Deloitte Access Economics

Fish oils for the secondary prevention of Coronary Heart Disease

Complementary Healthcare Council of Australia

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Deloitte.

Contents

Tables

Glossary

AIHW	Australian Institute of Health and Welfare
CBA	cost benefit analysis
CHD	coronary heart disease
DALY	disability adjusted life year
DART	Diet and Reinfarction Trial
DHA	docosahexaenoic acid
DOFD	Department of Finance and Deregulation (Australian Government)
EPA	eicosapentaenoic acid
GDP	gross domestic product
GISSI-P	Gruppo Italiano per lo Studia della Sopravvivenza nell'Infarto Miocardico' –Prevenzione
GRIM	General Record of Incidence of Mortality
ICER	incremental cost effectiveness ratio
JELIS	Japan EPA Lipid Intervention Study
MBS	Medicare Benefits Schedule
MI	myocardial infarction
NICE	National Institute for Health and Clinical Excellence
NHMRC	National Health and Medical Research Council
QALY	quality adjusted life year
VSLY	value of a statistical life year
WHO	World Health Organization

Executive summary

Dietary interventions are commonly suggested by general practitioners following a heart attack (i.e. a myocardial infarction or MI). Evidence of the effectiveness of these interventions has accumulated from epidemiological studies of different populations and their dietary intakes, which show links between the consumption of fatty fish and lower incidence rates of coronary heart disease (CHD), stroke and MI.

Where dietary changes cannot be made (or sustained) there is a role for the use of fish oil supplements to provide the necessary dietary intake of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). Fish oil is recommended as a supplement for people who have had an MI (people with CHD) by the World Health Organization (WHO), American Heart Association, National Health and Medical Research Council (NHMRC), and the National Heart Foundation of Australia.

Background

Access Economics (2010) provided cost effectiveness analyses of five complementary medicine interventions, one of which was Omega-3 fish oil for secondary prevention of heart disease, and found fish oil to be cost effective for this indication, using a benchmark of gross domestic product (GDP) per capita i.e. around $58,500 in 2011-12. This benchmark was based on WHO guidelines that interventions whose cost effectiveness is between one and three times GDP per capita per quality adjusted life year (QALY) gained (or DALY averted) are cost effective and those less than GDP per capita per QALY gained (or DALY averted) are very cost effective.[1]

The Complementary Healthcare Council of Australia commissioned Deloitte Access Economics to undertake cost benefit analysis (CBA) of fish oils and estimate the net benefit (or cost) of fish oils as adjunctive treatment for prevention of heart disease among those who have experienced MI, versus no fish oils, taking into account the cost per person of the treatment and the DALYs avoided.

Methods

The intervention is fish oils as a dietary supplement to current secondary prevention of CHD. The analysis is based on two branded forms of fish oil – Omacor and Maxepa, with dosage of 510-540mg EPA/day and 345-360mg DHA/day.[2] The comparator group is standard treatment without fish oil supplements.

Evidence for the benefit of these interventions is broadly based on two large clinical trials (GISSI-P and DART1). Both of these studies showed that the primary benefit of fish oils is in the reduction of cardiovascular disease deaths as well as the overall mortality within the populations.

[1] http://www.who.int/choice/costs/CER_levels/en/index.html

[2] Note these are above the Australian recommended levels of EPA and DHA assuming no dietary intake, but were used due to the literature evidence being based on these dosages.

Cooper et al (2007) conducted a cost effectiveness analysis based on a meta-analysis of these two clinical trials. Our cost effectiveness study used the treatment effects from that model to estimate the cost effectiveness of fish oil intervention within the Australian setting. We estimated benefits as the DALYs averted from morbidity from MI and stroke and from cardiovascular disease mortality, using disability weights for the morbidity impacts from the Australian Institute of Health and Welfare (AIHW). We estimated health system costs from AIHW data for MI and stroke, with the costs of revascularisation procedures and cardiovascular deaths estimated from published hospitalisation data obtained from the Department of Health and Ageing National Hospital Cost Data Collection and the Medicare Benefits Schedule (MBS). Retail prices of fish oil supplements were sourced from Pharmacy Online.

