

Technical Report: Estimating the modelling parameters around dietary counselling for preventing cardiovascular disease in New Zealand

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Summary

Aim: To detail the input parameters used in BODE³ modelling (effect size and costs) around dietary counselling and reduction of dietary sodium intakes (with some additional considerations around saturated fat intake and dietary energy intake). The purpose of the modelling is to: (i) determine the cost-effectiveness of dietary counselling for cardiovascular disease (CVD) prevention in New Zealand; and (ii) allow the impact of current practice to be allowed for in modelling new interventions (generating a partial null).

Methods: Literature review and information from key informants (interviews and reports).

Results: The literature review identified a recent (2013) meta-analysis on the impact of dietary counselling on reduced dietary sodium intake (a Cochrane systematic review). It reported a change of -41mmol/day in sodium excretion (95%CI: -57 to -25). From the trials included in the meta-analysis, the average dose of counselling was estimated and an effect per hour of counselling was calculated (-7.6 mmol/day; SD = 0.8).

For New Zealand adults aged 35+ the estimated dose of such salt-related dietary counselling being delivered annually was 4600 hours (SD = 920, gamma distribution) at an estimated annual health sector cost of NZ\$575,000, a mix of government and out-of-pocket costs).

For counselling related to dietary fats, the equivalent values were 6500 hours annually at an estimated cost of \$832,000. For both salt and dietary fat-related counselling, this is focused particularly on adults in their 40s and 50s (median = 51 years), but with a fairly even gender and ethnicity spread assumed (ie, Māori are a priority with DHB-funded counselling, while the private sector is nearly entirely utilised by non-Māori).

There are many limitations with the available data and various assumptions needed to be made (all outlined in further detail below).

Given the evidence from the literature, the baseline case assumed that the counselling worked for three years and then declined to zero over the following three years. For scenario analyses, we considered: (A) The full effect of counselling lasting for 3 years then dropping to zero; (B) Full effect for 3 years then declining linearly to zero at 5 years after that.

Conclusions: Given limitations with the data, there is large uncertainty with all these estimates. Some refinements of the parameters would be possible with additional

research (eg, more formal surveys of NZ dietitians) but this was not considered justified given that the priority areas for our research were around regulatory and fiscal interventions to modify CVD risk factors.

Introduction

Dietary counselling is an established part of CVD prevention in New Zealand. However, the specific aspects of it are not well documented in terms of: the topics covered by counselling, in what settings it is provided, to whom it is provided and the costs of its provision.

Our aim here was to generate input parameters for BODE³ modelling (effect size and costs) around dietary counselling and reduction of dietary sodium intakes (with some additional considerations around saturated fat intake and dietary energy intake). The purpose of the modelling is to: (i) determine the cost-effectiveness of dietary counselling for cardiovascular disease (CVD) prevention; and (ii) allow the impact of current practice to be allowed for in modelling new interventions (generating a partial null).

Methods

Specific details are covered in each of the following sections. But major methods included a literature search, key informant interviews, and analyses of the Dietitians NZ website. Information was obtained from:

- The President of Dietitians NZ (emails and discussion).
- An interview with a dietitian working in private (with extensive experience in a wide range of work).
- Interviews with two community dietitians (in two different DHBs).
- An interview with the team leader of a hospital-based dietitian service (who was also an experienced dietitian)

The dietitians at the DHB level also all supplied annual and quarterly reports of their work (on the basis that the specific details were not made publicly available).

Where possible, uncertainty estimates were based on data and standard deviations calculated. However, in most cases expert advice was used to estimate lower and upper plausible ranges for the key variables.

Literature review (dietary counselling with a focus on sodium reduction)

We identified two recent meta-analyses relating to dietary counselling and sodium intake. One was by Lin et al (2010)¹ which included three trials.^{2 3 4} These trials all showed reductions in sodium intake and also in systolic blood pressure.

But we decided to use the results of a 2013 Cochrane meta-analysis (Rees et al 2013⁵, as this was more recent, included more trials (including some from outside the USA), and the report had far more detailed documentation of its methods (possibly reflecting higher quality of the review methods). Overall effect size was a reduction of sodium

excretion of 40.9 mmol/day (95%CI 25.3 to 56.5) after 3 to 36 months. From the trials included in this meta-analysis we estimated the size of the counselling effect per hour (using data in Tables 1 and 2), ie, -7.6 mmol/24h [SD = 0.8], based on the uncertainty around all the effect sizes of the various studies). Of note was the apparent lack of relationship between results and the “dose” of dietary counselling.

