

Food taxes and subsidies to protect health: relevance to Aotearoa New Zealand

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ABSTRACT

The hazardous and obesogenic food environment are major contributors to health loss in Aotearoa New Zealand. Here we consider the potential use of food taxes and subsidies to protect health in this country. We find that each one of the 14 recent systematic reviews on the tax and/or subsidy topic since 2015 in the scientific literature report that such interventions have favourable impacts from a health perspective. The New Zealand evidence we considered (n=12 studies since January 2010) is less definitive, but the pattern of results is consistent with the international evidence. Given this overall picture, the New Zealand Government should seriously consider such tax/subsidy interventions, potentially starting with a UK-style sugary drinks industry levy.

The hazardous and obesogenic food environment are very major contributors to health loss in Aotearoa New Zealand. In this country 32% of adults are obese (Māori: 47%; Pacific: 65%)¹ and ischaemic heart disease (for which diet is a key risk factor) is the most common cause of death.² Indeed, dietary risk factors and high body mass index are both in the top three leading causes of health loss in the country, when considering death and disability combined.²

Nutrition-related diseases such as diabetes, cardiovascular disease and obesity-related cancers are a particular burden for Māori and Pasifika and so are a major driver of ethnic inequalities in health in New Zealand. In particular, obesity appears to increasingly be a key contributor to ethnic inequalities in the cancer burden in this country.³

To give an indication of the huge size of the preventable burden in the nutrition domain, a single intervention to reduce salt (sodium) in the processed food supply in New Zealand could save an estimated 294,000 years of life (more precisely quality-adjusted life-years [QALYs]), over the remaining lifetime of the New Zealand population.⁴ This salt reduction intervention was also estimated to produce

net cost-savings to the health system of NZ\$ 1.5 billion. (Examples of other health generating and cost-saving dietary interventions for New Zealand and Australia are detailed in a recently developed online league table⁵). More specifically, the health risks of some food products are increasingly being clarified eg, consumption of sugar-sweetened beverages (SSBs) is associated with increased mortality primarily through cardiovascular mortality, with a graded association with dose.⁶ Furthermore, there is evidence that sugary drinks may provide greater health risks relative to sugar-containing foods.⁷

There are some regulations around food safety in New Zealand, but processed food is largely unregulated for nutritional content, eg, manufacturers have no limits on the amount of potentially hazardous ingredients (ie, sugar, salt and saturated fat) they can add to processed foods (albeit a diverse category that includes ultra-processed foods⁸). None of the damage to health of New Zealanders and the public health system costs associated with processed food are specifically paid for by the food industry (ie, it is largely paid by the taxpayer-funded health system and also by individuals and

their families). This means a major market failure exists⁹ and negative externalities are imposed on society. Such a market failure provides one rationale for taxes on unhealthy foods and beverages; or at least some type of regulation. But a potentially more important rationale is that taxes can be used as an effective instrument to achieve a societal goal, such as reducing child obesity.

Under Te Tiriti o Waitangi (the Treaty of Waitangi), the New Zealand Government has a duty to protect the health and wellbeing of Māori. In addition to the well-established ethical arguments for reducing health inequities in society, the Treaty provides a strong basis for Government action to reduce the harm imposed on Māori by the processed food industry. The Treaty is also relevant to the protection of land, the environment and the food sources cultivated and harvested by Māori. Treaty settlements also need to address the confiscation of Māori land in the 1800s, with some of this land being a source of food for Māori and part of economic prosperity.¹⁰

Given this background, this article briefly considers recent international and New Zealand evidence concerning food/beverages taxes and subsidies. It then identifies those issues of potential relevance to the New Zealand Government around making progress in these domains.

International evidence

Following a literature search, 14 systematic reviews on food or beverage interventions involving taxes or subsidies were identified (search in PubMed from 1 January 2015 to 15 June 2019). The study designs used within these reviews varied and included experimental, cross-sectional, simulations and 'real world' quasi-experimental studies. Each systematic review consistently showed changes in food or beverage consumption in directions favouring health (Appendix Table 1). There is some evidence that such interventions can benefit all socio-economic groups (reviews by Olstad et al¹¹ and Backholer et al¹² in Appendix Table 1) and may reduce inequities.¹¹ However, one systematic review found unclear income-related impacts (Mizdrak et al¹³). The evidence around substitution behaviours is

somewhat limited. Nevertheless, one meta-analysis reported a suggestive pattern of increased bottled water use with SSB taxes (Teng et al,¹⁴ in Appendix Table 1).