Cost effectiveness findings

The incremental cost per person was $128 per annum and the incremental effectiveness was 0.06 DALYs. Incremental costs per person included the additional costs of fish oil supplementation as well as the expected costs per person of the health outcomes (MI, stroke, revascularisation and cardiovascular disease death).

> With an ICER of $2,041 per DALY averted, the cost effectiveness analysis shows that fish oils are cost effective in the secondary prevention of CHD relative to the WHO benchmark**.**

Results from our analysis were comparable to previous cost effectiveness studies and were cost effective under all of the scenarios analysed. Our conclusion was that the use of fish oil supplements is a cost effective intervention to prevent future cardiovascular mortality and morbidity in Australia.

CBA findings

Cost benefit analysis (CBA) assigns a monetary value to both the costs and to the measure of effect and reports a net benefit (or net cost), benefit to cost ratio and return on investment in percentage terms. The cost effectiveness analysis findings were extended to construct a CBA for fish oils as a dietary supplement to current secondary prevention of CHD. The CBA required a number of additional steps.

- CHD prevalence was estimated for 2012 by applying prevalence rates from Begg et al (2007) to the 2012 Australian population.
- The unit cost difference was inflated to $140 in 2011-12 prices using an average health care cost inflation rate of 3.1% (AIHW, 2008), .
- The maximum total cost of fish oil supplementation for Australians with CHD in 2011-12 was thus estimated as $53.3 million.
- The ICER from the cost effectiveness analysis of $2,041 was inflated to $2,237 in 2011-12 prices (also using average health care cost inflation).
- The 2009 estimate of a maximum of 19,424 DALYs averted increased to 23,827 DALYs averted in 2011-12 prices.

- The DALY value was monetised using a parameter estimate from the Australian Government Department of Finance and Deregulation (DOFD) for the value of a statistical life year (VSLY), of $151,000 in 2007, also inflated to 2011-12.

The maximum value of the DALY benefits from the intervention was estimated as $4.19 billion, valuing wellbeing using the VSLY estimate from DOFD. However, it is unlikely that these benefits would accrue to all people with CHD, as take-up rates would not be universal. Since potential take-up would depend on a number of factors such as affordability to individuals, awareness, marketing and preferences, a parameter of 50% take-up was modelled in the CBA, with sensitivity analysis at 90% and 10%. Also, in the base case the VSLY was valued at 50% of the DOFD value, with sensitivity analysis similarly at 90% and 10%.

The findings of the CBA base case (50%), together with the high and low scenarios (90% and 10% respectively) are presented in Table 3.3.

- In the base case, if 50% take-up could be achieved and with a VSLY of $87,951, the net benefit in FY12 would be $1.0 billion, with a benefit cost ratio of 39:1.
- In the high scenario, if 90% take-up could be achieved and with a VSLY of $158,312, the net benefit in FY12 would be $3.4 billion, with a benefit cost ratio of 71:1.
- In the low scenario, if 10% take-up could be achieved and with a VSLY of $17,590, the net benefit in FY12 would be $37 million, with a benefit cost ratio of 8:1.

Table 1.1: Cost benefit analysis findings

Metric	Inputs	Base case (50%)	High scenario (90%)	Low scenario (10%)
CHD prevalence (people)	379,929			
Unit cost difference (FY12$)	140			
Total cost (FY12$m)	53.3	26.65	47.97	5.33
ICER (FY12$/DALY)	2,237			
DALYs averted	23,827	11,914	21,444	2,383
VSLY (FY12$)	175,902	87,951	158,312	17,590
Value of DALY benefits (FY12$m)	4,191	1,048	3,395	42
Benefit cost ratio		**39.3**	**70.8**	**7.9**
Net benefit (FY12$m)		**1,021**	**3,347**	**37**

FY12 = financial year 2011-12

Despite these strong CBA findings, fish oil supplements are not currently subsidised under the PBS, and indeed, are currently subject to the GST levy. As the evidence of improved health outcomes and positive net benefits of complementary medicine interventions build it would be strategic for governments to review these arrangements.

