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How taking an evidence-informed approach can be used to prioritise interventions: The example of cardiovascular disease

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BRIEFING to the Incoming Government

Summary

New governments are fortunate in being able to use modern techniques to help them take evidence-informed decisions about which health priorities to focus on, and how to achieve maximum health gains. In this Briefing we firstly outline how evidence identifies the condition causing the greatest health loss in the Aotearoa NZ: cardiovascular disease. And secondly how evidence informs how governments can *maximise health gain and cost-savings* from specific interventions that have been studied for NZ. For example, we show a combined fruit and vegetable subsidy plus a sugar tax produces estimated lifetime savings of 894,000 health-adjusted life years and health system cost-savings of $19.4 billion. Applying an equity lens would also favour this dietary intervention for advancing Māori health.

A new government has the opportunity to apply modern epidemiological techniques to optimise the selection of public health interventions. In this Briefing we use the example of interventions to prevent cardiovascular disease (CVD) – the highest ranked cause of death and disability in Aotearoa New Zealand.

Cardiovascular disease: very high health burden and very expensive

Ischemic heart disease is the highest ranked cause of death and disability combined in Aotearoa New Zealand (NZ).[1] Stroke is ranked fifth. Both ischaemic heart disease and stroke are components of the broader category of cardiovascular disease, or CVD.

Each year CVD is estimated to cause nearly 12,000 premature deaths. Furthermore, many people live with poor health due to CVD. Together the premature deaths and morbidity from CVD can be captured with the measure of *disability-adjusted life years* (DALYs). One DALY represents the loss of the equivalent of one year of full health, and CVD costs New Zealanders 180,000 DALYs each year. As such, CVD accounts for about 15% of all ‘health loss’ in the country.[1] CVD is also an important contributor to health loss for Māori and a major contributor to health inequities.[2-4]

CVD is also very expensive to treat, costing the health system about $3.3 billion each year. And it is not just the health system out of pocket. New Zealanders lose over $700 million each year in lost income due to CVD (that is 16% of all disease-related income loss; and far ahead of cancer-related income loss).[5] Other NZ work has also highlighted the relevance of prioritising CVD.[6]

What we did

Firstly: Identifying high priority risk factors to guide preventive interventions

We first identified the most prominent risk factors for CVD in NZ using data from the Global Burden of Disease (GBD) Study (ie, using the "GBD Results Tool"[1]). A full description of the methods are in an article in a peer-reviewed journal: Wilson et al 2023.[7]

The most common risk factors for death and disability due to CVD were: high systolic blood pressure, dietary risk factors (such as a diet high in processed meat or low in fruits and vegetables), high LDL cholesterol, high body mass index (being overweight or obese), and then tobacco exposure. The total deaths and DALYs attributable to these risk factors are shown in the figure below (full table and additional details are available in the Appendix).

Secondly: Prioritising interventions (health gain, cost-effectiveness, equity)

Government resources are limited, and so wise governments should ensure that any interventions to prevent CVD are evidence-informed and cost-effective. Fortunately, we were able to identify 22 NZ-relevant peer-reviewed publications that had studied CVD-related control interventions (see the original publication:[7]). The top ranked interventions for the top five risk factors are in the table below (a full table is available in the Appendix). Also shown are the relevant health impacts for Māori vs non-Māori for each intervention. More detail can be accessed by clicking on individual cells in the table.

* *For further details see the Appendix. The terms health-adjusted life years (HALYs) and quality-adjusted life years (QALYs) used in different studies that inform this table's contents, can be considered to be broadly equivalent.*

Comment

It is clear from these results that the highest impact intervention for preventing CVD was a dietary one: a combined fruit and vegetable subsidy plus a sugar tax. This intervention was designed to be cost-neutral to the consumer, with tax-increases offset by subsidies so that the cost of a standard basket of groceries remains unchanged. Furthermore, this intervention was estimated to produce lifetime savings of 894,000 health-adjusted life years for the NZ population (referring to the remaining life of the NZ population alive in 2011, ie, modelled until all cohort members died – and not considering new births). Behind this intervention, in terms of impact size, were a salt tax (to address high blood pressure), a saturated fat tax (to lower LDL cholesterol), and a sinking lid on tobacco sales.

In health economic terms, the same fruit and vegetable subsidy plus a sugar tax intervention generated the highest cost-savings to the NZ health system at around $19 billion (NZD 2023; 3% annual discount rate). So this intervention would potentially be the preferred choice for those policy-makers concerned with maximising health gains and health cost-savings.