Table 1: Studies in the 2013 Cochrane Review on dietary counselling⁵

Trial (included in meta-analysis)	Intervention intensity (hours) and background information
Beckmann 1995 ⁶	The study reported dietary advice by a nutritionist at baseline followed-up by 4 other sessions (at 1 week, 2 weeks, 3 months and six months). Follow-up at 12 months. We assumed 1h of counselling at the start then 4 x 0.5h = 3h total. Of note was that this dietary counselling, although focused on sodium, also involved some weight loss and saturated fat advice for selected participants. Free unsalted foods were provided to participants for the first two weeks of the trial.
Koopman 1990 ⁷	The study reported that there were three dietitian visits (monthly). We assumed these were 1 hour each which seems typical of initial contact times in these trials (so the total was 3 hours).
TOHP I ⁸	<p>The Cochrane review noted: “The intervention included 8 group and 2 individual sessions in the first 3 months with less frequent counselling thereafter but a minimum contact of 1 individual meeting every 2 months. (Urinary sodium data were collected at 12 months).” Other detail was in Whelton et al 1997⁸ and in Kumanyika et al 1993.⁹</p> <p>From these sources we estimated the hours of counselling as: 8x1h + 2x1h + 4.5x0.5h = 12.25h (assuming follow-up sessions are for 30 minutes).</p> <p>There was no extra detail on the interventions in the follow-up publications in Cook et al 2007 (cited in Rees et al 2013) for TOHP I or TOHP II (see below).</p>
TOHP II ³ (referred to as Whelton et al 1997 in Rees et al 2013)	<p>The Cochrane review noted: “Group sessions and counselling weekly for 10 weeks, then 4 monthly sessions followed by 1 or 2 monthly contacts and refresher sessions offered.” (For 36 months for whole study).</p> <p>From this information we estimated the hours of counselling as: 10x1h + 4x1h + (29.5 months x 0.75 x 0.5h) = 25h</p>
ENCORE ^{10 11}	<p>The Cochrane review noted: That the intervention involved small group sessions weekly for 30-45 minutes per session (led by the study nutritionist).</p> <p>Blumenthal et al 2010 p126= The DASH class attendance also was excellent; for both intervention groups, the median number of sessions attended was 12 (92%).</p> <p>From this information we estimated the hours of counselling as: 12 sessions x 37.5 minutes = 7.5h</p>

Table 2: Results of the meta-analysis in the 2013 Cochrane Review on dietary counselling⁵ (random effects – “Analysis 1.3” in the Review; results ordered by increasing effect size)

Study (in Cochrane systematic review by Rees et al 2013)	Weighting used in Cochrane meta-analysis	Effect size (mmol sodium excretion/ 24h)	95% CI	Our estimated total hours of counselling provided in each intervention (see previous table)
ENCORE	17.0%	-9.40	-31.27 to 12.47	7.5
Koopman 1990	12.9%	-22.20	-52.84 to 8.44	3
TOHP II	22.1%	-42.70	-54.77 to -30.63	25
TOHP I	23.1%	-50.10	-60.05 to -40.15	12.25
Beckmann 1995	24.9%	-62.00	-66.74 to -57.26	3
	100.0%	-40.92	-56.54, to 25.29	10.76 (weighted mean, as per weights in the 2 nd column)

Given that use of individual and group counselling in these trials (Table 1), we also searched for systematic reviews that considered the differences. Although none were found for dietary counselling (individual vs group interventions), the results from a systematic review of smoking cessation counselling does not suggest major differences (ie, for group counselling: OR=2.17, 95%CI: 1.37 – 3.45; for individual: OR = 1.56, 1.32 – 1.84; for telephone (also individualised): OR = 1.56, 1.38 – 1.77).¹² This lack of significant difference is plausible given that group counselling may involve such components as learning from others and the provision of psycho-social support from other group members.

We identified a study that provided evidence of attenuation over the three years of the trial period (HPT⁴) with this occurring in 3 of the 4 relevant study arms (very roughly with the initial effect size halving over the subsequent two years). In the other study arm involving both sodium and weight reduction, there was some suggestion of a plateauing effect. In another study (in the above table⁶) there was also evidence of a plateauing effect for sodium excretion (at the 3 to 12 month period).

