The priorities: Estimating impact of interventions on health outcomes

Professor Tony Blakely, and on behalf of BODE^3 team

Productivity

Wellbeing

Health services 11% GDP

What chronic diseases are causing the most loss of health in NZ?

17.7%	14.7%	12.9%	12.0%	4.9%
Cancers	Cardiovascular disease	Musculoskeletal conditions	Mental and substance use disorders	Diabetes

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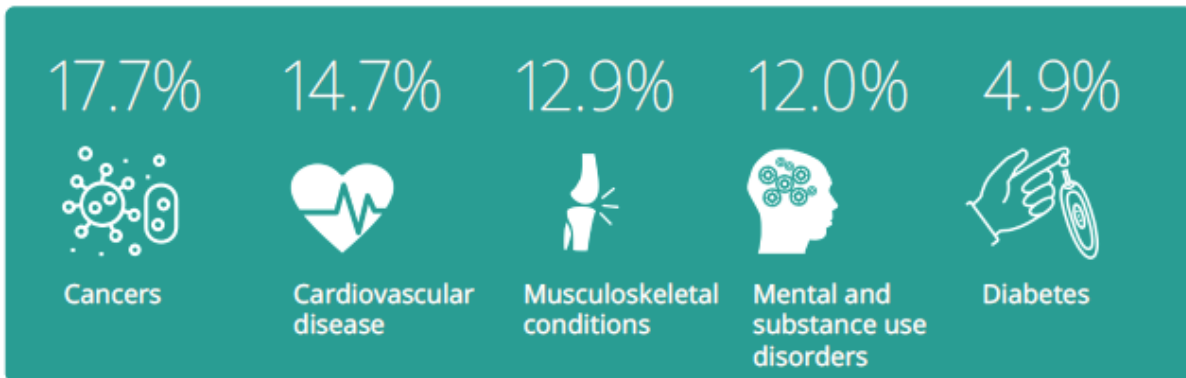
bode³

Burden of Disease Epidemiology, Equity and Cost Effectiveness Programme

Intervention effectiveness and cost

What risk factors are causing these diseases?

8.9%	8.6%	8.6%	8.0%	6.7%
Overweight	Unhealthy diet	Tobacco use	Blood pressure	Alcohol and other drug use

3

Aim of BODE³

To estimate health and wider societal gains, costs, cost-effectiveness and equity impacts of preventive interventions, and build capacity in modelling of preventive interventions.

HRC-funded BODE³ 2016-21

Obj 1: Dietary and physical activity interventions

Obj 2: Interventions targeted by absolute CVD risk

Obj 3: Morbidity & productivity in aging population

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PLATFORM: Models, league tables, knowledge translation

Plus much more

- **MBIE and other funding**
- **Tobacco, screening programmes, cancer treatments, palliation, health services effectiveness, health system costs**
- **Impacts on health inequalities**

We use QALYs

- QALYs = quality adjusted life years gained
  - Very similar to DALYs (disability adjusted life years) averted
- When we say "100,000 QALYs gained", we mean:
  - 100,000 QALYs gained for the 2011 New Zealand population alive (n= 4.4 million) over the remainder of their lives
  - Which would be:
    - 23 healthy life years gained per 1000 people, or
    - 8.3 healthy days per person
- We usually use 3% discounted QALYs (but also 0% and 6%)

So how do we actually do it?

- Build a 'business as usual' model of New Zealand population alive in 2011, over the rest of their lives

- Conceptualize and intervention, e.g. dietary counselling or an SSB tax or food reformulation

- Source the input parameters for the intervention (e.g. uptake rates, attrition, etc for counselling; price elasticities for taxes)

- Overlay intervention on BAU, and determine the change in QALYs and costs between intervention and BAU = intervention effect

