Review of literature and resources relating to the health benefit of regular consumption of seafood as part of a healthy diet

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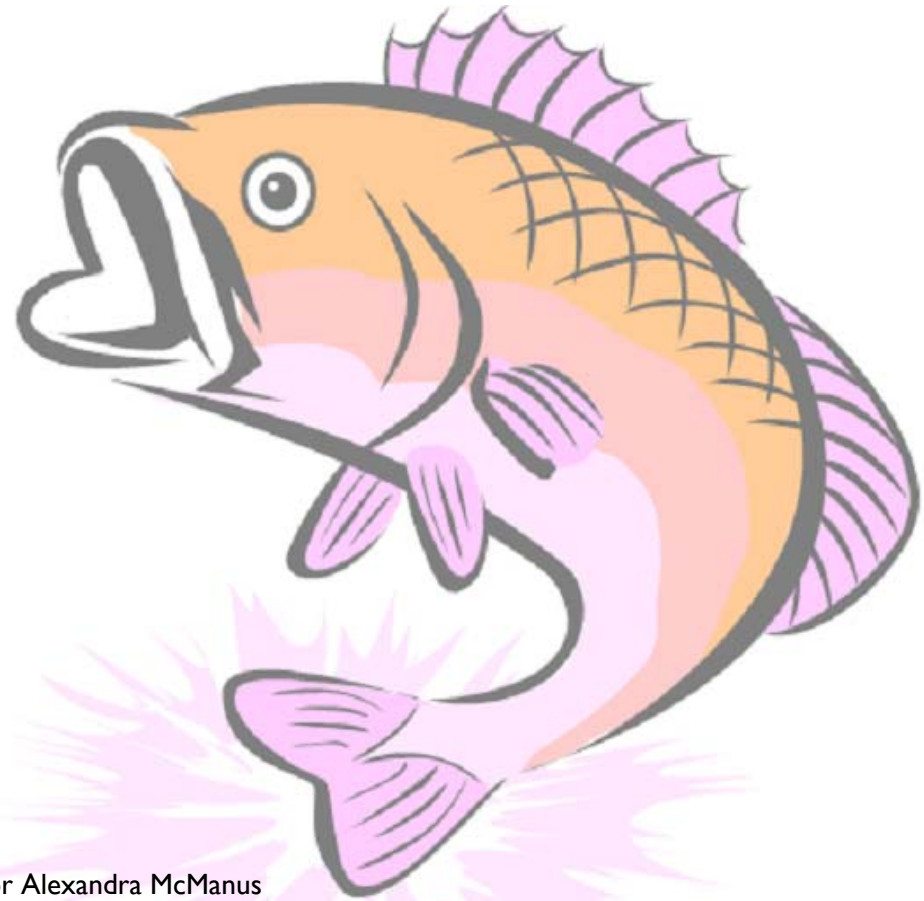

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AUSTRALIAN SEAFOOD COOPERATIVE RESEARCH CENTRE

Executive Summary

1.0 Evidence relating to health conditions and seafood consumption

The following provides an overview of evidence from studies published in peer-reviewed journals associated with seafood consumption and health. The level of evidence around each health issue was estimated using the following criteria:

A	High	• Further research is very unlikely to change our confidence in the estimate of effect • Several high-quality studies with consistent results • In special cases: one large, high-quality multi-centre study
B	Moderate	• Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate • One high-quality study • Several studies with some limitations
C	Low	• Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate • One or more studies with significant limitations • Any estimate of effect is very uncertain
D	Very low	• Expert opinion • No direct research evidence • One or more studies with very significant limitations

1.1 All cause mortality

- Regular fish consumption is associated with a significantly reduced risk of total mortality. (A)
- There is strong evidence that increased consumption of n-3 polyunsaturated fatty acids (PUFA) reduces the risk of all cause mortality. (B)
- 1-2 serves fish/wk (esp. those ⇧ in n-3 PUFAs) ⇩risk total mortality by 17%. (A)

1.2 Arthritis

- Evidence that fish consumption is protective against rheumatoid arthritis, and ulcerative colitis in males. (A)
- Ingestion of n-3 PUFA supplements has consistently shown improvement in joint tenderness and the amount of morning stiffness in those with rheumatoid arthritis. (B)
- Evidence that regular fish intake is beneficial in the management of inflammatory diseases. (B)
- Moderate to high intake of fish appears to be protective against rheumatoid arthritis. (B)

1.3 Asthma and allergies

- Fish consumption in the first year of life ⇩risk asthma and allergic rhinitis in childhood. (B)
- Risk of allergic rhinitis substantially ⇩ in children who had fish during the first year of life (Relative Risk (RR) 0.025) compared with children who had fish later in life (RR 0.060). (B)
- Early introduction to fish shows a consistent negative association with the risk of allergic rhinitis. (B)
- Results suggest that early intake of fish protects against airway disease in early life. (B)
- For children born to mothers with a history of asthma, Odds Ratio (OR) for asthma was 0.20 when mothers ate oily fish at least once month during pregnancy compared with no consumption. (B)
- In contrast, fish sticks (source of trans fats) consumption during pregnancy increased asthma risk in children (OR 2.04). (B)

1.4 Cardiovascular disease (CVD) - overall

- 2-3 fish meals/wk is protective against CVD. (A)
- Adequate intake of n-3 PUFAs ⇩ incidence of CVD. (A)
- Fish is more beneficial than fish oil in combating CVD and all cause mortality. (C)
- Traditional fish-based diets appear to be protective against CVD. (B)

1.4.1 CVD - Cardiac conditions

- Fish intake is beneficial to heart health. (A)
- 1 serve fish/wk (20gm/day) ⇩risk of coronary heart disease (CHD). (A)
- 1-2 serves/wk (esp species high in n-3 PUFAs) reduces the risk of:
  - coronary death by 36%; (A)
  - coronary heart failure by 20%; (A)
  - arterial fibrillation (28% ⇩risk 1-4 /wk, 31% ⇩risk ≥5 /wk; (A) and
  - myocardial infarction. (A)
- The risk of CHD is ⇩by 31% if 3-4 fish meals/wk and by 32% ⇩risk if consumed ≥ 5 /wk. (A)
- Fish oil acids may reduce potentially fatal arrhythmias in people at high risk. (C)

1.4.2 CVD - Stroke

- 1 serve fish/wk (white or oily fish) ⇩risk of stoke. (A)
- 1-4 serves fish/wk ⇩risk ischemic stroke by 27%. (A)
- ≥ 5 serves fish/wk ⇩risk ischemic stroke by 30%. (A)
- 44% ⇧ risk of ischemic stroke if > 1serve/wk of fried or sandwich fish. (A)
- Oily fish intake significantly ⇩ in women who subsequently had a stroke. (A)

1.5 Cancer

- 30yr follow-up, men who ate no fish had a 2-3 fold higher frequency of prostate cancer than those who ate moderate or high amounts of fish. (A)
- ≥ 4 serves fish/wk associated with ⇩risk of prostate cancer (strongest assoc with metastatic cancer (RR=0.56) (A).
- Daily intake of marine fatty acids associated with 24% ⇩risk in metastatic cancer. (B)
- Slightly ⇩risk of colorectal cancer in fish consumers, more pronounced in women. (B)
- Fish consumption assoc with ⇩risk of lung cancer mortality in males (independent of cigarettes, animal fat minus fish fat, vegetable and fruit consumption). (A)

1.6 Diabetes

- ⇧ consumption of fish assoc with ⇩risk of CHD in diabetic women. (A)
- ⇧ consumption of fish assoc with ⇩risk of islet autoimmunity precursor for Type 1 diabetes in children at increased risk of Type1 diabetes. (A)

1.7 Gender

1.7.1 Men

- 20% ⇩risk in total mortality assoc with ≥ 1 serve fish/wk in men. (A)
- Evidence fish consumption protective against CVD and chronic respiratory disease in males. (A)
- 30yr follow-up, men who ate no fish had a 2-3 fold higher frequency of prostate cancer than those who ate moderate or high amounts of fish. (A)
- Fish consumption assoc with ⇩risk of lung cancer mortality in males (independent of cigarettes, animal fat minus fish fat, vegetable and fruit consumption). (A)
- Men who consumed ≥ 1 serve fish/wk RR of sudden death of 0.48. (B)
- The influence of dominant male within the family unit should be considered in any intervention to increase regular seafood consumption. (C)

1.7.2 Women

- ⇧ consumption of fish assoc with ⇩risk of CVD (A) and colorectal cancer. (B)
- Women of childbearing age should consume ≥ 2 serves of fish /wk. (A)

1.8 Maternal

- Pregnant and lactating mothers should consume up to 12oz of a variety of fish each week (incl. shellfish low in mercury). (A)
- Fish consumption does not adversely affect infant gestation and birth size at a population level. (A)
- ≥ 340 g/wk maternal seafood intake beneficial to child cognitive development. (A)
- Low seafood intake during pregnancy could lead to adverse effects on neurodevelopment. (A)
- Occurrence of preterm delivery varied from 7.1% in group never consumed fish to 1.9% in those consuming fish at least once/wk. (A)
- Low consumption of fish was a strong risk factor for preterm delivery and low birth weight. (A)

- Small amounts of n-3 FAs (provided as fish or fish oil) protective against preterm delivery and low birth weight. (A)
- Fish sticks (source of trans fats) consumption during pregnancy ⇧ asthma risk in children (OR 2.04). (B)
- Nutritional education for pregnant women required. (C)
- Fish consumption assoc. with increased length of gestation in women with a low risk of adverse pregnancy outcomes. (C)
- High shellfish intake assoc. with ⇧ risk of small for gestational age births. (C)
- ⇧ intake maternal fish during pregnancy assoc with longer gestation, increased birth weight, reduced risk of intrauterine growth retardation and lower prevalence of pregnancy-induced hypertension. (C)

1.9 Mental health (including cognitive development)

- ≥ 340 g/wk maternal seafood intakes beneficial to child cognitive development. (A)
- Maternal intake of very-long-chain-fatty-acids during pregnancy and lactation may be favourable for mental development of children. (B)
- Compared with low intake (21mg/d), high intake (407mg/d) of n-3 PUFAs was associated with fewer depressive symptoms in adults (OR 0.46). (B)
- An average intake of 400 mg/d of n-3 PUFAs may reduce depression. (C)
- Fish consumption may be associated with slower cognitive decline with age. (C)
- Greater seafood consumption predicted lower lifetime rates of bipolar disorders. (C)
- There is limited evidence around seafood, fish oil or supplements in the management of attention disorders such as ADHD. However the evidence that is available is promising. (C)
- Brains of Alzheimer patients have lower DHA in gray matter. N-3 PUFAs retard the decline in cognition over time. (C)

1.10 Other issues

- Negative assoc between diet rich in fruit, veg and fish and the risk of Congestive Obstructive Pulmonary Disease (COPD). (A)
- Mercury levels in Alaskan women who had a ⇧ fish intake were well below World Health Organization effect levels. (C)
- National fish advisories overemphasis risks and undervalue the benefits of fish consumption. (C)
- Interventions seeking to promote seafood as an integral part of a healthy diet should address existing negative attitudes and beliefs around the storage and preparation of seafood. (C)
- The influence of dominant males within the family unit (whether child or adult) should be considered. (C)
- Strategies directed at parents and children should include experimental hands on components to encourage experimentation, particularly focussing on use of, preparation and the variety of lower cost seafood available. (C)
- Food involvement correlated positively with fish consumption intention and frequency. (C)
- Dietary fish and weight loss had significant independent and additive effects on 24 hour ambulatory blood pressure and heart rate in overweight persons. (C)

2.0 What are the health risks associated with eating fish and seafood?

- The level of pollutants in seafood, in general, was very low. (B)
- The benefits of seafood consumption far outweigh the risks associated with possible pollutants. (B)
- Fish low in mercury and high in n-3 PUFAs are recommended. (B)
- Consumption of n-3 PUFAs during pregnancy is essential for optimum foetus neural development. (A)

3.0 Consumer behaviour in relation to fish and seafood consumption

- Fish low in mercury and high in n-3 PUFAs are recommended. (B)
- Consumption of n-3 PUFAs during pregnancy is essential for optimum foetus neural development. (A)
- Perceived cost, freshness, quality, availability, taste and easy preparation were considered to be the main influences in consumer choice of fish and seafood products. (B)
- The lowest income households had the lowest fish consumption frequency. (B)
- The highly processed product varieties (battered and crumbed fish and fish in sauce dishes) were often popular among the families and perceived as easy and convenient to cook. (B)
- Odours common to fish and seafood often a deterrent to consumption. (B)
- Fresh fish and seafood preferred to alternative products (processed, smoked, canned and frozen products). (C)
- Bones and price influence purchase type but not intention to purchase. (C)
- The presence of children in the households led to lower fish consumption. (C)

4.0 Marketing and advertising

- Food advertising to children predominantly featured snack foods/fast foods and confectionary. (A)
- Modern marketing techniques had a strong influence on food choice. (B)
- Changing the food advertising environment within children's television viewing time to an environment where nutritious foods are promoted and less healthful foods unrepresented would lead to the normalisation and reinforcement of healthy eating.

5.0 A critical review of the current resources for General Practitioners and Allied Health Professionals to use with patients on the health benefits of regular consumption of seafood as part of a healthy diet.

This component of the review focused on the collection and critical review of relevant resources that were available to General Practitioners (GPs) and Allied Health Professionals (AHPs) to use with patients as either a prevention or treatment measure for common lifestyle or medical conditions. All resources reviewed are designed to be used during a five to ten minute consultation.

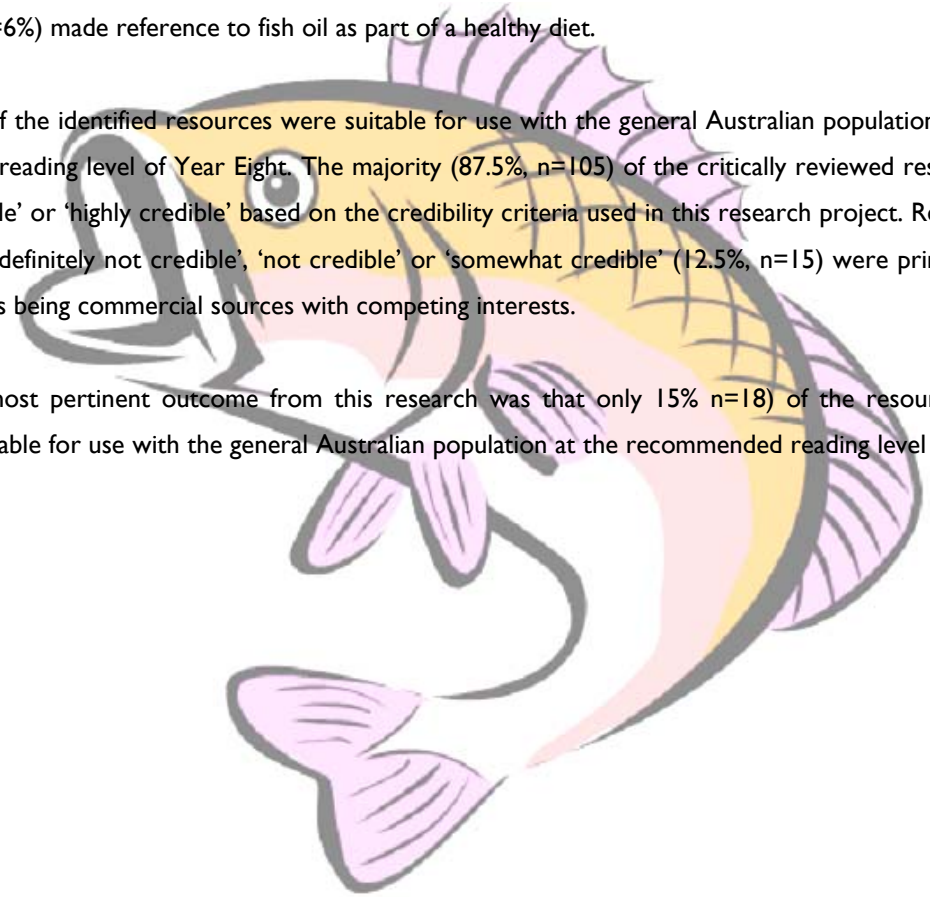
The identification process realised 120 current resources associated with the health benefits of regular consumption of seafood as part of a healthy diet that could be used by GPs and AHPs. The resource topics included nutrition (40),

heart health (30), preconception, pregnancy and breastfeeding (25), arthritis (seven), cancer (six), osteoporosis (six), diabetes (three), dental health (two), and dementia (one).

The critical review of resources revealed information about the format, target group, reference to seafood, credibility and suitability of the identified resources. The majority of identified resources (88.4%, n=106) were available electronically as either PDF files or webpages, a preferable, quick and easy mode of access for GPs and AHPs. Just over half (57.5%, n=69) of the identified resources were targeted at specific audiences. All of the resources made reference to the health benefits of regular consumption of fish (100%, n=120), 22.5% (n=27) made reference to seafood and 5% (n=6%) made reference to fish oil as part of a healthy diet.

Only 15% (n=18) of the identified resources were suitable for use with the general Australian population at or below the recommended reading level of Year Eight. The majority (87.5%, n=105) of the critically reviewed resources were found to be 'credible' or 'highly credible' based on the credibility criteria used in this research project. Resources that were found to be 'definitely not credible', 'not credible' or 'somewhat credible' (12.5%, n=15) were primarily due to information sources being commercial sources with competing interests.

In summary, the most pertinent outcome from this research was that only 15% n=18) of the resources critically reviewed were suitable for use with the general Australian population at the recommended reading level of Year Eight or lower.



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1.0 Introduction

1.1 Objectives for the review of evidence

The following outcomes (objectives) were proposed for the review of published literature related to seafood consumption and human health:

Capacity needs

1. Identify which organisations, institutions and spokespeople are currently providing information on seafood health benefits and the level of credibility that those organisations and institutions have. Undertake an initial assessment of their capacities and relevance to the seafood industry.
2. Assess the availability of trained people to develop the resources and to deliver health benefits information to the target audiences.

Health benefits research and development issues

3. Detail the work that has been done to document the health benefits of seafood.
4. Identify the work that has been done on how communication of health benefits can and does change consumer behaviour, particularly those in the target groups (young, older people, pregnant women and specific condition sectors).
5. Identify the barriers to and drivers for the use of seafood benefits information.
6. Identify current communication material used to disseminate health benefits information to target groups. Consider the strengths and weaknesses of these.
7. Identify the appropriate delivery frameworks for health benefits information and detail any specific requirements for these.

Opportunities for collaboration and co funding

8. Identify potential opportunities for collaboration nationally and internationally with industry, governments, NGOs and Research and Development organisations.
9. Identify potential alternative and collaborative funding partners.

2.0 Methodology

2.1 Criteria for considering studies

The following describes the methodology used to source literature relating to the relationship between seafood and human health.

2.2 Databases and sites searched

A comprehensive search was conducted of evidence utilising the following databases:

- Archive of Life Sciences;
- Proquest;
- PubMed;
- Science Direct;
- Taylor and Francis;
- The Cochran Collaboration;
- Web of Knowledge;
- Web of Science; and
- Wiley Interscience.

2.3 Other sources:

Other sources of information were:

- National and international seafood-based databases;
- Seafood industry websites or databases;
- Major national and international academic libraries;
- Electronic sources of information (e.g. Google, Google Scholar, international websites);
- Departments of Health within Australia; and
- Educational institutions.

2.4 Presentation of data

Data from published studies were summarised and presented in table form. The evidence from each study was then classified as: high, moderate, low or very low (see Table 2.1).

Table 2.1 Classification of the level of evidence

Code	Strength of evidence	Definition
A	High	• Further research is very unlikely to change our confidence in the estimate of effect • Several high-quality studies with consistent results • In special cases: one large, high-quality multi-centre study
B	Moderate	• Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate • One high-quality study • Several studies with some limitations
C	Low	• Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate • One or more studies with significant limitations • Any estimate of effect is very uncertain
D	Very low	• Expert opinion • No direct research evidence • One or more studies with very significant limitations

3.0 Literature Review Results

Key findings from published studies are presented herein in dot point form.

Table 3.1 follows the key findings and includes a summary of relevant peer-reviewed journal articles that provide evidence in relation to the health benefits of seafood consumption. Each has been assigned a level of evidence based on the 'Classification of Evidence' as outlined in Table 2.1.

3.1 Asthma and Allergies

What we know:

- Epidemiological studies of Australian schoolchildren have shown that children who eat fish more than once a week have one third the risk of airway hyper-responsiveness of children who do not eat fish regularly. [1, 2]
- Regular consumption of fresh, oily fish was associated with a reduced risk of asthma and airway diseases.[3, 4]
- Recent research suggests that eating fish and seafood during pregnancy may protect some children from asthma.[3, 5]
- Fish consumption in the first year of life was associated with a reduced risk of asthma and allergic rhinitis in childhood. [6]
- Early introduction to fish showed a consistent negative association with the risk of allergic rhinitis.[6]
- Fish sticks (trans fats) consumption during pregnancy significantly increased asthma risk in children (OR 2.04).[5]

What we need to know:

- Further evidence is needed to support the association between eating fish and seafood and reduced asthma risk among asthma sufferers.
- Investigation of the physiological function of the major nutrients found in various types of seafood and components that impact of the risk of asthma is warranted. [7,8]
- Future research is needed to investigate the protective mechanisms associated with eating fish and seafood during pregnancy.
- The protective link between common childhood allergies and seafood consumption (both and maternal and child) should be investigated further.
- The relationship between the increased risk of asthma and trans fats (fish sticks) should be investigated further.

3.2 Behavioural problems

What we know:

- There is limited evidence around seafood, fish oil or supplements in the management of attention disorders such as Attention Deficit Hyperactivity Disorder (ADHD). However the evidence that is available is promising.[9-14]

What we need to know:

- Treatment of attention disorders (including ADHD) in children and adults with fatty acids via fish intake and/or supplements warrants further attention.

3.3 Cardiovascular disease - overall

What we know:

- Fish intake is beneficial to heart health.[15-18]
- 1 serve fish/wk reduces the risk of coronary heart disease and stroke. 2 or > serves fish/wk provides increased protection against all cardiovascular diseases.[19-21]
- N-3 PUFAs associated with a reduced risk of cardiovascular disease, cardiac events (heart attack) and mortality (death).[22-24]
- N-3 PUFAs from fish and fish oils can protect against coronary heart disease.[25-29]
- Increasing fish consumption or fish-oil supplementation was associated with reduced coronary mortality for people with pre-existing coronary disease.[28]
- Regular consumption of fish and omega-3 fatty acids found in fish and seafood can lower blood pressure levels.[30]
- Fish consumption was associated with a reduced risk of death from stroke and all-cause ischemic heart disease (blockage of the arteries) in both men and women. Even consumption of fish as little as 1 to 3 times per month may reduce the risk of ischemic stroke.[18, 29, 31]
- The benefits of eating fish depended on the type of fish meal prepared. Broiled or baked fish was better than fried fish (which was not associated with lower risk of ischemic heart disease).[29]
- Strong evidence suggests that fish oil consumption is associated with a reduced heart rate (a major risk factor for sudden death).[32]
- Fish consumption associated with lower inflammatory markers indicating lower risk of coronary heart disease.[33]
- For women, higher consumption of fish and n-3 PUFAs (twice weekly), was associated with a reduced risk of coronary heart disease including, coronary artery atherosclerosis (the build up of fatty deposits in the arteries that carry blood to the heart).[22 28]
- Fish and seafood are preferred sources of essential fatty acids (such as DHA (docosahexaenoic acid) and EPA eicosapentaenoic acid) as the body processes them more efficiently (compared with supplements).[34]
- Regular fish consumption was associated with suppressed inflammation proving beneficial in the prevention of coronary heart disease. These benefits were particularly pronounced when 0.6g of n-3 PUFAs per day were consumed in the form of fish rather than supplement form.[33]
- Despite knowledge of the benefits of fish oil and favourable attitudes toward nutritional therapy, family physicians infrequently recommend fish oils to CVD patients. [35]
- Although evidence clearly shows that fish intake provides greater benefits than supplements such as fish oil, they may be beneficial to those who cannot or do not eat seafood. [36]
- Fish oil supplements and EPA/DHA enriched concentrates need to ensure accurate content claims, oxidative stability, negligible levels of environmental contaminants, the appropriate accompanying presence of physiological anti-oxidants, plus other factors.[36]
- Regular consumption of n-3 PUFAs may decrease cholesterol.[37-39]
- Consumption of non-fried fish containing n-3 PUFAs is associated with a lower OR of atherosclerosis.[40, 41]

- Consumption of fish is associated with beneficial structural changes in veins and arteries.[42]

What we need to know:

- We know that regular fish intake is protective against all cardiovascular diseases (CVD) and is also beneficial to those who have various forms of CVD. We urgently need guidelines around what a healthy diet that is protective against CVD at a population level looks like.
- We also need population-based dietary guidelines for those who are at higher risk of developing CVD and other lifestyle conditions such as diabetes, hypertension, arthritis, overweight and obesity.
- Evidence is mounting regarding problems associated with the composition and variability of over-the-counter supplements. Further research is needed to assess the health impact of commonly available supplements in relation to: accuracy of health claims; variability of fillers used; possible contaminants; stability over time; properties of common components; shelf life and interactions with various medications and herbal preparations.

3.4 Cancer

What we know:

- Epidemiological studies assessing the benefits of fish and seafood consumption associated with the risk of cancer (ie. lung, prostate, breast, colorectal, (non-Hodgkin), ovarian, pancreatic, skin (basal cell carcinoma), stomach and esophageal) show promising results. [18, 43-48]

What we need to know:

- More research is needed around the mechanisms by which fish consumption appears to protect against lung cancer.[18]
- Animal experiments have shown marine fatty acids, particularly the important n-3 PUFAs EPA and DHA, slow the growth rate of breast and prostate cancer cells in vitro. However whether a high intake of marine fatty acids can reduce the risk of these cancers or other hormone dependent cancers in humans is unclear and needs further investigation.[47]
- More evidence is needed to link the health benefits of fish and marine fatty acids to particular types of cancer.[47]
- Guidelines around diets protective against various types of cancer are required.

3.5 Cystic Fibrosis

What we know:

- Regular intake of n-3 PUFAs may provide some benefits for people with cystic fibrosis with relatively few adverse effects.[49]

What we need to know:

- More research is needed to determine whether or not there is a significant therapeutic effect to further assess the influence of disease severity, dosage and duration of treatment.
- Future research on n-3 PUFAs and cystic fibrosis is needed to be meaningful to people with, or making treatment decision about, cystic fibrosis.

