Otago Spotlight Series
Cardiovascular Disease

Dietary salt and cardiovascular disease: evidence to policy

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World Health Organization

GLOBAL ACTION PLAN

FOR THE PREVENTION AND CONTROL OF NONCOMMUNICABLE DISEASES

2013-2020

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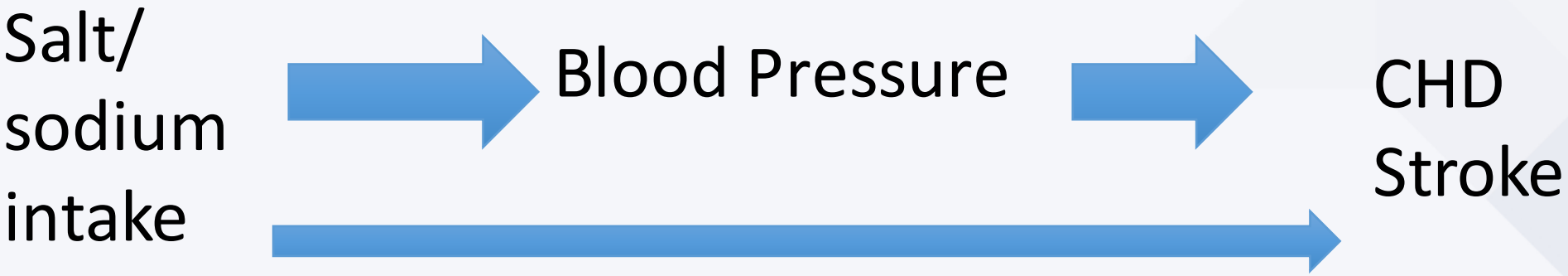
VOLUNTARY GLOBAL TARGETS

- A **25%** relative reduction in risk of premature mortality from cardiovascular diseases, cancer, diabetes, or chronic respiratory diseases.
- At least **10%** relative reduction in the harmful use of alcohol, as appropriate, within the national context.
- A **10%** relative reduction in prevalence of insufficient physical activity.
- A **30%** relative reduction in mean population intake of salt/sodium.
- A **30%** relative reduction in prevalence of current tobacco use in persons aged 15+ years.
- A **25%** relative reduction in the prevalence of raised blood pressure or contain the prevalence of raised blood pressure, according to national circumstances.
- **Halt the rise** in diabetes and obesity.
- At least **50%** of eligible people receive drug therapy and counselling (including glycaemic control) to prevent heart attacks and strokes.
- An **80%** availability of the affordable basic technologies and essential medicines, including generics, required to treat major noncommunicable diseases in both public and private facilities.