  We use macro-simulation, in particular a multistate lifetable
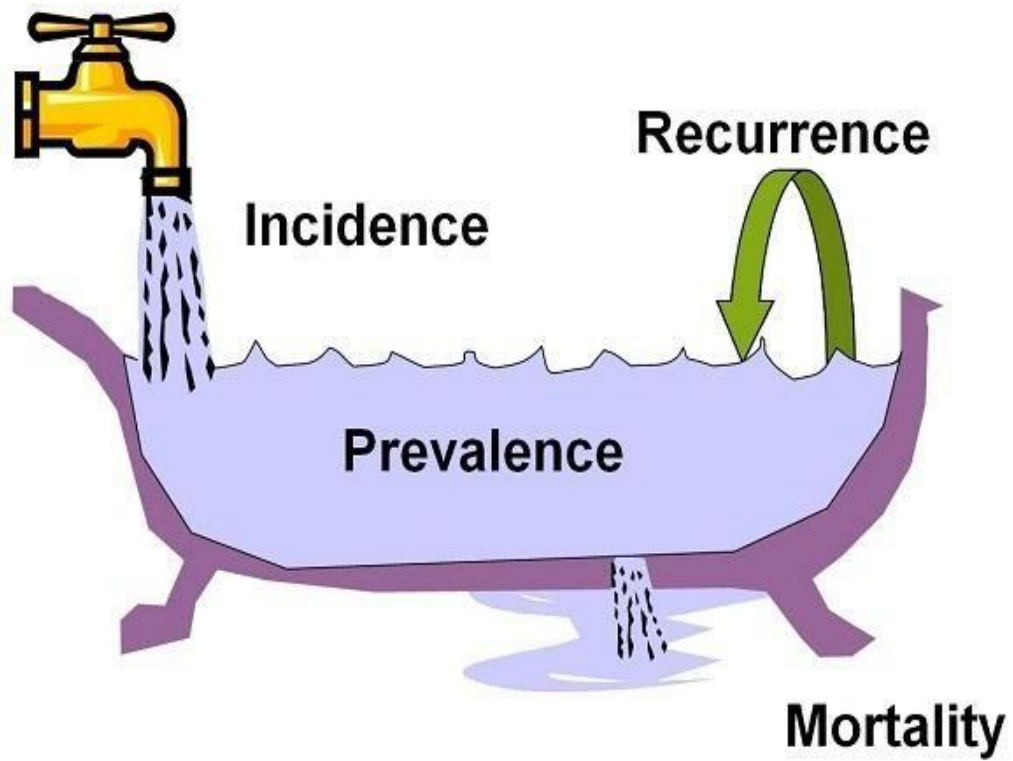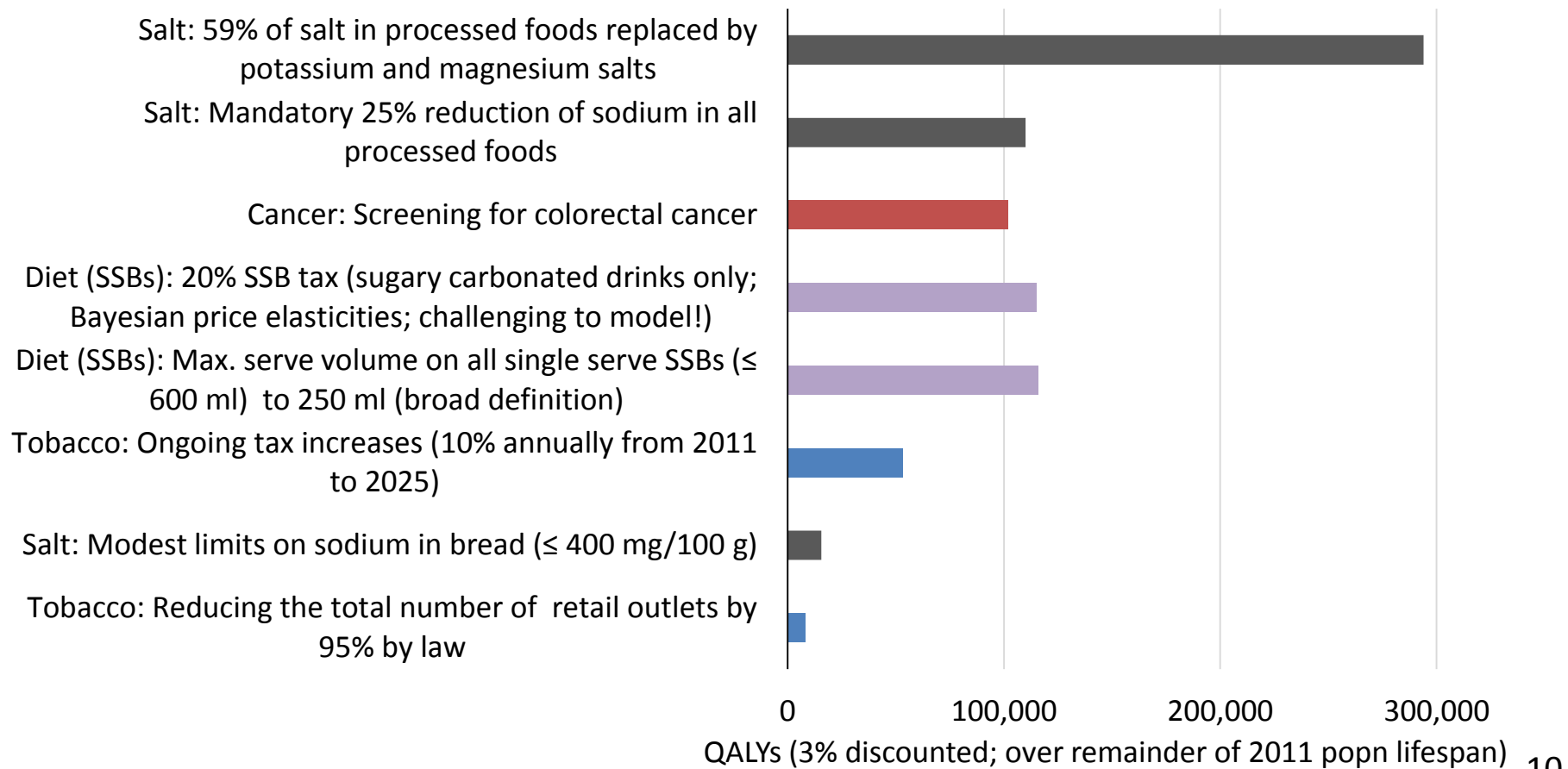
Methods – multistate lifetable