When considering this information collectively, we assumed in our base model that the final trial effect size persisted for 3 years and then declined linearly to zero at 3 years after that. For scenario analyses the variants were (A): Full effect for 3 years then zero; (B) Full effect for 3 years then declining linearly to zero at 5 years after that.

Dietary counselling in private practice in New Zealand

Dietitians for the Wellington Region were identified from the Dietitians NZ website and website searches (ie, identified one additional person in private practice). Out of 38 individuals identified, two were excluded since they were subsequently identified as working outside of NZ. Of the remaining 36, five were only in private practice and another four were in a mix of private and other (eg, academic), ie, a total of 9/36 (25%) in some private role. Of these nine, an estimated 6.7 FTEs were estimated to be in private practice provision of individual dietary counselling (excluding work for workplaces, academic work and considering part-time work). This estimate was based on website details and details on the Dietitians NZ website.

Using the population of the Wellington region (Statistical NZ data on the population aged 25 years plus for CCDHB and Hutt Valley DHB) the results for the number of private dietitian FTEs was scaled to give an estimated total for all of New Zealand. This gave an estimated 63.5 FTEs of dietitians in NZ working in private practice and just seeing private patients in that time.

Amongst the nutritional topic areas listed on the Dietitians NZ website or the dietitian's own website (which ever was the most detailed), the type of work scope was estimated. The focus on CVD-related counselling (usually blood pressure and cholesterol mentioned together) was 10% (SD=11%), (range = 0 to 29%). For weight management it was 18% (SD=10%), (range = 0 to 33%). These values were used in calculating the roles of counselling relating to sodium and dietary fats (see the Excel spread-sheet calculations).

The holistic approach to dietitian counselling is such that it is hard to partition counselling time into nutrient-specific related advice. Indeed, some counselling may deal only with general advice, including reducing portion sizes, preparing more home meals (and time management to facilitate this), and eating more fruit and vegetables (which then displaces other foods). But in this analysis, some division was necessary and so based on key informant advice, the following key assumptions were made and used in the calculations in Table 4:

Assumption 1: That a small proportion of weight management counselling will assist in reducing sodium intake. That is, it was assumed that such counselling had 10% of the value of sodium specific dietary counselling. The mechanisms assumed were:

- Advice on smaller portion sizes contributes to lower sodium intake.
- Advice on eating more fruit and vegetables contributes to displacing higher salt foods.
- Advice on increasing home cooking contributes to displacing higher salt takeaway and restaurant meals.
- Other general advice eg, label reading and use of “Tick” foods will tend to help.

Empirical evidence that weight control counselling can reduce intake of sodium intake (beyond sodium-specific counselling), comes from randomised trial data (eg, the HPT trial⁴).

Assumption 2: That a small proportion of weight management counselling will assist in modifying dietary fat intake. That is, it was assumed that such counselling had 10% of the value of dietary fat-specific dietary counselling. The mechanisms assumed were as for sodium above (*in Assumption 1*).

Assumption 3: That a small proportion of counselling relating to fruit and vegetables and to portion size will assist in modifying both sodium intake and dietary fat intake. That is, it was assumed that such counselling had 10% of the value of both dietary sodium and dietary fat-specific dietary counselling. The mechanisms assumed were similar to those in *Assumptions 1 and 2*).

Other considerations are detailed in the relevant Excel spread-sheet but include estimates of the time a typical dietitian works per year (adjusting for holidays, sick leave, conference leave etc). Also, the typical number of clients seen per day (key informant interview data).

For costs, the data from websites indicated a mean cost for first (one-hour) consultation of \$131 (SD=\$12.4).

Table 3: Selected key values used in the analysis for proportion of counselling time (see Excel spreadsheet for further details)

Wellington Region Estimate (DNZ, & websites)				
Work area	Best estimate	SD	Lower bound	Upper bound
CVD (BP & cholesterol)	10%	11%	5%*	32%
Weight management	18%	10%	10%*	38%
Other	73%			
CVD-related counselling (key informant)				
Dietary fats	43%		33%	53%
Sodium reduction	13%		8%	18%
Increasing fruit and vegetables	30%			
General (portions, cooking, food labels etc)	13%			
	99%			

* The lower bound was set artificially (not using the SD), based on key informant and other data.