1 Background

The use of complementary medicine has been embraced by Australian consumers. Two in three Australians have used complementary medicines over the past 12 months and approximately 42% of these people use complementary and alternative medicines to prevent or manage chronic, high priority health problems (Access Economics, 2010). The growth in the use of complementary medicine interventions over recent years is supported by a growing body of scientific knowledge on their effectiveness and understanding of how they work, together with increasing prevalence of chronic disease in Australia, in part due to demographic ageing.

Epidemiological studies have indicated links between the consumption of fatty fish (such as mackerel, herrings, sardines, salmon, tuna and other seafood) and lower incidence rates of coronary heart disease (CHD), stroke and myocardial infarction (MI). However, studies that have used fish consumption as the main intervention have shown efficacy in the short term, although not in the long term. In addition, high levels of high levels of fish consumption may lead to poisoning with dioxin or methylmercury, although levels of these toxins in Australian fish stocks are very low (Access Economics, 2010).

Fish oil supplements offer a number of advantages through lower potential risk profiles as well as controllable concentrations of fish oil supplement per tablet. The World Health Organization (WHO), American Heart Association (Kris-Etherton et al, 2003), National Health and Medical Research Council (NHMRC), and the National Heart Foundation of Australia recommend fish oil as a complementary treatment in addition to standard treatments following a MI. These organisations mainly base their recommendations on the results of a large randomised clinical trial '*Gruppo Italiano per lo Studia della Sopravvivenza nell'Infarto Miocardico*' –Prevenzione (GISSI-P) and later the Japan eicosapentaenoic acid (EPA) Lipid Intervention Study (JELIS) trial (Yokoyama et al, 2007). Since these recommendations were published, another seminal trial (the GISSI-HF trial) has been published (GISSI-HF Investigators, 2008).

Access Economics (2010) provided cost effectiveness analyses of five complementary medicine interventions, one of which was Omega-3 fish oil for secondary prevention of heart disease, and found fish oil to be cost effective for this indication, using a benchmark of gross domestic product (GDP) per capita i.e. around $58,500 in 2011-12. This benchmark was based on WHO guidelines that interventions whose cost effectiveness is between one and three times GDP per capita per quality adjusted life year (QALY) gained (or DALY averted) are cost effective and those less than GDP per capita per QALY gained (or DALY averted) are very cost effective.[3]

The Complementary Healthcare Council of Australia commissioned Deloitte Access Economics to undertake cost benefit analysis of fish oils and estimate the net benefit (cost) of fish oils as adjunctive treatment for prevention of heart disease among those who have experienced MI, versus no fish oils, taking into account the cost per person of the treatment and the DALYs avoided.

[3] http://www.who.int/choice/costs/CER_levels/en/index.html Average GDP per capita for the Western Pacific region including Australia is shown as US$30,708 with three times that shown as US$92,123 in the year 2005.

2 Methodology

2.1 Indication

The indication is for secondary prevention of morbidity and mortality from CHD, evidenced through previous MI. The target population was defined in line with the trial data evidence as people who have had a MI within three months and who are unable to eat sufficient amounts of oily fish (2-4 portions per week) to meet the recommended intake of approximately 3.5g EPA and 2.5g docosahexaenoic acid (DHA) per week. Fish oil supplements are thus indicated. Australian specific incidence rates for MI and stroke events were sourced from Begg et al (2007). Rates of revascularisation procedures were sourced and calculated from the AIHW hospital morbidity database (Table 2.1). Mortality rates from cardiovascular disease were sourced using the AIHW General Record of Incidence of Mortality (GRIM) books.