Salt intake, blood pressure, cardiovascular disease

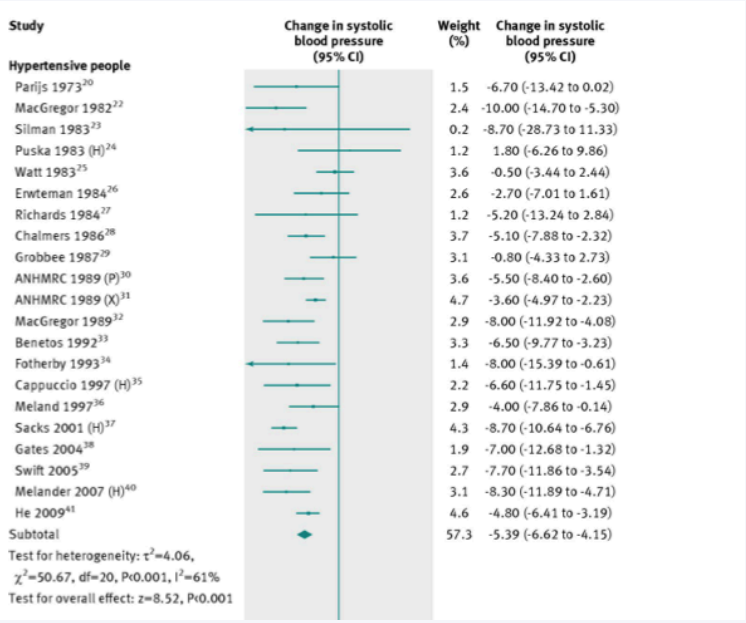


Global risk factor ranks for all ages and sexes combined in 2010

	2010	
Risk factor	**Mean rank (95% UI)**	**% change (95% UI)**
1 High blood pressure	1·1 (1–2)	27% (19 to 34)
2 Smoking (excluding SHS)	1·9 (1–2)	3% (–5 to 11)
3 Alcohol use	3·0 (2–4)	28% (17 to 39)
4 Household air pollution	4·7 (3–7)	–37% (–44 to –29)
5 Low fruit	5·0 (4–8)	29% (25 to 34)
6 High body-mass index	6·1 (4–8)	82% (71 to 95)
7 High fasting plasma glucose	6·6 (5–8)	58% (43 to 73)
8 Childhood underweight	8·5 (6–11)	–61% (–66 to –55)
9 Ambient PM pollution	8·9 (7–11)	–7% (–13 to –1)
10 Physical inactivity	9·9 (8–12)	0% (0 to 0)
11 High sodium	11·2 (8–15)	33% (27 to 39)
12 Low nuts and seeds	12·9 (11–17)	27% (18 to 32)
13 Iron deficiency	13·5 (11–17)	–7% (–11 to –4)
14 Suboptimal breastfeeding	13·8 (10–18)	–57% (–63 to –51)
15 High total cholesterol	15·2 (12–17)	3% (–13 to 19)

Lim et al *The Lancet* 2012, 380:9859 2224 - 2260

Dietary sodium and blood pressure:



- In those with 'hypertension' decreased sodium associated with SBP -5.4mmHg (95%CI: -6.6, -4.2)
- In those without 'hypertension' -2.4mmHg (95%CI: -3.6, -1.3)
- **Overall effect:** decreased sodium associated with SBP -4.2mmHg(95%CI: -5.2, -3.2)

He et al, *BMJ*, 2013 326: f1325

Sodium intake and CVD events

Study*	Reduced-salt		Control		Relative risk of CVD events (95% CI)	Relative risk (95% CI)
	Events	Total	Events	Total		
TOHP I	17	321	32	311		0·51 (0·29–0·91)
TOHP II	71	938	80	935		0·88 (0·65–1·20)
Morgan	6	34	5	33		1·16 (0·39–3·45)
TONE	36	322	46	331		0·80 (0·53–1·21)
Total	**130**	**1615**	**163**	**1610**		**0·80 (0·64–0·99)**

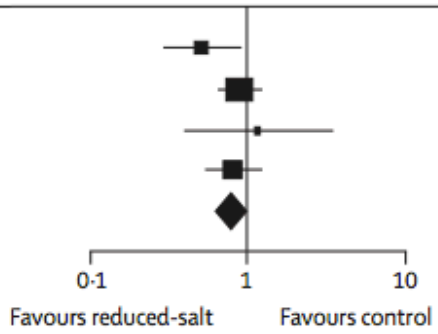


Figure: **Relative risk of cardiovascular disease (CVD) events in our meta-analysis of outcome trials of salt reduction at longest follow-up combining hypertensive and normotensive individuals**

Duration of follow-up ranged from 7 months to 11·5 years. We used fixed effect model with normotensives and hypertensives combined. Heterogeneity χ^2=3·20, df=3 (p=0·36); I^2=6%.Test for overall effect Z=2·02 (p=0·04). TOHP I=Trial of Hypertension Prevention, phase 1. TOHP II=Trial of Hypertension Prevention, phase 2. TONE=Trial of Nonpharmacologic Interventions in Elderly. *Data for individual trials taken from Taylor and colleagues' meta-analysis.[1]

Reduction in risk of CVD events with decreased sodium RR 0.80 (95%CI: 0.64, 0.99) p =0.04

He &, MacGregor, 2011, *The Lancet*, 378(9789):380.

Controversial?

SALT

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FOOD HEALTH ROAD WATER

FIVE OUT OF FIVE ER DOCTORS AGREE

SALT IS AN IMPORTANT INGREDIENT IN YOUR GOOD HEALTH. IN FACT, NO ELECTROLYTE IS MORE ESSENTIAL TO HUMAN SURVIVAL THAN SALT.

The sodium you get from salt is what allows nerves to send and receive electrical impulses. It is what makes your muscles stay strong. It's what makes your brain work. It's actually what makes every cell in your body function.

The body of evidence in favor of salt is strong, too.

Studies from the Journal of the American Medical Association show that people with the highest sodium intake have the longest lives.

The American Journal of Hypertension agrees. They say there is no strong evidence that cutting salt intake reduced the risk of heart attacks or strokes. In fact, reducing salt to levels recommended by the U.S. government can cause harm and decrease life expectancy.