Table 4: Key results for annual amount of hours for dietary counselling in private practice settings (scaled to the whole of NZ)

	Best (hours)	Lower (hours)	Upper (hours)
People given CVD counselling per year (just counting new cases)	3730	2167	17,244
Sodium-specific counselling hours	727	159	4,212
<i>If weight counselling is 10% of the value of sodium-specific counselling:</i>			
Then the benefit from weight counselling for sodium reduction is (hours)	1,007	397	2,779
Total sodium (sodium specific & via weight counselling)	1,734	556	6,991
Dietary counselling on fatty acids (hours)	2,406	655	12,403
<i>If weight counselling is 10% of the value of dietary fat specific counselling</i>			
Then the benefit from weight counselling for fatty acid changes is (hours)	1,007	397	2,779
Total fat (specific & via weight)	3,413	1,053	15,182

		Best (hours)	Lower (hours)	Upper (hours)
Out-of-pocket costs to clients*				
Just sodium specific counselling		\$ 99,284	\$ 17,970	\$ 673,568
Sodium + weight equivalent		\$ 236,755	\$ 62,894	\$ 1,117,936
Just fatty acids		\$ 328,402	\$ 74,125	\$ 1,983,285
Fats + weight equivalent		\$ 465,872	\$ 119,050	\$ 2,427,653

* See text for cost data. There are no government subsidies available to private dietitian consultations.

Comment: This analysis involves a range of simplifying assumptions. In particular, it could be further improved upon by a full analysis of all the private dietitians listed on the Dietitians NZ website.

DHB-funded dietary counselling in the community

Information was obtained from two dietitians who worked for, or were funded by, two different DHBs. Also supplied were quarterly and annual reports on their workload. Due to the confidential nature of these reports, the specific DHBs are anonymised in this document.

In DHB “A” the work involved both individual counselling and group counselling sessions. The benefit of these were treated equally (at a per-patient counselling exposure level) in the analysis. In this DHB, the work load was “poorly controlled Type 2 diabetes” (82%), “high risk for CVD” (11%) and “complex obesity” (7%). (See the Excel spread-sheet for more details).

In terms of CVD counselling, the distribution of counselling was estimated to be: “focus on weight control” (40%), “focus on fats in the diet” (40%), and “focus on reduced sodium intake (20%)”. Assumptions 1 and 2 (see above) were also utilised in subsequent calculations.

The cost-per-hour was as per dietitian costing for DHBs of \$115.89 (with SD being 10% of the point estimate [\$11.59] as per the Cancer Care Coordinators study by BODE³). These DHB costs are for both outpatient and domicillary services (“Outpatient Purchase Unit Final National Prices [code=AH01001; 6264], adjusted from 2012/13 to 2011/12 for BODE³, as per the BODE³ Costing Protocol).

For DHB “B” six-monthly data included first consultations, follow-up consultations, telephone contacts and home visits (there was no group counselling). After rescaling (to adjust for multiple topics per person) the focus for the dietary counselling was weight management (45%), diabetes and impaired glucose tolerance (27%), CVD or lipid management (14%) and hypertension (14%) (for data from a report). In terms of the latter, the additional assumptions were made:

Assumption 4: That 50% of hypertension-related counselling was around dietary sodium counselling (the rest being more focused on weight control), and 10% of it was relevant to dietary changes that modified dietary fat intake (eg, less takeaway foods as per Assumption 2).

Assumption 5: That 75% of “CVD or lipid management”-related counselling was relevant to dietary fat-related dietary counselling (the rest being more focused on weight control), and 20% of it was relevant to dietary changes that reduced sodium intake (eg, less takeaway foods as per Assumption 2).

Results from both DHB “A” and “B” were combined (hours of counselling and costs) and then scaled to the rest of New Zealand (using DHB adult populations for the 25+ age group).

Comment: This analysis involves a range of simplifying assumptions. One important one is that DHB arrangements for community-based dietary counselling vary widely. Eg, some run group sessions while others do not.

DHB funded dietary counselling in outpatients

For DHB “A”, there was a dietitian workforce of 11.5 FTEs – of which approximately 40% of work time is seeing outpatients and 60% with in-patient services. The latter do not involve CVD-related counselling for prevention (eg, an in-patient with dyslipidaemia would be referred to outpatients after discharge).

From the outpatient clinic hours and type it was possible to estimate hours of counselling delivered for DHB “A” (see Excel spread-sheet). It was possible to adjust clinic attendance with those that “did not attend”.