Table 2.1: Incidence and procedure rates in Australia, by age and gender

	MI		Stroke		Revascularisation	
	Males	Females	Males	Females	Males	Females
0-1	0.00%	0.00%	0.01%	0.01%	0.02%	0.02%
1-4	0.00%	0.00%	0.01%	0.01%	0.01%	0.01%
5-9	0.00%	0.00%	0.01%	0.01%	0.00%	0.00%
10-14	0.00%	0.00%	0.01%	0.01%	0.00%	0.00%
15-19	0.00%	0.00%	0.01%	0.00%	0.01%	0.00%
20-24	0.00%	0.00%	0.01%	0.01%	0.01%	0.00%
25-29	0.01%	0.00%	0.01%	0.04%	0.02%	0.01%
30-34	0.02%	0.01%	0.01%	0.05%	0.06%	0.02%
35-39	0.06%	0.01%	0.02%	0.03%	0.13%	0.04%
40-44	0.12%	0.03%	0.04%	0.03%	0.30%	0.12%
45-49	0.24%	0.05%	0.06%	0.06%	0.58%	0.22%
50-54	0.36%	0.07%	0.09%	0.09%	0.97%	0.39%
55-59	0.47%	0.13%	0.11%	0.09%	1.48%	0.62%
60-64	0.63%	0.22%	0.15%	0.09%	2.00%	0.92%
65-69	0.79%	0.33%	0.23%	0.15%	2.58%	1.30%
70-74	1.06%	0.54%	0.35%	0.25%	2.94%	1.61%
75-79	1.36%	0.81%	0.53%	0.39%	3.15%	1.93%
80-84	1.67%	1.14%	0.82%	0.69%	2.93%	1.67%
85-89	2.09%	1.64%	1.29%	1.26%	1.39%	0.61%
90-94	2.34%	1.75%	1.85%	1.99%	-	-
95-99	1.48%	1.52%	2.42%	2.72%	-	-
100+	0.50%	0.47%	2.88%	3.29%	-	-

Source: Begg et al (2007).

2.2 Intervention

The intervention is fish oils as a dietary supplement to current secondary prevention of CHD. The economic review by Cooper et al (2007) considers two branded forms of fish oil – Omacor and Maxepa, with dosageof 510-540mg EPA/day and 345-360mg DHA/day.[4]

2.3 Comparator

For the purpose of this study the comparator group is standard treatment without fish oil supplements.

2.4 Effectiveness

A literature review was undertaken by Access Economics (2010), which found a number of studies on fish oil for the secondary prevention of CHD. These were mainly randomised controlled trials, but also two meta-analyses, one review and one economic study. Cooper et al (2007) conducted cost effectiveness modelling as part of developing guidelines for post-MI secondary prevention review, for the National Institute for Health and Clinical Excellence (NICE) in the United Kingdom. Modelling was based on meta-analysis of outcomes from GISSI-P and the Diet and Reinfarction Trial (DART1). All of the studies in this area have analysed either the GISSI-P population or the DART1 population, hence the meta-analysis provided by Cooper et al (2007) is a comprehensive analysis of all available data. The Cooper meta-analysis showed a mean effect size[5]:

- for MI of 1.14 (0.75-1.74);
- for stroke of 1.22 (0.91-1.64);
- for revascularisation of 1.05 (0.97-1.13);
- for cardiovascular death of 0.79 (0.67-0.93); and
- for total mortality of 0.81 (0.68-0.96).

Cooper et al (2007) took a National Health System perspective, rather than a society-wide perspective, and looked at the end-point outcomes of MI, stroke, revascularisation rates, cardiovascular deaths and total mortality. In addition, gastrointestinal side effects were included based on Hooper et al (2004). Across all the studies in this review, the overall incremental cost effectiveness ratio (ICER) was £12,480 / QALY gained. This ICER was in the middle range of the ICERs reported in other studies (Franzosi et al 2001, Quilici et al 2006, Lamotte et al 2006, Schmier et al 2006),[6] and all the studies reviewed showed cost effectiveness as defined by the WHO (i.e. less than GDP per capita per QALY gained). Further analysis showed that cost effectiveness improved beyond £12,480 per QALY for older patients.