Given that most of the evidence in these 14 systematic reviews comes from high-income country studies, it probably has fairly high generalisability to the New Zealand setting. Even the systematic review of sugary drink taxes in middle-income countries¹⁵ may have relevance—especially for low-income New Zealand populations who may also be experiencing financial hardship. The overall international evidence is also consistent with the evidence for behaviour changes and health benefits from other health protecting taxes, including tobacco tax for tobacco control¹⁶ and alcohol taxes for alcohol control.^{17–19}

Evidence from New Zealand

The recent New Zealand evidence around pricing interventions and food costs is summarised in Appendix Table 2 (covering 12 studies published between 1 January 2010 and 31 March 2019; albeit 13 articles). In general, this evidence is consistent with the international evidence detailed above, by showing that tax and subsidy interventions can potentially improve health. The studies provide some indication that food pricing interventions may have pro-equity impacts (as in Appendix Table 2: Ni Mhurchu et al 2013²⁰; Ni Mhurchu et al 2014²¹). In some of this work a modelled 20% tax on all carbonated drinks was estimated to reduce daily energy intakes, avert or postpone 0.2% of all deaths in New Zealand per year, and reduce diabetes and obesity. The impact was estimated to be larger in Māori and Pacific populations compared to non-Māori and non-Pacific populations due to greater responsiveness to food price changes, and among children and young people compared to other ages due to their higher consumption of SSBs.²¹ A 20% tax on SSBs was estimated to generate NZ\$ 40 million in revenue per year (even allowing for reduced consumption), which could be used for health promotion and healthy food subsidies.

The evidence from randomised controlled trials (RCTs) in New Zealand is more limited. One of these was only a pilot study and involved free fruit in schools.²² It indicated an increase in fruit intake, albeit in the short-term. Another RCT indicated some

increased purchasing of healthier foods with price discounts in supermarkets.²³

More generally in terms of health protecting taxes, New Zealand research provides evidence that tobacco taxes are effective for tobacco control,^{24,25} and that alcohol taxes contribute to alcohol control.^{26,27}

Issues that the New Zealand Government should consider

The above evidence suggests that the New Zealand Government should give serious consideration to food and beverage pricing interventions. This approach would certainly be favoured by many New Zealand-based experts. For example, expert panels have described this country's use of "food fiscal policies" as involving "no action" in both 2014²⁸ and in 2017.²⁹ Furthermore, this work found that over 50 expert panel members rated the implementation of a tax on SSBs as a high priority for the Government. Below we consider some of the more specific issues that the Government should consider.

A strategic shift towards health protecting taxes

The Tax Working Group recommended in their 2019 Report,³⁰ and the Government accepted, the need to apply "corrective taxes" to reduce externalities and mitigate environmental damage caused by industry. We agree with aspects of this approach, but suggest that the prime reason for such taxes should be to achieve societal goals (ie, reducing child obesity), as opposed to merely "correcting" for negative externalities which are often hard to quantify. In Appendix Table 3 we detail the key issues around adopting a new health protecting tax (ie, a sugary drink industry levy) and make comparisons with an existing health protecting tax: tobacco tax.

Introduction of a sugary drink industry levy

Such a tax is increasingly being adopted in other jurisdictions.³¹ For New Zealand, it could potentially be modelled on the UK "soft drink industry levy" which triggered substantial reformulation by industry,³² and which modelling studies have suggested there will be significant health benefits.³³ Such a levy would be in line with current Government's priority on improving

wellbeing and protecting child health and would be consistent with New Zealand's approach to taxing tobacco and alcohol. Substitution concerns may be ameliorated by improving access to water (eg, provision of more drinking fountains in public places—which are deficient at present in New Zealand^{34,35}). The literature is also suggestive concerning SSB taxes being associated with increased water consumption (eg, in Berkeley, California³⁶).