3.6 Diabetes

What we know:

- Regular fish consumption should be considered as part of a healthy diet for diabetic management. [50]
- Regular fish consumption has a strong association with positive management of triglyceride levels in diabetic individuals and helps the kidneys to function more efficiently in Type 1 diabetic patients. [51]

What we need to know:

- Evidence is needed of the levels of regular fish (seafood) consumption that provides the best protection against developing or managing the various forms of diabetes, across the lifespan.
- Further evidence around the benefit of regular fish consumption on the positive management of diabetes is needed. In particular the effect of n-3 PUFAs on triglyceride levels and kidney function in type 1 diabetics.

3.7 Inflammatory conditions

What we know:

- Ingestion of n-3 PUFA supplements has consistently shown improvement in joint tenderness and the amount of morning stiffness in those with rheumatoid arthritis.[52, 53]
- Evidence shows that fish intake is beneficial in the management of inflammatory diseases.[53, 54]
- Moderate to high intake of fish appears to be protective against rheumatoid arthritis.[55]

What we need to know:

- Further research is needed to confirm that fish intake is beneficial to the management of inflammatory diseases. How much/how often/for which condition/s?
- Further research is needed to investigate if fish intake is protective against the development of inflammatory conditions.

3.8 Maternal health

What we know:

- High levels of fish intake during pregnancy have been associated with longer gestation, increased birth weight and lower hypertension during pregnancy. [56-60]
- Fish and seafood are potential sources of exposure to pollutants such as methylmercury that may adversely affect pregnancy outcomes. Thus, advising pregnant women about fish consumption requires consideration of potential risks as well as benefits. [56,61] While some pregnant women are potentially exposing their foetus to methylmercury, not enough women of child bearing age are consuming enough fish for health benefits.[62]
- Seafood is an excellent source of n-3 PUFAs, which are essential for optimum foetus neural development.[63]
- The beneficial effects on child development with maternal seafood intake of more than 340 g per week were found in a United States study. This suggests that advice to limit seafood consumption could actually be

detrimental. These results show that risks from the loss of nutrients were greater than the risks of harm from exposure to trace contaminants in 340 g seafood eaten weekly.[63, 64]

- Higher maternal fish consumption linked to higher childe developmental scores at 18 months, and improved performance on language and visual motor skills.[59, 60]
- Fish and seafood contain large amounts of essential fatty acids, as does breast milk. The fatty acid content of mothers' breast milk is determined mostly by diet. Maternal nutrition is important to foetal brain development. [65]

What we need to know:

- We need to understand the real risk of potential exposure to pollutants such as methylmercury through fish and seafood. More research is needed to determine safe levels of exposure and the source/s of exposure eg. local fish/seafood; imported fish/seafood.[66]
- Further investigation into exposure levels of imported seafood and regulatory food standards relating to exposure of seafood to pollutants is required.

3.9 Mental health

What we know:

- A growing body of evidence suggests a protective effect of n-3 PUFAs against dementia.[67, 68]
- Results of two clinical trials are due to be released, until then there is no strong evidence to support the intake of n-3 PUFAs for the prevention of cognitive impairment or dementia.[67]
- Mean daily intake of 10g/d seafood linked to lower prevalence of poor cognitive performance.[69]
- Intake of at least 1 fish serve/wk reduces the risk of Alzheimer Disease.[70-72]
- There is a significant negative correlations btwn worldwide fish consumption and rates of depression (including post-partum), bipolar disorder and suicidal ideation.[73-76]
- Evidence suggests a link between the consumption of fish and seafood and lower rates of mood and depressive disorders.[76, 77]
- Fish intake shown to have a negative association with depressed mood, risk of recurrent depressive episodes and depressive symptoms.[78-80]
- Fish consumption is significantly associated with higher self-reported mental health status.[73, 81]

What we need to know:

- Further research is needed to establish a significant association between fish consumption and its effect on mental health and cognitive impairment.
- Further research is needed to establish a strong positive association between fish and seafood consumption and mood disorders.
- Evidence of a therapeutic effect on general mental wellbeing would contribute to a population level campaign promoting the benefits of fish and seafood consumption.

3.10 What are the health risks associated with eating fish and seafood?

What we know:

- Levels of dioxins and other pollutants in fish are low, and potential carcinogenic and other effects are outweighed by potential benefits of fish intake and should have little impact on choices or consumption of seafood.[82]
- Fish that are likely to contain higher levels of mercury are shark, swordfish and king mackerel. Fish low in mercury and high in n-3 PUFAs are recommended.[83]
- Fish containing the highest amounts of n-3 PUFAs in the US are Farmed Trout, Farmed Atlantic Salmon, Coho Salmon, Toothfish, Copper River Salmon and Sockeye Salmon.[84]
- Women of childbearing age should consult regional advisories for locally caught freshwater fish. The benefits of modest fish intake, excepting a few selected species, also outweigh risks.[82]
- Women who are pregnant, may become pregnant or are breastfeeding plus very young infants should avoid fish with higher mercury content. However, consumption of fish and seafood should not be avoided altogether as it is the predominant source of n-3 PUFAs, which are essential for optimum foetal neural development. [63]
- Light tuna has relatively low levels of mercury, and other fish, such as wild and farmed salmon and shrimp, contain very low levels of mercury.
- A balance of risk-benefit in relation to the consumption of fish and seafood is recommended in the literature, as well as taking into consideration meal size and frequency of consumption.[85]
- Advances have made biomonitoring a cost-effective public health tool for helping federal, state and local health agencies develop optimal dietary guidance.[86]
- Guidelines are available to assist people to make informed choices about the types and amount of seafood they ingest based on higher n-3 PUFA content and low mercury concentrations.[66]

What we need to know:

- There is very little information available about actual dangers of mercury levels in seafood from Australian waters.
- More research is required on the nutritional security of fish and seafood in Australian waters. This should include guidelines for consumption of seafood.
- Evidence based guidelines on the amount of fish that Australian pregnant women and infants can safely eat are required.

3.11 Consumer behaviour in relation to fish and seafood consumption.

What we know:

- Perceived cost, freshness, quality, availability, ease of use, and (confidence in) preparation were considered to be the main influences in consumer choice of fish and seafood products. Quality was perceived by appearance and odour.[87, 88]
- Fresh fish and seafood was preferred to alternative products including processed, smoked, canned and frozen products.[87]
- Taste was the most important driver for eating fish, followed closely by health.[89, 90]

- Bones and price influenced purchase type but not intention to purchase.[89]
- Eating fish in compliance with health recommendations was higher among women and increases with increasing age.[89]
- The presence of children in the households led to lower fish consumption.[89]
- The influence family members (particularly the husband or partner) impacted upon the likelihood of the serving fish and seafood, and the types of products served.[88, 90]
- Lower income was positively associated with lower fish consumption. Higher education resulted in a higher intention to eat fish but has no effect on how often fish was eaten.[89]
- Fish was often perceived to be tasteless and preparation of sauces imposed extra cost. Consumers often fried fish in batter or butter which reduced the healthful effects on disease and conflicted with the health guidelines.[91]
- Packaged fresh fish was often perceived by heavy fish purchasers as inferior to fresh fish and by infrequent fish purchasers as having all the problems of fresh fish.[91]
- Plain fresh frozen fillets were sometimes rejected as they were perceived as grey, lifeless, anonymous and basic. They were associated with factories and processing.[91]
- The highly processed product varieties (battered and crumbed fish and fish in sauce dishes) were often popular among the families and perceived as easy and convenient to cook. However, they were negatively perceived to be made from poor quality fish, less healthy due to the cooking techniques associated with them (eg. deep fry) and they lacked variety.[91]
- Odours common to fish and seafood were often a deterrent to consumption. These were often related to bacteria.[92]
- Strategies directed at parents and children should include experimental 'hands-on' components to encourage experimentation, particularly focussing on ease of preparation and the variety of lower cost seafood available.[88]

What we need to know:

- The influence of the dominant male within the family unit should be considered and researched further.
- Interventions seeking to promote seafood (particularly fish) as an integral part of a healthy diet should be investigated further and should address existing negative attitudes and beliefs around the storage and preparation of seafood.

3.12 Marketing and advertising

What we know:

- Modern marketing techniques, in particular advertising, had a strong influence on food choice.[92]
- Food advertising to children predominantly featured snack foods/fast foods and confectionary. They often used themes that promoted grazing, the denigration of core foods and exaggerated health claims.[93]
- Changing the food advertising environment within children's television viewing time to an environment where nutritious foods are promoted and less healthful foods unrepresented would lead to the normalisation and reinforcement of healthy eating.[94]

- A health benefit message may increase consumers intention to eat fish by a greater amount than a health risk message may lower their intention.[95]
- More consumers recall hearing positive messages regarding fish consumption than negative messages. [90]
- Many consumers obtain the health information regarding seafood from the media.[90]

What we need to know:

- More research is required to inform a comprehensive social marketing campaign to promote the regular inclusion of fish and or seafood within the diet of Australian families.

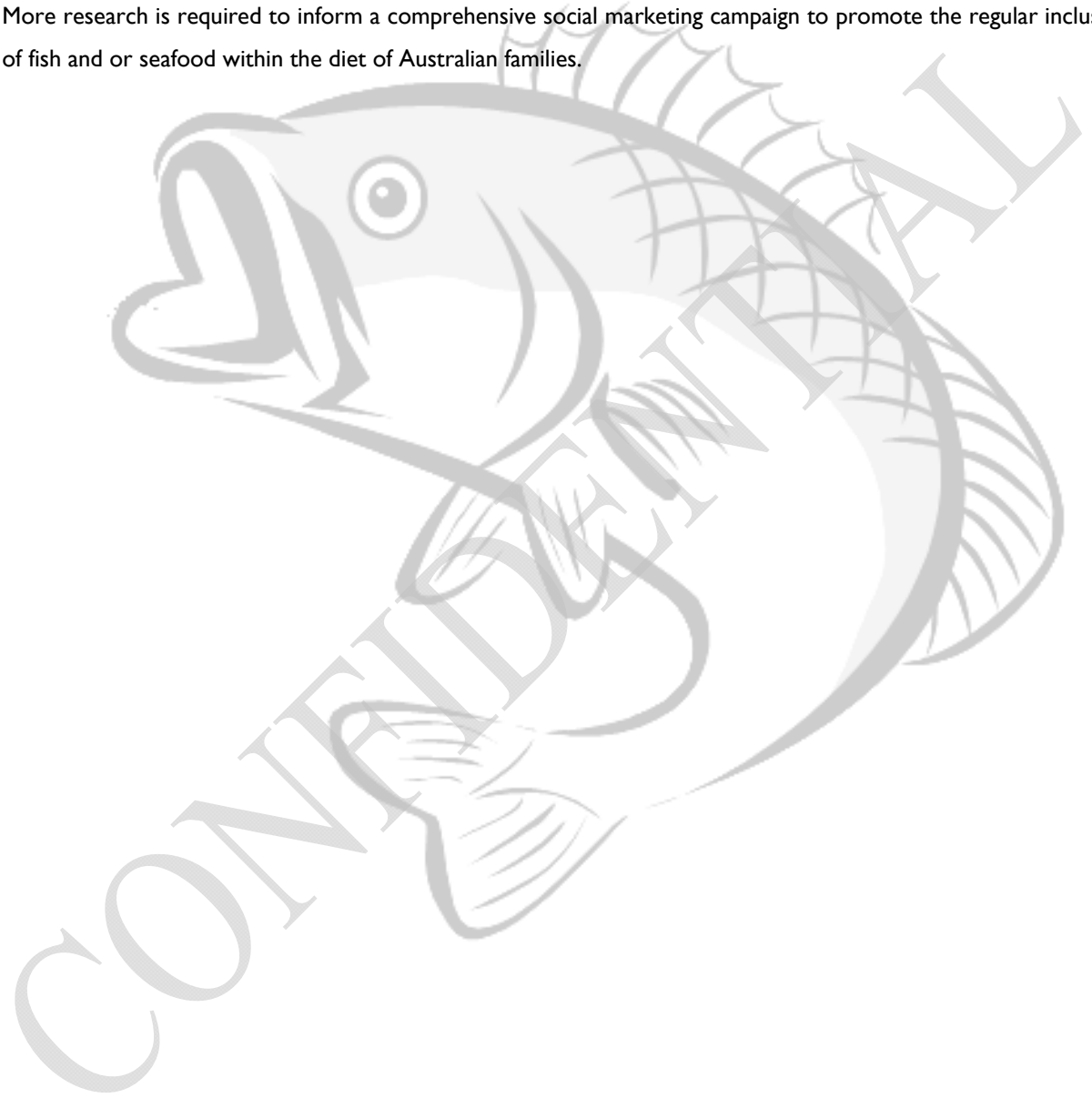

Table 3.1 Systematic review of peer-reviewed publications around Seafood Consumption and Health, to 2008

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Albert, Hennekens. et al., JAMA 1998; 279(1): 23-28[19]	Dept Prev Med, Harvard School of Public Health, Boston, USA	20 551/ USA	Fish consumption and risk of sudden **cardiac death.**	CVD – Cardiac	Cohort	Fish intake	• 133 sudden deaths throughout study. • After controlling for age, randomised aspirin and beta carotene assignment, and coronary risk factors**, dietary fish intake was assoc with a reduced risk of sudden death.** • Apparent threshold effect at consumption of 1 fish meal/wk. • For men who consumed fish > 1/wk, the multivariate RR of sudden death was 0.48 compared with men who consumed fish < 1/mth. • Fish consumption was assoc with a significantly reduced risk of total mortality.	A
Almqvist, et al., J Allergy Clin Immunol 2007; 119:1438-1444[2]	Woolcock Inst Med Research, Sydney, Australia	516 aged ≤5yrs/ Australia	Omega-3 and omega-6 fatty acid exposure from early life does not affect atopy and **asthma** at age 5 years.	Asthma	Cohort plus RCT	Fish oil	• Included children with familial link to asthma. • Plasma FAs measured at 18mths, 3 yrs & 5yrs. • Plasma levels of n-3 or n-6 acids were not associated with wheeze, eczema or atopy at age 5 yrs. • Observation of cohort supported negative findings of RCT. • **Modification of dietary PUFAs in early childhood is not helpful in preventing atopy and asthma.**	B
Amiano, et al., European J of Clin Nutr 2001; 55:827-832[96]	Dept of Health Basque Govt, Gipuzkoa, Spain	120 aged35-65 yr/ Spain	Relationship btwn habitual fish intake and fatty acid levels in serum	CVD	Cohort	Fish intake	• Concentrations of very-long-chain n-3 FAs are useful biomarkers for dietary fish intake, mainly lean fish.	D
Appleton et al., J Affect Disord 2007; 104: 217–223[78]	School of Psychology, Queen's Uni, UK	2747 M/ Northern Ireland & 7855 M/ France Total 10 602	**Depressed mood** and dietary fish intake: Direct relationship or indirect relationship as a result of diet and lifestyle?	Mental health	Cross sectional analysis	Fish intake	• While **fish intake was shown to have a negative assoc with depressed mood**, as fish intake increases, the incremental decrease in depressed mood was reduced. • The findings suggest that fish intake is directly assoc with decreased occurrences of depressed mood. • Fish intake is also assoc indirectly with decreased depressed mood, as part of a diet that is assoc with depressed mood.	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Arnold, Lynn et al. Am J Public Health 2005; 95(3): 393-397[86]	Alaska Division of Public Health, Epi, Anchorage, Alaska	150 pregnant & 52 of child bearing age (15-47 yrs) /Alaska	Human biomonitoring to optimize fish **consumption** advice	Fish intake Environ	Cohort	Fish intake	• All healthcare providers in Alaska recieved intro materials and encouraged to test pregnant women for Hg levels via hair samples. • Hg levels among pregnant women and women of child bearing age in Alaska were well below WHO no observed effect level. • **National fish advisories overemphasise risks and undervalue benefits of fish consumption.** • Highly respected generic fish consumption advisories can cause harm by unnecessarily warning people not to consume fish. • Among cultural groups who rely heavily on these foods for their nutritional, spiritual and cultural health, the results can be disastrous. • Advances have made biomonitoring a cost-effective public health tool for helping federal, state and local health agencies develop optimal dietary guidance.	C
Ascherio, Rimm, et al. N Eng J Med 1995; 332(15): 977-982[20]	Dept of Nutrition & Epi, Harvard School of Public Health, Boston, USA	1543 coronary events in M/ USA	Dietary intake of marine fatty n-3 acids, fish intake, and the risk of **CHD** among men.	CVD – CHD	Cohort	Fish intake Fish oil	• After controlling for age and several coronary risk factors, there were **no significant assoc between dietary intake of n-3 FAs or fish intake and the risk of coronary disease.**	B
Astorg, P et al., Prostaglandins, Leukot and Essent Fatty Acids 2008; 78(3): 171–182[79]	Unite´ Nutrition et Re´gulation Lipidique des Fonctions Ce´re´brales, Institut National de la Recherche Agronomique	664 cases & 3084 controls/ France	Association of fish and long-chain n-3 polyunsaturated fatty acid intakes with the occurrence of **depressive episodes** in middle-aged French men and women	Mental health	Cohort Case-control study Follow up 8 yr	Fish intake Fish oil Suppl	• Subjects consuming fatty fish or with an **intake of long-chain n-3 PUFA higher than 0.10% of total energy intake had a significantly less risk of any depressive episode and of recurrent depressive episodes**, but not of single depressive episodes. • These assoc were stronger in men and in non-smokers. • However female smokers eating fatty fish had an increased risk of recurrent depression.	C
Augood et al., Am J Clin Nutr 2008; 88:398–406[97]	Dept Epi & Population Health, London School of Hygiene &Tropical Med, London, UK	105 cases & 2170 controls/UK	Oily fish consumption, dietary DHA and EPA intakes, and associations with neovascular age-related **macular degeneration**	Optical health	Cross sectional	Fish intake	• This study examined the effect of DHA and EPA on neovascular age-related macular degeneration. • **Eating oily fish ≥1/wk compared with <1/wk was assoc with a halving of the odds of NV-AMD** (OR 0.47)	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Augustsson, Michaud et al. Cancer Epidemiol, Biomarkers & Prev 2003; 12: 64-7[43]	Dept of Nutrition & Epi, Harvard School of Public Health, Boston, USA	47 882 M aged 40-75 yrs/USA	Intake of fish and marine FAs and **prostate cancer**	Cancer – prostate	Cohort Follow up 12 yr	Fish intake Fish oil Suppl Other food	• **Eating fish ≥4/wk assoc with reduced risk of prostate cancer, and the strongest assoc was for metastatic cancer** (RR= 0.56). • Similar but weaker assoc with marine FAs. • Each additional daily intake of 0.5g of marine FAs from food was assoc with a 24% decreased risk of metastatic cancer.	A
Boa, et al., Hypertension 1998; 32:710-7[30]	Dept of Med, Uni of Western Aust, Perth, Aust	63 o/w hypertensive subjects /Australia	Effects of dietary fish and weight reduction on ambulatory **blood pressure** in **overweight** hypertensives	O/weight Blood pressure	Cohort Follow up16 wk	Fish intake	• Dietary fish and weight loss had significant independent and additive effects on 24 ambulatory BP. • Dietary fish also significantly reduced 24 hr and awake ambulatory heart rate. • Combining a fish meal with a weight reducing regimen led to additive effects on ambulatory BP and decreased heart rate. • The effects were large, suggesting that CV risk and antihypertensive drug requirements are likely to be reduced substantially by combining dietary fish meals rich in n-3 FAs with weight loss regimens in overweight medication treated hyptertensives. • **The reduction in heart rate seen with dietary fish suggests a cardiac/autonomic component, as well as vascular effects, of increased consumption of n-3 FAs from fish.**	C
Borresen, J Verbr Lebensm 2008; 3: 15 – 8[98]	Dept Seafood Research, Technical Uni of Denmark, Denmark	Program	SEAFOODplus – how to provide health promoting, safe seafood of high eating quality to consumers	Benefits Promotion	Program	Fish intake	• The strategic objective of the SEAFOODplus Integrated Project is to reduce health problems and to increase well-being among European consumers by applying the benefits obtained through consumption of health promoting and safe seafood products of high eating quality. • The six strategic areas of the program are: Seafood and human nutrition; Seafood and consumer behaviour and well-being; Seafood safety; Seafood from source to consumer product; Seafood from aquaculture; and Seafood traceability to ensure consumer confidence.	D

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Bravata et al., Neuroepidemiology 2007; 28:186–90[99]	Clinical Epi Research Center Veterans Affairs Connecticut Healthcare System, West Haven, US	5355 M twins/USA	Dietary Fish or Seafood Consumption is Not Related to **Cerebrovascular Disease** Risk in Twin Veterans	CVD	Cohort	Fish intake	• **No assoc was found** between dietary fish/seafood consumption and risk of stroke or transient ischemic attack.	C
Broadfield, McKeever et al. Clin Exp Allergy 2004;34 (8):1232-6[7]	Division of Respiratory Med, Uni of Nottingham, UK	89 asthma cases & 89 controls/ UK	A case-control study of dietary and erythrocyte membrane fatty acids in **asthma**.	Asthma	Cohort Case-control	Fish intake Other food	• **Results suggest that n-3 FAs do not play a major role in protecting against asthma**, and that higher levels of erythrocyte membrane linoleic acid are assoc with lower risk of asthma.	C
Brustad et al., J. Environ Monit 2008; 10(4): 422– 7[100]	Institute of Community Med, Centre for Sami Health Research, Uni of Tromsø, Norway	Review	10th Anniversary Review: when healthy food becomes polluted—implications for public health and dietary advice	Risks & benefits	Review	Fish intake	• **Fish intake is considered to be a protective factor for CVD.** This is attributed to n-3 FAs. • Many fish contain persistent organic pollutants, which can have neg health effects on humans. • Risk assessment must be balanced against health benefits. The authors recommend a risk management approach to setting seafood consumption guidelines.	C
Buck, et al., BioMed Central 2003; 2 (7):1-9[101]	National Institute of Child Health & Human Development, MD, USA	2716 infants/ USA	**Maternal** fish consumption and infant size and gestation	Pregnancy	Cohort	Fish intake	• No significant mean differences in gestation or any measure of birth size found in relation to duration of maternal lifetime fish consumption. • Gestational age, male sex, number of daily cigarettes, parity and placental infraction were significant determinants of birth size. • **Study adds to evidence that fish consumption does not adversely affect infant gestation & birth size at population level**. • This will help to demystify issues so public can be advised accordingly.	A

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Burger & Gochfiled, Sci Tot Environ 2008; 390; 346 – 54[102]	Division of Life Sciences, Rutgers Uni, NJ, US	172 College students/ New Jersey, USA	Knowledge about **fish consumption advisories**: A risk communication failure within a university population	Consumer perceptions	Cross sectional	Fish intake Risks & benefits	• **Overall, more people had heard about the health benefits of consuming fish compared to the risks from eating fish**. • Nearly 85% of respondents knew some of the reasons why fish were healthy, while only 38% knew any specific information about the risks. • When given a list of potential health risks assoc with fish consumption, about half of respondents understood that contaminants can cause cognitive problems or developmental defects. • Only 10% of respondents did not know who issued consumption advisories.	C
Burgess, et al., Am J Clin Nutr 2000; 71(suppl): 327-30[9]	Dept Foods and Nutr, Purdue Uni, West Lafayette, IN, USA	Review/ International	Long-chain polyunsaturated fatty acids in children with **attention-deficit hyperactivity disorder.**	ADHD Attention disorders	Review	Fish intake Fish oil	• **Children with ADHD have lower levels of LC PUFAs**. • Further research is needed to assess the association between PUFA and management of attention disorders.	C
Buydens-Branchey, Branchey & Hibbeln, Prog Neuropsychopharmacol Biol Psychiatry 2008; 32(2): 568–75[103]	Psychiatry Service, DVA NY Harbor Healthcare System, NY, USA & National Institute on Alcohol Abuse and Alcoholism, MD, USA	22 substance abusers/ Brooklyn, USA	Associations between increases in plasma n-3 polyunsaturated fatty acids following supplementation and decreases in **anger and anxiety** in substance abusers	Mental health	Randomised double-blind study	Fish intake Suppl	• Substance abusers assigned to daily administration of 2.250 g of EPA and 500 mg of DHA for 3 months experienced significant decreases in anger and anxiety scores compared to placebo group. • These changes were associated with increases in plasma levels of both EPA and DHA but an increase in EPA was more robustly correlated with low end-of-trial anxiety scores and an increase in DHA was more robustly correlated with low end-of-trial anger scores. • **The results of this study provide further support to emerging evidence of a link between n-3 PUFAs and hostility.**	C
Caslake et al., Am J Clin Nutr 2008; 88:6: 18 – 29[37]	Dept Vascular Biochemistry, Faculty of Med, Uni of Glasgow, UK	312 aged 20 – 70 yrs/UK	Effect of sex and genotype on **cardiovascular** biomarker response to fish oils: the FINGEN Study	Blood lipids	RCT	Fish intake Suppl	• The study aimed to measure the effects of moderate intake of EPA and DHA on blood lipid profile. • In the group as a whole, **8% and 11% lower plasma triacylglycerol concentrations were evident from 0.7 or 1.8 g doses of EPA and DHA per day.** • The enrichment of EPA and total LC n-3 PUFA in plasma PC after fish-oil supplementation was significantly greater in females than in males.	B

