PUBLIC HEALTH COMMUNICATION CENTRE AOTEAROA

Dietary counselling – how effective and cost-effective is it?

18 March 2018

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In this blog we consider recent literature (particularly reviews) on the effectiveness and cost-effectiveness of dietary counselling as a health intervention. Most studies suggest that dietary counselling is effective though the benefits are typically modest and short-term. The literature on cost-effectiveness is mixed, and there is substantial uncertainty about long-run cost-effectiveness given the typically short-term trials involved. Addressing the obesogenic environment will have potentially (much) larger gains, and due to substantial reductions in obesity-related disease it is likely to be cost-saving. However, governments, policy-makers and the public are often interested in counselling interventions, necessitating close attention to cost-effectiveness of these interventions relative to more structural changes to the environment.

In NZ, dietary counselling is delivered by dietitians, practice nurses, doctors and various allied health workers (from community health workers to personal trainers in gyms). Such counselling often relates to weight management (to prevent or manage obesity-related diseases such as diabetes) but also to address risk factors for cardiovascular disease (CVD) ie, high blood pressure, high lipid levels etc (eg, some people might prefer dietary counselling to starting on CVD preventive medications). We know that in some health domains that counselling definitely helps (eg, the Quitline in NZ is a well-studied effective and cost-effective intervention [1]) – but what about dietary counselling?

What does the most recent evidence in major reviews show?

A systematic review by Patnode et al published in 2017 included 88 trials of diet and/or physical activity counselling [2]. In terms of “hard” outcomes (mortality and disease rates) the high-intensity diet-only interventions (4 trials): “reported no differences in all-cause or CVD -related mortality between intervention and control groups at 3 to 15 years of follow-up. Also, there were no consistent findings for the effects on CVD events over 8 to 15 years of follow-up.” “Results of 10 trials (mostly physical activity interventions) showed general improvements in quality of life over 6 to 12 months among intervention groups, but there was no consistent benefit of the intervention compared with control conditions.”

These findings are not encouraging, but not altogether unexpected due to lag-times from any dietary change to disease event and death rates, difficulties in both measuring diets and sustaining dietary change, and the small effect sizes that require large and well-conducted studies to detect. But more favourable findings came from the meta-analyses in this review of “intermediate” health-related outcomes. These included evidence of small, statistically significant improvements in: blood pressure, cholesterol levels (LDL and total), body mass index (BMI), waist circumference, and weight (see Table 1 in the Appendix below

for more details). Various behavioural outcomes were also favourable (eg, increased intake of fruit and vegetables, lower sodium intake, and higher physical activity per week). But there was no clear evidence of an association with some lipid changes (HDL cholesterol, triglycerides), or fasting glucose level (except for the latter benefiting from high-intensity interventions).

“There was evidence of a dose-response effect, with an association between increasing intervention intensity and larger improvements in intermediate outcomes, but insufficient evidence to assess the effects of low-intensity interventions alone on intermediate outcomes.” There were relatively few low-intensity dietary counselling interventions included in the review compared to medium and high-intensity ones.

However, the review could not establish other patterns: “Using qualitative analyses and meta-regression, we did not find that the intervention focus (healthful diet alone, physical activity alone, or healthful diet plus physical activity), format (group vs. individual, phone, print), number of sessions, person delivering the intervention, or duration of the intervention significantly affected the direction or magnitude of the benefit.”

A particularly valuable feature of this systematic review was its contextualisation with previous work – including 6 diet-related Cochrane Reviews, and the previous US Preventive Services Task Force (USPSTF) Review in 2010 [3]. There was fairly high compatibility between findings reported and this past work. Nevertheless, a Cochrane Review published in 2012 did report a reduction in cardiovascular events in trials involving dietary reductions in saturated fat and/or modifying dietary fat compared with usual diets among persons at high or low risk for CVD [4]. Also of note is that this Patnode et al Review included four NZ-based trials, but all of them were on physical activity interventions [5-8].

Another recent (2017) systematic review examined counselling by dietitians in primary care [9], although it did not generate pooled estimates in a meta-analysis. This work found that most trials had benefits in the health-favouring direction (18 out of 26 trials with CIs excluding the null) for dietary, anthropometric, or clinical indicators.

A meta-analysis of 5 trials published in 2017 [10] has also considered dietary advice to people with diabetes from nurses or doctors or individualised nutrition therapy provided by a dietitian. It reported that in the first year of intervention (at 6 or 12 months), nutrition therapy from a dietitian was superior in terms of significantly: lower mean difference in HbA1c (a key measure of blood glucose control), lower BMI, lower body weight, and more favourable impacts on cholesterol.