In Australia, the discourse around SSB taxes has been informed by using a citizens' jury,³⁷ and this methodology could be used in New Zealand. However, public support in New Zealand is already relatively high (eg, 67% in one poll in 2017,³⁸ up from 52% in an earlier poll in 2015³⁹), if the tax revenue is used to fund childhood obesity prevention programmes. Support might be further enhanced, at least among parents of adolescents, if the SSB tax also encompassed sugary alcohol drinks (ie, ready-to-drink beverages).

A Mexican-style junk food tax

There is real-world evidence for such a tax having an impact from Mexico.^{40,41} Chile also has such a tax, with modelling work suggesting a likely favourable impact.⁴² These type of taxes have the particular advantage of covering a wide range of potentially hazardous foods (ie, processed foods high in sodium, sugar and saturated fat, which are also low in dietary fibre). As such, this broad type of tax may lower the risk of adverse substitution effects (eg, people switching from junk food high in sugar to junk food high in sodium). Including targeted food subsidies and tax revenue recycling could be considered as part of the same policy package (as detailed further below).

Tax revenue recycling to the community

To help address concerns around regressivity of food and beverage taxes, it is ideal that the tax revenue is recycled to the community. This could be by funding free (fully-subsidised) healthy breakfasts and lunches in all low-income schools and early childhood education centres, and ensuring adequate drinking water fountains in all public settings. But as per the experience in Philadelphia with a new SSB

tax, the community might favour directing the tax revenue to non-health areas such as improved childcare services or parental leave.⁴³ Reductions in GST and income tax are other recycling options. This type of tax revenue recycling can increase community support for raising specific taxes, as seen with British Columbia's successful carbon tax.^{44,45}

Further research

We consider that there is clearly enough evidence around food/beverage pricing interventions for policy-makers in New Zealand to seriously consider such approaches, eg, adopting a UK-style sugary drinks industry levy. But while doing so, health authorities should also keep systematically evaluating ongoing research (eg, a RCT in New Zealand suggesting benefits of food tax/subsidy interventions that was published just after the review period used in this article⁴⁶ and as part BODE³ modelling work, as per these publications on dietary interventions^{47,48}). Also further research may help fine-tune any New Zealand-adopted interventions so as to maximise the health

gain, the cost-effectiveness of intervention application and the impact on reducing health inequalities in the New Zealand setting (ie, especially for Māori, Pasifika and low-income New Zealanders).

Conclusions

In this article we briefly consider recent literature (14 recent systematic reviews and 12 relevant New Zealand studies) on food/beverage taxes and subsidies. This evidence clearly indicates that tax and subsidy interventions have favourable impacts from a health perspective and would seem likely to work in the New Zealand setting. Given this overall picture, such tax/subsidy interventions would be an important evidence-based policy as part of a wider strategy to improve the nutritional health of New Zealanders. A UK-style sugary drinks industry levy should be considered as an initial step. The findings of this review forms the basis of the position of the Health Coalition Aotearoa, a new non-governmental organisation which includes New Zealand health workers and researchers with expertise in nutrition.

Appendix

Appendix Table 1: Systematic reviews (n=14) published on food and beverage taxes and subsidies (ordered by ascending publication year for the period January 2015 to June 2019).*

Main findings of the systematic review	Review citation
Impact of taxes and subsidies dietary behaviours: This systematic review reported that: "there was consistent evidence that taxation and subsidy intervention influenced dietary behaviors." ... "To maximise success and effect, this review suggests that food taxes and subsidies should be a minimum of 10 to 15% and preferably used in tandem. Implementation of population-wide policies for taxation and subsidies with ongoing evaluation of intended and unintended effects are supported by this review."	Niebylski et al 2015 ⁴⁹
Tax and subsidy interventions: This systematic review included studies from a range of country types, but the analysis was still dominated by high-income country studies. It reported that fiscal interventions: "on foods can influence consumption of taxed and subsidised foods and consequently have the potential to improve health."	Alagiyawanna et al 2015 ⁵⁰

Appendix Table 1: Systematic reviews (n=14) published on food and beverage taxes and subsidies (ordered by ascending publication year for the period January 2015 to June 2019) (continued).*