[4] Note these are above the recommended levels of EPA and DHA assuming no dietary intake.

[5] The effect size from meta-analysis does not have a natural unit, as it represents a combination of outcome metrics from its source studies. The lower and upper confidence levels are reported in brackets.

[6] See Access Economics (2010, Table 4.3).

2.5 Benefits

Benefits are estimated in terms of healthy life gained from the intervention relative to the comparator. In our modelling, we used DALYs rather than QALYs to measure healthy life, since the DALY measure includes both loss of life due to morbidity and mortality, whereas the QALY measure does not capture impacts of premature mortality.

Disability weights for morbidity burden were sourced from AIHW reports on the burden of disease in Australia (Begg et al 2007 and Mathers et al 1999). These sources reported multiple disability weights depending on the disability present after the event, for example, disability weights for stroke were reported as follows.

- **No disability (0.00)**: First ever stroke, no long term disability after 6 months.
- **Mild disability (0.36)**: No mobility or self care problems, some problems with usual activities, pain, anxiety and depression.
- **Moderate/Severe disability (0.63):** Some mobility and self care problems, some problems with usual activities, pain, anxiety and depression.
- **Profound disability (0.92):** Some problems walking about, severe problems with self care, usual activities, pain, anxiety and depression.

Proportions of people with each disability (Table 2.2) reported by Mathers et al (1999) were used to estimate an overall disability weight for stroke events.

Table 2.2: Disability weights of stroke events by age and gender

Age group (years)	Males	Females
0-4	0.45	0.48
5-14	0.27	0.48
15-24	0.16	0.40
25-34	0.08	0.15
35-44	0.04	0.07
45-54	0.02	0.03
55-64	0.17	0.12
65-74	0.19	0.38
75+	0.33	0.42

Source: Access Economics (2010: Table 4.5) based on Mathers et al (1999).

Disability weights for an acute MI were taken from Mathers et al (1999) at 0.395, while it was assumed that the disability weight for a revascularisation would be zero (with no associated long term disabilities).

2.6 Costs

2.6.1 Health system costs

Health system costs for the five health states were included in the model. Costs associated with disease states were based on AIHW health expenditure by disease and injury

estimates (Table 2.3). Cost estimates were converted into a cost per case (2009 prices) using Australia incidence rate data.

Table 2.3: Cost in Australia per case of MI and stroke (2009 $)

	MI		Stroke	
Age group	Male	Female	Male	Female
0-4	83.3	27.3	0.0	891.6
5-14	32.0	0.7	0.0	448.4
15-24	132.2	115.1	0.0	1,111.1
25-34	1,647.8	523.5	3,587.8	1,513.0
35-44	3,054.5	3,515.1	2,271.5	1,146.4
45-54	4,487.8	2,652.1	2,088.4	3,459.0
55-64	3,704.3	2,442.5	2,236.8	3,225.3
65-74	3,179.4	2,915.8	5,264.7	4,246.2
75-84	3,993.9	2,912.4	7,940.0	6,875.2
85+	4,037.5	3,818.8	12,688.8	15,699.6

Source: AIHW (special data request), Access Economics. Projected to 2009 prices using an average health care cost inflation rate of 3.1% (AIHW, 2008).

Costs of revascularisation procedures and cardiovascular deaths were estimated from published hospitalisation data. Private inpatient cost data for 2006-07 were obtained from the Department of Health and Ageing National Hospital Cost Data Collection. However, as the National Hospital Cost Data Collection does not record expenditure on specialist fees within private hospitals, cost data was supplemented by schedule fee data derived from the Medicare Benefits Schedule (MBS). Adjustments to the schedule fees were made for additional out-of-pocket expenses. In summary, cost components included in our model relate to:

- salaries, including ward medical, ward nursing, and non clinical;
- pathology and diagnostic imaging;
- allied health;
- in-hospital pharmacy;
- critical care;
- operating rooms;
- emergency department;
- supplies;
- special procedural suites;
- stents;
- specialist fees;
- on-costs;
- hospital bed (hotel); and
- depreciation.