Even Scientific American has called for an end to the war on salt, saying that the drive to limit our salt intake has little basis in science.

Just something to think about. And not something to be taken with a grain of salt.

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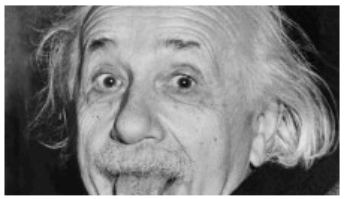

How Adding Iodine to Salt Boosted Americans' IQ

Iodized salt is so commonplace in the U.S. today that you...
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Iodized Salt

Sugar, Not Salt, to Blame for Hypertension

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Dietary sources:

In a ‘Western’ style diet

- Processed food 75-80%
- Naturally occurring 10%
- Cooking 5%
- Added at the table 5%
- Drinking water <1%

Mattes & Donnelly *Journal of the American College of Nutrition*. 1991, 10:383-393

Discretionary Salt

Salt in processed food

UK Strategy for Reducing Salt

Salt intake		Reduction needed	Target intake g/day
Source	g/day		
Table/Cooking (15%)	1.4 g	40% reduction	0.9 g
Natural (5%)	0.6 g	No reduction	0.6 g
Food industry (80%)	7.5 g	40% reduction	4.5 g
	Total 9.5 g		Target 6.0 g

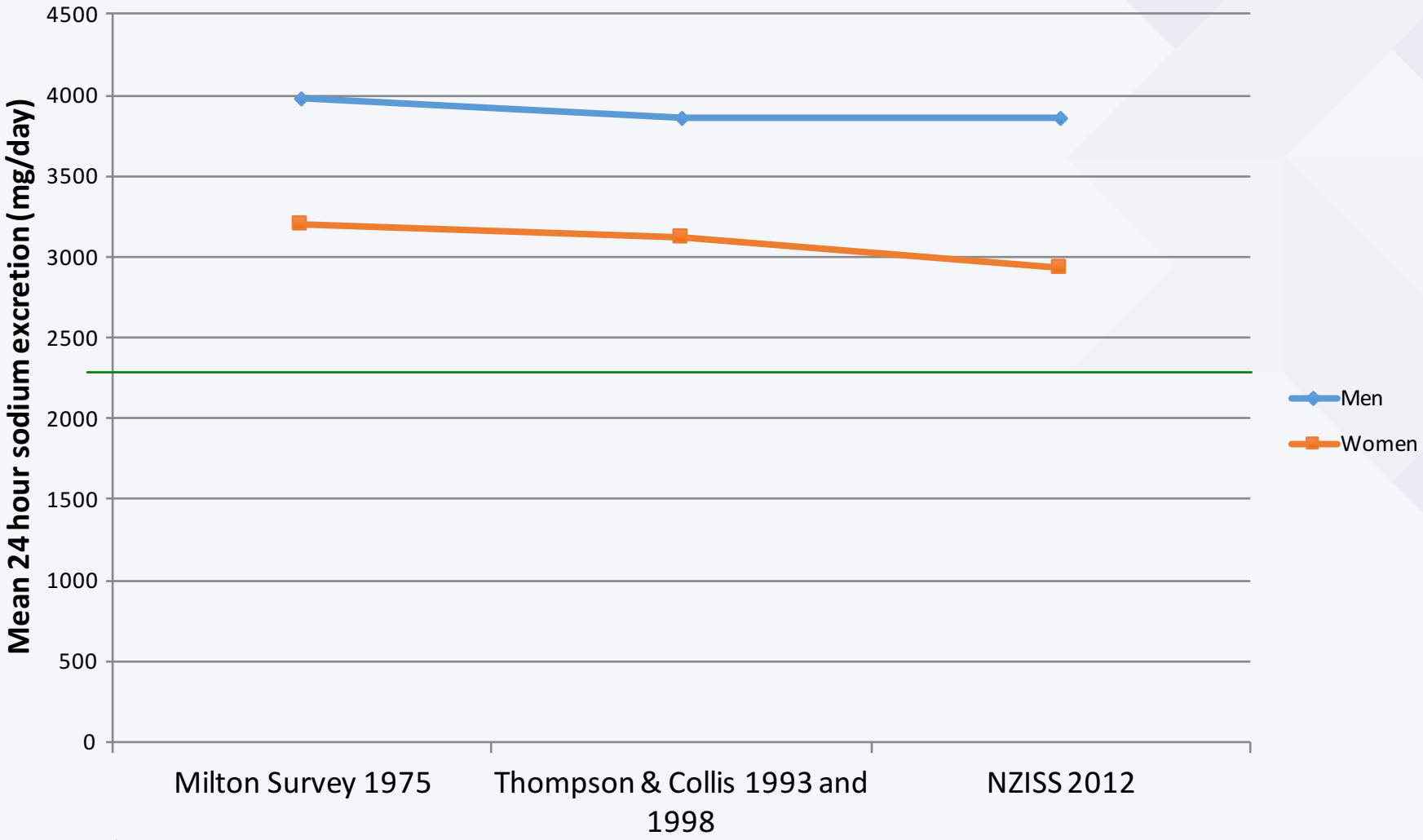
Therefore the food industry needs to reduce salt content of all foods where salt has been added by 40% over the next 5 years