Main findings of the systematic review	Review citation
<p>Inequities impact: This systematic review reported on a range of interventions to promote healthy eating. For price interventions it reported that: “‘Price’ interventions were most effective in groups with lower SEP [socioeconomic position], and may therefore appear likely to reduce inequalities. All interventions that combined taxes and subsidies consistently decreased inequalities.” The authors concluded that: “‘Upstream’ interventions categorised as ‘Price’ appeared to decrease inequalities, and ‘downstream’ ‘Person’ interventions, especially dietary counselling, seemed to increase inequalities.”</p>	<p>McGill et al 2015⁵¹</p>
<p>Responsiveness by personal characteristics: This systematic review of food and beverage experimental studies reported that: “the difference in price elasticity varied from 0.02 to 2.43 between groups within the same study.” Income-related factors were considered: “but the direction of this effect was not clear.” The review concluded that: “Patterns in price sensitivity by personal characteristics are complex. General conclusions pertaining to the effects of personal characteristics on price sensitivity are not supported by the evidence, which shows heterogeneity between studies and populations.”</p>	<p>Mizdrak et al 2015¹³</p>
<p>Inequities impact: This systematic review concluded that: “Fiscal measures had consistently neutral or positive impacts on inequities.”</p>	<p>Olstad et al 2016¹¹</p>
<p>Inequities and SSB tax: This systematic review concluded that: “Based on the available evidence, a tax on SSB will deliver similar population weight benefits across socioeconomic strata or greater benefits for lower SEP [socioeconomic position] groups. An SSB tax is shown to be consistently financially regressive, but to a small degree.”</p>	<p>Backholer et al 2016¹²</p>
<p>Taxes on SSBs: This systematic review was on SSB taxation in middle-income countries (nine studies). It reported: “estimates for own-price elasticity ranged from -0.6 to -1.2, and decreases in SSB consumption ranged from 5 to 39 kilojoules per person per day given a 10% increase in SSB prices. The review found that milk is a likely substitute...”. The review concluded that: “taxing SSBs will increase the prices of SSBs” and that “taxing SSBs will also reduce net energy intake by enough to prevent further growth in obesity prevalence, but not to reduce population weight permanently.”</p>	<p>Nakhimovsky et al 2016¹⁵</p>
<p>Salt tax: This systematic review concluded that: “Tax and community based counselling could, each typically reduce salt intake by 0.3g/day.” But this tax impact was considered likely to have less impact than: “comprehensive strategies involving multiple components (reformulation, food labelling and media campaigns).”</p>	<p>Hyseni et al 2017⁵²</p>
<p>Impact of taxes and subsidies on consumption: This systematic review and meta-analysis reported that: “In pooled analyses, a 10% decrease in price (ie, subsidy) increased consumption of healthful foods by 12% (95%CI=10–15%; N=22 studies/intervention arms) whereas a 10% increase price (ie, tax) decreased consumption of unhealthful foods by 6% (95%CI=4–8%; N=15).” ... “Each 10% price increase reduced sugar-sweetened beverage intake by 7% (95%CI=3–10%; N=5)”...“These prospective results, largely from interventional studies, support efficacy of subsidies to increase consumption of healthful foods; and taxation to reduce intake of unhealthful beverages and foods. Use of subsidies and combined multicomponent interventions appear most effective.”</p>	<p>Afshin et al 2017⁵³</p>

Appendix Table 1: Systematic reviews (n=14) published on food and beverage taxes and subsidies (ordered by ascending publication year for the period January 2015 to June 2019) (continued).*