But governments should also be concerned with health inequities, and so need to consider the relative and absolute changes to Māori health. Here the best choice depends on the perspective taken:

1. The sinking lid (tobacco control) intervention in the above table gave the highest *relative* gain for Māori vs non-Māori (of 3.23 times that of non-Māori: actually 155 QALYs per 1000 Māori population vs 48 QALYs per 1000 population for non-Māori[8]).
2. The fruit and vegetable subsidy and sugar tax produced lower *relative* gains than the sinking lid – but would improve Māori health more in *absolute* terms (ie, 826,000 QALYs gained for Māori from this dietary intervention[9] vs 467,000 QALYs gained from the sinking lid intervention[8] [using the comparable results for the 0% discount rate from the two studies]).

This whole prioritisation exercise might seem unrealistic to those with a realpolitik perspective – given that government decision-making is often driven by ideological factors or for short-term political gain. Indeed, the only part of the NZ health system that appears to systematically attempt evidence-informed prioritisation is Pharmac. But we have seen with the last government the use of evidence[10] [11] to inform the progressive 2022 law to bring in tobacco retail reductions, the denicotinisation of tobacco and the smokefree generation.

With this in mind, we encourage the new government to be open to taking evidence-informed approaches to major health issues so as to maximise health gain, maximise cost savings, and improve health equity for the population it serves. But we recognise that such prioritisation exercises should ideally also consider issues of intervention acceptability/feasibility and the potential non-health co-benefits that can arise from these type of interventions (as detailed further in the Appendix).

What is new in this Briefing?

- We take an evidence-informed approach to show how to prioritise public health interventions for an example disease: cardiovascular disease (the major cause of health loss and premature death in Aotearoa NZ).
- We show that for this example it is possible to systematically prioritise interventions using NZ-specific data in terms of maximum health gain, maximum cost-savings and gains in equity (Māori vs non-Māori).

Policy implications

- In the real-world, policy-makers may continue to favour new health interventions for reasons of political ideology and political expediency. But if they wish to move in an evidence-informed direction – then the data and analytic techniques can be available to support such decision-making for major causes of health loss.

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BRIEFING to the Incoming Government

This article is part of the series Briefings to the Incoming Government, highlighting challenges and opportunities in the public health policy space.

Appendix: Additional details on CVD risk factors and examples of the non-health co-benefits of the interventions considered

Table A1: Cardiovascular (CVD) health burden in 2019 for NZ attributable to specific risk factors and ranked by number of disability-adjusted life years lost [DALYs; for all ages, both sexes; (95% uncertainty intervals), GBD data extracted using the "GBD Results Tool"; Source: Adapted from:[7] and with a longer list in the figure at the end of this Appendix.

Risk factor*	**CVD deaths**		**DALYs lost**	
	Count	**%****	**Count**	**%****
High systolic blood pressure	5400 (4210 to 6470)	45.2	84,800 (71,400 to 97,700)	46.3
Dietary risk factors – all	3970 (3180 to 4810)	33.3	62,400 (51,000 to 74,900)	34.1
High LDL cholesterol	3330 (2300 to 4530)	27.9	51,200 (40,000 to 64,600)	28.0
High body-mass index (BMI)	1940 (1130 to 2850)	16.3	40,100 (25,500 to 56,300)	21.9
Tobacco (including secondhand smoke***)	1400 (1270 to 1520)	11.7	30,400 (28,000 to 32,900)	16.6

* *Most of these risk factors are not independent of one another. Eg, the blood pressure risk factor, the high LDL cholesterol risk factor and high BMI risk factor, will each be partly mediated via "dietary risk factors".*
** *This is the proportion out of the total of 11,900 deaths and 183,000 DALYs attributed to CVD in NZ in 2019 (with 79.6% of the total DALYs being attributed to named risk factors in the GBD [ie, not all risk factors are covered in the GBD]).*
*** *Of the tobacco group, 11% of the deaths and DALYs were attributed to secondhand smoke exposure.*
Values rounded to three meaningful digits.

Table A2: Top five risk factors for CVD health loss ordered by decreasing size of health gain (through all diseases) and the impact of interventions studied in the NZ context (on health, costs and equity; 3% discount rate applied to HALYs/QALYs and costs)

Risk factor (from Table 1)	Highest impact health gain from an intervention identified	Highest impact cost-saving* from an intervention identified	Equity impact (Māori vs non-Māori)	Comment
Dietary risk factors	894,000 health-adjusted life years (HALYs) gained (a combined fruit and vegetable subsidy plus a sugar tax)[9]	US$ 11.0 billion saved (US$ 2018) (as per this same intervention)	1.55 times higher per capita health gains for Māori vs non-Māori (age-standardised). Even higher in an equity analysis[#]: 2.26 times.	Out of the 8 different interventions in this modelling study.[9] The estimated health gain includes that from both preventing CVD but also non-CVD diseases.
High systolic blood pressure (BP)	453,000 HALYs gained (salt tax)[9]	US$ 5.90 billion saved (US$ 2018) (salt tax)[9]	1.80 times higher per capita health gains for Māori vs non-Māori (age-standardised). Even higher in an equity analysis[#]: 2.58 times.	As above.
High LDL cholesterol	436,000 HALYs gained (saturated fat tax)[9]	US$ 5.87 billion saved (US$ 2018) (saturated fat tax)[9]	1.70 times higher per capita health gains for Māori vs non-Māori (age-standardised). Even higher in an equity analysis[#]: 2.43 times.	As above.