- A multistate lifetable is literally that – a lifetable in which subjects (proportions of a cohort) can be in multiple states simultaneously

	A	B	C	D	E	F	G	H	I	
1					Life table cohort	Deaths in cohort				
2	sex	age	average mortality rate at age x	probability of dying between age x and x+1	no. of survivors at age x out of those in year 1	no. who die between age x and x+1	no. of person-years lived by cohort to age x+½	life expectancy	prevYLD rate from all causes	disa p
3		x	m_x	q_x	l_x	d_x	L_x	e_x	w_x	
4			mortality data	$q_x = 1 - EXP(-m_x)$	l_0 = population $l_x = l_{x-1} - d_{x-1}$	$d_x = q_x \times l_x$	$L_x = (l_x + l_{x+1})/2$ $L_{110+} = l_{110+}/m_{110+}$	$e_x = \Sigma L_x / l_x$	from BOD data	$Lw_x =$
7	male	4	0.000135194	0.0001	114928	16	114920	79.14	0.026408649	
8	male	5	0.00010438	0.0001	114912	12	114906	78.15	0.03374444	
9	male	6	8.39192E-05	0.0001	114900	10	114895	77.16	0.03374444	
10	male	7	6.41376E-05	0.0001	114891	7	114887	76.17	0.03374444	
11	male	8	5.40211E-05	0.0001	114883	6	114880	75.17	0.03374444	

LifeTable CHD Stroke COPD LRTI BladderCan CervicalCan EndometrialCan

Ready 100%

What we are aiming to achieve is…..

Salt: 59% of salt in processed foods replaced by potassium and magnesium salts

Salt: Mandatory 25% reduction of sodium in all processed foods

Cancer: Screening for colorectal cancer

Diet (SSBs): 20% SSB tax (sugary carbonated drinks only; Bayesian price elasticities; challenging to model!)

Diet (SSBs): Max. serve volume on all single serve SSBs (≤ 600 ml) to 250 ml (broad definition)

Tobacco: Ongoing tax increases (10% annually from 2011 to 2025)

Salt: Modest limits on sodium in bread (≤ 400 mg/100 g)

Tobacco: Reducing the total number of retail outlets by 95% by law

0   100,000   200,000   300,000

QALYs (3% discounted; over remainder of 2011 popn lifespan)

BODE³ League Table

This interactive league table allows researchers and policy-makers to rank health 'interventions' by health gains, costs, or cost-effectiveness. You can use the section on the left to customize your search.