Main findings of the systematic review	Review citation
<p>Impact of SSB taxes: Although this was a systematic review of health-related taxes in general, it did also consider specific ones, eg, SSB taxes. It reported that: “Findings demonstrate that high tax rates on sugar-sweetened beverages are likely to have a positive impact on health behaviours and outcomes...”. The review concluded that: “If the primary policy goal of a health tax is to reduce consumption of unhealthy products, then evidence supports the implementation of taxes that increase the price of products by 20% or more. However, where taxes are effective in changing health behaviours, the predictability of the revenue stream is reduced.” Additionally, “... earmarking health taxes for health spending tends to increase public support so long as policymakers follow through on specified spending commitments.”</p>	Wright et al 2017 ⁵⁴
<p>Price promotions: This systematic review covered pricing interventions with these mainly around promotion of foods (primarily fruit and vegetables). It reported that: “Pricing interventions generally increased stocking, sales, purchasing, and consumption of promoted foods and beverages.”</p>	Gittelsohn et al 2017 ⁵⁵
<p>Impact of SSB taxes: This systematic review reported that: “Findings indicated that purchases or sales of SSBs decreased significantly with taxation amounts of 8% (Berkeley, CA) and 10% (Mexico).” The review found one study that “found no effect on sales of SSBs” and 12 studies “resulting in a decrease in either purchasing behavior or sales or intent behaviour”. The review concluded: “Taxation significantly influences planned purchases and increases the probability of the purchase of healthy beverages. SSB taxes have the potential to reduce calorie and sugar intake, but further research is needed to evaluate effects on diet quality.”</p>	Redondo et al 2018 ⁵⁶
<p>Impact of SSB taxes: This systematic review and meta-analysis reported that: “The equivalent of a 10% SSB tax was associated with an average decline in beverage purchases and dietary intake of 10.0% (95%CI: -5.0% to -14.7%, n=17 studies, 6 jurisdictions) with considerable heterogeneity between results ($I^2=97%$). The equivalent of a 10% SSB tax was also associated with an average 1.9% increase in total untaxed beverage purchases and dietary intake (eg, for bottled water), but this was not statistically significant (95%CI: -2.1% to 6.1%, n=6 studies, 4 jurisdictions).”... The review concluded that: “Based on real-world evaluations, SSB taxes introduced in jurisdictions around the world appear to have been effective in reducing SSB purchases and dietary intake.”</p>	Teng et al 2019 ¹⁴
<p>Sugar reduction interventions—economic tools: This Cochrane systematic review included a section on economic tools (seven studies). The categories of interventions included were: (i) Price increases on SSBs; (ii) Financial incentives to purchase low-calorie beverages implemented through supermarket loyalty cards; and (iii) Price discounts on low-calorie beverages in community stores. The overall results were: “we found moderate-certainty evidence that price increases on SSBs are associated with decreasing SSB sales. For price discounts on low-calorie beverages reported effects on SSB sales varied.” One New Zealand study was included in this review, ie, Ni Mhurchu et al 2010²³ (see Table A2). This review noted that there is to be a forthcoming Cochrane Review on taxation of SSBs.</p>	von Philipsborn et al 2019 ⁵⁷

Note: *The search was conducted in PubMed for the period 1 January 2015 to 15 June 2019 with a range of search terms: eg, “systematic review” and food/beverage, price/subsidy. But the Teng et al study was identified via co-author involvement in this particular study and the Cochrane review was identified via media reporting. We excluded the systematic review by Sisnowski et al 2015⁵⁸ as it did not cover impacts (but rather the popularity of taxation relative to other interventions).

Appendix Table 2: New Zealand studies (n=12) relating to food pricing and food costs, published in the peer-review literature (for the period January 2010 to March 2019; ordered by publication year).*