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Choi & Grandjean, Environ Chem. 2008:; 5: 112–20[104]	Dept Environ Health, Harvard School of Public Health, Boston, USA.	Review/ International	**Methylmercury exposure** and health effects in humans	Contam.	Review	Fish intake Contam.	• Seafood and freshwater fish constitute the dominant source of human exposure to MeHg. • MeHg can have negative effects on the brain development of children whose mothers were exposed. There is also emerging evidence that MeHg may promote the development of heart disease. • The health risks of seafood consumption must be balanced by the health benefits. • **Consumption of fish which are high in n-3 FAs but low in MeHg should be encouraged.**	B
Choi et al., Environmental Research 2008; 107(1): 45-52[105]	Dept Environ Health, Harvard School of Public Health, Boston, USA.	1204 infants/ Faroe Islands	**Selenium** as a potential protective factor against mercury developmental neurotoxicity	Infants Contam.	Cohort Follow up 7 yr	Contam.	• **Overall, no evidence was found that Se was an important protective factor against MeHg neurotoxicity.**	B
Chrysohoou, et al., Am J Clin Nutr 2007;85(5): 1385-91[21]	First Cardiology Clinic, Uni of Athens, Greece	1514 M, 1528 F aged 18-89 yrs/ Greece	Long-term fish consumption and **arrhythmia** in healthy people	CVD – Cardiac	Cohort	Fish intake	• Long-term consumption of fish is assoc with lower QTc interval in fish-eating people without evidence of CVD. • **Fish intake seems to provide antiarrythmic protection at a popn level.**	C
Cohen, Bellinger et al. Amer J Prev Med 2005; 29(4):366-74[61]	Harvard Center for Risk Analysis, Harvard School of Public health, USA	Meta-analysis/ International	Quantitative analysis of prenatal intake of n-3 polyunsaturated FAs and **cognitive development**	Cognition Brain dev	Cohort Meta-Analysis RCT	Fish intake Fish oil Suppl	• **An increase in maternal intake of DHA during pregnancy of 1 g/day will increase child IQ by 0.8 to 1.8 pts.** • Study has provided a starting point to quantitatively evaluate the cognitive benefits of maternal fish consumption, so that these benefits can be compared to the attendant risks resulting from prenatal exposure to Hg.	B
Cohen, et al. Amer J Prev Med 2005; 29(4):325-34[61]	Harvard Center for Risk Analysis, Harvard School of Public health, USA	Review/ USA	A quantitative **risk-benefit** analysis of changes in population fish **consumption**	Intake	Cohort Review RCTs	Fish intake Fish oil Suppl	• **Recommendations to women of child bearing age to eat fish with less MeHg may result in a reduction in consumption, thus may reduce net benefits.** • Other adults may also reduce their fish intake resulting in a negative net public health benefit. • Risk managers should investigate and carefully consider how populations respond to interventions, how these responses influence nutrient intake and contaminant exposure, and how these changes affect aggregate public health.	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Connor & Conner Am J Clin Nutr 2007; 85: 929-30[70]	Division of Endocrinology, Diabetes and Clincial Nutrition, Oregon Health & Science Uni, Portland, USA	Review/ USA	The importance of fish and docosahexaenoic acid in **Alzheimer Disease**	Alzheimer disease	Cohort Review	Fish intake Fish oil	• It is estimated that 20-40% of the population over the age of 85 yrs may have Alzheimer Disease. • Brains of Alzheimer Disease patients have a lower content of DHA in the gray matter of the frontal lobe and hippocampus than do the brains of persons without Alzheimer disease. • The major dietary sources of FAs (DHA & EPA) are fish and shellfish, from both salt water and fresh water. • **n-3 FAs retarded the decline in cognition over time.**	C
Crowe et al., Am J Clin Nutr 2007; 86: 1278–85[81]	Dept Human Nutrition, Uni of Otago, NZ	2416 aged ≥ 15 yrs /New Zealand	Serum phospholipid n-3 long-chain polyunsaturated fatty acids and physical and **mental health** in a population-based survey of New Zealand adolescents and adults	Mental health	Cohort	Fish intake	• **The results from this study suggest a strong and consistent assoc between EPA in serum phospholipids and self-reported physical well-being.** • However the association between n-3 LC PUFAs and self-reported mental well-being was not as consistent.	B
Daviglus, et al., N Eng J Med 1997; 336(15): 1046-53[106]	Dept Prev Med, NthWstn Uni Med School, Chicago, USA	1822 M aged 40-55 yrs/ USA	Fish consumption and the 30-year risk of **fatal myocardial infarction**.	CVD CHD Myocardial infarction	Cohort Follow up 47153 person yrs (30 yr)	Fish intake	• For men who consumed ≥35 gm of fish/day (compared with those who had none) the RR of death from CHD and from sudden or non sudden MI were 0.62 and 0.56 respectively, with a graded relation between the RR and the strata of fish consumption. • **These data show an inverse assoc between fish consumption and death from CHD especially non sudden death from MI.**	B

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Denomme, J Nutr 2005, 135: 206-11[107]	Dept Human Biology & Nutrition Science, Uni of Guelph, ON Canada	20 pregnant F/Canada	Directly quantitated dietary n-3 acid intakes of **pregnant** Canadian women are lower than current dietary recommendations	Pregnancy	Cohort	Fish intake	• Maternal intake of n-3 PUFAs must be sufficient to maintain maternal tissues stores and meet fetal accruement. • Recommendations for pregnant women include 0.6 to 1.2% of energy for n-3 PUFA intake in the current dietary reference intakes, and ≥ 300 mg/d of DHA suggested by the International Society for the Study of Fatty Acids and Lipids. • Nutritional education of pregnant women to ensure adequate intakes of n-3 PUFA for optimal health of mother and child and the inclusion of DHA in prenatal vitamins may be pertinent. • The n-3 PUFA intakes of pregnant women reported herein raise concerns and implications for public health. • **There is a need to create greater awareness, educational programs and counselling regarding DHA intake targeted at women planning to become pregnant.**	C
Dewailly, et al., Am J Clin Nutr 2002; 76:85-92[108]	Public Health Research Unit, Centre Hospitalier Uni Quebec, Canada	917 aged 18-74 yrs/Canada	**Cardiovascular disease risk** factors and n-3 fatty acid status in the adult population of James Bay Cree	CVD	Cohort	Fish intake	• n-3 FAs may favourably influence some CVD risk factors. • The Cree population must be encouraged to maintain their traditional fish-based diet, which may be one of the factors protecting then against mortality from CVD.	B
Dewey et al., The Cochrane Library 2008; 3[109]	The Cochrane Collaboration	Review - Five trials (involving 587 patients)	Eicosapentaenoic acid (EPA, an omega-3 fatty acid from fish oils) for the treatment of **cancer cachexia** (Review)	Cancer	Review	Fish intake Suppl	• There were **insufficient data** to establish whether oral EPA was better than placebo for treating cachexia, a weight loss syndrome affecting in cancer patients.	D
Din, Newby et al. BMJ 2004; 328:30-5[25]	Cardiovascular Research, Uni of Edinburgh, UK	Clinical review/ International	Omega-3 FAs and **CVD** – fishing for a natural treatment	CVD – Cardiac	Review	Fish intake Fish oil	• n-3 FAs from fish and fish oils can protect against CHD. • There is evidence to support the use of fish and fish oil supplementation after MI. • **Consumption of fish and higher blood concentrations of n-3 FAs are assoc with a reduced risk of sudden death.**	A

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Domingo JL. Environmental International 2007; 33: 993-8[85]	School of Med, Rovira I Virgili Uni, Catalonia, Spain	Review/ Spain	Omega-3 FAs and the **benefits** of fish consumption.	CVD – Cardiac Intake	Review	Fish intake	• Balancing adequately the risks and benefits of fish consumption is currently a nutritional/ environmental health key issue. • Although evident that fish must be a part of a balanced diet, choosing suitable species in terms of levels of PUFAs and pollutants, the freq of consumption and the meal size are essential aspects to balance benefits and risks of regular consumption. • For all – benefits of fish consumption outweigh potential risks. • For women of childbearing age, benefits of modest fish intake, excepting a few selected species, also outweigh risks. • **Evidence supports 500 mg/d of EPA and DHA for CVD reduction, which equates to 2 fish meals/wk (preferably fatty fish).**	B
Donaldson. Nutrition 2004; 3(19): 1-21[110]	Hallelujah Acres Foundation, Ellensburg, WA, USA	Meta-analysis/ International	Nutrition and **cancer**: a review of the evidence for an anti cancer diet	Cancer	Review	Fish intake	• ~30-40% of all cancers can be prevented by lifestyle and dietary measures alone. • Positive assoc between high ratio of n-3 and n-6 FAs (incl DHA) and **reduced risk of breast cancer**. • Diet high in cooked veg, pulses and fish **protective against colon cancer**.	B
Dullemeijer, et al., Am J Clin Nutr 2007; 86: 1479-85[111]	Wageningen Centre Food Sc, Wageningen Uni, Netherlands	807 aged 50-70 yrs/ Netherlands	n-3 fatty acid props in plasma & **cognitive** performance in older adults	Mental health Cognitive decline	Cohort	Suppl	• **Higher plasma n-3 PUFA proportions predicted less decline in sensory motor speed and complex speed**.	B
Elvevoll et al., Atherosclerosis 2008; 200(2): 396 - 402[38]	Dept of Marine Biotechnology, Norwegian College of Fishery Science, Uni of Tromsø, Norway	43 F & 37 M/ Norway	Seafood diets: Hypolipidemic and antiatherogenic effects of taurine and n-3 fatty acids	Blood lipids	RIT	Fish intake Suppl	• **Significantly stronger reductions were observed in total cholesterol, LDL-cholesterol in the n-3 + taurine intervention group compared to the n-3 group**. The n-3 + taurine intervention also had appositive effect on the total-to-HDL cholesterol ratio in the group.	C
Fan et al., Nutr Cancer 2008; 60(3): 354–63[112]	The Cancer Center, Uni of Minnesota, USA & Dept of Epi, Shanghai Cancer Institute, Shanghai	18 244 M aged 45 – 64 yrs/ Shanghai	Alcohol, Tobacco and Diet in Relation to **Esophageal Cancer**: The Shanghai Cohort Study	Cancer	Cohort	Fish intake	• After adjusting for potential confounders there was a **significant inverse assoc between intake of seafood products and risk of esophageal cancer in males** (p = 0.04).	A

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Fernandez, et al., J Br Menopause 2006; 12(4): 139-42[113]	Cancer Prevention and Control Unit, Institute Catala d'Onocologia, Barcelona, Spain	Meta-analysis/ International	Nutrition and **cancer** risk	Cancer	Review	Fish intake	• Mediterranean diet (adequate consumption of fruit, veg, cereals, whole-grain foods and fish) is associated with low mortality rates for CVD. • **n-3 FAs found in fish inhibit the growth in vitro of colon, breast and prostate cancers.**	C
Fung, et al., Arch Intern med 2003; 163(3): 309-14[44]	Dept of Nutrition, Harvard School of Public Health, Boston, USA	76 402 F aged 38-63 yrs/USA	Major dietary patterns and the risk of **colorectal cancer** in **women**	Cancer – colorectal	Cohort Follow up 12 yr	Fish intake	• Observed a RR for colon cancer of 1.46 when comparing the highest with the lowest quintiles of the Western diet of high intakes of red and processed meats, sweets, desserts, French fries and refined grains. • **Diet with high intakes of fruit, vegetables, legumes, fish, poultry and whole grains had a non sign inverse association with colon cancer** (RR 5th quintile compared to 1st of 0.71). • Finding was a significant positive assoc between Western diet and the risk of colon cancer.	B
Geelen, A J Epi 2007; 166(10): 1116-25[114]	Division of Human Nutrition, Wageningen Uni, The Netherlands.	Review/ International	Fish consumption, n-3 fatty acids and **colorectal cancer**: a meta analysis of prospective cohorts	Cancer – colorectal	Cohort Meta analysis	Fish intake	• The **pooled RR for colorectal cancer incidence were 0.96 for each extra occurrence of fish consumption/wk and 0.97 for each extra 100gm of fish/wk.** • The effect was more pronounced in women and in studies with a large exposure contrast. • In cohort studies, fish consumption was shown to slightly reduce colorectal cancer risk.	B
Gillum, Mussolino & Madans. Arch Intern Med 1996; 156(5): 537-42[115]	Centers for Disease Control, Hyattville, Md, USA	2351F 2059 M/USA	The relationship between fish consumption and **stroke** incidence in (A) females and (B) males.	CVD – Stroke	Cohort	Fish intake	• **Fish consumption was assoc with a reduced risk of stroke.**	B
GISSI-HF Investigators, The Lancet 2008; 372: 1223–30[24]	GISSI-HF Coordinating Centre, ANMCO Research Centre, Florence, Italy	3494 cases 3481 controls/ Italy	Effect of n-3 polyunsaturated fatty acids in patients with **chronic heart failure** (the GISSI-HF trial): a randomised, double-blind, placebo-controlled trial	CVD	RCT	Fish intake Suppl	• This study found that the long-term administration of **1g per day n-3 PUFA was effective in reducing both all-cause mortality and admissions to hospital for cardiovascular reasons.**	B

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Gochfeld and Burger. Neuro Toxicology 2005; 26: 511-20[83]	Environmental & Occupational Health Sciences Institute, Piscataway, USA	Review/ International	Good fish/bad fish: a composite **benefit-risk** by dose curve	Pregnancy	Review	Fish intake Fish oil Suppl	• **The duration of pregnancy and birth weight improve at a benefit threshold of about 8-15 g/day maternal fish intake.** • Meta-analysis revealed adult CVD benefits around 7.5-22.5 g/day bracket. • Using EPA Ref Dose of 0.1ug/kg/day, the fish intake threshold for harm converts to 27 g/day to 65 g/day for someone choosing fish low in MeHg (0.1 ppm). • Benefits of fish consumption replaced by fish oil suppl remains uncertain. • Visual acuity and neural pathways assoc with language acquisition showed a positive relationship to DHA in breast milk. • Choosing fish low in Hg and PCB's and high in PUFA is clearly desirable. • Documenting the margin of safety between the benefit threshold and the harm threshold is both an individual and public health priority.	B
Grobe, Manore & Still, J Consumer Affairs 2007; 41(2): 250- 64[116]	Human Development and Family Sciences, Oregon State University, Corvallis, US	26 F/USA	Trading Off Fish Health and Safety: Female Decision-Making Processes toward the Risk of **Methylmercury** in Fish	Consumer perceptions Risks & Benefits	Qual Cross sectional	Fish intake Risks & Benefits	• The analyses revealed five different decision processes that provide some understanding of how the participants traded off a healthy and beneficial protein source with the risks of Hg. These were (1) benefits of consuming fish outweighed the risks of MeHg, (2) personal risk was perceived to be less than the risk faced by others, (3) perceived risk was reduced through self-protective strategies, (4) they felt conflicted by the health and safety trade-off of fish and reduced fish consumption, and (5) lack of trust in information sources led to ambivalence. • Seventeen of the 26 participants did not change their fish consumption patterns because of concerns with the risks of Hg.	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Guldner et al., Environmental Health 2007; 6 (33)[57]	1Inserm U625, GERHM, IFR140, Campus de Beaulieu, Rennes, F-35042 France; Univ-Rennes I, Rennes, F-35042 France	2398 F/ France	**Maternal** fish and shellfish intake and **pregnancy outcomes**: A prospective cohort study in Brittany, France	Pregnancy	Cohort	Fish intake	• **A decrease in the risk of SGA birth with increasing frequency of fish intake for women eating fish twice a week or more compared with those eating it less than once a month** (OR = 0.57). • The risk of SGA birth was significantly higher among women eating shellfish twice a week or more than among those eating it less than once a month (OR = 2.14). • Each additional monthly meal including fish was sign related to an increase in gestational length of 0.02 week. • No assoc was observed with birth weight or preterm birth.	B
Guldner, et al., BioMed central Online 2007: 6(33): 1-18[117]	National School of Public Health, Campus de Beaulieu, Rennes, France	2398 pregnant F w low background risk of adverse pregnancy outcomes & high seafood consumption /France	Maternal fish (salt water only) & shellfish & **pregnancy** outcomes.	Pregnancy	Cohort	Fish intake	• **Fish & shellfish together assoc with decreased risk of SGA birth with increasing freq of fish intake: (OR 0.57) for women who eat fish ≥2/wk compared with those 1/mth.** • Risk of SGA significantly higher in those eating shellfish ≥2/ week compared with those eating shellfish once mth (OR 2.14). • Each add mthly meal incl fish sign related to increase in gestational length of 0.02 week. • Suggests diff categories of seafood may be diff assoc with birth outcomes. • Increased fish consumption assoc with increased length of gestation. • High shellfish intake assoc with increased risk of SGA births.	C
Gunnarsdottir et al., Int J Obes 2008; 32(7): 1105–12[39]	Unit for Nutrition Research, Landspitali-Uni Hospital, Iceland	140/ Iceland, 120/ Spain & 60/Ireland aged 20 – 40 yrs Total 320	Inclusion of fish or fish oil in weight-loss diets for young adults: effects on **blood lipids**	Obesity Blood lipid conc.	RCT	Fish intake Fish oil	• The average weight loss from all diets was 6.5 kg for men and 4.2 kg for women. • **Groups receiving fish or fish oil lost about 1kg more on average than control group.** • The groups receiving the cod diet, salmon diet or fish oil experienced greater reduction in blood triglyceride concentration than the control group. • Groups receiving fish (cod or salmon), experienced greater reduction in total cholesterol than those in the fish oil and control group.	B

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Haldorssen et al., Am J Epi 2007;166 (6): 687–96[58]	Maternal Nutrition Group, Dept of Epi Research, Statens Serum Institut, Copenhagen, Denmark	44 825 F/ Denmark	Is High Consumption of Fatty Fish during Pregnancy a Risk Factor for **Fetal Growth Retardation**? A Study of 44,824 Danish Pregnant Women	Pregnancy Fetal growth	Cohort	Fish intake	• High intake of fatty fish (>60g/day) was found to be inversely related to birth weight, birth length, and head circumference.	B
Harper & Jacobson Arch Intern Med 2001; 161: 2185-92[118]	Dept of Med, Office of Health Promotion & Disease Prevention, Emory Uni, Atlanta, USA	Systematic review/ International	The role of Omega-3 fatty acids in the prevention of **Coronary Heart Disease**	CVD – CHD	Cohort Review	Fish intake. Fish oil Suppl Other food	• Fish is an important source of n-3 PUFAs in the US diet, however, vegetable sources, including grains and oils, offer an alternative source for those who are unable to regularly consume fish. • Current evidence suggests that the 'quantity' and 'quality' of dietary fat intake determine CHD risk.	C
He et al. JAMA 2002; 288(24): 3130-6[119]	Dept Preventive Med, North Western Uni Feinberg School of Med, Chicago, USA	43 671/ USA	Fish consumption and risk of **stroke** in **men**	CVD – Stroke Men	Cohort Meta analysis	Fish intake	• **Intake of fish is inversely related to risk of stroke, particularly ischemic stroke.** • RR for stroke 0.91 for fish intake 1-3 serves/mth 0.87 for 1serve/wk 0.82 for 2-4 serves/wk and 0.69 for ≥ 5 serves/wk • Consumption of fish 1-3 serves/mth may protect against the incidence of ischemic stroke.	B
He et al., Am J Clin Nutr 2008; 88:1111– 8[40]	School of Public Health and School of Med, Uni of North Carolina at Chapel Hill, US	5488 aged 45–84 yrs/ USA	Intakes of long-chain n-3 polyunsaturated fatty acids and fish in relation to measurements of subclinical **atherosclerosis**	Atherosclerosis	Cross sectional	Fish intake	• This study found that **dietary intake of LC n–3 PUFAs and nonfried fish consumption were assoc with a lower OR of subclinical atherosclerosis classified by common CIMT**. The inverse associations were consistent in men and in women.	B
He, Song et al. Circulation 2004; 109:2705-2711[23]	Dept Preventive Med, North Western Uni Feinberg School of Med, Chicago, USA	222 364/ USA Netherlands Italy Finland UK Denmark	Accumulated evidence on fish consumption and **CHD** mortality: A meta-analysis of cohort studies	CVD – CHD	Cohort Meta-analysis	Fish intake	• **Fish consumption is inversely assoc with fatal CHD.** • Mortality from CHD may be reduced by eating fish > 1/wk. • Relative risks for CHD mortality – 0.89 for fish intake 1-3 serves/wk, 0.85 for 1/wk, 0.77 for 2-4 serves/wk, 0.62 for ≥ 5 serves/wk. • Each 20 g/d increase in fish intake was related to a 7% lower risk of CHD mortality.	A

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
He, Song et al. Stroke 2004; 35:1538-42[31]	Dept Prev Med, Nth Western Uni Feinberg School of Med, Chicago, USA	Meta analysis/ International	Fish consumption and incidence of **stroke**	CVD – Stroke	Cohort Meta-analysis	Fish intake	• Intake of fish is inversely related to risk of stroke, particularly ischaemic stroke. • Fish consumption as seldom as 1-3 serves/mth may protect against incidence of ischaemic stroke.	A
Helland, et al., Pediatrics 2003, 111: e39-e44[64]	Institute of Nutrition Research, University of Oslo, Norway	590 pregnant F & 341 F post birth/ Norway	Maternal suppl. with very-long-chain n-3 FAs during **pregnancy** and lactation augments children's IQ at 4 years of age.	Cognition Brain dev	Cohort	Fish oil Suppl	• **Children's mental processing scores at 4 years of age correlated significantly with maternal intake of DHA and EPA during pregnancy** (only variable of sign). • Maternal intake of very-long-chain n-3 FAs during pregnancy and lactation may be favourable for later mental development of children.	B
Hibbeln, Davis, et al. The Lancet 2007;369(9561); 578-85[63]	US National Institute on Alcohol Abuse and Alcoholism, NIH, USA.	11 875 pregnant F at 32 wks gestation/ UK	Maternal seafood consumption in pregnancy and **neuro developmental outcomes in childhood**	Cognition Brain dev	Cohort	Fish intake	• Found **beneficial effects on child development with maternal seafood intakes of more than 340 g/wk** therefore advice to limit seafood consumption could actually be detrimental. • Low seafood intake during pregnancy could lead to fetal deficiency in essential LC n-3 FAs such as DHA and EPA, resulting in adverse effects on neurodevelopment.	A

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Hicks, Pavarnik & McDermott, J Foodservice 2008; 19: 213–26[90]	Uni of Delaware, Delaware Sea Grant Program, USA	1062/USA	**Consumer perceptions** about seafood – an Internet survey	Consumer perceptions	Cross sectional	Fish intake	• 88% of respondents were current seafood eaters (CSE), 9% were former seafood eaters (FSE) and 3% were nonseafood eaters (NSE). • Of the CSE, 46% could be classified as regular or freq seafood eaters (≥1/ week), 29% as moderate seafood eaters (few times per month), and 25% as infreq seafood consumers (≤1/mth). • **Only 22% of respondents were meeting the US dietary recommendations and guidelines for seafood consumption.** • Taste preference (46%) was the primary reason FSE and NSE did not eat seafood. Seafood safety, environmental and overfishing concerns, quality concerns, seafood preparation and prior bad experience did not rate highly as reasons for not consuming seafood in this group. • For CSE, less affordability (45%), less availability (21%) and change in taste preferences of a household member (16%) were reasons for decreased seafood consumption. • Consumers identified the government as the source of advice that they trusted the most regarding which seafood to eat (47%). • 45% of participants believed that seafood was too expensive. • 85% of respondents reported hearing a positive message, and 61% had heard a negative message. 47% of those who heard a positive message mentioned n-3 FAs, fish oils and healthy fats, of those who heard a negative message 57% mentioned Hg. • **63% of respondents obtained their health information regarding seafood from the media.**	C
Hirayama, et al., Euro J Clin Nutr 2004; 58: 467-73[10]	Dept of Early Childhood Educ & Care, Japan	40 aged 6-12 yrs w ADHD	Effect of docosahexaenoic acid - containing food admin on symptoms of **ADHD** - a placebo controlled double blind study	ADHD Attention disorder	Cohort	Fish oil	• Previous study by authors reported aggression-controlling effects of DHA. • **This study showed a downward trend in aggression in the DHA group.** • Treatment of ADHD with FAs deserves further investigation but careful attention should be paid as to which FA(s) is used**.**	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Hodge, et al., MJA 1996; 164: 137-40[1]	Instit Resp Med, Royal Alfred Hosp, Sydney, Australia	574 children with asthma	Consumption of oily fish and childhood **asthma risk**	Asthma	Cohort	Fish intake	• **Consumption of oily fish may protect against asthma.**	B
Holub & Holub Mol Cell Biochem 2004; 263: 217-25[36]	Dept of Psychiatry & Behav Neurosc, McMaster Uni, Ontario, Canada	Review/ International	Omega-3 fatty acids from fish oils and **cardiovascular disease.**	CVD	Review	Fish oil	• The suitability of fish oil suppl and EPA/DHA enriched concentrates for any eventual clinical application will need to ensure accurate content claims, oxidative stability, negligible levels of environmental contaminants, the appropriate accompanying presence of physiological anti-oxidants, plus other factors.	B
Holub. CMAJ 2002; 166(5): 608-15[120]	Dept of Human Biology & Nutr Sciences, Uni of Guelph, Ontario, Canada	Review/ Canada	Omega-3 fatty acids in **cardiovascular care**.	CVD	Cohort Review	Fish intake	• **There is evidence for the beneficial effect of regular fish consumption (up to 2-3/wk) both in healthy subjects and in those at considerable risk for CHD or with established coronary artery disease.** • Current mean intakes of EPA & DHA (combined) are about 130 mg/day or 14-20% of target intakes of 650 mg/day and 900 mg/day.	C
Hooper, et al., BMJ Online 2006; 1136: 1-9[121]	School of Med, Health Policy & Practice, Uni of East Anglia, Norwich, UK	Systematic review/ International	Risk and benefits of omega 3 fats for mortality, **CVD** and **cancer**	CVD – Stroke Cardiac Cancer	Cohort 48 RCT's & 41 cohort studies	Fish intake Fish oil	• LC and shorter chain n-3 fats do not have a clear effect on total mortality, CVD events or cancer. • Guidelines encourage the general public to eat more oily fish and higher amounts are advised after MI. This advice should continue at present but the evidence should be reviewed regularly. • Probably not approp to recommend high intake of n-3 fats for people who have angina but have not had a MI. • **Some effects of fish on health may be due to components other than n-3 – for example selenium or vitamin D.** • **People who ate white or oily fish at least once per week had a sign reduced risk of stroke.**	A
Hu, Bronner et al. JAMA 2002; 287(14): 1815-21[28]	Dept of Nutrition & Epi, Harvard Medical School, Boston, USA	84 688 F nurses aged 34-59 yrs free from CVD & cancer/USA	Fish and omega-3 FA intake and risk of **CHD** in **women**	CVD – CHD	Cohort Follow up 14 yr	Fish intake	• **Among women, higher consumption of fish and n-3 FAs is assoc with lower risk of CHD, particularly CHD deaths**. • Strong evidence to support current dietary guidelines recommending fish consumption 2/wk for the prevention of CHD.	A