Another systematic review in 2017 [11] on lifestyle counselling came to similar conclusions as to the above reviews – ie, some benefits from diet/weight loss/physical activity counselling. But diversity of study designs precluded any meta-analysis. Similarly, another narrative review concluded that primary care physicians can be effective in delivering weight loss counseling, particularly if they are able to individualise the message for a given patient [12]. It reported that: “interventions most likely to produce clinically important weight loss are those that provide high-intensity counseling”. Also that: “physician time is costly and at least 1 trial has suggested that registered dietitians, when provided with the same tools, facilitate greater weight losses than physicians.”

Is diet counselling cost-effective?

The studies and reviews in Table 2 in the Appendix generally suggest that dietary

counselling is cost-effective. Nevertheless, some interventions were not cost-effective (and were indeed very cost ineffective as per a US study of counselling in primary care for people with high BMIs [13]). Also this particular body of literature has been critiqued for its limited methodological quality [14]. Indeed, we are cautious about suggesting that dietary counselling is "generally cost-effective overall" since the literature may suffer from publication bias, and because some of the analyses are based on short-term trials and so don't consider if the dietary changes are sustained in the long-term.

In NZ, our own modelling work suggests that dietary counselling for reducing dietary sodium (salt) intake is cost-effective. However, all the 31 other sodium reduction interventions modelled were better value-for-money (actually all were cost-saving over the long-run allowing for future reduced disease rates), see the BODE^3 online interactive league table.

Nevertheless, some potential ways in which cost-effectiveness might be enhanced include group-based interventions (vs individualised ones; so long as effectiveness not compromised too much) [15] and also the use of new technologies (e.g., teledietetics) [16]. Other technologies (digital assistants on smartphones and on home-based devices) may also have a possible role in improving the effectiveness and cost-effectiveness of dietary counselling (eg, Wilson et al's (2017) study on smartphone digital assistants and health advice [17]). We also suspect that further examination of the literature (regarding intensity, setting and who is delivering the counselling) may allow for further considerations around cost-effectiveness. Such research is part of our on-going work plan.

Comment – what might central and local government policy-makers do next?

Ideally central government policy-makers should prioritise addressing the key drivers of the obesogenic environment, over dietary counselling. They could consider taxes on junk food and soft drinks (as per other countries [18]), limits on junk food marketing to children, banning sugary drinks in schools, upgraded food labelling regulations, and improving walking/cycling infrastructure (see this blog for the latter in the US). These interventions are likely to have greater and more lasting health impacts, and possibly might make dietary counselling become more effective (via making the advice easier to adhere to). More specifically for preventing CVD, our NZ modelling work suggests various regulatory interventions (eg, setting limits on sodium in processed foods) would achieve larger health gains and be cost-saving relative to dietary counselling [19-21].

Local government could also address the obesogenic environment by investing more in walking and cycling infrastructure, making parks more attractive to exercise in, and improving walkway quality [22]. Councils can also address the lack of drinking fountains in NZ's playgrounds and parks [23, 24] – to provide alternatives to sugary drinks and support outdoor activities in hot summer months. Councils can also restrict sales of sugary drinks/junk food on council-owned properties such as gyms and community centres, and advocate for central government to act (eg, on the policies in the paragraph above).

We suspect that these environment modifying measures may also favour reductions in health inequalities – since they are not dependent on differential access to health services by different social groups. Indeed, this pro-equity impact has been described for tobacco control in NZ (eg, for increases in tobacco tax [25]).

Despite our judgement that a strong focus on the obesogenic environment is best, it is still

important to consider a comprehensive approach which may include such options as individual counselling, group counselling, and various mixes of app-based/internet-based and telephone-based support (eg, as per the NZ Quitline). But we still need more research to determine which mix of these is optimal for maximising benefit in the most cost-effective way for the different socio-demographic groups in NZ.

Conclusions

The evidence from recent reviews suggests that dietary counselling is effective though the benefits are typically modest and may be limited in duration. The literature on cost-effectiveness is mixed and we are somewhat skeptical of its value given the typically short-term trials involved. Overall policy-makers should ideally prioritise addressing the obesogenic environment where gains are potentially larger and the interventions are probably better value-for-money.

Acknowledgements: Some of our work in the diet domain is support by grants from the Ministry of Business, Innovation and Employment (MBIE) (UOOX1406) and from the Health Research Council (16/443).

Appendix

Table 1: Effect sizes for intermediate outcomes from all trials in the Patnode et al 2017 systematic review [2] **(all trials – with the full Report also giving results by intensity level or by the different mixes of healthy diet and physical activity or just one of these)**

Key variable	Effect size (95%CI)	Number of trials	Our interpretation / comment
Systolic blood pressure (BP), mm Hg	-1.26 (-1.77 to -0.75)	22	Small but statistically significant benefit, but much less than achievable with a strict low-sodium diet or by taking blood pressure lowering medication.
Diastolic BP, mm Hg	-0.49 (-0.82 to -0.16)	23	Very small but statistically significant benefit.
Low-density lipoprotein cholesterol, mg/dL	-2.58 (-4.30 to -0.85)	13	Small but statistically significant benefit. Much less than achieved with a very healthy diet or by taking medication.
Total cholesterol, mg/dL	-2.85 (-4.95 to -0.75)	19	As above.
High-density lipoprotein cholesterol, mg/dL	-0.17 (-1.05 to 0.71)	15	Very small change and a non-significant result.