Main findings of the New Zealand study	Study citation/s
<p>RCT of price changes: The SHOP randomised controlled trial in eight New Zealand supermarkets reported the impact of price discounts of 12.5% (the same as a removal of GST at this time). At six months there was no impact on saturated fat purchased. “However, those subjects who were randomly assigned to receive price discounts bought significantly more predefined healthier foods at 6 mo (11% more; mean difference: 0.79 kg/wk; 95% CI: 0.43, 1.16; P<0.001) and 12 mo (5% more; mean difference: 0.38 kg/wk; 95% CI: 0.01, 0.76; P=0.045).” The authors concluded: “the significant and sustained effect of discounts on food purchases suggests that pricing strategies hold promise as a means to improve population diets.”²³</p> <p>In terms of the impact by ethnicity, the authors wrote in a separate paper: “While a statistically significant variation by ethnicity in the effect of price discounts on food purchasing was found, the authors caution against a causal interpretation due to likely biases (eg, attrition) that differentially affected Māori and Pacific people.”⁵⁹</p>	<p>Ni Mhurchu et al 2010²³</p> <p>Blakely et al.2012⁵⁹</p>
<p>Price sensitivity: This study of New Zealand food expenditure data reported that: “Own-PE [price elasticities] estimates (with two exceptions) ranged from -0.44 to -1.78. Cross-PE estimates were generally small; only 31% of absolute values were greater than 0.10. Excluding the outlier ‘energy drinks’, nine of 23 food groups had significantly stronger own-PEs for the lowest versus highest income quintiles (average regression-based difference across food groups -0.30 (95% CI -0.62 to 0.02)). Six own-PEs were significantly stronger among Māori; the average difference for Māori: non-Māori across food groups was -0.26 (95% CI -0.52 to 0.00).” The authors concluded that: “Food pricing policies have potential to improve population diets. The greater sensitivity of low-income households and Māori to price changes suggests the beneficial effects of such policies on health would be greatest for these groups.”</p>	<p>Ni Mhurchu et al 2013²⁰</p>
<p>Low cost and sustainable diets: This modelling study: “identified daily dietary patterns that met key nutrient requirements for as little as a median of NZ\$ 3.17 per day (US\$ 2.41/d) (95% simulation interval [SI]=NZ\$ 2.86 to 3.50/d). Diets that included ‘more familiar meals’ for New Zealanders, increased the cost. The optimised diets also had low GHG [greenhouse gas] emission profiles compared with the estimate for the ‘typical New Zealand diet’ ...” ... “All of the optimised low-cost and low-GHG dietary patterns had likely health advantages over the current New Zealand dietary pattern, ie, lower cardiovascular disease and cancer risk.”...“These results could help guide central and local government decisions around which foods to focus policies on. That is which foods are most suitable for: food taxes (additions and exemptions); healthy food vouchers and subsidies;...”</p>	<p>Wilson et al 2013⁶⁰</p>
<p>Cost of low salt diets: In this modelling study that constrained daily food cost to <NZ\$ 9/day [d], it was possible to have a diet with the sodium intake levels below the 2,300 mg/d (5.8 g salt/d) recommended maximum. The authors concluded that: “These results provide some reassurance for the feasibility of substantially reducing population sodium intake given currently available low-cost foods and while maintaining some level of familiar meals.”</p>	<p>Wilson et al 2013⁶¹</p>

Appendix Table 2: New Zealand studies (n=12) relating to food pricing and food costs, published in the peer-review literature (for the period January 2010 to March 2019; ordered by publication year) (continued).*

Main findings of the New Zealand study	Study citation/s
<p>Access to lower cost food at fresh food markets: This modelling study on access to markets reported that: “farmers’ markets provided fairly poor access for the total population: 7% within 12.5 km (15 min driving time); 5% within 5km; and 3% within 2km. Modelling the optimal distribution of the 48 markets substantially improved access for the most deprived groups...”. “Access for Māori also improved: 22% (vs 7%) within 12.5km...” The authors concluded that: “These results highlight the potential for improving farmers’ market locations to increase accessibility for groups with low FV [fruit and vegetable] consumption. Given that such markets are easily established and relocated, local governments could consider these results to inform decisions, including subsidies for using government land and facilities.”</p>	Pearson & Wilson 2013 ⁶²
<p>Fruit and vegetable prices in fresh food markets: This study of prices in markets (including farmers markets) reported that: “In these locations general markets appear to be providing some substantially lower prices for fruit and vegetables than supermarkets. They also appear to be depressing prices in neighboring supermarkets. These results, when supplemented by other needed research, may help inform the case for interventions to improve access to fruit and vegetables, particularly for low-income populations.”</p>	Pearson et al 2014 ⁶³
<p>SSB tax modelling: This modelling study considered the impact of a 20% tax on all carbonated drinks. It reported that this intervention would reduce obesity and diabetes and avert or postpone 0.2% of all deaths in New Zealand a year. The impact was estimated to be larger in Māori and Pacific populations (due to greater price sensitivity to food price changes, and among children and young people due to their higher consumption of SSB). It was estimated that this 20% tax would generate NZ\$ 40 million in revenue per year in revenue.</p>	Ni Mhurchu et al 2014 ²¹
<p>Salt tax modelling: A modelled salt tax for New Zealand was estimated to generate large health gains and cost savings. However, the benefits were not as much as a sinking lid on the sodium supply down to recommended levels, or when compared to a subsequently studied reformulation intervention (using potassium salts) for sodium reduction.⁴ “Also the salt tax would raise revenue (up to NZ\$ 452 million/year)”.</p>	Nghiem et al 2015 ⁶⁴
<p>Tax and subsidy modelling: This modelling study estimated that: “a 20% subsidy on fruit and vegetables would result in 560 (95% uncertainty interval, 400 to 700) DPP [deaths prevented or postponed] each year (1.9% annual all-cause mortality). A 20% tax on major dietary sources of saturated fat would result in 1,500 (950 to 2,100) DPP (5.0%), and a 20% tax on major dietary sources of sodium would result in 2,000 (1300 to 2,700) DPP (6.8%). Combining taxes on saturated fat and sodium with a fruit and vegetable subsidy would result in 2,400 (1,800 to 3,000) DPP (8.1% mortality annually). A tax on major dietary sources of greenhouse gas emissions would generate 1,200 (750 to 1,700) DPP annually (4.0%). Effects were similar or greater for Maori and low-income households in relative terms.” The authors concluded that: “Health-related food taxes and subsidies could improve diets and reduce mortality from diet-related disease in New Zealand. Our study adds to the growing evidence base suggesting food pricing policies should improve population health and reduce inequalities, but there is still much work to be done to improve estimation of health impacts.”</p>	Ni Mhurchu et al 2015 ⁶⁵