Select Domain

| 3 items selected | ▼ |

Select Main Intervention

| 4 items selected | ▼ |

Currency

| NZ | ▼ |

In Year

| 2 006 | 2 011 | 2 016 |

2 006   2 008   2 010   2 012   2 014   2 016

| Heterogeneity | OFF |

Plotting Options

Select Outcome Variable

| QALYs | ▼ |

Total population | Per 1000 total population | Per capita target population | Cost Effectiveness Plane

Table | **Plot**

59% of salt in processed foods replaced by potassium and magnesium salts: NZ

| 0 | 100k | 200k | 300k |

Sinking lid on tobacco supply (reducing tobacco commercial sales each year until sales are zero in 2025): NZ

| 0 | 100k | 200k | 300k |

Ongoing tobacco tax increases (10% annually from 2011 to 2025): NZ

| 0 | 100k | 200k | 300k |

Sauces sodium reduction target achieved (30 to 63% reduction in sodium) *voluntary*: NZ

| 0 | 100k | 200k | 300k |

BODE³ League Table

This interactive league table allows researchers and policy-makers to rank health 'interventions' by health gains, costs, or cost-effectiveness. You can use the section on the left to customize your search.

Please allow up to 30 seconds for plots to be created.

Select Domain

Salt reduction ▾

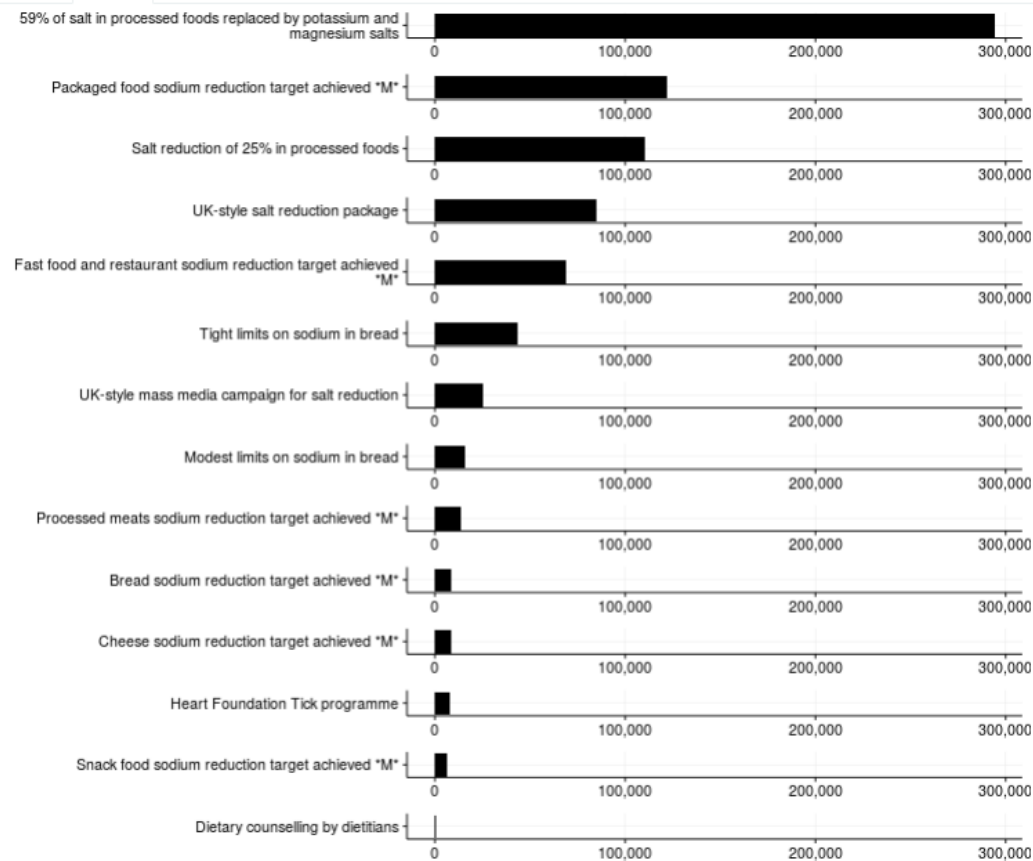**Select Main Intervention**

14 items selected ▾

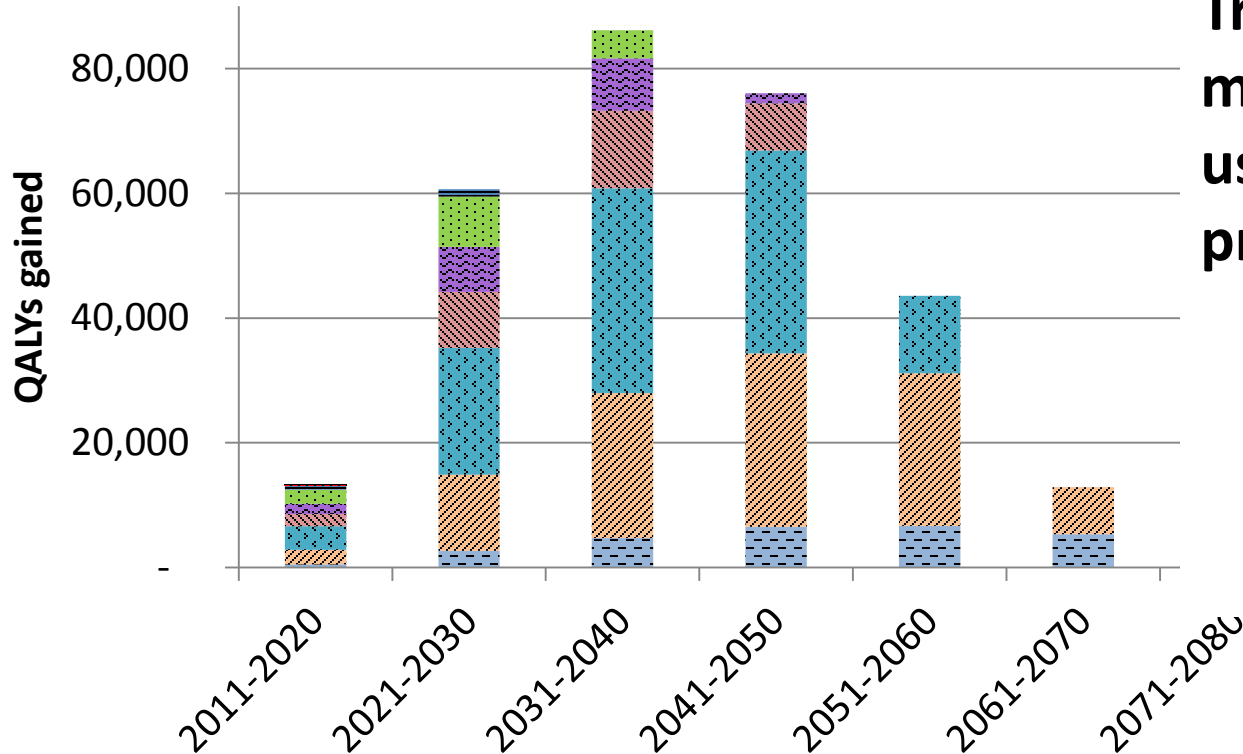Uncertainty **OFF**

Plotting Options

Select Outcome Variable

QALYs ▾

Tables | **Plots** | Cost Effectiveness Plane

2

How soon do we get these health gains? Example of salt substitution (NaCl for KCl)

Treatments usually much earlier (but usually smaller than prevention)

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NEW ZEALAND

Public Health Expert

What could we do, and what should we not do, to improve public health? This Blog has postings from Tony Blakely, Nick Wilson and other public health experts on issues such as efficiency, equity, interventions, politics, cost effectiveness and much more.