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Hu, Cho et al. Circulation 2003; 107:1852-57[51]	Dept of Nutrition & Epi, Harvard School of Public Health, Boston, USA	5103 F nurses w T2 diabetes free of CVD or cancer at baseline/ USA	Fish and long chain n-3 FA intake and risk of **CHD** and **total mortality** in **diabetic** women	CVD – CHD	Cohort Follow up 17 yr	Fish intake	• **Higher consumption of fish and LC n-3 FAs was assoc with a lower CHD incidence and total mortality among diabetic women.** • Findings suggest that regular fish consumption should be considered as part of a healthy diet for diabetic management.	A
Hughner, Mayer & Childs, J Am Coll Nutr 2008; 27(2): 185–94 [62]	Morrison School of Management and Agribusiness, Arizona State University, US	Review/US	Review of Food Policy and Consumer Issues of Mercury in Fish	Risks & benefits	Review	Fish intake Contam.	• This review highlights the need to communicate to consumers the risks of seafood consumption compared to the benefits. The authors note that in the US 250 000 pregnant women are potentially exposing their fetuses to MeHg, while **2 million women of child bearing age are not consuming enough fish for health benefits.**	C
Iso, et al., Circulation 2006; 113: 195-202[122]	Dept of Public Health Med, University of Tsukuba, Japan	41 578 aged 40-59 yrs/ Japan	Intake of fish and n-3 FAs and risk of **CHD** among Japanese	CVD – CHD	Cohort Follow up 10 yr	Fish intake	• Compared with a modest fish intake of 1/wk or ~20 g/day, **a higher intake was assoc with substantially reduced risk of CHD**, primarily nonfatal cardiac events, among middle aged persons. • The risk of CHD was ~ 40% lower among persons at the highest quintile of fish intake (8 serves/wk or ~ 180 g/day). • Findings suggest that a high fish intake may add a further beneficial effect for the prevention of CHD among middle aged persons.	A
Iso, et al., JAMA 2001; 285:304-12[122]	Div Prev Med, Brigham & Women's Hosp, Boston, USA	79 839 F aged 34-59 yrs	Intake of fish and omega-3 fatty acids and risk of **stroke** in **women**	CVD – Stroke Women	Cohort Follow up 14 yr	Fish intake Other food	• 1 086 261 person/yrs follow up, 574 incident strokes. • Compared with women who ate fish < 1/mth, **those with higher intake of fish had a lower risk of total stroke RR 0.93 fish 1-3 serves/mth, RR 0.78 1/wk, RR 0.73 2-4 serves/wk, RR 0.48 5 or< serves/wk)**. • Higher consumption of fish and n-3 PUFAs was assoc with a reduced risk of thrombotic infarction, primarily among women who did not take aspirin regularly, but was not related to risk of hemorrhagic stroke.	A
Kalmijn, et al., Am J Epidemiol 1997, 145(1): 33-41[74]	Dept Chron Diseases & Enviro Epi. Nat Instit PH & Environ, Netherlands	342 M aged 69-89 yrs/ Netherlands	Polyunsaturated fatty acids, antioxidants and **cognitive function** in very old **men**	Mental health Cognitive decline Men	Cohort	Fish intake	• **High fish consumption tended to be inversely assoc with cognitive impairment (OR = 0.63) and cognitive decline (OR= 0.45).**	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Kamphius, et al., Am J Clin Nutr 2006; 84(6): 1513-17[75]	Julius Center for Health Science & Primary Care, Uni Medical Center Utrecht, the Netherlands	332 M aged 70-90 yrs/ Netherlands	**Depression** and **CV** mortality: a role for n-3 fatty acids?	Depression	Cohort Follow up 10 yr	Fish intake Fish oil	• Compared with low intake (21mg/d), **high intake (407mg/d) of n-3 FAs was assoc with fewer depressive symptoms (OR 0.46).** • An average intake of ~ 400 mg/d of n-3 FAs may reduce depression. • No support for hypothesis that the intake of n-3 FAs explains the relation between depression and CVD.	C
Kaushik et al., Microcirculation 2008; 15(1): 27–36[42]	Centre for Vision Research, Dept of Ophthalmology, Westmead Millennium Institute, Uni of Sydney, Sydney	3654 aged ≥49yrs /NSW	Frequency of Fish Consumption, Retinal Microvascular Signs and **Vascular Mortality**	Vascular health	Cohort	Fish intake	• This study found **reg (≥ 2/wk) fish intake, esp oily fish, was assoc with slight widening of mean retinal arteriolar diameter and slight narrowing of mean retinal venular diameter**. Both are beneficial structural changes found assoc with lower risk of cardiovascular and cerebrovascular diseases.	B
Kremer, Am J Clin Nutr 2000; 71(suppl): 349s-351s[52]	Div Rheumatology, Albany Med Center, NY, USA	Review/ International	n-3 fatty acid supplements in rheumatoid arthritis	Arthritis Inflamm. disorders	Cohort Review	Fish intake Fish oil Suppl	• Some evidence to support the use of n-3 FA supplements in patients with rheumatoid arthritis. • **It is recommended that patients consume 3-6gm n-3 FAs daily for ≥ 12 wks.** • Further clinical studies required to demonstrate the efficacy of n-3 FAs in the management of rheumatoid arthritis. • Further research required to assess the effectiveness of fish oil in the management of a variety of inflammatory conditions.	B
Kris-Etherton, Harris et al. Artherioscler Thromb Vasc Biol 2003; 23: e20-e30[123]	American Heart Association, Dallas, USA	AHA Statement	Fish consumption, fish oil, omega-3 FAs and **cardiovascular disease**	CVD	Cohort Review	Fish Intake Suppl	• **A dietary (i.e. food based) approach to increasing n-3 FAs is preferable.**	B

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Kris-Etherton, Harris et al. Circulation 2002; 106: 2747-57[26]	American Heart Association, Dallas, USA	AHA Scientific Statement	Fish consumption, fish oil, omega-3 FAs and **CVD**	CVD – Cardiac	Cohort Review	Fish intake Suppl	• n-3 FAs have been shown in epi and clinical trails to reduce the incidence of CVD. • Evidence from prospective secondary prevention studies suggests that **EPA+DHA suppl ranging from 0.5 to 1.8 g/day significantly reduces subsequent cardiac and all cause mortality.** • AHA Dietary Guidelines to include ≥2 serves/wk of fish. • Consumption of a variety of fish is recommended to minimise any potentially adverse affects due to environmental pollutants and, at the same time, achieve desired CVD health outcomes.	A
Kris-Etherton & Hill, J Diet Assoc 2008; 108(7); 1125 - 30[124]	Dept Nutritional Sciences, Pennsylvania State Uni, USA	Review/USA	N-3 Fatty Acids: Food or Supplements?	Intake Suppl.	Review	Fish intake Suppl	• **A food based approach to FA consumption is recommended.** • For those who do not eat fish there are a number of foods that are supplemented with FAs. • Based on apparent consumption data for the United States, it is evident that fish intake does not meet recommendations for either fish or EPA and DHA.	C
La Vecchia, et al., Nutr Metab Cardiovasc Dis 2001; 11(4 Suppl): 10-15[125]	Instituto di Richerche Farmacologiche Mario Negri, Milano, Italy	Analysis of epi studies Italy	Nutrition and health: epi of diet, **cancer and CVD** in Italy	CVD, Cancer	Review	Fish intake Other food	• **A low risk diet for CVD and cancer includes high consumption of fish, veg and fruit.**	B
La Vecchia. Public Health Nutr 2004; 7(7): 965-8[126]	Instituto di Richerche Farmacologiche Mario Negri, Milano, Italy	>20 000 int. 10 000 controls/ Nth Italy	Mediterranean diet and **cancer**	Cancer	Review	Fish intake	• **Fish intake was a favourable diet indicator of cancer risk.**	D

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Laerum, et al., Clin Exp Allergy 2007; 37; 1616 - 23[4]	Dept of Thoracic Med & Centre for Clin Haukeland Uni Hospital, & Institute of Med, Uni of Bergen, Norway Dept of Pulmonary Med, Landspitali Uni Hospital, Iceland & Dept of Respiratory Med & Allergology, Uppsala Uni, Sweden	16 187 /Northern Europe	Relationship of fish and cod oil intake with adult **asthma**	Asthma	Cohort	Fish intake Fish oil	• When adjusted for a range of potential confounders, **asthma risk was significantly higher in the small group of subjects who had never eaten fish in childhood.** • However there was no indication that frequent fish intake in childhood was beneficial with regard to adult asthma or asthma symptoms. • **Asthma and asthma symptoms were less common in adults eating fish weekly** as compared with those eating fish more rarely. • In subjects who were eating fish <1/week at the time of the study, the risk for asthma was higher, suggesting a dose–response relationship.	B
Laidlaw & Holub, Am J Clin Nutr 2003; 77:37-42[127]	Dept of Human Biology & Nutr Sc. Uni of Guelph, Ontario, Canada	30 F/ Canada	Effects of suppl with fish oil-derived n-3 fatty acids and γ-linolenic acid on circulating plasma lipids and **fatty acid profiles** in **women**.	Women	Cohort	Fish oil	• **A mixture of 4gm EPH+DHA and 2gm GLA favourably altered blood lipid and fatty acid profiles in healthy women.**	C
Leaf, Albert et al. Circulation 2005; 112: 2762-8[128]	Dept of Med, Harvard Medical School, Boston, USA	402 w implanted cardioverter defibrillator/ USA	Prevention of **fatal arrhythmias** in high-risk subjects by fish oil n-3 FA intake.	CVD – Cardiac	Cohort Randomised double-blinded study	Fish oil	• This study provides evidence that for individuals at high risk of fatal ventricular arrhythmias, **regular daily ingestion of fish oil acids may significantly reduce potentially fatal ventricular arrhythmias.**	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Lindberg et al., Am J Clin Nutr 2008; 88:722–9[129]	Dept Med Biochemistry, St Olavs Hospital, Trondheim Uni Hospital and Dept of Lab Med, Children's and Women's Health, Norwegian Uni of Science and Tech, Trondheim, Norway	254 seniors/ Norway	Long-chain n-3 fatty acids and **mortality** in elderly patients	Mortality	Cohort Follow up 3 yr	Fish intake	• This study followed frail & elderly hospital patients to measure the impact of marine FAs on mortality. • After 3 years, the low-EPA group experienced 46 (73%) deaths, whereas the high-EPA group experienced 55 (40%) deaths. • Median survival time was 1.5 y in the low-EPA group and 2.4 y in the high-EPA group. • There was no significant difference between the upper 3 quartiles, suggesting that EPA has a threshold concentration above which the survival functions do not change further. • **Compared with patients in the lowest quartile, patients in the upper 3 quartiles had a 48% lower risk of all-cause mortality.**	B
Logan. BioMed Central Online 2004; 3(25): 1-8[73]	Integrative care Centre of Toronto, Toronto, Canada	Review/ International	Omega-3 FAs and major depression: a primer for the **mental health** professional.	Mental health Depression	Review	Fish intake Fish oil	• n-3 FAs play a critical role in the development and function of the CNS. • Emerging evidence of assoc between n-3 FAs and major depressive disorder. • Evidence suggests that dietary lipids and other assoc nutritional factors may influence vulnerability and outcome in depressive disorders. • Emerging evidence that n-3 FAs may be of therapeutic value in the treatment of depression. • **Significant negative correlations between worldwide fish consumption and rates of depression**. • Fish/seafood consumption also correlated with protection against post-partum depression, bipolar disorder and seasonal affective disorder. • Freq seafood consumption in general population assoc with decreased risk of depression and suicidal ideation. • Fish consumption significantly assoc with higher self-reported mental health status. • 25mg of zinc suppls sign increased n-3 status in plasma phospholipids at the expense of saturated fats.	B

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Lucey et al., Am J Clin Nutr 2008; 87 (4):1045–52[130]	Depts of Food and Nutritional Sciences and Med, University College Cork, Ireland	140/Iceland, 120/Spain & 64/Ireland Total 324	Influence of moderate energy restriction and seafood consumption on **bone turnover** in **overweight** young adults	O/weight Bone turnover	RCT	Fish intake Fish oil	• An energy restricted diet (-30%kcal intake) resulted in an average amount of weight loss was 5.14 kg across all groups (control, fish oil, cod and salmon). • The **inclusion of fish or fish oil in the diet was unable to reduce the effect of weight loss on bone turnover**.	B
MacLean, et al, JAMA 2006:295:403-15[45]	Sth California Evidence-based practice Center, Los Angeles, USA	Review	Effects of Omega-3 fatty acids on **cancer** risk	Cancer	Cohort Review	Fish oil Suppl	• A large body of evidence from numerous cohorts from many countries and with differing demographic characteristics does not provide evidence to suggest a significant assoc between n-3 FAs and cancer incidence. • **Dietary suppl with n-3 FAs is unlikely to prevent cancer.**	B
Mahaffey, Clickner & Jeffries, Environ Res 2008; 107: 20–9[131]	US Environ Protection Agency, Washington, US	3614 F/ USA	**Methylmercury** and omega-3 fatty acids: Co-occurrence of dietary sources with emphasis on fish and shellfish	Contam. Risks & benefits	Cohort	Fish intake	• Evaluation of the most commonly consumed seafood indicated that salmon followed by shrimp are principal sources of n-3 FAs and are lesser sources of MeHg, in contrast with tuna which provides n-3 FAs, but considerably higher levels of MeHg.	B
Marchioli, et al., Circulation 2002; 105:1897-1903[132]	Dept Clin Pharmacology & Epi, Santa Maria Imbaro, Italy	11 323	Early protection against sudden death by n-3 polyunsaturated fatty acids after **myocardial infarction**	Cardiac	Cohort Follow up 12 m	Suppl	• Four arms, n-3 PUFA suppl, Vit E suppl, n-3 PUFA & Vit E and controls. • Needs formal testing however **n-3 PUFA suppl appeared to take an anti arrhythmic and/or anti fibrillatory role in the treatment of patients with MI** in relation to a reduction in sudden death.	C
Marckmann P. Am J Clin Nutr 2003;78:1-2[133]	Medical Dept, Roskilde Hospital, Denmark	Editorial/ USA	Fishing for **heart** protection	CVD – CHD	Cohort Review Editorial	Fish intake Fish oil	• Fish consumption was assoc with decreased CAD mortality but not with total CAD mortality in high-risk subjects. • In general terms, an **average daily intake of 50g fish was reported to halve mortality.** • Consumption of fish and fish oil lowers CAD and total mortality in post MI patients, but only as long as consumption of fish and fish oil is continued. • **Fish is more beneficial than fish oil.** • For patients with stable angina, this is no benefit from eating fish and there may even be harmful effects of consuming fish oil capsules.	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Marrette, Roosen & Blanchemange, J Regul Econ 2008; 34: 119–43[134]	UMR Economie Publique INRA-AgroParisTech, Grignon, France	120 F/ France	Taxes and subsidies to change **eating habits** when information is not enough: an application to fish consumption	Consumer perceptions		Fish intake Consumer perceptions	• In the laboratory, information about health effects leads to a statistically significant decrease in the willingness to pay for tuna (assoc with health risks), and an increase in the willingness to pay for sardines (assoc with health benefits).	C
McKellar, et al., Ann Rheum Dis 2007; 66: 1239-43[135]	Glasgow Royal Infirmary, Scotland	130 F w rheumatoid arthritis aged 30-70 yrs	A pilot study of a mediterranean-type diet intervention in female patients with **rheumatoid arthritis** living in areas of social deprivation in Glasgow	Arthritis CVD	Cohort	Fish intake	• Patients with RA at high risk of CVD • Diet – high in fruit, veg, legumes, fish and unsaturated fats and low in dairy and red meats. • **Pain score sign better at 3 and 6 months.** • Intervention group also lost weight.	C
McManus, et al., BMC Public Health 2007; 7(119):1-7[88]	Western Australian Centre for Health Promotion Research, Curtin Uni, Australia	Qualitative study/ Australia	Factors influencing the **consumption** of seafood among young children	Intake	Cohort QI study	Fish intake	• **Interventions seeking to promote seafood as an integral part of a healthy diet should address existing negative attitudes and beliefs around the storage and preparation of seafood.** • The influence of dominant male influences within the family unit should be considered. • Strategies directed at parents and children should include experimental hands on components to encourage experimentation, particularly focussing on use of preparation and the variety of lower cost seafood available.	C
McMichael & Butler, Am J Prev Med 2005; 29(4): 322-3[136]	National Centre for Epi & Popn Health, Aust National Uni, Australia	Editorial/ International	Fish**, health** and sustainability	CVD	Editorial	Fish intake	• **Plenty of evidence that the consumption of fish reduces the risk of CVD.** • Fish consumption, most probably because of the oils, is also beneficial to the developing fetus and infant brain (and perhaps the ageing brain).	D

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Mehta et al., Am J Clin Nutr 2008; 87; :949 –56[137]	Dept of Upper Gastrointestinal Surgery & Dept of Histopathology, Norfolk , UK	34 w known Barrett's oesophagus, 18 controls/ UK	Effect of n-3 polyunsaturated fatty acids on Barrett's epithelium in the human lower esophagus	Cancer	RCT	Fish oil Suppl	• The EPA content of esophageal mucosa increased over the study period in the n-3 supplemented subjects and was significantly different from the content in the controls ($P < 0.01$). • There was also a significant decline in COX-2 protein concentrations in the n-3 group, and the difference was significant from that in the controls ($P < 0.05$). • **Supplementation with EPA significantly changed n-3 FA concentrations and reduced COX-2 concentrations in Barrett's tissue.**	C
Mitchell, Zhang & Smith, Food ChemToxicol 2008; 46(5): 1734–8[138]	Biomolecular Med, SORA Division, Faculty of Med, Imperial College, London	6 M/UK	**Dimethylamine** and diet	Contam.	Cohort	Fish intake Contam.	• With the exception of prawns, plaice and freshwater trout, all of the fish and seafoods investigated gave rise to a statistically significant increase in subsequent urinary dimethylamine excretion. The highest values were obtained for squid, coley and whiting (up to 7-fold increase), with skate, cod, sardine, haddock and swordfish producing substantial (3–4-fold) increase.	C
Montgomery & Richardson, The Cochrane Library 2008; 3[80]	The Cochrane Collaboration	Meta analysis of 5 RCTs	Omega-3 fatty acids for **bipolar disorder** (Review)	Mental health	Review RCTs	Fish intake Suppl	• Only one study (75 participants) provided data for analysis, and **showed a benefit of active treatment over control for depression symptom levels** (WMD - 3.93, 95% CI -7.00 to -0.86) and Clinical Global Impression scores (WMD -0.75, 95% CI -1.33 to -0.17) but not for mania (WMD -2.81, 95% CI -7.68 to 1.90). • No serious adverse effects were reported in the five studies.	C
Morris, et al., Arch Neurol 2003; 60: 940-6[71]	Rush Institute for Healthy Aging, Rush-Presby. St Luke Medical Center, Chicago, USA	815 aged 65-94 yrs/ USA	Consumption of fish and n-3 fatty acids and risk of incident **Alzheimer Disease**	Alzheimer Disease	Cohort Follow-up 3.9 yr (9 av)	Fish intake Other food	• **Participants who consumed fish ≥1/wk had 60% less risk of Alzheimer disease** compared with those who rarely or never ate fish (RR 0.4) in a model adjusted for age and tother risk factors. • Dietary intake of ≥ 1 fish meal /wk, oil-based salad dressings and nuts may reduce the risk of Alzheimer disease.	B
Morris, et al., Arch Neurol 2005; 62: 1849-53[72]	Rush Institute for Healthy Aging, St Luke Med Center, Chicago, USA	6158 aged ≥ 65 yr /USA	Fish consumption and **cognitive decline** with age in a large community study	Mental health Cognitive decline	Cohort	Fish intake	• **≥1 fish meal/wk may protect against cognitive decline assoc with old age.** • Fish consumption may be assoc with slower cognitive decline with age.	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Mosca et al., Circulation 2007; 115: 1481-1501[139]	American Heart Association, Dallas, USA	Systematic review/ International	Evidence-based guidelines for **CVD** prevention in **women**: 2007 update AHA	CVD Women	Cohort Review	Fish intake Fish oil	• **Recommend consumption of fish 2/wk for prevention of CVD in women.** • Pregnant and lactating women should consume up to 12 oz of a variety of fish/wk and shellfish low in Hg.	A
Mozaffarian and Rimm. JAMA 2006;296: 1885-99[82]	Dept of Med & Epi, Harvard Medical School, Boston, USA	Meta-analysis/ International	Fish intake, **contaminants** and **human health**	CVD – CHD	Cohort Meta-analysis	Fish intake	• **Benefits of fish intake exceed the potential risks.** • For women of child bearing age benefits of modest fish intake, excepting a few selected species, also outweigh risks. • Modest consumption of fish (1-2 serve/wk), esp species higher in n-3 FAs (EPA and DHA) reduces risk of coronary death by 36% and total mortality by 17% and may favourably affect other clinical outcomes. • Intake of 250 mg/d of EPA and DHA appears sufficient for primary prevention. • **Women of childbearing age and nursing mothers should consume 2 seafood servings/wk.** • Individuals with very high consumption (≥ 5 serve/wk) should limit intake of species high in Hg levels. • A variety of seafood should be consumed.	A
Mozaffarian, Bryson, et al., J Am Coll Cardiol 2005; 45(12): 2015-21[140]	Dept of Med & Epi, Harvard Medical School, Boston, USA	4738 aged ≥65 yrs free of CHF on recruitment/ USA	Fish intake and risk of incident **heart failure**	CVD – Cardiac	Cohort Follow up 12 yr	Fish intake	• Consumption of broiled or baked fish (mainly tuna) was correlated with plasma phospholipid n-3 FAs. • 955 participants developed coronary heart failure (CHF) during 12 yr follow-up. • **20% lower risk of CHF if consumed broiled or based fish 1-2 times/wk, 31% lower risk if consumed 3-4 times/wk and 32% lower risk if consumed ≥ 5 times/wk compared with intake 1/mth.** • Dietary long chain n-3 FA intake was inversely associated with CHF with 37% lower risk in the highest quintile of intake compared with the lowest. • Consumption of fried fish was positively associated with CHF. • In older adults, consumption of broiled or baked fish is associated with lower incidence of CHF.	A

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Mozaffarian, Geelen et al. Circulation 2005; 112:1945-52[32]	Dept of Med & Epi, Harvard Medical School, Boston, USA	Meta-analysis/ International	Effects of fish oil on **heart rate** in humans: a meta analysis of RCT's	CVD	Cohort Meta analysis	Fish oil	• **Strong evidence that fish oil consumption directly or indirectly influences cardiac electro-physiology.** • This effect may directly account for part of the observed benefits of fish intake on CVD risk, particularly risk of arrhythmic events. • Fish oil lowers BP in humans, possibly by reducing systemic vascular resistance.	A
Mozaffarian, Gottdiener, et al., Am J Cardiol 2006; 97(2): 216-22[141]	Dept of Med & Epi, Harvard Medical School, Boston, USA	5073 aged ≥ 65 yrs/ USA	**Physiological effects** of tuna or other broiled or baked fish on **cardiovascular system**	CVD – Cardiac	Cohort Follow up 12 yr	Fish intake	• **Intake of tuna and other broiled or baked fish was associated with improved cardiac hemodynamics.** • Fried fish was assoc with structural abnormalities indicative of systolic dysfunction and potential coronary arteriosclerosis. • Potential species physiological mechanisms that may in part account for the effects of fish intake on CV health.	A
Mozaffarian, Lemaitre et al. Circulation 2003; 107: 1372-7[29]	Dept of Med & Epi, Harvard Medical School, Boston, USA	3910 aged ≥65 yrs free of known CVD/USA	**Cardiac** benefits of fish consumption	CVD – Cardiac	Cohort	Fish intake	• Modest consumption of tuna or other broiled or baked fish, but not fried fish or fish sandwiches, among adults aged ≥65 yrs, is associated with lower risk of IHD death, especially arrhythmic IHD death. • Cardiac **benefits of fish consumption may vary depending on the type of fish meal consumed.** • The authors support the recommendations of fatty fish consumption ≥ 1 - 2 servings per week.	A
Mozaffarian, Longstreth et al. Arch Intern Med 2005; 165(2): 200-6[142]	Dept of Med & Epi, Harvard Medical School, Boston, USA	4775 aged ≥65 yrs free of cerebro vascular disease at baseline/ USA	Fish consumption and risk of **stroke**	CVD – Stroke	Cohort Follow up 12 yr	Fish intake	• 626 experienced stroke during 12 yr follow-up including 529 ischemic stroke. • **Consumption of tuna/fish inversely assoc with incidence of all stroke.** • 27% lower risk ischemic stroke w consumption of broiled or baked fish 1-4 times/wk and 30% lower risk if consumed ≥ 5/wk. • 44% higher risk of ischemic stroke if fried or sandwich fish is consumed more than 1/wk. • Fish not assoc with hemorrhagic stroke. • Overall broiled or baked fish assoc with lower risk of ischemic stroke while intake of fried or sandwich fish is assoc with higher risk. • Suggestion that fish consumption could influence stroke risk later in life.	A

