanced availability of healthy food options + price discount				quality studies addressing several types of relevant point-of-sale interventions to increase purchase and/or intake of healthier food options.
Powell et al. (2013)	- Price manipulations - Vouchers	N/R	- Economic incentives (vouchers and price reductions) effective in increasing consumption of healthy food items The evidence for fruits and vegetables showed that consumption was price inelastic with a mean estimated price elasticity of demand for fruits at - 0.49 and vegetables at - 0.48, suggesting that subsidizing fruits and vegetables by 20% would increase consumption by 10%.	- Economic incentives (vouchers and price reductions) effective in improving body weight status BMI, especially for lower socioeconomic populations The evidence that linked prices to weight outcomes demonstrated fairly consistent findings that lower fruit and vegetable prices were associated with lower body weight among low income populations.	- This review indicates that changes in the relative prices of less healthy and healthier foods and beverages can significantly change consumption patterns and may have significant impacts on weight outcomes at the population level, particularly among populations most at risk for obesity and its consequences.  - Raising the prices of less healthy options by taxing them has the added benefit of generating considerable revenues that can be used to support costly programs and other interventions aimed at improving diets, increasing activity and reducing obesity, including subsidies for healthier foods and beverages.
Purnell et al. (2014)	- Weight-loss program with economic incentives - Vouchers	Economic incentives (vouchers) effective in increasing sales of healthy food items	Economic incentives (vouchers) effective in increasing consumption of healthy food items	Economic incentives (vouchers and weight loss programs with economic incentives) effective in reducing body weight	<ul> <li>- 11 of 12 studies included in this review found a positive association between incentives and dietary behavior change in the short term.</li> <li>- Additional tests of theoretically driven interventions are necessary alongside innovations in the type and administration of incentives for this complex set of behaviors.</li> </ul>



Thow et al. (2010)	- Reduced tax + subsidy - Subsidy - Removal of tax + subsidy	N/R	Economic incentives (subsidies) effective in increasing the consumption of healthy food items and improving body weight status/BMI both when applied on their own, and in combination with economic disincentives (food taxes).		- Findings from this review indicate that food taxes and subsidies can influence consumption in high-income countries and that imposing substantial taxes on fattening foods may improve health outcomes such as body weight and chronic disease risk Findings support current recommendations that taxes and subsidies should be included as part of a comprehensive strategy to prevent obesity Current evidence is generally of low quality - The empirical evaluation of existing taxes is a research priority, along with research into the effectiveness and differential impact of food taxes in developing countries.
Thow et al. (2014)	- Subsidies - Taxation and subsidies	N/R	Economic incentives (subsidies) effective in increasing consumption of healthy food items both on their own, and when applied in combination with economic disincentives (food taxes).	N/R	- This review suggests that fiscal measures, particularly soft drink taxes and healthy food subsidies, can be effective in promoting desired dietary changes Future research should consider the effect of taxation in conjunction with other interventions (as part of a multi-sectoral strategy to improve diets and health), the effect of brand variation (i.e., consumers substituting with cheaper brands or varieties of a product in response to a tax), and industry responses to taxation.
Wall et al. (2006)	- Multi- component interventions (SBT + additional components) Price manipulations - Farmers' market coupons - Nutrition education +	increasing sales and consum weight status/BMI both on the	rovision, price reductions, coupons) effective in uption of healthy food items, and in improving body their own, and when combined with other interventions reatment, structured meal plans, grocery lists, shared ucation.		- All RCT studies included in this review demonstrated a positive effect of economic incentives on food purchases, food consumption, or weight loss Trials had some methodological limitations including small sample sizes and short durations No studies assessed effects according to socioeconomic or ethnic group or measured the cost-effectiveness of such schemes Authors concluded that economic



coupons	incentives are a promising strategy to
	modify dietary behavior, but more research
	is needed to address the gaps in evidence. In
	particular, larger, long-term RCTs are
	needed with population groups at high risk
	of nutrition-related diseases.



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