Appendix Table 2: New Zealand studies (n=12) relating to food pricing and food costs, published in the peer-review literature (for the period January 2010 to March 2019; ordered by publication year) (continued).*

Main findings of the New Zealand study	Study citation/s
<p>Stakeholder views (taxes/subsidies): Based on 20 New Zealand stakeholder interviews, this study found that: “According to key stakeholders there appears to be little appetite for taxes on foods high in saturated fat or salt in New Zealand. Stakeholders largely agreed that a tax on sugar-sweetened beverages (SSBs) and a subsidy on fruit and vegetables were both feasible and likely acceptable. There was strong support for starting with a SSBs tax, possibly framed around protecting children and dental health.”...“A tax on SSBs and a subsidy on fruit and vegetables, possibly in tandem, could be part of the solution in New Zealand.”</p>	Signal et al 2018 ⁶⁶
<p>Cost of New Zealand diets/GST exemption: “The average cost of healthy household diets was NZ\$27 more expensive than the average cost of current diets, but 25.8% of healthy diets were cheaper than the average cost of current diets. This cost differential could be reduced if fruits and vegetables became exempt from Goods and Services Tax. Healthy diets were cheaper with an allowance for discretionary foods and more expensive when including takeaway meals. For Māori and Pacific households, healthy diets were on average \$40 and \$60 cheaper than current diets due to large energy intakes.” (That is, a healthier diet with a lower energy intake would be cost-lowering in these populations).</p>	Vandevijvere et al 2018 ⁶⁷
<p>Cost of New Zealand diets/GST removal: “The modelled healthy diet was cheaper than the current diet for the total population (3.5% difference) and Pacific households (4.5% difference) and similar in cost for Māori households (0.57% difference). When the diets were equivalent in energy, the healthy diet was more expensive than the current diet for all population groups (by 8.5% to 15.6%). For households on the minimum wage, the diets required 27% to 34% of household income, and if receiving income support, required 41% to 52% of household income.”...“Both the modelled healthy and current diets are unaffordable for some households as a considerable portion of income was required to purchase either diet. Policies are required to improve food security by lowering the cost of healthy food or improving household income.” Gifting and gathering of kai was estimated to reduce the cost of a healthy diet by 10%. Removing GST from fruit and vegetables was estimated to reduce the cost of a healthy diet by 5%, and removing GST off core foods would reduce the cost by 13%.</p>	Mackay et al 2018 ⁶⁸

Note: * The search was conducted in PubMed for the period 1 January 2010 to 31 March 2019. Search terms included: “Zealand” and food/beverage and price/subsidy/cost.