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Mozaffarian, Psaty, et al., Circulation 2004; 110(4): 368-73[140]	Dept of Med & Epi, Harvard Medical School, Boston, USA	4815 adults aged ≥ 65 yrs/USA	Fish intake and risk of incident of **atrial fibrillation** (AF)	CVD – Cardiac	Cohort Follow up 12 yr	Fish intake	• 12 year follow-up, 980 cases of AF. • Consumption tuna or other broiled or baked fish inversely associated with AF. • 28% lower risk with intake 1-4/wk and 31% lower risk with intake >5/wk • **Broiled or baked fish (but not fried fish or fish sandwiches) assoc with lower incidence of AF.**	A
Mozaffarian,, Ascherio, et al., Circulation 2005; 111(2): 157-64[143]	Dept of Med & Epi, Harvard Medical School, Boston, USA	45 722 M free of CVD/USA	Interplay btwn diff polyunsaturated fatty acids and risk of **CHD** in men	CVD – CHD	Cohort Follow up 14 yr	Fish intake Other food	• From baseline to 14 yrs – 2306 total CHD events including 218 sudden deaths and 1521 non-fatal MI's. • **Both LC and IC n-3 PUFA intake assoc with lower CHD risk.** • Plant-based n-3 PUFAs may particularly reduce CHD risk when seafood-based n-3 PUFA intake is low, which has implications for population with low consumption or availability of fatty fish.	A
Mozaffarian. The Lancet 2007; 369(9567): 1062-3[15]	Dept of Med & Epi, Harvard Medical School, Boston, USA	Review/ International	Fish and fish oil intake and **cardiac** events	CVD – Cardiac	Cohort	Fish oil	• Commends investigators on conduction of large clinical trial of fish oil. • Although well tolerated and beneficial, need to follow up use of fish oil over long term suggested, as **research has shown low to moderate intake of fish is most beneficial to cardiac risk**, much of Japanese population already consuming fish to this level weekly. • Focus should be placed on fundamental risk factors for CVD (e.g. intake fish at least 1/wk).	B
Myers & Davidson. The Lancet, 2007;369 (9561):537-8[65]	University of Rochester Medical Center, New York, USA	Review/ USA	**Maternal** fish consumption benefits children's **development**	Pregnancy Neuro dev.	Review	Fish intake	• Fish and seafood contain large amounts of essential FAs, as does breast milk. • The FA content in breast milk is determined mostly by the mother's diet. • All fish contain small amounts of MeHg in their flesh but they also contain nutrients essential to brain development. • The only confirmed cases of perinatal human poisoning by MeHg from fish consumption was in the 1950s and 1960s after massive industrial pollution of nearby waters. • **Reduction in fish consumption can lower the amounts of essential FAs below optimum brain development and therefore might result in harm.**	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Myint, et al., Public Health Nutr 2006; 9(7): 882-8[144]	Dept of Public Health and Primary Care, Uni of Cambridge, UK	24 312 aged 40-79 yrs/UK	Habitual fish consumption and risk of incident **stroke**: (EPIC)	CVD – Stroke	Cohort Follow up 8.5yr	Fish intake	• **Oily fish consumption was significantly lower in women who subsequently had a stroke.** • Trends in men were similar but not significant.	B
Nafstad, et al., J Asthma 2003; 40(4): 343-8[6]	Division of Epi, Norwegian Institute of Public Health, Oslo, Norway	2531 children tested at age 2 & 4 yrs /Norway	**Asthma and allergic rhinitis** at 4 years of age in relation to fish consumption in infancy	Asthma Allergic rhinitis	Cohort Follow-up 4 yr	Fish intake	• **Fish consumption in the first year of life may reduce the risk of developing asthma and allergic rhinitis in childhood.** • The risk of allergic rhinitis was substantially lower in children who had fish during the first year of life (0.025) compared with children who had fish later in life (0.060). • Early introduction to fish showed a consistent negative assoc with the risk of allergic rhinitis in diff levels of potential confounders – length of breast feeding, parental atopy, early atopic eczema and experience of respiratory tract infection. • Results suggest that early intake of fish protects against airway disease in early life.	B
Nagata, et al., Am J of Epidemiol 2002; 156:824-31[145]	Dept of Public Health, Gifu Uni School of med, Gifu, Japan	13 355 M & 15 724 F /Japan	Soy and fish oil intake and **mortality** in a Japanese community	All cause mortality	Cohort Follow up >7yr	Fish oil	• **For women but not for men, n-3 FAs from fish were significantly inversely assoc with total mortality.**	A
Navas-Carretero et al., J Am Coll Nutr 2008; 27(1): 96–101[146]	Instituto del Frı´o (CSIC), Jose´ Antonio Novais Madrid, Spain	21 young F/ Spain	Oily Fish Increases **Iron Bioavailability** of a Phytate Rich Meal in Young Iron Deficient Women	Iron availability	RCT	Fish intake	• **The results from this study show that adding salmon fish to a bean meal increased iron absorption in young women with low iron stores.**	C
Noaghiul, A J Psychiatry 2003; 160:2222-7[147]	Laboratory of Membrane Biochemistry & Biophysics, NIAAA/NIH, Rockville MD, USA	Data from 10 countries plus published studies/ International	Cross-national comparisons of seafood consumption and rates of **bipolar disorders**	Mental health Bipolar disorders	Cohort Review	Fish intake	• **Greater seafood consumption predicted lower lifetime prevalence rates of bipolar** • **I disorder, bipolar II disorder and bipolar spectrum disorder.** • Bipolar II disorder and bipolar spectrum disorder had an apparent vulnerability threshold below 50 lbs seafood/ person/ year. • These data describe a robust correlational relationship between greater seafood consumption and lower prevalence rates of bipolar disorders.	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Norris, et al., JAMA 2007; 298(12): 1420-8[148]	Dept Prev Med and Biometrics, Uni of Colorado, Denver, USA	1770 children at increased risk of Type 1 diabetes	Omega-3 polyunsaturated fatty acid intake and islet autoimmunity in children at increased risk for type 1 diabetes	Diabetes	Cohort Follow up 12 yrs	Fish intake Other food	• **Dietary intake of n-3 FAs is assoc with reduced risk of autoimmunity in children at increased risk for type 1 diabetes.**	B
Nurk et al., Am J Clin Nutr 2007; 86: 1470–8[69]	Dept of Pharmacology and the Dept of Physiology, Anatomy and Genetics and the Oxford Project to Investigate Memory and Ageing, Uni of Oxford, UK	2031 aged 70 – 74yrs/ Norway	**Cognitive performance** among the elderly and dietary fish intake: the Hordaland Health Study	Cognitive perform.	Cohort	Fish intake Suppl	• **Subjects whose mean daily intake of fish and fish products was 10 g/d had significantly better mean test scores and a lower prevalence of poor cognitive performance than did those whose intake was 10 g/d.** • The assoc between total intake of seafood and cognition were strongly dose-dependent; the maximum effect was observed at an intake of 75 g/d. • Most cognitive functions were positively influenced by fish intake. The effect was more pronounced for nonprocessed lean fish and fatty fish.	B
Oddy, et al., J Asthma 2004; 41 (3) 319-26[3]	Telethon Institute for Child Health Research, Uni of Western Australia, Aust.	2602 aged 6-8 yrs	Ratio of Omega-6 to Omega-3 fatty acids and childhood **asthma**	Asthma	Cohort	Fish intake Other foods	• **The promotion of a more natural diet rich in n-3 FAs** (fresh or oily fish at least 1/wk, whole grain cereals, raw sunflower and flax seeds, canola oil) **and less n-6 FAs** (margarines, vegetables oils, processed foods) **may protect against the symptoms consistent with childhood asthma.**	B
Oh, et al., J Am Board Fam Med 2006; 19: 459-67[35]	Tripler Army Medical Center, Honolulu & Uni of Washington , USA	223 GPs/USA	Fish in secondary prevention of **heart disease** (FISH) survey	CVD – Cardiac	Cohort	Fish oil	• **17% were high fish prescribers.** • Knowledge of benefits of fish oil in sudden death reduction was assoc with higher fish prescribers. • High fish prescribers more likely to report sufficient time to discuss dietary therapies.	C
Oken et al., Am J Epi 2004; 160(8): 774–83[149]	Dept of Ambulatory Care and Prevention, Harvard Medical School &Harvard Pilgrim Health Care, Boston, MA.	2109 mothers/ Massachusetts, USA	Associations of Seafood and Elongated n-3 Fatty Acid Intake with **Fetal Growth** and **Length of Gestation**: Results from a US Pregnancy Cohort	Pregnancy Birth weight Length of gestation	Cohort	Fish intake	• Increased consumption of the elongated n-3 PUFA DHA and EPA was associated with reduced birth weight resulting from reduced fetal growth but was **not associated with altered length of gestation or risk of preterm birth.**	B

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Oken et al., Am J Clin Nutr 2008; 88:789 –96[59]	Dept of Ambulatory Care and Prevention, Harvard Medical School &Harvard Pilgrim Health Care, Boston, MA.	25 446 children/ Denmark	Associations of **maternal fish intake** during **pregnancy** and **breastfeeding** duration w attainment of developmental milestones in early childhood: a study from the Danish National Birth Cohort	Child health Breastfeed	Cohort	Fish intake	• **A benefit from higher maternal fish consumption during pregnancy on attainment of developmental milestones at 6 and 18 months was observed.** • Higher maternal fish intake was associated with higher child developmental scores at 18 months (OR: 1.29 for the highest versus the lowest quintile of fish intake).	A
Oken et al., Am J Epi 2008; 167(10): 1171 – 81[60]	Dept of Ambulatory Care and Prevention, Harvard Medical School & Harvard Pilgrim Health Care, Boston, MA.	341 mother child pairs/ Massachusetts, USA	**Maternal Fish Intake** during **Pregnancy,** Blood Mercury Levels, and Child Cognition at Age 3 Years in a US Cohort	Contam. Cognitive perform.	Cohort	Fish intake	• Women who ate more fish when pregnant had higher blood Hg levels. Among their children, higher prenatal Hg exposure was assoc with lower developmental test scores at age 3 years. **However, no overall adverse effect upon child development was observed with higher maternal fish intake**. • **Maternal fish intake more than 2/week was assoc with improved performance on tests of language and visual motor skills**.	B
Olsen & Secher, BMJ 2002; 324:1-5[150]	Danish Epi Science Centre, Copenhagen, Denmark	8729 pregnant F/ Denmark	Low consumption of seafood in early **pregnancy** as a risk for preterm delivery	Pregnancy	Cohort	Fish intake	• Occurrence of preterm delivery varied from 7.1% in group never consumed fish to 1.9% in those consuming fish at least 1/wk. • **Low consumption of fish was a strong risk factor for preterm delivery and low birth weight.** • In women with zero or low intake of fish, small amounts of n-3 FAs (provided as fish or fish oil) may confer protection against preterm delivery and low birth weight.	A
Oomen, et al., Am J Epidiomol 2000; 151(10): 999-1006[151]	Dept of Chronic Diseases Epi, National Institutes of Public Health & the Environ, Bilthoven, the Netherlands	1088 Finns 1097 Italians, 553 Dutch M aged 50-69 yrs	Fish consumption and **CHD** mortality in Finland, Italy and the Netherlands	CVD – CHD	Cohort Follow up 20 yr	Fish intake	• **Fatty fish compared with non-fatty fish consumption was assoc with lower CHD mortality.**	A

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Panagiotakos, Pitsavos et al. J Amer Diet Assoc 2007; 107:979-87[152]	Dept-Nutrition & Dietetics, Harokopio Uni, Athens, Greece	1514 M, 1528 F aged ≥18 yrs/ Greece	Assoc btwn food patterns and **metabolic syndrome** using principal component analysis: the ATTICA Study	CVD	Cohort	Fish intake Other food	• **Those who adopted Mediterranean diet of fish, vegetables, legumes, cereals and fruits had a 13% lower likelihood of having metabolic syndrome.** • Those with high levels of alcohol intake increased their odds of acquiring the syndrome by 26% • Mediterranean diet could be protective against metabolic syndrome in adults.	C
Panagiotakos et al., J Med Food 2007: 10(4); 615–21[153]	Dept Nutrition Science and Dietetics, Harokopio University, Athens, Greece	283 M 363 F aged ≥ 65 yrs Mediterranean Islands	Food Pattern Analysis and Prevalence of **Cardiovascular Disease** Risk Factors Among Elderly People from Mediterranean Islands	CVD	Cohort	Fish intake	• **Diets which included seafood were associated with a reduced risk of CVD.**	A
Parra et al., Eur J Nutr 2007; 46: 460–7[154]	Institute of Nutrition and Food Sciences Uni of Navarra, Spain	43 M & 71 F/ Iceland, 53 M & 52 F/ Spain and 22 M & 35 F/ Ireland Total 276	Impact of fish intake on oxidative stress when included into a moderate energy-restricted program to treat **obesity**	Obesity Oxidative stress	RCT	Fish intake Suppl	• Results of the caloric restriction in the diets resulted in an average weigh loss of 5.14%. **The dietary groups including seafood or fish-oil capsules lost more weight than the remaining two groups.** • A moderate calorie restricted cod-based diet was found to be a useful strategy to lose weight, which was accompanied by a specific improvement on oxidative stress markers. • The low saturated fat content and the seafood protein source of this diet may be important factors involved in these findings.	C
Pedersen, et al., J Rheumatol 2005; 32(7): 1249-52[55]	Dept Epi Research, Danish Epi Sc Centre, Denmark	57 053	Diet and risk of **rheumatoid arthritis** in a prospective cohort	Arthritis Inflamm. conditions	Cohort Follow up 5.3 yr av	Fish intake	• Small number developed RA (n=69) during study • **Intake of 30g fat fish/day assoc with 49% reduced risk of RA.** • No assoc with other dietary factors including LC FAs, olive oil, etc. • Diet may play an important role in modifying the risk factors assoc with RA.	B

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Ponce, et al., Risk Anal 2000; 4:529-42[155]	Dept of Environmental Health, Uni of Washington, USA	USA	Use of QALY's with dose response for PH decisions: a case study of the **risk and benefits** of fish consumption	Health benefits & risks	Review Case-control study	Fish intake	• Two end points used – MI fatality and developmental delay – to demonstrate use of QALY's and dose-response models. • Using this model – across a range of fish MeHg concentrations (0-1ppm) and intake levels (0-25g/day), indiv would have to weight the neurodevelopmental effects 6 times more (in the whole popn) or 250 x less (among women of childbearing age and their children) than the MI benefits in order to be ambivalent about whether or not to consume fish.	C
Ramel et al., Diabetologia 2008; 51(7): 1261–8[156]	Unit for Nutrition Research, Landspitali Reykjavik, Iceland	278 o/w participants/ Iceland	Beneficial effects of long-chain *n*-3 fatty acids included in an energy-restricted diet on **insulin resistance** in **overweight and obese** European young adults	Insulin resistance/ overweight and obesity	RCT	Fish intake Fish oil	• **Fish oil consumption during an 8 week energy restricted diet exerted a positive effect on fasting insulin and on a measure of insulin resistance in young overweight or obese individuals.**	B
Richardson, A.J. Intern Rev Psychiatry 2006; 18(2); 155-72[11]	Dept of Psychiatry, Uni of Oxford, England	Review	Omega-3 fatty acids in **ADHD** and related neuro developmental disorders	ADHD Brain dev	Review	Fish intake Fish oil	• **Dietary supplements with fish oil appear to alleviate ADHD related symptoms in at least some children.** • One study found benefits in academic achievement. • Larger trials are now needed to confirm these findings and to establish specificity and durability of treatments.	C
Robinson et al., J Am Geriatr Soc. 2008; 56(1): 84–90[157]	MRC Epi Resource Centre, Uni of Southampton, UK	2983 aged 59 – 73yrs/ Hertfordshire, UK	Diet and its relationship with **grip strength** in community-dwelling older men and women: the Hertfordshire Cohort Study	Muscle function	Retro. cohort Cross sectional	Fish intake Other food	• Of the dietary factors considered in relation to grip strength, the most important was fatty fish consumption. **An increase in grip strength of 0.43kg in men (*P*=0.005), and 0.48kg in women (*P*<0.001), was observed for each additional portion of fatty fish consumed per week.**	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Rose & Holub Food Research Intern 2006; 39: 910-6[158]	Dept Human Biol & Nutr Sciences. Uni of Guelph, Ontario, Canada	15 M aged 30-65 yrs/ Canada	Effects of a liquid egg produce containing fish oil on selected **cardiovascular disease** risk factors: A randomised cross over trial	CVD	Cohort	Fish oil	• The predominant source of EPA & DHA in the US and Canadian diet is fish, which accounts for 90% and 75%, respectively, of the total daily consumption of these n-3 FAs. • **Currently, the US populations are only consuming approx 130-150 mg/day of EPA and DHA combined, well below the recommended intake of 900 mg/day for patients with CVD.** • A convenient liquid egg breakfast as a novel source of considerable levels of EPA and DHA was very well tolerated as a functional food. • This finding may be important to those who eat little fish or no fish for various reasons.	C
Sakamoto, et al., Inflamm Bowel Dis 2005; 11(2): 154-63[53]	Dept of Hygiene, Hyogo College of Med, Japan.	239 int, 219 controls aged 15-34 yrs	Dietary risk factory for **inflammatory bowel disease**: a multicenter case-control study in Japan.	Inflamm. conditions	Cohort	Fish intake	• **Findings suggest the importance of dietary factors in inflammatory bowel disease prevention**.	C
Salam, et al., Journal of Asthma 2005; 42: 513-8[5]	Dept Prev Med, USC Keck School of Med, LA, USA	279 cases 412 controls aged 5 yrs	Maternal fish consumption during pregnancy and risk of early childhood **asthma**	Asthma	Cohort	Fish intake	• **For children born to mothers with a history of asthma, OR for asthma was 0.20 when mothers ate oily fish ≥ 1/mth during pregnancy compared with no consumption.** • In contrast, fish sticks (source of trans fats) consumption during pregnancy increased asthma risk in children (OR 2.04).	B
Samieri et al., Am J Clin Nutr 2008; 88:714 – 21[68]	Equipe Epidémiologie de la Nutrition et des Comportements Alimentaires, Bordeaux, France	1214/France	Low plasma eicosapentaenoic acid and depressive symptomatology are independent predictors of **dementia** risk	Mental health	Cohort Follow up 4 yr	Fish intake Suppl	• **Regular fish consumption was assoc with a lower risk of dementia.** • Higher plasma EPA or DHA as well as total n-3 PUFA proportions were significantly assoc with lower risks of dementia. • Higher ratios of n-6 to n-3 and of arachidonic acid to DHA were significantly assoc with a higher incidence of dementia, particularly in depressive subjects.	C
Sanchez et al., Eur J Nutr 2007; 46: 337–46[77]	Dept of Clinical Sciences, Uni of Las Palmas de Gran Canaria, Spain	7903/Spain	Long chain omega-3 fatty acids intake, fish consumption and **mental disorders** in the SUN cohort study	Mental health	Cohort Follow up 2 yr	Fish intake	• **Subjects with a moderate consumption of fish had a relative risk reduction of suffering a mental disorder of more than 30%,** although a dose–response relationship was not found.	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Santerre, J Foodservice 2008; 19: 205–21[159]	Dept Foods and Nutrition, Purdue University, Stone Hall, US	Review	Balancing the **risks and benefits** of fish for sensitive populations	Risks & benefits	Review	Fish intake	Benefits • Fish and seafood provide a number of micro and macro nutrients which are **important for maternal and foetal health.** • There is a link between n-3 FA intake and **healthy development of the eyes and brain.** • n-3's may also have a positive impact on adult **cardiovascular health.** Risks • Many fish contain contaminants such as Hg., which can damage the nervous system at high levels. • The risks of consuming fish may scare off consumers who would benefit from fish consumption.	B
Scholderer & Trondsen, Appetite 2008; 51(3): 576– 91[160]	Aarhus School of Business, Uni of Aarhus, Aarhus V, Denmark	4184/ Norway	The dynamics of **consumer behaviour** On habit, discontent, and other fish to fry	Consumer Behaviour	Cohort	Fish intake Consumer perceptions	• Seafood consumption patterns shifted during the late 1990's, as processed seafood products and aquacultured salmon gained market dominance and consumption of wild-caught lean fish dropped off, reflecting changes to the global seafood industry. • The main conclusion for seafood marketers is that pricing and product development – in terms of quality management, differentiation, and convenience – are the main parameter to focus on.	C
Sinn & Bryan, J Dev Behav Pediatr 2007; 28(2): 82-91[12]	Comm Sc & Industrial Res Org Human Nutr, Adelaide, Australia	132 aged 7-12 yrs /Australia	Effect of supplementation with polyunsaturated fatty acids and micronutrients on learning and behaviour problems associated with child **ADHD**	ADHD	Cohort	Suppl	• **ADHD related problems with inattention, hyperactivity and impulsivity might respond to treatment with PUFAs and that improvements may continue with suppl up to 30 weeks**.	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Siscovick, et al Am J Clin Nutr 2000; 71(1)[17]: 208S-212S	CV Hlth Unit, Dept of Med & Epidemiol, Uni of Washington, USA	Case-control study/ USA	Dietary intake of long-chain n-3 polyunsaturated FAs and the risk of **primary cardiac arrest**	CVD – Cardiac	Cohort Case-control study	Fish intake	• **Dietary intake of LC FAs from seafood is assoc with a reduced risk of primary cardiac arrest.** • Compared with no seafood intake, modest dietary intake of LC n-3 PUFAs from seafood (1 fatty fish meal/wk), is assoc with a reduction in the risk of primary cardiac arrest. • Compared with modest intake, higher intakes of these FAs are not assoc with a further reduction in risk. • Reduced risk of primary cardiac arrest may be mediated, at least in part, by the effect of dietary n-3 PUFA intake on cell membrane FA composition.	B
Smithers et al., Am J Clin Nutr 2008; 87: 912–20[161]	Child Health Research Institute, Child, Youth and Women's Health Service, North Adelaide, Australia	10 trials reviewed	Effect of long-chain polyunsaturated fatty acid supplementation of **preterm infants** on disease risk and neurodevelopment: a systematic review of randomized controlled trials	Pre term infant nutrition	Meta analysis	Suppl	• LC PUFA-supplemented formula does not alter the risk of NEC or sepsis. Further work is needed to determine the extent of benefit of LCPUFA-supplemented formula on the mental development of preterm infants.	C
Stark, et al., Nutr 2002; 18:627-30[162]	Dept Human Biol & Nutr Sciences. Uni of Guelph, Ontario, Canada	15 Inuit and 16 non-Inuit F aged 45-65 yrs/Canada	Fatty acid compositions of serum phospholipids of **postmenopausal women**: A comparison btwn Greenland Inuit and Canadians before and after supplementation with fish oil	Women	Cohort	Fish oil	• The apparent benefit of the Greenland Inuit marine diet compared with the Western diet was reviewed. • The fish oil suppl in the Canadian women increased the EPA and DHA levels and decreased linoleic acid levels to those found in corresponding Inuit women but only slightly lowered arachidonic acid levels.	C
Sun, et al., Am J Clin Nutr 2007; 86(1): 74-81[163]	Dept of Nutr & Epi, Harvard School of Public Health, Boston, USA	306 F aged 43-69 yrs/ USA	Comparison btwn plasma & erythrocyte fatty acid content as **biomarkers** of fatty acid intake in US **women**.	Biomarkers FA intake women	Cohort	Fish intake	• Erythrocyte n-3 FAs of marine origin and trans fatty acid content are suitable biomarkers for long-term intake.	B

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Takaoka & Norback, Respir Med 2008; 102(7): 1045–54[164]	School of Human Sciences, Kobe College, Japan & Department of Medical Sciences, Uppsala Uni and Uni Hospital, Sweden	153 F uni students/ Japan	Diet among Japanese female university students and **asthmatic symptoms**, infections, pollen and furry pet allergy	Asthma Allergies	Cohort	Fish intake	• **Participants who consumed fish more often had less respiratory infections requiring antibiotic treatment** (OR ¼ 0.43; *p* ¼ 0.02). • Correlations analysis showed that many of the protective food items (fish, seafood, fruit, raw vegetables, milk) were inter-correlated.	C
Terry, et al. Am J Clin Nutr 2003; 77: 532-43[47]	Dept Epi & Social Med, Albert Einstein College of Med, New York, USA	Review/ international	Intakes of fish and marine FAs and risk of **cancers of breast and prostate**.	Cancer	Review	Fish intake	• Assoc between fish consumption or marine FA intake and the risk of hormone-related cancers unclear, however they may be important. • Future studies should focus on the assessment of FAs in the diet as dietary constituents have been infrequently examined in humans. • Recommendations of the American Heart Assoc of ≥2 serves of fish/wk for the prevention of sudden cardiac death may have additional benefits including those related to blood tri-acylglycerol concentrations, clotting mechanisms, blood pressure, the immune system, and the developing CNS.	B
Terry, et al., The Lancet 2001, 357: 1764-5[46]	Dept of Nutr & Epi, Harvard School of Public Health, Boston, USA	6272 M/ Sweden	Fatty fish consumption and risk of **prostate cancer**	Cancer	Cohort Follow up 30 yr	Fish intake	• During 30 yr follow-up, **men who ate no fish had a 2 - 3 x higher frequency of prostate cancer than those who ate moderate or high amounts of fish**. • Results support hypothesis that fatty fish consumption lowers the risk of prostate cancer.	A
Thien, Woods & Walters, MJA 1996; 164: 135-56[8]	Dept of Respiratory Med, Alfred Healthcare Group, Melbourne, Australia	Review/ Australia	Oily fish and **asthma**	Asthma	Review	Fish intake	• One large study of 2526 adults aged 30-70 yrs. **Eating fish > 1/wk compared with <1/wk was assoc with higher lung function** but only 2.9% in study were asthmatics therefore no conclusion can be drawn regarding asthma and fish consumption. • Another large study of 8960 adults found high dietary intake of n-3 FAs was inversely related to risk of COPD. • Studies urgently needed to assess relationship between fish consumption and asthma.	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Thies et al., The Lancet 2003; 361: 477 – 85[41]	Institute of Human Nutrition, Southampton Uni Hospitals NHS Trust, Southampton, UK	168/UK	Association of n-3 polyunsaturated fatty acids with stability of **atherosclerotic plaques**: a randomised controlled trial	Atherosclerosis	RCT	Fish oil	• Atherosclerotic plaques readily incorporate n-3 PUFAs from fish-oil supplementation, inducing changes that can enhance stability of atherosclerotic plaques. By contrast, increased consumption of n-6 PUFAs does not affect carotid plaque FA composition or stability over the time course studied here.	C
Thorsdottir et al., Int J Obes 2007; 31(10): 1560–6[165]	Unit for Nutrition Research, Dept of Food Science and Human Nutrition, Landspitali Uni Hospital, Uni of Iceland, Reykjavik, Iceland	138 M 186 F aged 20 – 40 yrs/ Iceland, Spain and Ireland	Randomized trial of **weight-loss** diets for young adults varying in fish and fish oil content	O/weight	RCT	Fish intake Fish oil	• Males lost an average of 6.5 kg and females lost an average of 4.2kg on a diet which restricted their calorie intake by 30% of the daily requirements. • **Weight loss was greater in the intervention groups** (fish oil, cod & salmon) in males only. This may partly be explained by the fact that a 30% energy restriction for women was less than for men in absolute values. • The results of the present study may indicate that there are components of fish, for example, particular combinations of amino acids that may be beneficial to human health beyond the n-3 FAs or other bioactive constituents.	C
Thurston et al., NeuroToxicology 2007; 28(5): 924–30[166]	Dept of Biostatistics and Computational Biology, Uni of Rochester School of Med and Dentistry, United States	779 mother child pairs/ Seychelles	Does prenatal methylmercury exposure from fish consumption affect **blood pressure** in childhood?	Contam. Blood pressure	Cohort Follow up 12 & 15 yr	Contam.	• **No assoc were found for prenatal MeHg exposure in girls or in systolic BP in either sex at either age.** • Prenatal MeHg exposure was assoc with increased diastolic BP in boys at age 15 years, however there is no biological reason for this finding in males at this ages only, therefore this finding does not suggest a consistent assoc between MeHg and BP.	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Torpy, et al., JAMA 2006; l296(15):1926[167].	JAMA recommendations for physicians and health care professionals	Review of evidence USA	Eating fish: health benefits and risks	Health benefits CVD – Stroke, CHD, Cardiac Pregnancy, Mercury, Depression Mental decline, Brain dev.	Review	Fish intake	Health benefits fish consumption: • n-3 FAs (esp oily fish such as salmon, sardines and herring) can **lower BP and HR**, and **improve CVD risk factors**; • **Reduces risk of death from CHD**; • Is linked to **lower risk of stroke, depression and mental decline** with age; and • For pregnant women, mothers breastfeeding and women of childbearing age, fish intake is important because it supplies DHA, a specific n-3 FA that is **beneficial for the brain development of infants.** • The benefits of fish intake can be maximised by consuming a variety of different seafood. Possible risks fish consumption: • Not clear that Hg exposure from typical levels of fish intake has any adverse health effect; • Hg exposure from fish intake should not be a major concern for men and women of non-childbearing age; • Hg may have subtle effects on the developing nervous systems of infants; • Women who are pregnant, may become pregnant or are breastfeeding plus very young infants should avoid 4 types of fish with higher Hg content: shark, swordfish, king mackerel and golden bass; • Light tuna has relatively low levels of Hg, and other fish (wild /farmed salmon, shrimp), contain very low levels of Hg. These types of fish should be consumed by infants to receive benefits of DHA for brain development. • Chemicals (dioxins and polychlorinated biphenyls) can accumulate in foods, incl fish. • Levels of chemicals are very low in fish and similar to levels in meat and dairy products. • Compared with health benefits of fish intake, the health risks of these chemicals are very low and should not influence individual decisions about fish intake. • Compared with store-bought fish, locally caught freshwater fish may have higher chemical levels.	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Tsuchiya et al., Am J Clin Nutr 2008; 87:1867–75[168]	Dept Environ & Occupational Health Services & Institute for Risk Analysis and Risk Communication, Uni of Washington, Seattle, US	214 Japanese & Korean mothers/ Washington USA	**Fish intake guidelines**: incorporating n-3 fatty acid intake and contaminant exposure in the Korean and Japanese communities	Risks & benefits	Cohort	Fish intake	• Both communities are considered high consumers of seafood, and ate nearly identical mounts of finfish, although choices of fish differed. • 53% of the Japanese cohort exceeded the reference dose for MeHg, compared to 13% of the Korean cohort. However **both communities have a large percentage of persons not obtaining the daily dietary requirement of DHA + EPA**. • The authors note that their findings "support the premise that nutrients as well as contaminants should be concomitantly considered when providing fish consumption guidelines for public health protection."	C
van de Rest et al., Am J Clin Nutr 2008; 88:106 –13[169]	Wageningen Uni, Division of Human Nutrition, Wageningen, Netherlands	302 aged ≥ 65yrs/ Netherlands	Effect of fish-oil supplementation on **mental well-being** in older subjects: a randomized, double-blind, placebo-controlled trial	Mental health	RCT	Fish intake Suppl	• **In a non-depressed older population, no effect on mental well-being was observed after EPA+DHA supplementation over 26 weeks.**	C
van Eijsden et al., Am J Clin Nutr 2008;87:887–95[170]	Dept of Epi, Documentation, and Health Promotion, Municipal Health Service, Amsterdam, The Netherlands	8266 pregnant F/ Amsterdam	Maternal n-3, n-6, and trans fatty acid profile early in pregnancy and term **birth weight**: a prospective cohort stud	Pregnancy Birth weight	Cohort	Fish intake	• The results of this study suggest that **low maternal blood concentrations n-3 and high blood concentrations of some n-6 FAs are associated with lower birth weight.**	B
Van Gelder, et al., Am J Clin Nutr 2007; 85 (4): 1142-7[171]	Centre for Prevention & Health Services Research, Bilthoven, Netherlands	210 aged 70-89 yrs/ Netherlands	Fish consumption, n-3 fatty acids and subsequent 5 yr **cognitive decline** in elderly men: the Zutphen Elderly Study	Mental health Cognitive decline	Cohort	Fish intake Other foods	• **Fish consumers had significantly (p=0.01) less 5-yr subsequent cognitive decline than did non consumers.** • A moderate intake of EPA&DHA may postpone cognitive decline in elderly men.	B