Excluding paediatrics, the work area divisions for adult counselling services was 60% people with diabetes, 30% other specific conditions, 5% weight management, and 5% reducing CVD risk. (Of note for the paediatric clinic there are children seen at aged 10-15 with pre-diabetes and actual Type II diabetes.) The list of referral conditions includes dyslipidaemia, but not hypertension.

As discussed above, a holistic approach was taken to counselling. Nevertheless, the key informant estimates in the CVD topic area were: dietary fats (25%), fish and omega 3 fatty acids (17%), fruit and vegetable intake (25%), reduced sodium intake (17%), and general, eg, reduced portion sizes (17%).

For sodium, the specific category (17% of the time) was combined with a 10% portion of the hours given to fruit and vegetable [F&V] counselling and general counselling (see *Assumption 3*). For dietary fat intake, both the “dietary fats” and “fish and omega 3” categories were included, but so was the 10% portion of other categories, as per for dietary sodium (ie, of the F&V intake and general counselling)

Costs per hour were calculated as per the previous section (ie, the same DHB cost-category is used). Scaling was from this DHB’s outpatient workload to the total NZ population.

Comment: The diversity of arrangements around New Zealand will be a limitation with the scaling process undertaken here. That is some DHBs may put greater effort into dietitians working more to train practice nurses (to expand their role).

Which groups receive dietary counselling?

Key informant and report data are summarised in the table below. Based on these data, in this proposed modelling work we spread the exposure to dietary counselling evenly by sex and ethnicity. However, in terms of age-groups, we used the data from DHB (community) to distribute the benefit by age group. (Note that for the modelling, we do not identify specific types of individuals to deliver counselling to, but rather spread the counselling benefit over the whole adult population aged 35+ years, using the community data from DHB “[B]”).

Table 5: Demographic groups receiving dietary counselling* (key informant data or reports where specific numbers are provided, the shaded values are the ones used in the modelling)

Service provider (referral source)	Age	Gender	Ethnicity
Private sector (mainly GP referral)	40s and 50s mainly	Fairly even	<5% Māori
DHB [A] – community (meet criteria for high need)	40s and 50s mainly	Fairly even	Focus is on Pacific (53%), Māori (23%), European (16%), and Other (8%) - includes refugees and other high needs communities
DHB [B] – community (meet criteria for high need)	35-44y: 26% 45-64y: 64% 65+: 10% Estimated median = 51 years	Females (57%), males (43%)	Māori (43%), Pacific (32%), quintile 5 (most deprived) and non-Māori/non-Pacific (21%), other (4%)
DHB – outpatients (meet criteria for high need).** Report data analysed for the combined lipid and obesity group (non-drug related obesity)	35-39 12% 40-44 17% 45-49 16% 50-54 14% 55-59 13% 60-64 12% 65-69 8% 70-74 4% 75-79 1% 80-84 1% 85-89 1% median = 52y	Females (56%), males (44%)	Varies – higher some areas

* In all settings virtually none of the clients had had a known previous CVD event (heart attack or stroke).

** Requires a referral from a hospital health worker or a GP or practice nurse. The criteria are such that the person has to have multiple conditions/risk factors eg, dyslipidaemia plus overweight. For patients with CVD risk factors, it is often those who do not tolerate statins or who do not wish to take medications (eg, statins or anti-hypertensives).

Summary results

The results in the table below show that most dietary counselling delivered around sodium and dietary fats was estimated to be occurring in the private sector. The estimates involve large ranges, reflecting large uncertainty around most of the parameters.

Table 6: Summary results (see Excel spread-sheets for further details)

	Hours of counselling received* by NZ adults (per year, national)			Cost per year (NZ\$)			
Results for dietary counselling around sodium (with a proportion attributed to weight counselling)							
	Best	Lower	Upper		Best	Lower	Upper
Private sector	1966	619	8195		\$ 268,396	\$ 69,994	\$ 1,310,409
DHB - Community	1505	1074	1927		\$ 174,470	\$ 99,601	\$ 267,939
Outpatients	1136	557	1919		\$ 131,646	\$ 51,644	\$ 266,836
Total	4608	2250**	12,041**		\$ 574,512	\$ 221,239	\$1,845,184
Results for dietary counselling around dietary fats - results (with a proportion attributed to weight counselling)							
Private sector	3,637	1,113	16,350		\$ 496,494	\$ 125,900	\$ 2,614,298
DHB - Community	2126	1501	2766		\$ 246,348	\$ 139,176	\$ 384,669
Outpatients	768	336	1403		\$ 88,950	\$ 31,150	\$ 195,106
Total	6531	2950	20,519		\$ 831,791	\$ 296,226	\$3,194,074

* As opposed to “delivered” given that for some group settings, multiple individuals are counselling recipients.