Appendix Table 3: Primary and supportive issues when considering a new health protecting tax (ie, in this case on sugary drinks) and a comparison with an established tax in New Zealand on tobacco.

Key issue	Tobacco tax (in place in New Zealand and regularly increased)	Sugary drinks industry levy (a potential policy tool for New Zealand)
<p>Primary issue: Does the tax work to help achieve a societal/health goal?</p>	<p>Yes: Tobacco tax is a very effective and well-established tobacco control tool.¹⁶ It is probably the most important single mechanism used in New Zealand to make progress towards the New Zealand Government’s goal⁶⁹ of a Smoke-free Aotearoa by 2025.</p>	<p>Yes: As per a meta-analysis, SSB taxes appear to be effective in reducing purchases and dietary intake.¹⁴ This approach would therefore help achieve the New Zealand Government’s “Childhood obesity plan”⁷⁰ that includes the aim of preventing obesity in children and young people. The New Zealand Government’s budget of 2019 was titled a “Wellbeing budget” which also included the relevant goals of “Improving child wellbeing” and “Supporting Māori and Pasifika aspirations”.⁷¹</p>
<p>Supportive issue: Does the tax help to address negative externalities including harm to others?</p>	<p>Yes: Part of the justification for a tobacco tax is the harm to non-smokers (and fetuses) from second-hand smoke exposure. Sometimes other negative externalities are detailed in the New Zealand setting eg, litter from tobacco packaging⁷² and nuisance impacts.⁷³</p>	<p>Yes: In the case of sugary drinks, the extra health costs generated by the users of SSBs that are imposed on the public health system are appropriately considered as a “fiscal externality” (albeit also described as a “moral hazard cost”).⁷⁴</p>
<p>Supportive issue: Is the cost of administering the tax relatively low?</p>	<p>Yes: This is such a well-established tax with well-refined collection mechanisms that administration costs appear to be very low.</p>	<p>Yes: Other countries with SSB taxes have not reported administration costs as a major concern and New Zealand has a very long experience of taxing a wide range of alcoholic beverages.</p>
<p>Supportive issue: Can any downsides of the tax be ameliorated?</p>	<p>Yes: While there is the potential to increase financial harm to smokers who don’t quit or cut down, this can be ameliorated via: welfare benefits; permitting access to very much cheaper e-cigarettes (currently the case in New Zealand); providing free quitting services (eg, the New Zealand Quitline); and potentially by subsidising e-cigarettes (not yet in place in New Zealand).</p>	<p>Yes: There is a slight potential for increased financial hardship for those in poverty who don’t reduce their SSB intake after the tax. But this can be ameliorated by: (i) promoting water as a substitute (eg, done in many New Zealand schools); (ii) improving access to drinking water fountains in public places (being done in parts of New Zealand); and (iii) requiring warning labels on SSBs so that people are informed of the hazard (not yet in place in New Zealand).</p>

Competing interests:

Nil.

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Vitamin D concentrations in New Zealanders with and without inflammatory bowel disease: do they differ?

Hannah Morton, Kevin C Pedley, Robin JC Stewart, Jane Coad

People with inflammatory bowel disease (IBD), which occurs at a high prevalence in New Zealand, are at increased risk of vitamin D deficiency. This study investigated the vitamin D status of people with IBD (Crohn's disease and ulcerative colitis) recruited from various towns throughout New Zealand and compared them to healthy controls. The main findings suggest that vitamin D status may be associated with disease severity in Crohn's disease.

Food taxes and subsidies to protect health: relevance to Aotearoa New Zealand

Nick Wilson, Lisa Te Morenga, Sally Mackay, Sarah Gerritsen, Christine Cleghorn, Amanda C Jones, Boyd Swinburn

The hazardous and obesogenic food environment are major contributors to health loss in Aotearoa New Zealand. In this article we report that each one of the 14 recent systematic reviews on the food tax and/or subsidy topic since 2015, find that such interventions have favourable impacts from a health perspective. The New Zealand-specific evidence we considered (12 studies since January 2010) is less definitive, but the pattern of results is consistent with the international evidence. Given this overall picture, the New Zealand Government should consider such tax/subsidy interventions, potentially starting with a UK-style sugary drinks industry levy.

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