Figure 14 UK strategy for reducing salt.

Journal of Human Hypertension

He, F.J., & MacGregor, G.A. (2008). *Journal of Human Hypertension, 23*, 363-384.

Estimated sodium intake New Zealand adults

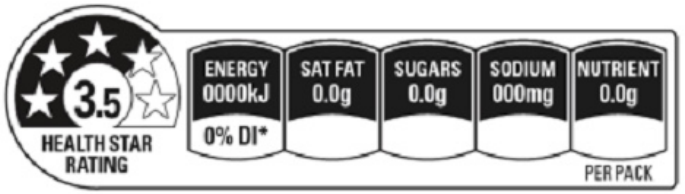


New Zealand

Case study 1: Project Target 450

The bread industry in New Zealand and the Heart Foundation worked together on a project to reduce sodium content in lower cost, high volume breads.

HeartSAFE
Sodium Advisory + Food Evaluation



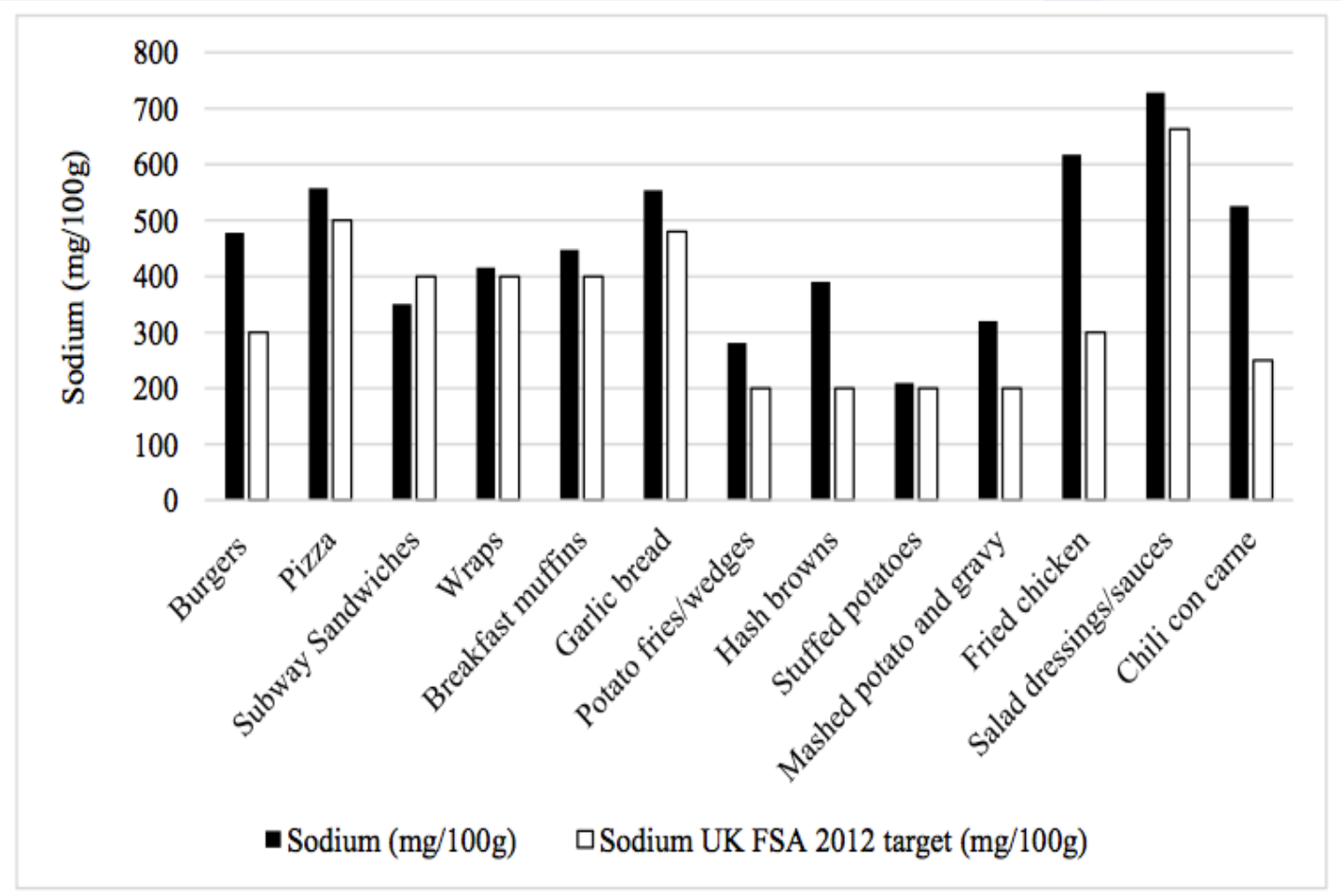
What about ‘fast food’