These data showed that on average the cost of a revascularisation procedure was approximately $16,570, while the hospitalisation cost associated with a cardiovascular disease related death was approximately $4,367.

2.6.2 Cost of fish oil supplements

Fish oil supplements are an over-the-counter medication with cost variations between brands.[7] Retail prices of fish oil supplements were sourced in Access Economics (2010) from Pharmacy Online.[8] Supplements that included additional products such as Gingko were excluded. Supplements that had a EPA:DHA ratio of approximately 1.5:1 were included (in line with dosages used in the clinical trials).

> A mean annual price of fish oil treatment ($112.15) was used in the cost effectiveness analysis.

2.7 Cost effectiveness model

A summary of the parameters used in the cost effectiveness analysis is in Table 2.4.

Table 2.4: Summary of model parameters

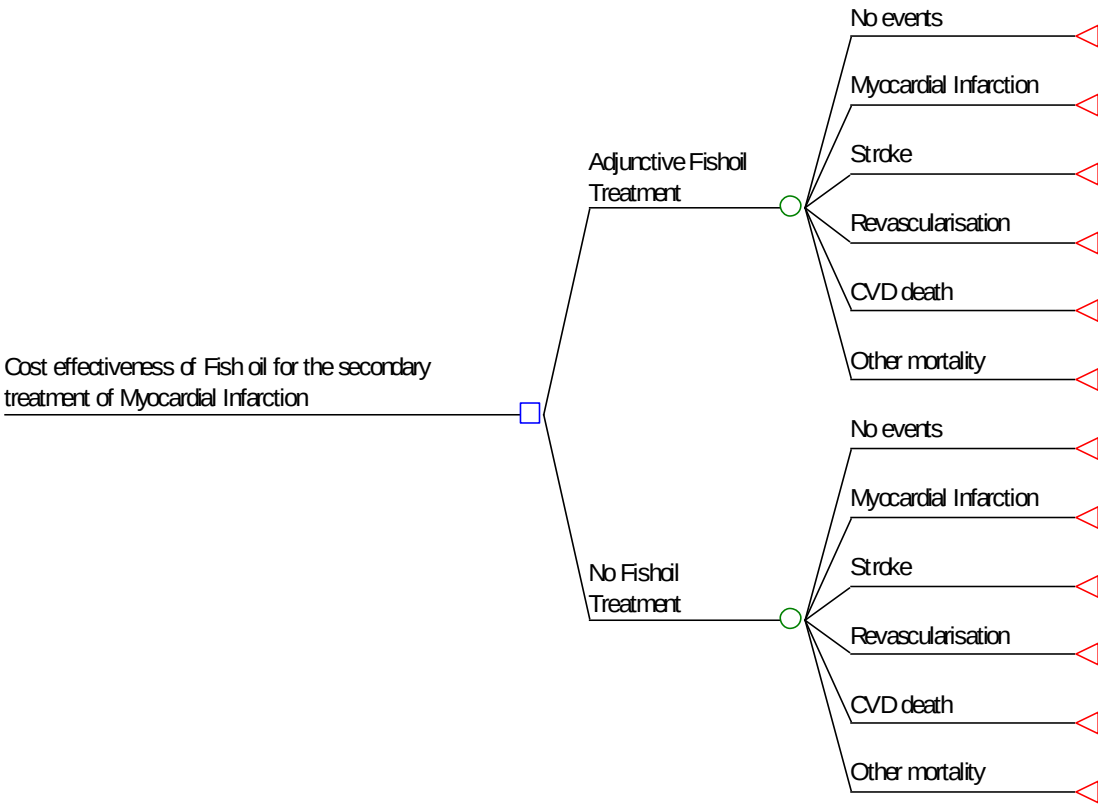
Parameter	Source and methods	Estimate
Efficacy of fish oil treatment	Cooper et al (2007)	Section 2.4
Incidence, mortality and procedure rates	Begg et al (2007) as well as AIHW hospital morbidity dataset	Table 2.1
Quality of life	Mathers et al (1999)	Disability weights for an MI event were taken as 0.395, while revascularisation rates were assumed to have a disability weight of 0. Disability weights associated with stroke used an age gender weighted average based on data describing post disability severities Table 2.2Table 2.2.
Costs – Fish oil	Pharmacy Online	$112.15
Costs – Revascularisation	National Hospital Cost Data Collection	$16,570
Costs – MI and Stroke	AIHW (special data request)	Table 2.3
Costs – cardiovascular disease mortality	Department of Health and Ageing National Hospital Cost Data Collection	Approximately $4,367