Key variable	Effect size (95%CI)	Number of trials	Our interpretation / comment
Triglycerides, mg/dL	-1.82 (-5.05 to 1.42)	13	Small change in a beneficial direction – but not at a statistically significant level.
Fasting glucose, mg/dL	-0.36 (-1.22 to 0.5)	13	Small change in a beneficial direction – but not at a statistically significant level. But the meta-analysis of just the high intensity interventions – did show a statistically significant benefit.
BMI, kg/m^2	-0.41 (-0.62 to -0.19)	20	Small beneficial change at a statistically significant level.
Weight, kg	-1.04 (-1.56 to -0.51)	20	Modest beneficial change of around 1kg at a statistically significant level.
Waist circumference, cm	-1.19 (-1.79 to -0.59)	17	Small but statistically significant beneficial change.

Table 2: Health economic studies and reviews relating to dietary counselling interventions (last five years identified in PubMed, albeit a limited range of search terms)

Population group	Key health economic results	Reference
Suggestive of being cost-saving or cost-effective		
People at increased risk for type 2 diabetes mellitus (T2DM)	A systematic review was conducted of combined diet and physical activity promotion programmes for prevention of diabetes (for the USPSTF). It found a median incremental cost-effectiveness ratio (ICER) of US$13,761 per QALY gained (interquartile interval, $3067 to $21,899 [16 studies]). “Subgroup analysis of 5 studies that reported ICERs for both individual and group-based programs indicated that the latter were more cost-effective.”	Pronk et al 2015 [15]

Population group	Key health economic results	Reference
Mainly healthy individuals (21 studies), and 15 other studies (mainly if overweight/ obesity, T2DM, hypertension).	This review identified 36 economic evaluations of interventions aimed at improving nutritional habits (mainly via counselling but also via food labelling and media campaigns etc). The overall pattern was for the interventions to be cost-saving or cost-effective. (But we have some issues with how these interventions were classified in this review in that one study (that one of us was involved in) was included in the list of cost-saving studies whereas this work actually evaluated 4 interventions, 2 of which were cost-saving and 2 not remotely cost-effective.) Overall the authors concluded that: “the methodology for the economic evaluation of nutrition interventions requires substantial improvement”.	Fattore et al 2014 [14]
Lactating overweight and obese women	This RCT involved counselling (1.5 hour of individual counselling at study start and 1 hour at follow-up home visits after 6 weeks of intervention, with support through cell phone text messages every two weeks). “Based on conservative assumptions of no remaining effect after 1 year follow-up, the diet intervention was cost-effective”. The ICER was: US$ 8643 – 9758. The likelihood for cost-effectiveness, considering a willingness to pay US$50,000 for a QALY, was 87–93%.	Hagberg et al 2014 [26]
Adults with BMI > 23	This study had a quasi-experimental design and reported greater accumulated reductions in weight and fat in the teledietetics group than those in the face-to-face group. The teledietetics group recorded their diet on a Web-based platform. “The observed direct costs for 1% weight loss and 1% fat loss were USD 28.24 and USD 17.09, respectively” (ie, the dietetic service delivered as a teledietetics model was more cost-effective). The latter values would suggest reasonable cost-effectiveness – but no specific cost per QALY/life year was calculated.	Chung et al 2015 [16]
Suggestive of not being cost-effective		
Mothers at risk of T2DM and their children	A 90% probability of the intervention being cost-effective if society is willing to pay additional €100 per one avoided sickness absence day. The intervention was regarded as “not cost-effective for QALY gained because study indicated only 70% of probability of cost-effectiveness if society is willing to pay €33,000 per one-point improvement in QALY gained.” Comment: this study was unusual with the high length of follow-up at 7 years.	Kolu et al 2016 [27]
Women with 1+ risk factor for gestational diabetes	While the intervention was effective it was not regarded as cost-effective (€7 per 1g of extra birth weight avoided).	Kolu et al 2013 [28]

Population group	Key health economic results	Reference
Primary care participants with BMI: 30–50	This trial included different intensities of lifestyle counselling. The incremental cost per QALY gained was US$115,397 (which would be considered not cost-effective in the NZ setting).	Tsai et al 2013 [13]

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Public Health Expert Briefing (ISSN 2816-1203)