** These values represent the extremes of uncertainty so we took a more realistic approach and used SD=20% of the point estimate (ie, SD = 920 hours)

Discussion – strengths and limitations of this information and analysis

This analysis benefited from the fact that New Zealand is a small country and so some organisational arrangements have standardised aspects (eg, DHB structures). Furthermore, the key informants suggested that dietitians in this country tended to be in general agreement about key messages around desirability of reducing dietary sodium intakes and of some dietary shifting from saturated fats to polyunsaturated fats in typical NZ diets. Nevertheless, the following limitations should be noted:

1. The **meta-analysis** on dietary counselling around sodium was based on trials involving different types of counselling (individual, group-based and sometimes both [Table 1]). Yet group counselling is less frequently used in the current New Zealand setting. Given some evidence for similar effects (albeit from the smoking cessation literature¹²), we have had to assume that an hour of one is approximately equivalent to an hour of another – and yet this may not be the case.
2. Various other limitations with using the **meta-analysis** results include the age of some of the trials (eg, the 1990s for TOPHI and II) and these trials being

predominantly conducted in North America. Long-term effects on sodium excretion (ie, beyond three years) were not identified (though in BODE³ we do model various scenarios around attenuation). It is certainly plausible that such attenuation occurs to a significant extent given the impacts of the overall food environment in terms of relatively high-sodium and high-saturated fat foods being intensively advertised, often being relatively low cost, and being in take-away and restaurant foods. It is possible that health literacy levels vary between countries along with other background factors (eg, food labelling, mass media campaigns around dietary hazards, the retail availability of healthy food options). Average cooking skills may also have declined since the 1990s in developed country populations.

3. **Extrapolation to the national level:** The use of extrapolation from the DHB or Regional level results is limited given arrangements are not uniform around the country. Eg, there may be disproportionately more private sector dietitians in main cities. This problem could be reduced in the future with a larger study.
4. **Spill over effects:** Dietary counselling may have wider benefits on the food intakes of other household members as a result of food purchasing and cooking changes by the person exposed to counselling. Future modelling work might consider this eg, assuming that 10 to 50% of the dietary change in the counselled person, occurs for one other additional adult who they are associate with (and of similar age). Of note however, is the possibility of an opposite effect. That is, dietary change (eg, buying trim milk or eating out less) may actually sometimes be blocked by a partner in the same household.
5. **Spill over benefits – other dietary counselling:** This analysis did not consider the spill over benefits (in terms of sodium and dietary fats) for counselling for people with impaired glucose tolerance or diabetes. Yet some benefit is probably plausible as dietary counselling for this group should generally involve smaller portion sizes, less “junk” food, and a dietary pattern that also reduces CVD risk (given that people with diabetes are at increased risk of CVD). Nevertheless, if people are overloaded with different dietary messages, then this might reduce their capacity to make changes and limit such additional benefits.
6. **Other health workers:** This analysis focused on dietitians. This was because key informants considered that doctors such as GPs gave such brief dietary advice (if at all). Also some key informants suggested that dietary advice from doctors may be too complex to be very effective, or even mistaken (eg, “not to drink milk” rather than to “shift to trim”, or to actually eat *more* saturated fat, were mentioned). To a lesser extent these problems may apply to practice nurses, but this group may have more time to provide counselling than doctors. In some parts of the country it seems that DHB funded dietitians are involved in providing training to practice nurses to improve their capacity to provide dietary counselling. Nevertheless, in a practice nurse based “heart health appointment” in 2012, this author noted zero provision of dietary advice.
7. **Individuals vs populations:** In the ideal model we would model the delivery of dietary counselling to specific types of individuals (ie, those at identified increased absolute risk of CVD events). But the PREDICT data (Auckland University) does not have adequate quality information on dietary counselling provision [Personal Communication, Rod Jackson, 2013]. Hence our approach is to spread the counselling benefit to the whole modelled population (albeit more on some particular age-groups, as detailed above). This assumes that the

dose-specific benefit of dietary counselling is linear eg, 1 hour of counselling for one person is equivalent in benefit of 30 minutes each for 2 people. This is therefore crude as various threshold effects may apply and also diminishing margin returns.

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