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Varraso, et al., Am J Clin Nutr 2007; 86(2): 488-95[172]	Dept of Nutrition & Epi, Harvard School of Public Health, Boston, USA	72 043 F/ USA	Dietary patterns and **Congestive Obstructive Pulmonary Disease (COPD)** among US women	COPD	Cohort Follow up 16 yr	Fish intake	• 754 new cases of COPD identified among 72 043 women during 16 yr follow-up. • **Negative assoc between diet rich in fruit, veg and fish and the risk of COPD.** • Positive assoc between diet rich in refined grains, red meats, desserts and French fries and the risk of COPD. • Dietary patterns were not assoc with the risk of adult onset asthma.	A
Verbeke & Vackier, Appettite 2005; 44: 67-82[89]	Dept Ag Economics, Ghent Uni, Belgium	429	Individual determinants of **fish consumption**: application of the theory of planned behaviour	Intake	Cohort	Fish intake	• Favourable attitudes, high subjective norm and high perceived behavioural control have a positive impact on fish consumption decisions. • Significant habit effects were detected. • **Appreciation of taste was the most important driver for eating fish, followed closely by health**. • Bones and price were negative attitude factors. • Women consumed more fish than men and consumption increased with age. • Children in the household were assoc with lower consumption rates. • Lowest income assoc with lowest consumption. • Food involvement correlated positively with fish consumption intention and frequency.	C
Verbeke et al., Ambio 2007; 36 (7): 580 – 5[173]	Dept Ag Economics, Ghent Uni, Belgium.	381 F aged 20 – 50yrs/ Belgium	Perceived Importance of Sustainability and Ethics related to Fish: A **Consumer Behaviour** Perspective	Consumer perceptions	Cross sectional	Fish intake Consumer perceptions	• **Respondents believed that eating fish is healthy and nutritious**, and felt that eating fish was ethical and safe. The majority agreed that fish was expensive. • 10.2% of respondents refused to eat farmed fish and 11.7% refused to eat wild fish when informed of its origin.	C
Verbeke et al., Risk Anal 2008; 28(4): 951- 67[95]	Dept Ag Economics, Ghent Uni, Belgium.	381 F aged 20 – 50yrs/ Belgium	Communicating **Risks and Benefits** from Fish Consumption: Impact on Belgian Consumers' Perception and Intention to Eat Fish	Risks & benefits Intake	Cross sectional	Fish intake	• Participants ate fish 4.6 x/month on average. **Only 13% of participants consumed the recommended amount of fish.** • A **health benefit only message, which stressed the health benefits from eating fish, increased consumers' intention to eat fish** by 21% as compared to their current fish consumption level. • The risk-only message led to an 8% lower behavioral intention.	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Von Shackey 2006, Vasc Health Risk Manag 2006; 2(3): 251–62[174]	Medizinische Klinik, Uniof Munich, Germany	Review	A review of omega-3 ethyl esters for **cardiovascular prevention** and treatment of increased blood triglycerides levels	CVD	Review	Fish intake	• **Relevant cardiac societies recommend using 1 g/day of EPA and DHA for cardiovascular prevention, after a myocardial infarction and for prevention of sudden cardiac death.**	B
Wang, Harrris et al. Am J Clin Nutr 2006; 84: 5-17[175]	Institute for Clinical Research & Health Policy Studies, Tufts-New England Medical Center, Boston, USA	Systematic review/ International	N-3 fatty acids from fish and fish-oil suppl and **CVD** outcomes	CVD Cardiac	Cohort Review	Fish intake Fish oil	• **Evidence suggested that increased consumption of n-3 FAs from fish and fish oil suppl**, but not of α-linolenic acid, **reduced the rates of all-cause mortality, cardiac and sudden death, and possibly stroke.** • Evidence of the benefits of fish oil was stronger in secondary than primary prevention settings. • Adverse effects appeared to be minor. • Evidence appeared strong for a beneficial effect of very-long-chain n-3 FA intakes on VD risk in secondary, but not primary prevention.	B
Willett WC, Am J Prev Med 2005; 29(4): 320-1[176]	Harvard School of Public Health, Boston, USA	Review/ USA	Fish: Balancing **health risks and benefits**	Health benefits	Review	Fish intake	• **Overall consequences could be adverse if fish consumption is reduced in the general population**. • This analysis supports current guidelines that focus on changes in the type of fish eaten by women in the reproductive age, but also highlights concerns that educational messages and the implementation of policies must be carefully crafted to avoid unintended consequences.	D
Weaver et al., J Am Diet Assoc 2008; 108; 1178 – 85[84]	Dept Internal Med, Section on Molecular Med, Wake Forest Uni School of Med, Winston-Salem, US	30 commonly eaten fish/ USA	The Content of Favorable and Unfavorable Polyunsaturated **Fatty Acids** Found in Commonly Eaten Fish	Fatty acids	Cross sectional	Fish	• **Fish with the highest n-3 FA concentrations were Farmed Trout, Farmed Atlantic Salmon, Coho Salmon, Toothfish, Copper River Salmon and Sockeye Salmon.** • Tuna, Red Snapper, Corvina, Triggerfish and monkfish had the lowest concentrations on n-3 FAs.	
Wennberg et al., Br J Nutr 2007; 98:1038–45[177]	Dept of Med, Skelleftea Hospital, Skelleftea, Sweden	369 cases 738 controls/ Sweden	Fish intake, mercury, long-chain *n*-3 polyunsaturated fatty acids and risk of **stroke** in northern Sweden	Stroke risk	Cohort	Fish intake Hg Fatty acids	• Fish intake was assoc with an increased risk for stroke for men. • In women there was a non-significant decrease in stroke risk with increasing fish intake. • **Neither Hg, nor EPA & DHA, was assoc with an increased risk of stroke.**	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Woods, Stoney, et al., Asia Pacific J Clin Nutr 2002; 11(1): 56-61[178]	Dept of Epi & Preventive Med, Central & Eastern Clinical School, Victoria, Australia	4500 aged 20-44 yrs/ Australia	A **valid FFQ** for measuring dietary fish intake	Valid measure tool	Cohort	Fish intake	• FFQ developed to measure FA intake in large scale epi study where logistics and resources prevent the use of more objective markers.	B
World Health Organization, 2007[179]	WHO, Geneva	Systematic review - report WHO	Popn nutrient intake goals for preventing diet-related **chronic diseases**	CVD – Cardiac	Review	Fish intake	• Most of the epi evidence related to n-3 FAs is derived from studies of fish consumption in populations or interventions involving fish diets in clinical trials. • Fish oil study with survivors of MI – after 3.5 yrs follow up, 20% reduction in total mortality, 30% reduction in CV death and 45% decrease in sudden death. • In high risk population, fish consumption of 40-60 g/day would lead to 50% reduction in death from CHD. • Re-infarction trial – 2 yr mortality reduced by 29% in survivors of a first MI in persons receiving advice to consume fatty fish at least 2/wk. • **Recent study of data from 36 countries reported fish consumption was assoc with a reduced risk of death from all causes as well as CVD mortality.** • **Dietary goal should be a regular intake of fish (1 or 2 times/wk)** – protective against CHD and ischaemic stroke.	B

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Xue, Holzman et al. Environ Health Perspect 2007; 115:42-7[56]	Michigan State University, USA	Hair segments from 1024 pregnant women from 52 prenatal clinics/ USA	**Maternal** fish consumption, mercury levels and risk of preterm birth.	Pregnancy	Cohort	Fish intake	• **High levels of maternal fish consumption during pregnancy assoc with longer gestation, increased birth weight, reduced risk of intrauterine growth retardation and lower prevalence of pregnancy-induced hypertension.** • Only a small % of women (10%) consumed sport-caught fish during pregnancy. • Women who delivered very preterm (35 wks) were more likely to have had hair Hg levels ≥90th percentile even after adj for maternal characteristics and fish consumption. Assoc not evident in lower threshold levels of Hg. • Very few women in study delivered before 35 wks (n=44) therefore further studies are required in this area. • Many limitations to the study e.g. 10% of women in study reported not eating fish but had Hg levels in 4th and 5th quintiles.	C
Yokayama, et al., The Lancet 2007; 369(9567): 1090-8[180]	Kobe Uni, Kobe, Japan	18 645 aged 40 - 70 yrs with total cholesterol ≥6.5mmol/L /Japan	Effects of eicosapentaenoic acid on major **coronary** events in patients with total cholesterol 6.5mmol/L or >	CVD – Cardiac	Cohort Randomised open-ended label, blinded endpoint analysis	Fish intake	• Pharmacological intervention • Baseline plasma FA concentrations as indication of fish consumption and EPA intake. • **19% reduction in major coronary events with therapeutic dose of 1800 mg/day of EPA.** • No significant difference in all-cause mortality or in rates of cancer and stroke between treatment and control groups. • EPA is a very promising regimen for prevention of major coronary events.	C
Young & Conquer Reprod Nutr Dev 2005; 45(1): 1-18[181]	Dept Human Biol & Nutr Sciences. Uni of Guelph, Ontario, Canada	Review	Omega-3 fatty acids and **neuropsychiatric disorders**	ADHD Alzheimer's Disease Depression	Review	Fish intake Fish oil Suppl	• **Decreased levels of n-3 FAs have been assoc with several neuropsychiatric conditions – ADHD, Alzheimer's Disease, Schizophrenia and depression.** • Both DHA & EPA assoc with many aspects of brain function. • Further research required in this area	C

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Young et al., Reprod Nutr Dev 2005; 45(5): 549-58[182]	Dept Human Biol & Nutr Sciences. Uni of Guelph, Ontario, Canada	Review	Effect of randomized supplementation with high dose olive, fax or fish oil on serum phospholipid fatty acid levels in adults with **attention deficit hyperactivity disorder**	ADHD	Review	Fish intake Fish oil Suppl	• **Further study required to determine whether correction of low levels of LC n-3 FA are of therapeutic benefit in ADHD.**	C
Yuan, Ross et al. Am J Epidemiol 2001; 154:809-16[27]	Dept of Prev Med, Uni of Sthn California, LA, USA	18 244 M aged 45-64 yrs/China	Fish and shellfish consumption in relation to death from **MI** among men in Shanghai, China	CVD – Cardiac	Cohort Follow up 10 yr	Fish intake	• 113 deaths from acute MI were identified. • Men who consumed ≥200g of fish/ shellfish per wk had a RR of 0.41 for fatal acute MI compared with men consuming <50g/wk. • Dietary intake of n-3 FAs derived from seafood was significantly assoc with reduced mortality from MI. • Approx 20% reduction in total mortality assoc with wkly fish/shellfish intake. • **Study found that weekly intake of fish or shellfish reduces the risk of fatal MI in middle-aged and older men in China.**	A
Zampelas, et al., J Am Coll Cardiol 2005; 46:120-4[33]	Dept of Nutrition & Dietetics, Harokopio Uni, Athens, Greece	1514 M aged 18-87 yrs & 1528 F aged 18-89 yrs/ Greece	Fish consumption among healthy adults is assoc with decreased levels of inflammatory markers related to **CVD**	CVD	Cohort	Fish intake	• **Fish consumption was independently assoc with lower inflammatory marker levels among healthy adults.** • Significant results were observed with quantities as low as 150 to 300 g/wk of fish were consumed. • Stratified analysis showed that fish and n-3 FA intake were inversely assoc with lower inflammatory marker levels in people with diabetes and hypertension, but not in people with hypercholesterolemia. • Observed strong inverse relationship between fish consumption and levels of inflammatory markers related to CVD, irrespective of other potential confounders.	B
Zhang, Sasaki, et al., Preventive Med 1999; 28: 520-9[48]	School of Public Health, Catholic Uni of Leuven, Belgium	Data 36 countries WHO statistics	Fish consumption and mortality from **all causes, ischaemic heart disease and stroke**: an ecological study	CVD – Cardiac	Cohort Ecological study	Fish intake	• **Fish consumption was assoc with a reduction in all cause, ischaemic heart disease and stroke mortality at the population level.** • Further studies required to clarify the strength and consistency of the relation between fish consumption and the risk of these diseases.	B

Reference	Institution	# /Country	Title	Theme	Design	Type	Outcome	Evidence
Zhang, Temme et al. Intern J Epidemiol 2000; 29: 615-21[18]	Dept of Epi, School of Public Health, Catholic Uni of Leuven, Belgium	Data 36 countries international	Fish consumption is inversely assoc with **male lung cancer** mortality in countries with high levels of cigarette smoking or animal fat consumption	Cancer CVD, Chronic respiratory disease, Rheumatoid arthritis, Ulcerative colitis, All cause mortality.	Cohort Ecological study	Fish intake	• **Fish consumption is assoc with a reduced risk of lung cancer mortality in males** (independent of cigarettes, animal fat minus fish fat, vegetable and fruit consumption). • n-3 FAs, abundantly available in fish, have shown to possess an anti-inflammatory effect. • Fish intake protective for cigarette smokers against COPD and the deterioration of lung function (possibly due to anti-inflammatory effects). • Fish oil has been reported to inhibit rectal mucosal cell proliferation in subject with sporadic adenomatous colorectal polyps and the growth of human breast carcinoma maintained in athymic nude mice. • **Evidence fish consumption protective against CVD, chronic respiratory disease, rheumatoid arthritis, ulcerative colitis and all cause mortality.** • It is inferred that increasing the amount of fish consumption could decrease the mortality of lung cancer and other related diseases, esp in popns with high levels of cigarette consumption and animal fat intake.	A

4.0 Seafood Benefits Health Communication Strategic Review

4.1 Capacity needs

The objectives of this section were to:

- Identify which organisations, institutions and spokespeople are currently providing information on seafood health benefits and the level of credibility of those organisations and institutions;

- Undertake an initial assessment of organisations, institutions and spokespersons' capacities and relevance to the seafood industry; and

- Assess the availability of trained people to develop the resources and to deliver health benefits information to the target audiences.

4.2 Summary

The collated information is presented in four tables:

- *Table 4.1* summarises organisations providing credible and consumer friendly reference material for advice on general seafood health benefits;

- *Table 4.2* summarises information provided on seafood health benefits (and, if referenced, the source of information is from Table 4.1) by a variety of organisations with a stake in the seafood industry. These include health and fisheries government agencies and authorities, peak industry representative bodies, medical/condition/nutrition representative agencies, education and training providers, seafood companies/retailers and environmental groups;

- *Table 4.3* summarises consumer information related to seafood preparation/cooking that may be a conduit to providing information on health benefits; and

- *Table 4.4* summarises personalities/professionals providing health benefits information.

4.3 Comments

Many relevant organisations do not provide any advice on the health benefits of seafood, furthermore, many health and food agencies have little information available.

- When information is provided, messages are generally similar. The most common messages refer to omega 3 oils and health benefits (high in protein, vitamins and minerals) and usually a reference recommending two fish meals per week. Some detail relates fish to: slimming; specific health benefits of specific vitamins and minerals (eg iodine, etc); and the omega 3 levels in different fish types. The balance between risks and benefits associated with mercury levels in fish is reported.

- Most discussions reference a particular source of information, however the actual reference details are rarely given.

- Reliable resources are not numerous, most Australian references are to 'What's so Healthy About Seafood', National Health and Medical Research Council (NHMRC), Australian Dietary Guidelines and Food Standards of Australia and New Zealand (FSANZ) guidelines. Seafood Services Australia (SSA) website 'Seafood for Health' is excellent and carries a significant amount of information but was rarely referenced.

- It appears very little information on the health benefits of seafood is included in training packages/curriculum at a primary, secondary and technical level. However, it is noteworthy that there is considerable scope to include such information in already developed competencies and curricula (see Table 3). The research does indicate that a single reference point for seafood health benefits (updated frequently) may be advantageous.

- Few simple pamphlets or educational materials are available for point of sale (except FRDC 'What's so Great About Seafood').

- Live demonstrations (real or on television) (particularly as regards cooking classes, demonstration, celebrity chefs) are not yet well researched.

- Professional Spokespeople: Roy Palmer, SSA; Prof Bob Gibson (Flinders University) are two notable examples.

- Personalities: Don Hancey; Ian Parmenter; Ian Bowman are notable examples personalities who promote seafood through various media avenues.

Table 4.1: Credible and Consumer Friendly Sources of Information about the General Benefits of Seafood (General)

Organisation	Title	Contents	website	Credibility
FRDC/CSIRO	1. What's so Healthy About Seafood: A Guide for Seafood Marketers (book)	General guide to health benefits of seafood	www.frdc.com.au/fish/healthy/	High level of credibility CSIRO publication
	2. What's so Healthy About Seafood: A Guide for Seafood Marketers (pamphlet)	Pamphlet summarising results of book	www.frdc.com.au/fish/healthy/	High level of credibility CSIRO publication
FRDC/CSIRO	3. Seafood the good food: oil content and composition of Australian commercial fishes, shellfishes and crustaceans.	Source of omega 3 data	publishing.sales@csiro.au	High level of credibility CSIRO publication
CSIRO/FRDC	4. Seafood the good food II	Source of omega 3 data in further species	publishing.sales@csiro.au	High level of credibility CSIRO publication
CSIRO	5. Fish Oils Keep the heart Running Smoothly (fact sheet)	Summary of omega 3 benefits		High level of credibility CSIRO publication
Seafood Services Australia (SSA)	6. Australian Seafood Users manual – making the most of the world's best.	Cooking, nutritional and other information	www.seafoodservices.com.au/bookshop	High level of credibility
SSA	7. Seafood for Life website	Much general compiled information on health benefits of seafood (including media releases)	www.seafoodservices.com.au/	Information site using referenced material
SSA	8. Seafood for Life Workshop	Held November 2006	www.seafoodservices.com.au/	International and national experts
National Health and Medical Research Council (NHMRC)	9. Dietary Guidelines for Australian adults (2003)	Scientific summary leading to suggested dietary guidelines (including fish meal recommendations)	www.nhmrc.gov.au	High level of credibility
NHMRC	10. Dietary Guidelines for Children and Adolescents in Australia (including the infant feeding guidelines for healthy babies) (2003)	Scientific summary leading to suggested dietary guidelines (including recommendations of two fish meals per week)	www.nhmrc.gov.au	High level of credibility
NHMRC	11. Food for health	Consumer version of scientific summaries on guidelines (including recommendations of two fish meals per week). Also fish is high in Zinc, Vitamin B12 and Omega 3's.	www.nhmrc.gov.au	High level of credibility

Organisation	Title	Contents	website	Credibility
Food Standards Australia and New Zealand.	12. Guidelines for mercury in fish	List benefits and also set limits for pregnant women and children (mercury risk)	www.foodstandards.gov.au	High level of credibility
National Heart Foundation of Australia	13. Guidelines a. Plant Sterols, Omega 3 Fats and heart disease b. Dietary Fats and heart disease	Recommend two fish meals per week List fish with higher omega 3 fats	www.heartfoundation.com.au	Panel of experts producing heart foundation guidelines
Institute of Medicine (USA)	14. "Seafood Choices: Balancing Benefits and Risks." (article)	Results of large, long term study on benefits of fish consumption and confirms that seafood is a good source of high-quality protein, low in saturated fat, and rich in many vitamins and minerals.	http://jama.ama-assn.org	Peer reviewed journal
Harvard School of Public Health (HSPH)	15. "Fish Intake, Contaminants, and Human Health: Evaluating the Risks and the Benefits" (report)		www.iom.edu/CMS/3788/23788/37679.aspx	Peer reviewed journal publication
American Association for the Advancement of Science (AAAS)	16. Recommendation following expert panel	A panel of experts has confirmed the health benefits of seafood. A. recommendation has emerged to eat seafood not just the usually suggested two to three times a week but instead four to seven times a week.	www.aaas.org/	Expert consultation
American Heart Association	17. Recommendation	2 meals per week	www.americanheart.org	Panel of experts producing heart foundation guidelines
NHMRC	18. Nutrient Reference Values for Australia and New Zealand including Recommended Dietary Intakes	Levels of omega 3's that need to be consumed	www.nhmrc.gov.au	High level of credibility

Table 4.2: Summary of Current Status of Seafood Health Benefits Communication from Stakeholder Organisations

Organisation	Key Message	Source of Information	Website
Australian Health and Food Safety organisations			
Western Australian (WA) Dept Health	None		www.fish.wa.gov.au
Primesafe Victoria a. Better Health Channel	None General health benefits of fish consumption Pregnancy guidelines include fish consumption	 7 12	www.betterhealthchannel.vic.gov.au
Safefood Qld	None		
South Australian (SA) Dept of Health	None		
Tasmanian (TAS) Dept of Health	Fact sheets on general benefits, iodine, omega 3's and managing diabetes.		www.dhhs.tas.gov.au/
New South Wales (NSW) Food Authority	General Health benefits of fish consumption Specific advice on mercury, fish and pregnancy	7, 8, 12	www.foodauthority.nsw.gov.au
Northern Territory (NT) Dept of Health and Community Services	None		
Food Standards Australia and New Zealand (FSANZ)	Benefits including protein, omega 3's and iodine. Set safe levels of fish for pregnant women and children.	12, 13, 9, 10 and own risk assessment	www.foodstandards.gov.au
Department for Health and Ageing	Nutrition advice, benefits and Dietary Guidelines (all foods including fish)	9, 10, 11.	www.health.gov.au
Fisheries Management Organisations			
WA Dept of Fisheries	None		www.fish.wa.gov.au
SARDI			
NSW Dept Plng & Infrastructure (DPI)	None		www.dpi.nsw.gov.au
Queensland (QLD) DPI	General health benefits of fish consumption	7, 8	www.dpi.qld.gov.au
Tas Dept Primary Industries and Water	None		www.dpiw.tas.gov.au
Victorian (VIC) DPI	None		www.dpi.vic.gov.au
NT Department of Primary Industries, Fisheries and Mines	None		www.nt.gov.au
AFMF	None		www.afma.gov.au
FRDC	Publications on website.	1, 2, 3, 4, 6.	www.frdc.com.au