Public Health Expert

Search   **Search**

The case for lowering salt levels in processed foods is now even stronger – new research

Tuesday, June 26th, 2018 | dayhi34p | *No Comments*

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Prof Nick Wilson, Dr Cristina Cleghorn, Dr Nhung Nghiem, Prof Tony Blakely

The scientific case for lowering dietary salt intakes became a bit confused in recent years by studies which suggested that *both* low sodium (salt) intake and high sodium intake were associated with higher risk of death. But new research suggests that low sodium intakes are not associated with a higher risk of death and the results for low sodium intake in these other studies may be largely due to inaccurate measurement of sodium intake. So the scientific community can now more confidently recommend that governments progress interventions to reduce sodium levels in processed foods. This could substantially benefit health, reduce

TAGS

alcohol   alcohol tax   cancer   climate change   cost-effective   cost effectiveness   cvd   DALYs   diet   e-cigarettes   environmental health   food   health inequalities   Health policy   healthy culture   healthy eating

Key messages

- Dietary interventions have massive variation in impact on QALYs, from a few 100 (e.g. dietary counselling) to several 100s of thousands (e.g. substituting potassium chloride for sodium chloride in foods).

- Many preventive interventions are cost saving to the health system.

- Generalizing:
  - population-wide interventions (e.g. reformulation) tend to have greater impact than targeted or personalized interventions (e.g. counselling)
  - health gains and costs tend to start within years of an intervention, but for preventive interventions often take decades to reap full benefits.

- There is genuine and large uncertainty in modelling, but when impacts differ by an order of magnitude, we are confident in their ranking.