[7] For example, many patients use super strength or liquid formulations for convenience, e.g. Blackmore's Omega, Bioglan superstrength etc.

[8] The brands, volumes and retail prices sourced are shown in Access Economics (2010, Table 4.7).

To estimate the cost effectiveness of fish oils in the treatment protocol for secondary prevention of MI, a two-arm decision model was constructed in TreeAge with a modelled time period of one year (Figure 2.1). The six health outcome metrics were modelled using effect sizes from Section 2.4 and Australian age and gender specific incidence rates.

Figure 2.1: Model structure – fish oil for secondary prevention of MI



A second order Monte Carlo simulation was undertaken (with 1 million trials) on the decision model shown in Figure 2.1. Age and gender distributions were sampled in the model so that the overall results represented the same profile as those reported to have had a MI from Begg et al (2007).

3 Results

3.1 Cost effectiveness findings

The incremental cost per person was $128 per annum and the incremental effectiveness 0.06 DALYs. Incremental costs per person included the additional costs of fish oil supplementation as well as the expected costs per person of the health outcomes (MI, stroke, revascularisation and cardiovascular disease death).

> With an ICER of $2,041 per DALY averted, the cost effectiveness analysis shows that fish oils are cost effective in the secondary prevention of CHD relative to the WHO benchmark.

Table 3.1: Cost effectiveness of fish oils for secondary prevention of CHD ($ per annum)

Strategy	Cost	Incremental cost	Effectiveness	Incremental effectiveness	C/E	ICER
No fish oil	450		0.33		1,360	
Adjunctive fish oil	579	128	0.27	0.06	2,159	2,041

Note: Incremental effectiveness refers to the average number of DALYs avoided. C/E – cost effectiveness ratio. ICER – incremental cost effectiveness ratio. Cost difference is not exactly 128 due to rounding.

Access Economics (2010) conducted scenario analysis on the cost effectiveness findings and fish oils for the secondary prevention of CHD were considered cost effective under all of the scenarios.

3.2 Population wide applications

Access Economics (2010) applied the unit cost difference (using the DALY approach) of $128/person/annum to overall CHD prevalence of 309,726 people (Begg et al, 2007:282) to estimate an overall cost of the fish oil intervention of $39.6 million per year. Naturally there is unlikely to be 100% treatment so this represents an upper cost bound. Given the ICER of $2,041/DALY, the maximum wellbeing gain was thus estimated as 19,424 DALYs averted per annum.

Table 3.2: Population wide applications

1. Prevalence of CHD (Begg et al, 2007)	309,726
2. Unit cost difference (from model)	$128 pa
3. Total cost ($m) (1.*2.)	$39.6m pa
4. ICER ($/DALY) (from model)	$2,041/DALY
5. DALYs averted (3./4.*1,000,000)	19,424

3.3 Cost benefit analysis

There are four types of cost efficiency analysis: cost effectiveness analysis, subsets of which are cost utility analysis and, cost efficacy analysis; cost minimisation analysis; and cost benefit analysis.