Organisation	Key Message	Source of Information	Website
Seafood Industry Representation			
SSA	Extensive reviewed and coordinated information	1, 2, 3, 4, 6, 7, 8, 15, 16, 17	www.seafoodservices.com.au
National Aquaculture Council	None		www.australian-aquacultureportal.com/
WA Fishing Industry Council (WAFIC)	General health benefits, omega 3 levels	1, 12	www.wafic.com.au
SA Fishing Industry Council	General health benefits, omega 3's.	1,2	www.safic.com.au
Seafood Industry Victoria	None		www.siv.com.au
Qld Seafood Industry Assoc.	Omega 3's, protein, vitamins and minerals and slimmers		www.qsia.com.au
Tas Fishing Industry Council	None		
NT Seafood Council	Reference	1	www.ntsc.com.au
Australian Prawn Farmers Association	None		www.apfa.com.au
Southern Rock lobster	Omega 3 and National Heart Foundation tick of approval	14	www.southernrocklobster.com/
NSW Oyster Growers Assoc	None		
Nutrition/Medical/Condition Specific Representation			
Nutrition Australia	General Omega 3 for health	Own experts	www.nutritionaustralia.org
NHMRC	Nutritional guidelines, recommend 2 meals per week	9, 10, 11	www.nhmrc.gov.au
Cancer Council	Reference	9, 10.	
Diabetes Foundation	Factsheets suggesting eat fish three times per week (Omega 3's)	Own research and recommendations	www.diabetesaustralia.com.au/
Heart Foundation	Omega 3's reduce heart disease, oily fish, recommend two fish meals per week	13 (own guidelines)	www.heartfoundation.com.au
Omega 3 Centre	Long chain Omega 3 vital for Good Health, 2 meals of oily fish per week, levels of omega 3 in some fish	18, fatty acid levels from RMIT University fatty acid database	www.omega-3centre.com

Organisation	Key Message	Source of Information	Website
American Heart Association	At least two serves of fish per week		www.americanheart.org
Seafood Companies/ Retailers/Supermarkets			
Sydney Fish markets	Reference (SSA media releases)	15, 16, 17	www.sydneyfishmarket.com.au
Seafood Secrets	Slimmers, high in protein, low in fat, high in vitamins and minerals, Omega 3's, mercury	12	www.seafoodsecrets.com.au
Kailis Bros	None		www.Kailisbrosleederville.com.au
Soareast Australia	Specific health attributes to specific products (abalone and lobster)		www.soareast.com.au
Clean Seas Tuna	Omega 3 benefits	12	www.cleanseas.com.au
Greenseas Tuna	Omega 3 benefits	9, 12	www.greenseas.com.au
Coles Supermarkets	Recommend two fish meals per week Comment on mercury in fish		www.coles.com.au
Environmental NGO's			
Environmental Defence Fund	Balance health benefits with contaminant risks	14	http://www.edf.org/page.cfm?tagID=1521

Table 4.3: Education and Training in Relation to Seafood Health Benefits

Curriculum	Curriculum Units/Resources which may be used to communicate seafood health benefits	Messages	Website
Vocational training			
Seafood Industry Training Package	SFIPROC608A: Provide practical or commercial advice to seafood users. SFIDIST201A: Prepare cook and retail seafood products SFIDIST202A: Retail fresh, frozen and live seafood SFILEAD01A: Develop and promote industry knowledge.	To be ascertained	www.ntis.gov.au
Retail training package	WRRFM6A: Prepare and Display fresh, frozen and live seafood products WRRFM.6A Advise on seafood products	To be ascertained	www.ntis.gov.au
Food Processing Training Package	(no specialist seafood units)	N/a	www.ntis.gov.au
Tourism and Hospitality Training Package	THHBCC06B: Prepare and cook seafood. THHBFB11B: Develop and update food and beverage knowledge THHADFB01B: Provide specialist advice on food	To be ascertained	www.ntis.gov.au
K-10 Curriculum Learning Area (based on EDWA)			
Health and Physical Education	1. Growth and Development/Sexual Health 2. Lifestyle Awareness	To be ascertained	http://K10syllabus.curriculum.wa.edu.au/output/outcomes/health-physical-education
Science	1. Sustainability and wise use of resources	To be ascertained	http://K10syllabus.curriculum.wa.edu.au/output/outcomes/science
Technology and Enterprise	1. Home Economics	To be ascertained	http://K10syllabus.curriculum.wa.edu.au/output/outcomes/technology-enterprise
Kondinin Workbook Series	The Story of Seafood (Book and educational resource)	Sustainability of industry Health benefits of seafood	www.kondinin.com.au

Table 4.4: Seafood Cooking/Recipe Resources

Seafood Cooking Resource	Source	Media	Website
Recipes			
Recipes (Australian)	WAFIC	Cards, website	www.wafic.com.au
	QSIA	Website	www.qsia.com.au
	Australian Seafood Handbook	Book, website	www.frdc.org.au
	Cook with SA Seafood	Book	www.safic.com.au
Seafood Cooking Demonstration/Classes			
Sydney Seafood School	Sydney Fish market	Classes	www.sydneyfishmarket.com.au
Consuming Passions	Ian Parmenter	Television	
	Don Hancey	Print media and television	
	Ian Bowman	Print media	

5.0 Review of current seafood health benefit resources available for use of GPs and health professionals

This review focused on the collection and critical review of relevant resources that were available to General Practitioners (GPs) and Allied Health Professionals (AHPs) to use with patients as either a prevention or treatment measure for common lifestyle or medical conditions. All resources reviewed are designed to be used during a five to ten minute consultation.

5.1 Sourcing resources

Resources were sourced for this research project through multiple avenues including individual organisations, South Australian health information services and Internet search engines. All resources sourced were printed in English and produced by Australian organisations.

Based on background research that promoted seafood consumption as part of a healthy diet for certain lifestyle and specific medical conditions, all the materials available from the following individual organisations were assessed for their relevance:

- Arthritis Australia;
- Australian General Practice Network ;
- Better Health Channel;
- Children, Youth and Women's Health Service;
- Commonwealth Scientific and Industrial Research Organisation (CSIRO);
- Department of Health and Ageing;
- Diabetes Australia;
- Dietetics Association of Australia;
- Heart Foundation;
- New South Wales Department of Health;
- Nutrition Australia;
- Pharmaceutical Society of Australia;
- South Australian Department of Health; and
- South Australian Dental Service.

South Australian health information services that provide a large range of health information were visited to gather appropriate resources. These services included the Health Promotion Shopfront located at the Royal Adelaide Hospital (Central Northern Adelaide Health Service) and the Health Information Centre located at the Women's and Children's Hospital (Children, Youth and Women's Health Service). Visiting such services provided an opportunity to access resources that were not well promoted or accessible to the public but could be ordered in hardcopy by organisations and individuals such as GPs and AHPs.

Two internet search engines were used to research and gather resources for this research project being 'HealthInsite' and 'Google Australia'. 'HealthInsite' (www.healthinsite.gov.au) is an Australian Government website that provides up-to-date and quality assessed information on a range of health topics. 'Google Australia' (www.google.com.au) is one of the most popular search engines in Australia.

The following key terms were used to research and source electronic information:

- seafood health benefits;
- fish health benefits;
- seafood healthy eating;
- fish healthy eating;
- seafood and arthritis;
- seafood and cholesterol;
- seafood and heart health;
- seafood and osteoporosis;
- seafood and pregnancy;
- fish and arthritis;
- fish and cholesterol;
- fish and heart health;
- fish and osteoporosis; and
- fish and pregnancy.

5.2 Key criteria for critical review

All resources collected for this research project were critically reviewed based on a strict range of criteria in an endeavour to minimise rater bias. Resources were also reviewed for accuracy, bias and obvious commercial interest. A wide range of research was undertaken to ensure that a thorough assessment was conducted. A range of readability formulas, assessment tools and guidelines were investigated.

The critical review criteria included:

- source of information;
- date of publication;
- key message(s) of the resource;
- key information in relation to seafood;
- appropriateness for use within a five to ten minute consultation;
- ease of readability for public; and
- overall credibility of the resource.

5.3 Appropriateness for use within a five to ten minute consultation

All resources assessed needed to be able to be used by GPs and AHPs within the short timeframe (5 to 10 minutes) available for consultations. This is important because the best outcomes for consumers are seen when health information, surrounding discussion and decision making are provided as part of an ongoing professional and trusting relationship with members of a health care team.

Many people trust the information imparted by doctors and provided at places such as doctors' rooms rather than that which comes from other sources such as the Internet. Providing health information that can be read in detail at the consumer's leisure as part of a consultation allows the consumer to be more involved in the decision making process, and allows time to consider options.

Readability was included as it was essential to assess whether resources were developed in a manner that enabled target audiences to understand the content, thus maximise the value of the resource being used by consumers

5.4 Overall credibility

The overall credibility of each of the resources was assessed to ensure that the credibility and acceptance of health information was also incorporated into the criteria. This includes:

- the name and expertise of the author(s);
- the name of the publisher, publication date;
- current, accurate and consistent information;
- non-judgmental language;
- unbiased information;
- references to support information related to research and statistics;
- Information that is relevant and related to the consumer's experience;
- disclosure of sponsors;
- quality presentation of the information; and
- references to other relevant literature.

Interviews were also conducted with general practitioners to ensure the time factors assessed were appropriate and the overall credibility was acceptable 'in practice'.

NB: Further information on the criteria used can be found in the (unpublished) dissertation of Jane Taylor held in the closed reserve section of the Curtin University library.

5.5 Review of resources

The criteria headings used to review all resources as part of this research project were:

- Resource title;
- Format of resource (web / hardcopy / PDF etc);
- Source;
- Date of publishing / latest review;
- Key message(s) of resource;
- Key information on fish / seafood;
- What is described as part of a healthy diet (fish / seafood / fish oil);
- Target audience;
- Likely to be used by;
- Likely to be used in a five to ten minute consultation;
- Readability for patients (using SMOG Readability level); and
- Seen to be a credible resource.

5.6 Summary of results

The identification process realised 120 current resources associated with the health benefits of regular consumption of seafood as part of a healthy diet that could be used by GPs and AHPs. The resource topics included arthritis (seven), cancer (six), dementia (one), dental health (two), diabetes (three), heart health (30), nutrition (40), osteoporosis (six) and preconception, pregnancy and breastfeeding (25).

The critical review of resources revealed information about the format, target group, reference to seafood, credibility and suitability of the identified resources. The majority (88.4%, n=106) of identified resource were available electronically as either PDF files or webpages, a preferable, quick and easy mode of access for GPs and AHPs. Just over half (57.5%, n=69) of the identified resources were targeted at specific audiences. All of the resources made reference to the health benefits of regular consumption of fish (100%, n=120), 22.5% (n=27) made reference to seafood and 5% (n=6%) made reference to fish oil as part of a healthy diet. Only 15% (n=18) of the identified resources were suitable for use with the general Australian population at or below the recommended reading level of Year Eight. The majority (87.5%, n=105) of the critically reviewed resources were found to be 'credible' or 'highly credible' based on the credibility criteria used in this research project. Resources that were found to be 'definitely not credible', 'not credible' or 'somewhat credible' (12.5%, n=15) were primarily due to information sources being commercial sources with competing interests.

In summary, the most pertinent outcome from this research was that only (18%, n=15) of the resources critically reviewed were suitable for use with the general Australian population at the recommended reading level of Year Eight or lower.

Table 5.1 Arthritis

Resource Title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
10 steps for living well with arthritis	HC/ Arthritis Australia/ Apr 2007	Arthritis can be difficult to live with, but there are many simple measures that can help to manage the symptoms and cope with everyday life.	A healthy diet is important to help maintain good health and this includes eating fish. Including foods rich in omega-3 fatty acids as part of a healthy diet may help reduce inflammation. Foods that are high in omega-3s include fish and seafood.	Fish & seafood	Those with arthritis	• GP • Dietitian • CHN • Physio • Osteopath • Chiropractor	5
Healthy eating and arthritis	PDF from web[1]/ Arthritis Australia/ 2007	There is no diet that can cure arthritis. The best diet for someone with arthritis is a healthy balanced diet to maintain general health and prevent other medical problems developing. Foods rich in omega-3 fatty acids can help reduce inflammation.	A healthy diet is important to help maintain good health and this includes eating fish. Oily fish such as sardines and salmon have a greater amount of omega-3 fats. Try to eat them at least once a week. Fish oil supplements are high in omega-3 fats.	Fish & fish oils	Those with arthritis	• GP • CHN • Community health worker • Dietitian • Physio • Osteopath • Chiropractor	5
Fish oils	PDF from web[1]/ Arthritis Australia/ 2007	Omega-3 fatty acids may help reduce inflammation in some forms of arthritis. It may help relieve joint pain in a similar way to non-steroidal and anti-inflammatory drugs. Make sure that you are taking the right dose to help with inflammation.	Eating foods rich in omega-3 fats is good for general health. Eat oily fish such as sardines, salmon, herring and mackerel. It is unlikely that you will get enough omega-3 fats from your diet alone to reduce inflammation without fish oil supplements.	Fish & Fish oil (capsules and liquid)	Those with arthritis	• GP • Dietitian • CHN • Physio • Osteopath • Chiropractor	5
Rheumatoid Arthritis	PDF from web[2]/ Better Health Channel (Vic Govt)/ Oct 2007	Rheumatoid arthritis affects the joints, particularly the feet, hands and knees. Due to inflammation, the joints are painful, swollen and movement becomes restricted. The inflammation can cause damage to the joints.	A healthy diet can help to manage fatigue. This includes eating deep sea fish regularly for its anti-inflammatory effect.	Fish	Those with rheumatoid arthritis	• GP • Physio • Osteopath • Chiropractor	4
Arthritis and Nutrition	Web[3]/ My Dr site - MIMS consumer Health Group/ Aug 2006	There is little scientific evidence that taking expensive food supplements or eating elaborate diets is beneficial. The same results can be obtained by eating balanced meals that keep your weight down while providing all the vitamins and minerals you need.	There are benefits to eating fish as the omega-3 fatty acids found in them can help reduce the number of tender joints and the amount of morning stiffness for people with rheumatoid arthritis.	Fish & fish oil	Those with arthritis	• GP • CHN • Dietitian • Physio • Osteopath • Chiropractor	3

Resource Title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Arthritis – you can do something about it	PDF on web[4]/ NSW Multicultural Health Communication Service/ Mar 2005	Arthritis that commonly affects older people is called osteoarthritis and the joints of the body become worn and damaged. There is no cure, but a lot can be done to relieve the symptoms.	Eat a variety of healthy foods including fish. Fish has omega-3 fat in it which may help to reduce inflammation.	Fish	Those with osteoarthritis	• GP • Dietitian • CHN • Physiotherapist • Osteopath • Chiropractor	5
Rheumatoid arthritis	HC/ Pharmaceutical Society of Australia/ Jan 2006	Rheumatoid arthritis is an immune system disorder which causes swelling, pain and stiffness in joints. It can lead to joint deformity and may also affect other body organs. Treatment started early can prevent or limit damage.	The omega-3 fatty acids found in fish oils can have an anti-inflammatory effect to reduce joint pain and stiffness. Eating foods rich in omega-3 fatty acids as part of a healthy lifestyle may reduce inflammation.	Fish oils (capsules / liquid)	Those with rheumatoid arthritis	• GP • CHN • Physiotherapist • Osteopath • Chiropractor	3

Key:
CHN: Community health nurse
Cred.: Credibility 1 (lowest) to 5 (highest).

Table 5.2 Cancer

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Healthy eating and physical activity – to reduce your risk of cancer	HC, PDF on Web[4]/ QLD Cancer Fund/ July 2006	Healthy eating, regular physical activity and achieving and maintaining a healthy body weight can lower your risk of cancer.	Foods with good fat are part of a healthy diet. This includes oily fish like salmon, mackerel, sardines and tuna. Eat one to two meals of fish (preferably oily) a week.	Fish	General population	• GP • CHN • Dietitian	5
Healthy eating to reduce cancer risk	HC, PDF on web[5]/Cancer Council ACT/ July 2007	To reduce your risk of cancers The Cancer Council ACT recommends a healthy body weight, regular exercise and a healthy diet.	Fish is part of a healthy diet.	Fish	General population	• GP • CHN • Dietitian	5
Healthy eating and physical activity	Web[6]/ Cancer Council NSW/ Feb 2006	Healthy eating and regular physical activity can lower your risk of cancer.	Boost your intake of fish and omega-3 fats as they are associated with a range of health benefits. Eat fish at least twice a week	Fish	General population	• GP • CHN • Dietitian	5
Healthy eating and physical activity for adults: how to reduce your risk of cancer	HC/ Cancer Council SA/ unknown	People who eat fruits and vegetables, are active, keep their weight down and avoid drinking alcohol are less likely to get cancer.	Enjoy fish (fresh or canned) one to two times a week as part of a healthy diet.	Fish	General population	• GP • CHN • Dietitian	5
Healthy eating and physical activity for children: how to reduce your child's risk of cancer in later life	HC/ Cancer Council SA/ unknown	People who eat fruits and vegetables, are active, keep their weight down and avoid drinking alcohol are less likely to get cancer. Teaching children healthy lifestyle behaviours early helps them to adopt healthy habits that can lead to better health now and in the future.	Offer fish (fresh or canned) one to two times a week as part of a healthy diet.	Fish	Parents of children	• GP • CHN • Child health nurse • Dietitian	5
Healthy eating to reduce cancer risk	HC, PDF on web[8]/ Cancer Council Vic/ July 2005	To reduce your risk of cancer The Cancer Council Victoria recommends a healthy body weight, regular exercise and a healthy diet.	Fish is part of a healthy diet.	Fish	General population	• GP • CHN • Dietitian	5

Table 5.3 Dementia

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Dementia – risk reduction	PDF[2]/ Better Health Channel (Vic Govt)/ Sept 2006	Dementia cannot be prevented or 'cured' but the choices that you make in midlife can help you to keep your brain healthy as you age.	A healthy diet can help to keep your brain healthy. Fish (especially oily) is part of a healthy diet - aim to have one to two meals with fish a week.	Fish	General population	• GP • Dietitian	5

Table 5.4 Dental Health

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Top tips	Web[9]/ Dental Health Service Vic/ unknown	Eating a wide variety of food is important for good oral health and overall wellbeing.	Fish is part of a healthy diet.	Fish	General population	• GP • CHN • Dietitian • Dentist • Dental therapist • Dental hygienist	5
Snack Ideas	HC/ Health Promotion, SA Dental Service/ June 2007	Snacking on sugary food can start tooth decay. Keep your teeth healthy and eat food with little or no sugar between meals.	Canned sardines or tuna make a healthy snack choice.	Fish	General population	• GP • CHN • Dietitian • Dentist • Dental therapist • Dental hygienist	5

Table 5.5 Diabetes

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Food choices for people with diabetes	HC/PDF on web[10]/ Diabetes Australia/ Aug 2007	Healthy eating for people with diabetes is no different to that which is recommended for everyone. By choosing healthy food and being active blood glucose and weight can be managed.	The fats found in fish (polyunsaturated) are good for health – especially those in oily fish. Eat more fish - at least three times a week. Seafood is also part of a healthy diet and is a good source of protein.	Fish and seafood	Those with diabetes	• GP • CHN • Dietitian	4
Healthy food for healthy living	PDF on web[11]/ International Diabetes Institute/ 2002	Healthy eating for people with diabetes is no different to that which is recommended for everyone. By choosing healthy food and being active blood glucose and weight can be managed.	Fish and seafood are a part of a healthy diet when eaten 'moderately'.	Fish and seafood	Those with or at risk of developing diabetes	• GP • CHN • Dietitian	5
Healthy eating for diabetes	PDF on web[12]/ QLD Health/ Feb 2005	Diabetes occurs when a hormone called insulin does not work properly. Healthy eating can help to control diabetes.	Fish is part of a healthy diet. The type of fat found in fish is healthy. Fish should be included at least twice a week.	Fish	People with diabetes	• GP • CHN • Dietitian	5

Table 5.6 Heart Health

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Cholesterol explained	PDF on web[2]/ Better Health Channel (Vic Govt)/ June 2006	There is no need to eat foods high in cholesterol. Too much cholesterol in your diet can lead to heart disease. Cholesterol is a type of fat that is needed for many bodily functions. It is also an essential component of cell membranes. It is a problem only when there is too much of it in the blood. Heart disease is the leading cause of death in Australia. Food is directly involved in many of the risk factors for coronary heart disease. Paying attention to what you eat is one of the most important preventative measures you can take. The best source of omega-3 fatty acids is fish and fish oils. Omega-3 fatty acids protect against heart rhythm disorders and have benefits for blood clotting and blood vessel function. Eat more fish for better health. Fish and seafood are good sources of omega-3 fatty acids. Blood cholesterol and blood triglycerides are fatty substances found in the blood. People can lower their blood cholesterol levels by eating a healthy diet that is low in saturated fat. Fats found in food are a mixture of sat, polyunsaturated and monounsaturated. Sat fat raises blood cholesterol, polyunsaturated and monounsaturated fats lowers blood cholesterol.	Fish (at least twice a week) is part of a healthy diet. Seafood is a healthy food but is high in cholesterol – it is fine to eat in moderation as long as your overall diet is low in saturated fats.	Fish and seafood	People with or at risk of high cholesterol	• GP • CHN • Dietitian	5
Cholesterol – healthy eating tips	PDF on web[2]/ Better Health Channel (Vic Govt)/ July 2007		Fish (at least twice a week) is part of a healthy diet that will help to reduce your cholesterol levels.	Fish	People with or at risk of high cholesterol	• GP • CHN • Dietitian	5
Heart disease and food	PDF on web[2]/ Better Health Channel (Vic Govt)/ July 2007		Oily fish is part of a healthy diet and can help protect against heart disease as it lowers cholesterol, improves blood vessel elasticity and thins the blood. Eat fish at least once a week.	Fish	General population	• GP • CHN • Dietitian	5
Fish oils help keep the heart running smoothly	PDF on web[13]/ CSIRO/ Nov 2007		Eat more fish for better health. Fish and seafood are good sources of omega-3 fatty acids. The most beneficial amount of fish oil is currently unknown. It is better to eat fish meals than use supplements.	Fish, seafood and fish oil	General population	• GP • Dietitian	5
Cholesterol, Triglycerides and heart disease	HC/ Heart Foundation/ March 2007		Fish (at least twice a week) is part of a healthy diet.	Fish	General population	• GP • CHN • Dietitian	5
Dietary Fat and Heart Disease	PDF on web[14]/ Heart Foundation/ Feb 2004		Fish is part of a healthy diet and contains polyunsaturated fat. Eat fish at least twice a week.	Fish	Those at risk of developing heart disease	• GP • CHN • Dietitian	5

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Enjoy healthy eating. A guide to keeping your blood cholesterol in check (Pamphlet)	HC/ Heart Foundation/ Dec 2006	Eating a healthy diet is very important for reducing your cholesterol levels and improving your heart health.	Fish is part of a healthy diet and contains a high amount of healthy fat. Eat fish at least twice a week. Fish helps to reduce your risk of heart disease. All types of fish are good choices. Seafood is also a good choice as it is low in saturated fat.	Fish and seafood	Those at risk of high cholesterol	• GP • Dietitian • CHN	5
Enjoy healthy eating. A guide to keeping your blood cholesterol in check (Magnet)	HC/Heart Foundation/ unknown	Eating a healthy diet is very important for keeping your cholesterol levels in check.	Fish is part of a healthy diet. Eat fish at least twice a week.	Fish	Those at risk of high cholesterol	• GP • Dietitian • CHN	4
Healthy eating for the heart	PDF on web[14]/ Heart Foundation/ Feb 2004	Nutrition plays a role in four of the risk factors for heart, stroke and blood vessel disease – high blood lipids (fats), blood pressure, diabetes and being overweight.	Fish is part of a healthy diet. Have it at least twice a week.	Fish	General population	• GP • Dietitian • CHN	5
High blood pressure – the facts	HC/Heart Foundation/ June 2007	High blood pressure is one of the most common disorders affecting the heart and blood vessels. High blood pressure rarely gives warning signs and can be a silent killer. Healthy eating is particularly important in controlling high blood pressure and reducing your risk of heart disease.	Fish is part of a healthy diet that may help to reduce high blood pressure.	Fish	Those with high blood pressure	• GP • Dietitian • CHN	5
Live healthy to live longer – your guide	HC/ Heart Foundation/ 2005	Your heart needs care for life. A healthy heart is about enjoying a healthy lifestyle and making this a part of every day life. It is about living healthily to live longer. It's also about making positive steps to reduce risk factors.	Moderate amounts of fish as part of a healthy diet.	Fish	General population	• GP • Dietitian • CHN	5

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Nourish your heart	Web[15]/ Heart Foundation/ unknown	Enjoying a variety of foods from the different food groups is the key to healthy eating.	Fish is part of a healthy diet. Have fish at least twice a week.	Fish	General population – especially women due to location on website (women and heart disease)	• GP • Dietitian • CHN	5
Questions and Answers – General Position Statement – Phytosterol/stanol enriched foods	PDF[14]/ Heart Foundation/ Aug 2007	Plant sterol enriched foods can be included in a healthy eating plan. For good health it is important to enjoy a variety of foods every day.	Fish is part of a healthy diet.	Fish	Those at risk of developing, or with, high cholesterol	• GP • Dietitian • CHN	5
Women and heart disease	HC/ Heart Foundation/ 2006	Heart disease is the number one killer of women in Australia. The biggest risk to your heart is the gradual clogging of the arteries that supply blood to the heart.	Eating fish (at least twice a week) is part of a healthy diet which can help prevent heart disease.	Fish	Women	• GP • Dietitian • CHN	5
Your blood pressure	PDF on web[14]/ Heart Foundation/ Dec 2003	Blood pressure is the pressure of the blood in the arteries as the heart pumps it around the body. It does not stay the same all the time. There are things that you can do to prevent your blood pressure increasing and control the risk of heart disease.	Enjoy fish as part of a healthy diet to prevent your blood pressure increasing and control the risk of heart disease.	Fish	Those with, or at risk of high blood pressure	• GP	5
Eating for a healthy heart	Web[16]/ My Dr website - MIMS consumer Health Group/ July 2006	You can make a huge difference to your heart and to your general health by just making a few simple changes to your way of eating.	Eat fish (fresh or canned and not fried) at least twice a week.	Fish	General population	• GP • Dietitian • CHN	3
Heart Disease: Reduce the Risk	Web[17]/ My Dr website - MIMS consumer Health Group/ July 2006	Heart disease is rarely caused by one thing. It is important to know the risk factors and to try and avoid them.	Fish is part of a healthy diet – eat it regularly (at least twice a week).	Fish	General population	• GP • CHN	3