Risk factor (from Table 1)	Highest impact health gain from an intervention identified	Highest impact cost-saving* from an intervention identified	Equity impact (Māori vs non-Māori)	Comment
Tobacco use	282,000 quality-adjusted health years (QALYs) gained (from a sinking lid on supply)[8] [##]	NZ$ 5.43 billion saved (NZ$ 2011) (~ US$ 4.07 in US$ 2018) (from a sinking lid on supply)[8]	3.23 times higher per capita health gains for Māori vs non-Māori (age-standardised). Even higher in an equity analysis[#]: 4.58 times.	This study captured CVD-related health benefits but also the benefits of preventing 14 other tobacco-related diseases. The sinking lid would involve regular reductions in the amount of tobacco supplied to the commercial market until supply ends.
High body-mass index (BMI)	250 QALYs gained (from the weight-loss counselling intervention applied to 21.6% of the eligible population[12]).	No cost-saving intervention identified	2.33 times greater per capita health gains for Māori vs non-Māori in the target population of obese and overweight people (age-standardised). This value increased by 27% in an equity analysis.[#]	We note however, that the "combined fruit and vegetable subsidy plus a sugar tax" intervention detailed above – would also deliver BMI reduction benefits (in addition to other benefits).

** That is, cost-saving from a NZ health system perspective at a 3% discount rate.*
*** With cost-effective being defined as up to the GDP per capita of NZ (NZ$45,000 in 2011 or ~US$31,000) as per the standard BODE[3] modelling approach for NZ analyses.[13]*
 # An "equity analysis" involves the use of non-Māori all-cause mortality and morbidity in the analysis. This is so as to remove penalisation for Māori having higher background mortality and morbidity limiting the envelope of health gain relative to non-Māori.
Since the analysis on which this tabulated data are based was performed, a further analysis suggests a higher health gain than the sinking lid intervention. That is the 594,000 HALYs gained by the combined package of denicotinisation, tobacco retail reduction and smokefree generation.[14] This is primarily due to the faster phase-in process of this intervention package (relative to the slower sinking lid phase-in).

Examples of non-health benefits from CVD interventions

When considering new interventions, policy-makers should ideally consider commissioning updated literature reviews of the evidence for effectiveness and cost-effectiveness (eg, updates of studies in league tables such as this one of NZ and Australian interventions:[15]). They also need to consider the acceptability and feasibility of intervention implementation (eg, if mass media campaigns are needed to explain the potential benefits and costs to the public before roll-out). They should also ideally factor in the wider non-health benefits – for which we give examples below that relate to some of the CVD interventions in Table A2:

Taxes on sugar

- New Zealanders who had lower rates of diet-related diseases would be expected to experience higher incomes (as per NZ data[5]).
- The government would be expected to receive increased income tax as a result of increased worker productivity from lower rates of diet-related diseases (as per NZ data[16]).
- All sugar in NZ is imported, so there could be an advantage to NZ's balance of payments (ie, the difference between all money flowing into the country and the outflow of money to the rest of the world).
- If the sugar tax was not designed to be cost neutral for consumers (eg, via being combined with fruit and vegetable subsidies) the tax could pay for other health investments (eg, expanding the healthy school lunch programme).

Taxes on saturated fat

- New Zealanders who had lower rates of CVD would be expected to experience higher incomes (as per NZ data[5]).
- The government would be expected to receive increased income tax as a result of increased worker productivity from lower rates of CVD (as per NZ data[16]).
- If the tax was not designed to be cost-neutral for consumers (eg, via being combined with fruit and vegetable subsidies) the tax could pay for other health investments (eg, expanding the healthy school lunch programme).
- If such taxes reduced the number of ruminant livestock in NZ, then this could help NZ meet its international obligations concerning greenhouse gases.
- As per the point directly above, such taxes may also reduce other environmental harms from livestock agribusiness (on water quality, erosion, zoonotic diseases etc).

Sinking lid (or other similar tobacco control measures)

- New Zealanders who had lower rates of tobacco-related diseases would be expected to experience higher incomes (as per NZ data[5]).
- The government would be expected to receive increased income tax as a result of increased worker productivity from lower rates of tobacco-related diseases (as per NZ data[16]).
- All tobacco in NZ is imported, so there could be an advantage to NZ's balance of payments.
- The litter problem would probably decrease as tobacco is a major cause of litter.
- The occurrence of fires would probably decrease as tobacco use is a cause of fires in houses and of forests.

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https://www.phcc.org.nz/briefing/how-taking-evidence-informed-approach-can-be-used-prioritise-interventions-example

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