- Cost effectiveness analysis compares the relative costs and outcomes (effects) of two or more courses of action. The numerator is measured in monetary units and the denominator in non-monetary units.
- In cost utility analysis, the denominator measures multi-attribute utility, typically in the health sector through uses a common metric unit of health measure such as disability adjusted life years (DALYs) or quality adjusted life years (QALYs), and reports an incremental cost effectiveness ratio (ICER) (i.e. the ratio of change in costs to the change in effects measured in DALYs/QALYs);
    - In cost efficacy analysis , the denominator uses a natural unit to measure the effect such as the number of additional student completions and also reports an ICER (e.g. the additional cost to achieve these additional student completions);
    - Cost minimisation analysis assumes that the effectiveness of both the intervention and control are the same, and analyses whether one is cheaper.; and
- Cost benefit analysis (CBA) assigns a monetary value to both the costs and to the measure of effect and reports a net benefit (or net cost), benefit to cost ratio and return on investment in percentage terms.

This section utilises the findings from the cost effectiveness analysis above to construct a CBA for fish oils as a dietary supplement to current secondary prevention of CHD. The CBA required a number of additional steps.

- CHD prevalence was estimated for 2012 by applying prevalence rates from Begg et al (2007) to the 2012 Australian population by age and gender groups, estimated from the Deloitte Access Economics Demographic model.
- The unit cost difference from the cost effectiveness analysis of $128 was inflated to $140 in 2011-12 prices using an average health care cost inflation rate of 3.1% (AIHW, 2008), .
- The maximum total cost of fish oil supplementation for Australians with CHD in 2011-12 was based on multiplying the unit cost difference by the CHD prevalence estimate, concluding the maximum cost of the intervention in 2011-12 would be $53.3 million.
- The ICER from the cost effectiveness analysis of $2,041 was inflated to $2,237 in 2011-12 prices using an average health care cost inflation rate of 3.1% (AIHW, 2008).
- The 2009 estimate of a maximum of 19,424 DALYs averted increased to 23,827 DALYs averted in 2011-12 prices, derived by dividing the new total cost estimate by the new ICER estimate.
- The DALY value was monetised using a parameter estimate from the Australian Government Department of Finance and Deregulation (DOFD) for the value of a

statistical life year (VSLY), of $151,000 in 2007, also inflated to 2011-12 using the health inflator of 3.1%.[9]

The maximum value of the DALY benefits from the intervention was estimated as $4.19 billion, valuing wellbeing using the VSLY estimate from DOFD.

However, as in the cost effectiveness analysis, it is unlikely that these benefits would accrue to all people with CHD, as take-up rates would not be universal. Since potential take-up would depend on a number of factors such as affordability to individuals, awareness, marketing and preferences, a parameter of 50% take-up was modelled in the CBA, with sensitivity analysis at 90% and 10%. Also, in the base case the VSLY was valued at 50% of the DOFD value, with sensitivity analysis similarly at 90% and 10%.

The findings of the CBA base case (50%), together with the high and low scenarios (90% and 10% respectively) are presented in Table 3.3.

- In the base case, if 50% take-up could be achieved and with a VSLY of $87,951, the net benefit in FY12 would be $1.0 billion, with a benefit cost ratio of 39:1.
- In the high scenario, if 90% take-up could be achieved and with a VSLY of $158,312, the net benefit in FY12 would be $3.4 billion, with a benefit cost ratio of 71:1.
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DALYs averted	23,827	11,914	21,444	2,383
VSLY (FY12$)	175,902	87,951	158,312	17,590
Value of DALY benefits (FY12$m)	4,191	1,048	3,395	42
Benefit cost ratio		**39.3**	**70.8**	**7.9**
Net benefit (FY12$m)		**1,021**	**3,347**	**37**

FY12 = financial year 2011-12

Despite these strong CBA findings, fish oil supplements are not currently subsidised under the PBS, and indeed, are currently subject to the GST levy. As the evidence of improved health outcomes and positive net benefits of complementary medicine interventions build it would be strategic for governments to review these arrangements.

[9] http://www.finance.gov.au/obpr/docs/ValuingStatisticalLife.pdf

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