- Nutrition information from websites fast food companies
- Purchased food from independent outlets Dunedin and Wellington- tested in lab
- Estimated mean daily Na intake from savoury fast foods was 283 mg/d for the total adult population and 1229 mg/d for fast-food consumers.

Prentice et al, *Public Health Nutrition* 2015
doi:10.1017/S1368980015001731

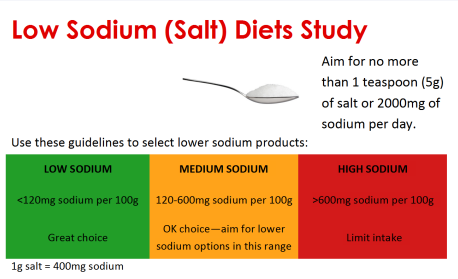
Results: Large chain outlets

Mean sodium (mg/100g) of fast foods from online Nutrition Information Panels, compared to the sodium (mg/100g) UK FSA 2012 targets



Low sodium diets: feasibility in New Zealand (pilot study)

- How successfully can healthy NZ adults adhere to a diet that meets the WHO recommendation for Na intake (< 2000 mg) for four weeks?
- What are the barriers and supports for healthy adults trying to adhere to the WHO recommendation for sodium intake?



Lofthouse et al, Appetite 2016, 105;721

Results

A new way of eating: major changes to food purchasing and eating behaviours

"So, um, yeah it's about constructing really a new lifestyle based around, um, different recipes and different menus, you know."

"I'm trying to pretty much not have cheese unless I've sort of budgeted for it. Like the pizza the other night was fine because the rest of the day had been releatively low sodium. So it's kind of like treating cheese as junk food I suppose."

"I suppose cutting out my packet food was the big thing for me. And having to make things from scratch, which really isn't that difficult because all you do is put the same stuff in as the packet, but it doesn't have salt in it"

Results

Eating out

" I miss going to the Asian takeaway place, because I love Asian food. But maybe when I get a bit more, um, experience in the cooking department I can learn to make it from scratch"

Label reading

"I thought I knew how to read food labels. And then you showed me how to do it properly. So I must have been doing it wrong for years."

Support

"So, if I hadn't have done a weekly meeting with you, I, I don't think I would have been so good. You've kept me really accountable... it wouldn't work without doing a weekly, kind of... and it's like a reminder of what you're doing and why you're doing it"

Achieving the WHO sodium target in New Zealand

TABLE 4
Summary of the final New Zealand sodium reduction model

	Current mean	Target mean
Sodium intake—food only, mg		
Packaged foods (NutriSales)	1724	1096
Unpackaged fruits and vegetables	74	74
Unpackaged fresh meat	152	152
Unpackaged fish and seafood	34	34
Takeaway and restaurant meals	887	532[1]
Total	2871	1888
Sodium intake—discretionary, mg	506	304[1]
Sodium intake including discretionary, mg	3377	2192
Salt intake including discretionary, g	8.4	5.5

[1]Assuming a 40% reduction.

Eyles et al, *American Journal of Clinical Nutrition*, 2016, 104;470

Conclusions

- WHO global target 30% reduction in population salt intake
- Evidence of benefit – blood pressure and cardiovascular disease morbidity & mortality
- Individual efforts alone will not be enough in current environment
- Evidence should be used to guide public health policy