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Heart Health: Be Physically Active and Enjoy Healthy Eating	Web[18]/ My Dr website - MIMS consumer Health Group/ April 2004	Small changes to your eating and physical activity habits can make a big difference to your heart health.	Fish is part of a healthy diet.	Fish	General population	• GP • Dietitian • CHN	3
Triglycerides	Web[19]/ My Dr website - MIMS consumer Health Group/ March 2007	Triglycerides are a type of fat found in your blood and your fat cells. Triglycerides are the main form of fat stored in the body. You can lower the amount of triglycerides that you have in your body by eating healthily.	Fish can help you to lower your triglycerides level and are part of a healthy diet.	Fish	General population	• GP • Dietitian • CHN	3
The importance of lower cholesterol	PDF on web[20]/ Northern Rivers Division of General Practice (Lismore NSW)/ unknown	Lowering cholesterol levels in the blood has significant health benefits. Reducing cholesterol through the diet is preferable.	Omega-3 fatty acids are good for you. Polyunsaturated fats found in seafood are recommended.	Seafood	Those with or at risk of high cholesterol	• GP • Dietitian • CHN	4
Blood pressure	Web[21]/NSW Health/ unknown	Blood pressure is the pressure of the blood in the arteries as the heart pumps blood around the body. Blood pressure is normal. We all need it to stay alive.	Eating plenty of fish can help control blood pressure	Fish	General population	• GP • CHN	5
Cardiovascular disease	Web[22]/NSW Health/ unknown	Cardiovascular disease (CVD) is a term used to describe a vascular condition that can affect the heart and blood vessels including: heart attack and angina, cerebrovascular disease (including stroke),high blood pressure, blood clotting and other heart or blood vessel diseases.	Eating plenty of fish can help control blood pressure and prevent cardiovascular disease.	Fish	General population	• GP • CHN	5

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Cholesterol: too much is dangerous. Asian foods	PDF on web[23]/ NSW Multicultural Health Communication Service/ March 2005	Too much cholesterol in the blood increases the risk of heart attack or stroke. Knowing what foods to eat and enjoying regular physical activity can help to keep cholesterol under control.	Having fish (canned or fresh) at least twice a week can help keep your cholesterol at a healthy level. Shellfish is fine in moderation if your cholesterol is at a healthy level.	Fish and seafood	Asian people	• GP • Dietitian • CHN	5
Cholesterol: too much is dangerous. European and Middle Eastern foods	PDF on web[23]/ NSW Multicultural Health Communication Service/ March 2005	Too much cholesterol in the blood increases the risk of heart attack or stroke. Knowing what foods to eat and enjoying regular physical activity can help to keep cholesterol under control.	Having fish (canned or fresh) at least twice a week can help keep your cholesterol at a healthy level. Shellfish is fine in moderation if your cholesterol is at a healthy level.	Fish and seafood	European and Middle Eastern people	• GP • Dietitian • CHN	5
Cholesterol: too much is dangerous. Samoan and Tongan foods	PDF on web[23]/ NSW Multicultural Health Communication Service/ March 2005	Too much cholesterol in the blood increases the risk of heart attack or stroke. Knowing what foods to eat and enjoying regular physical activity can help to keep cholesterol under control.	Having fish (canned or fresh) at least twice a week can help keep your cholesterol at a healthy level. Shellfish is fine in moderation if your cholesterol is at a healthy level.	Fish and seafood	Samoan and Tongan people	• GP • Dietitian • CHN	5
Eating well to prevent heart disease and stroke	PDF on web[23]/ NSW Multicultural Health Communication Service/ May 2003	Any healthy changes that you make to your diet should be lifelong.	Fish have good unsaturated fats. Eat fish that is fresh, frozen or canned (in spring water) at least twice a week	Fish	General population	• GP • CHN	5
How to keep your blood pressure healthy	PDF on web[23]/ NSW Multicultural Health Communication Service/ Sept 1997	Blood pressure is the force that drives blood through your veins and arteries. If is becomes too high it can damage arteries making it easier for them to become blocked and cause heart attack or stroke. Healthy eating, reducing salt intake and regular exercise can help prevent high blood pressure.	Eating moderate amounts of fish can help to reduce high blood pressure.	Fish	General population	• GP • CHN	5

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Summary Cholesterol and Heart Health	Web[24]/ Nutrition Australia/ May 2007	We need a certain amount of cholesterol in our bodies, but having more than the right amount is potentially harmful. A high level of LDL cholesterol is strongly associated with increased risk of heart disease.	Eating one to two fish meals per week reduces the risk of heart disease.	Fish	General population	• GP • CHN • Dietitian	4
Fats and cholesterol	HC/ Pharmaceutical Society of Australia/ July 2003	Our bodies need cholesterol and triglycerides (fat), but having too much cholesterol or fat in our blood can increase our chances of developing high blood pressure, heart disease and stroke. They can be lowered be healthy eating, lifestyle changes and medicines.	Fish is part of a healthy diet to help reduce bad cholesterol. Fish oils are polyunsaturated fats. Have fish at least twice a week as part of a healthy diet.	Fish and fish oil	General population	• GP	1
Helping Your Heart	Web[25]/ Victor Chang Cardiac Research Institute/ unknown	Healthy eating means enjoying a wide variety of nutritious foods with the ultimate goal of reducing heart disease risk factors - high blood cholesterol levels, high blood pressure, excess weight and high blood sugar levels if diabetic. Healthy food for your heart is healthy for all the family, and it can be simple and tasty.	Seafood is a great alternative to meat and poultry. The fats in fish are known to be heart-healthy, and most experts would recommend that you eat fish at least two to three times a week. Canned fish is also suitable.	Fish and fish oil	General population	• GP	5

Table 5.7 Nutrition

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Antioxidants	PDF on web[1]/ Better Health Channel (Vic Govt)/ Nov 2007	An overload of free radicals has been linked to certain diseases, including heart disease, liver disease and some cancers. A diet high in antioxidants may help reduce the risk of these diseases. Antioxidants are found in certain healthy foods and neutralise free radicals.	Seafood – contains cooper, manganese, selenium and zinc which are good sources of antioxidants. Fish – contains zoochemicals which is a good source of antioxidants.	Fish and seafood	General population	• GP • CHN • Dietitian	5
Calcium	PDF on web[1]/ Better Health Channel (Vic Govt)/ Feb 2008	Calcium is vital for healthy teeth and bones.	Fish with edible bones are a good source of calcium.	Fish	General population	• GP • Dietitian	5
Calcium – children	PDF on web[1]/ Better Health Channel (Vic Govt)/ Nov 2006	Calcium is an important part of the daily diet, especially for children. It is essential for the growth of strong teeth and bones.	Fish with edible bones (sardines or salmon) are a good source of calcium for children that refuse to drink milk.	Fish	Parents of children	• GP • Dietitian • CHN • Child Health Nurse	5
Fats and oils	PDF on web[1]/ Better Health Channel (Vic Govt)/ Feb 2008	Fat is important for many body processes and you need to eat some fat in your diet.	Fish contains omega-3 fats which are polyunsaturated fats. Have fish at least twice a week. The benefits of omega-3 fats include: lower triglyceride levels; improved blood vessel elasticity; normal heart rhythm; thinner the blood, which is less sticky and less likely to clot; reduced inflammation; reduced blood pressure; preventing and treating depression; and contributing to the normal fetal brain development.	Fish	General population	• GP • CHN • Dietitian	5
Fish	PDF on web[1]/ Better Health Channel (Vic Govt)/ Nov 2007	Australians should eat more fish. Fish is low in fat, high in protein and an excellent source of omega-3 fatty acids. Eating fish regularly (once or twice a week) may reduce the risk of a range of diseases. The best source of omega-3 fatty acids is in fish, not fish oil capsules.	Eating fish regularly may reduce the risk of: Asthma; cardiovascular disease; dementia; depression; diabetes; poor eyesight; inflammatory conditions; and prematurity.	Fish and seafood	General population	• GP • CHN • Dietitian	5

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Food variety and a healthy diet	PDF on web[2]/ Better Health Channel (Vic Govt)/April 2006	Food variety means eating a wide variety of foods from each of the five food groups, in the amounts recommended. Eating many different foods helps maintain a healthy and interesting diet and provides adequate nutrition. Eating a mixture of foods can help prevent diseases such as diabetes, cancer and cardiovascular disease.	Fish are a part of a healthy and varied diet.	Fish	General population	• GP • CHN • Dietitian	5
Iodine explained	PDF on web[2]/ Better Health Channel (Vic Govt)/Feb 2008	Iodine is found in dairy products, seafood, kelp, eggs, some vegetables and iodised salt. It is important for essential hormone development in the human body.	Iodine is found in seafood. Any type of seafood is a rich source of iodine. Eating seafood (including fish) once a week is enough to fulfill the average iodine requirement and eating it two to three times a week will give you benefit from the fish oils.	Fish and seafood	General population	• GP • CHN • Dietitian	5
Nutrition – women's extra needs	PDF on web[2]/ Better Health Channel (Vic Govt)/Aug 2007	A woman's reproductive life means that her nutritional needs differ greatly from those of a man. Menstruation, pregnancy, breastfeeding and menopause are times of increased nutritional demand.	Seafood is a good source of zinc which is needed to maintain healthy cells. Fatty fish are a good source of vitamin D.	Fish and seafood	Women	• GP • CHN • Dietitian • Midwife	5
Feeding your baby in the first year	HC, PDF on web[26]/ Centre for Health Promotion, Children, Youth and Women's Health Service (SA)/ unknown	Babies need the right foods at the right times to grown, learn to eat and help them learn to talk. Breastmilk is the best food for babies for the first six months, then smooth foods at six to seven months and then lumpy foods until one year.	Fish is a good food to prepare for your baby.	Fish	Parents of children under 1 year old	• GP • CHN • Community health worker • Child health nurse	5

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Snacks for children aged 1 year and over	HC, PDF on web[26]/ Centre for Health Promotion, Children, Youth and Women's Health Service (SA)/ unknown	Children need a range of healthy foods to learn and play.	Fish is a healthy snack for children.	Fish	Parents of children over one year	• GP • CHN • Community health worker • Child health nurse	5
Healthy eating	Web[27]/ Child and Youth Health, Children, Youth and Women's Health Service (SA)/April 2008	Eating healthily can make you look better and feel better, even small changes in the way you eat can make a difference.	Fish is part of a healthy diet. Fish and seafood provide nutrients such as omega-3 fatty acids which are very necessary.	Fish and seafood	Youth	• GP • CHN • Dietitian	5
Healthy eating guidelines	Web[28]/ Choice magazine – online/ Mar 2003	Healthy eating guidelines are: eat plenty of fruit and veggies, eat plenty of cereals, preferably wholegrain, include lean meat, fish, poultry and/or alternatives such as legumes and nuts, limit saturated (and trans) fat, include reduced-fat dairy foods and/or alternatives in your diet, drink plenty of water, choose foods low in salt, limit alcohol, don't eat too much sugary food.	Fish is a good source of iron. Two to three fish meals a week are recommended for omega-3 benefits.	Fish	General population	• GP • CHN • Community health worker • Dietitian	5
Australian Guide to healthy eating – background information for consumers	HC/Dept of Health and Ageing/1998	Enjoy a variety of healthy foods every day including fruits, vegetables, legumes, milk, yoghurt, cheese, water, bread, cereals, rice, pasta and noodles.	As part of a healthy diet, fish provides some of the important nutrients the body needs. Canned fish is a nutritious substitute for fresh fish. Eat moderate amounts of fish.	Fish	General population	• GP • CHN • Dietitian	5
Australian Guide to healthy eating – summary information	HC/Dept of Health and Ageing/1998	Enjoy a variety of healthy foods every day including fruits, vegetables, legumes, milk, yoghurt, cheese, water, bread, cereals, rice, pasta and noodles.	As part of a healthy diet, fish provides some of the important nutrients the body needs. Canned fish is a nutritious substitute for fresh fish. Eat moderate amounts of fish.	Fish	General population	• GP • CHN • Dietitian	5

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Australian Guide to healthy eating - poster (A4 and A3)	HC/Dept of Health and Ageing/1998	Enjoy a variety of healthy foods every day including fruits, vegetables, legumes, milk, yoghurt, cheese, water, bread, cereals, rice, pasta and noodles.	Enjoy fish as part of a healthy diet.	Fish	General population	• GP • CHN • Dietitian	5
Food for health – dietary guidelines for children and adolescents in Australia	HC/Dept of Health and Ageing/2003	Enjoy a wide variety of nutritious food and drink plenty of water. Encourage and support breastfeeding. Children and adolescents need sufficient nutritious foods to grow and develop normally. Care for your child's food: prepare and store it safely.	Enjoy fish as part of a varied diet.	Fish	Parents and carers of children and adolescents	• GP • CHN • Child health nurse • Dietitian	4
Food for health – dietary guidelines for Australian adults	HC/Dept of Health and Ageing/2003	Enjoy a wide variety of nutritious food. Encourage and support breastfeeding. Prevent weight gain: be physically active and eat according to your energy needs. Care for your food: prepare and store it safely.	Enjoy fish as part of a varied diet.	Fish	General population	• GP • CHN • Dietitian	4
Food for health – dietary guidelines for Australians	HC/Dept of Health and Ageing/2003	Enjoy a wide variety of nutritious food and drink plenty of water. Encourage and support breastfeeding. Children and adolescents need sufficient nutritious foods to grow and develop normally. Care for your and your child's food: prepare and store it safely.	Enjoy fish as part of a varied diet. Try to eat one to two fish meals a week. Fish is an excellent source of omega-3 fats, iron and protein.	Fish	General population	• GP • CHN • Child health nurse • Dietitian	4
Indigenous Lifescripts – healthy eating action plan	PDF on web[29]/Dept of Health and Ageing/2008	Eating well will help to maintain health, increase energy and help with some medical conditions.	Eat more fish as part of your healthy eating plan.	Fish	General Indigenous population	• GP	5
Eating fish	PDF on web[30]/ Department of Health and Human Services Tas/ unknown	All fish and seafood are excellent sources of protein, vitamins and minerals. All fish are good for health with the higher fat varieties having extra benefits of omega-3 fatty acids. Aim to eat fish at least three times a week.	All fish and seafood are excellent sources of protein, vitamins and minerals. All fish are good for health with the higher fat varieties having extra benefits of omega-3 fatty acids. Aim to eat fish at least three times a week.	Fish and seafood	General population	• GP • CHN • Dietitian	5

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Calcium	Web[31]/ Dietitians Ass of Australia/ Jan 2008	Calcium is important for strong bones and healthy teeth.	Fish with edible bones are a good source of calcium as part of a healthy diet.	Fish	General population	• GP • CHN • Dietitian	5
Mercury in fish	Web[32]/ Dietitians Ass of Australia/ Jan 2008	While there are many benefits of eating fish, if you are pregnant, planning on becoming pregnant or preparing meals for a young child, you need to be careful about the types of fish you eat. Some fish contain high levels of mercury which can be harmful to your developing baby and to young children.	Fish should be eaten as party of a healthy diet at least twice a week. Fish is an excellent source of protein, low in saturated fat and contain omega-3 fatty acids. It is also a good source of vitamins (especially vitamin D) and iodine.	Fish	General population	• GP • CHN • Dietitian • Midwife • Child health nurse	5
Advice on fish consumption – mercury in fish	HC/ Food Standards Australia and New Zealand/ unknown/	There are many nutritional benefits of eating fish. All fish contains small amounts of mercury, some more than others. Eating too much fish with 'high' mercury levels is bad for you especially for those planning pregnancy, those that are pregnant and children under six.	Fish is part of a varied and healthy diet it is low in saturated fat, an excellent source of protein, essential omega-3 fatty acids and iodine.	Fish	Those planning to become pregnant, those that are pregnant, parents of children under six.	• GP • CHN • Dietitian • Midwife • Child health nurse	5
Healthy eating	PDF on web[33]/ Jean Hailes Foundation for Women/ Dec 2005	Poor eating has a direct impact on our health. Being overweight can stop us from being our best. It you're not eating well, your body struggles to stay in balance.	Eat one to three serves of fish a week; fish contain omega-3 fatty acids which are powerful protectors of the heart and blood vessels.	Fish	Women	• GP • CHN • Dietitian	5
Could you be iron deficient?	HC/ Meat and Livestock Australia/ Mar 2003	There are three easy steps to an iron-rich diet: choose foods high in absorbable iron at each meal, combine non-meat meals with good sources of vitamin C to increase absorption of non-haem iron, drink tea and coffee between meals.	Canned fish is a source of haem iron.	Fish	General population	• GP • CHN • Dietitian	2
Fatty acids in the diet	Web[34]/ My Dr website - MIMS consumer Health Group/ May 2002	Fats are made up of many different fatty acids. Fatty acids have an important role in preventing heart disease, skin conditions and inflammatory diseases. Fish are an excellent source of omega-3 fatty acids. Two to three meals of fish a week will provide sufficient amounts of fatty acids.	Fish are an excellent source of omega-3 fatty acids. Two to three meals of fish a week will provide sufficient amounts of fatty acids.	Fish	General population	• GP • CHN • Dietitian • Physio	3

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Nutrition: Benefits	Web[35]/ Foundation 49 – Men's Health/ Sept 2006	A healthy diet can not only help reduce cancer risk, but also protect against heart disease, stroke and other health conditions.	Fish are a rich source of healthy unsaturated fats called omega-3 fatty acids.	Fish	Men	• GP • CHN • Dietitian • Physio	3
Get the good eating habit	HC/Heart Foundation/ Mar 2004	For good heart health: enjoy healthy eating, be active every day, be smoke free and achieve and maintain a healthy body weight.	Enjoy a wide variety of foods including fish. Have fish at least twice a week.	Fish	General population	• GP • CHN • Dietitian	5
Losing weight the healthy way	HC/Heart Foundation/ April 2006	Achieving a healthy weight is a balancing act between what goes in and what is used up.	Fish and seafood are part of a healthy diet that can contribute to maintaining or achieving a healthy weight.	Fish and seafood	General population	• GP • CHN • Dietitian	5
The Aboriginal and Torres Strait Islander Guide to Healthy Eating	HC/Northern Territory Government – Department of Health and Community Services/ unknown	Food is required every day from each of the five food groups for good nutrition and health. Healthy eating throughout life will help reduce the risk of health problems later in life such as diabetes, heart disease, cancer and obesity.	Fish and seafood are good sources of protein, iron and zinc.	Fish and seafood	Aboriginal and Torres Strait Islanders	• GP • CHN • Dietitian • Community health worker • Aboriginal health worker	4
Facts on fat	PDF on web[36]/ NSW Multicultural Health Communication Service/ June 2005	All fats are very high in energy and will increase your weight if eaten in excess. Foods contain a combination of three types of fat: saturate, monounsaturated and polyunsaturated. The different fats have different effects on your blood cholesterol.	Omega-3 fatty acid is a polyunsaturated fat and is a healthy fat. It will help to reduce high blood triglycerides, reduce high blood pressure and reduce the risk of blood clots. Limit seafood that is high in cholesterol (prawns, calamari and octopus) to no more than once a week.	Fish and seafood	General population	• GP • CHN • Dietitian	5
Good reasons to eat fish	PDF on web[36]/ NSW Multicultural Health Communication Service/ Mar 2005	Eating fish at least twice a week is good for your health, it helps prevent heart disease and stroke, fish is low in fat and good for your bones.	The omega-3 fatty acids help prevent heart disease and stroke. Fish is low in fat which helps maintain a healthy weight. Some canned fish (salmon and sardines) contain edible bones which are a good source of calcium. Fish is good for people with diabetes because it is low in fat and helps to prevent heart disease and stroke.	Fish	General population	• GP • CHN • Dietitian	5

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
What are omega-3 fats and what is the science behind the claims relating to foods high in omega-3 fats	Web[37]/ Nutrition Australia/ Feb 1999	Omega-3 fats are polyunsaturated fats that are found in significant quantities in several plants and plant oils and in even greater quantities in many varieties of seafood. Omega-3 fats are beneficial in at least three areas of human health: heart disease, inflammatory disease, and development of vision and brain function in babies.	Eating fish regularly is associated with a reduced risk of heart disease. Rheumatoid arthritis and other inflammatory diseases (eg psoriasis) generally respond positively to increased consumption of foods containing omega-3 fats.	Fish	General population	• GP • CHN • Dietitian • Midwife • Child health nurse	5
Weight and health	HC/ Pharmaceutical Society of Australia/Oct 2006	The main way to lose weight and improve health is to change eating habits and increase physical activity.	To reach and maintain a healthy weight, eating a moderate amount of fish is recommended as part of a healthy diet.	Fish	General population	• GP • CHN • Dietitian	1
Choosing good food	Web[38]/ Raising Children Network/ unknown	If your child eats a variety of healthy foods they will get the nutrients they need and develop healthy eating habits for life. Help your child make good food choices by offering them lots of different healthy foods.	Fish supplies vital iron, zinc and vitamin B12 as well as protein – these are things children need to grow. Fish is a good source of omega-3 fatty acids, which help the brain to develop.	Fish	Parents of children aged one to eight years old.	• GP • CHN • Dietitian • Child health nurse	5
What's so healthy about seafood?	HC/ Seafood Services Australia/ Unknown	Seafood is an important part of a healthy diet and that includes whole fish, not just the fish oils. Fish is a good source of protein, iron, zinc and iodine.	Seafood is an important part of a healthy diet and that includes whole fish, not just the fish oils. Fish is a good source of protein, iron, zinc and iodine.	Fish and seafood	General population	• GP • CHN • Dietitian	1
Checklist for the 45 – 49 year old health check Incorporating the Smoking, Nutrition and Physical Activity (SNAP) guide to behavioural risk factors in general practice.	PDF on web[39]/ Royal Australian College of General Practitioners/ Oct 2004	Taking the time to identify potential and early problems can help to prevent chronic disease and allow for early intervention.	Fish is part of a healthy diet.	Fish	General population aged 45 – 49 years old	• GP	5

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Health benefits	Web[40]/ WA Fishing Industry Council	Substantial evidence suggests that people at risk from coronary heart disease, heart arrhythmia, rheumatoid arthritis, diabetes, obesity and hypertension may benefit by making seafood a cornerstone of a healthy balanced diet. Eat one to two serves of fish a week.	Substantial evidence suggests that people at risk from coronary heart disease, heart arrhythmia, rheumatoid arthritis, diabetes, obesity and hypertension may benefit by making seafood a cornerstone of a healthy balanced diet. Eat one to two serves of fish a week.	Fish	General population	• GP • CHN • Dietitian	I
Women's Health in the Middle Years	HC/ Women's and Children's Hospital, Children, Youth and Women's Health Service (SA)/ Feb 2004	During the middle years, women experience many changes and face a number of issues related to lifestyle and health. You may be able to prevent some illnesses through making healthy lifestyles choices.	Fish is part of a healthy diet.	Fish	Women in the middle years (middle aged)	• GP	5
Nutrition – student fact sheet	Web[41]/ Women's Health QLD Wide/ Nov 2007	During adolescence, young women's eating habits often change due to spending more time with friends, part-time work and a generally more independent lifestyle. They tend to have more meals outside of the home, thus making their own decisions regarding what to eat. Therefore, providing young women with information on the nutritional requirements for a person of their age may help them to make better food choices.	Fish is an important part of a healthy diet. It is a good source of iron, calcium and protein – all of which are important for adolescent girls.	Fish	Young women Parents of young women	• GP • CHN • Dietitian	5

Table 5.8 Osteoporosis

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Osteoporosis	PDF on web[2]/ Better Health Channel (Vic Govt)/ Sep 2006	With osteoporosis bones become less dense, lose strength and break more easily due to calcium loss. Breaks are most common in the spine, hip and wrist and often occur as the result of a minor fall. It is never too late to seek treatment.	Canned fish with small edible bones, like sardines, is a good source of calcium to help prevent osteoporosis.	Fish	Those at risk of osteoporosis	• GP	5
Osteoporosis	Web[42]/ Dietitians Ass of Australia/ Jan 2008	Osteoporosis is a condition of brittle bones affecting many Australians. Eating enough calcium rich foods throughout life can help to prevent osteoporosis.	Fish with edible bones contains calcium that can help to prevent osteoporosis.	Fish	Those at risk of developing osteoporosis	• GP • CHN • Dietitian	4
Calcium	Web[43]/ Osteoporosis Australia/ unknown	Calcium is essential for building and maintaining bones. It combines with other minerals to form the hard crystals that give bone its strength. Almost all the body's calcium (about 99%) is found in the bones.	Eat canned fish with bones, particularly canned salmon and sardines (the fish bones contain calcium).	Fish	Those at risk of developing osteoporosis	• GP • CHN • Dietitian	5
Calcium, Vitamin D and osteoporosis	PDF on web[44]/ Osteoporosis Australia/Mar 2006	Osteoporosis is a disease in which the bones become fragile and brittle. They fracture more easily than normal bone. Calcium is important for building strong bones in childhood and helping protect us from developing osteoporosis later in life.	Fish with edible bones are a source of calcium. Small amounts of vitamin D can be found in fatty fish like salmon, herring and mackerel.	Fish	Those at risk of developing osteoporosis	• GP • CHN • Dietitian	5
Osteoporosis	HC/ Pharmaceutical Society of Australia/ Aug 2006	Bones can become so weak that the fracture very easily. This is called osteoporosis and it is most common in postmenopausal women.	A healthy well balanced diet that includes fatty fish can help prevent osteoporosis.	Fish	Those at risk of developing osteoporosis	• GP • CHN • Dietitian	1
Osteoporosis	Web[45]/ Women's Health QLD Wide/Nov 2007	Osteoporosis is a disease which affects the skeleton and is characterised by low bone mass, deterioration of bone tissue and a consequent increase in bone fragility and susceptibility to fracture. Many people unaware they suffer from it until they sustain a fracture.	Non-dairy sources of calcium include: canned fish with bones such as salmon and sardines. 100g canned salmon/sardines is equal to approximately 300mg of calcium	Fish	Women	• GP • CHN • Dietitian	4

Table 5.9 Preconception, pregnancy and breastfeeding

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Good Nutrition in pregnancy	HC/ACT Health/June 2007	A healthy pregnancy is important for you and your baby. Even though you are eating for two there is no need to eat twice as much. It is the quality of the food not the quantity which matters most.	Fish is part of a healthy diet in pregnancy. Fish and seafood are good sources of iron, iodine, calcium, vitamin D and omega-3 fats.	Fish and seafood	Pregnant women	• GP • CHN • Dietitian • Midwife	5
Mercury in fish	PDF on web[2]/ Better Health Channel (Vic Govt)/June 2006	Mercury is a naturally occurring element that is found in air, water and food. Most people are exposed to mercury via food. Unborn babies are at the greatest risk from too much mercury as too much in their system can slow their development in the early years of life. Fish is still an important part of a healthy diet for pregnant women – just choose to eat fish and seafood with lower levels of mercury.	Fish is an important part of a healthy diet. Some of the health benefits include high in protein, low in saturated fat, high in unsaturated fat and high in omega-3 oils.	Fish and seafood	Pregnant women	• GP • CHN • Dietitian • Midwife	5
Pregnancy and diet	PDF on web[2]/ Better Health Channel (Vic Govt)/Nov 2007	Good nutrition during pregnancy keeps the mother and baby healthy. It is important to eat a wide variety of healthy foods to ensure that nutritional needs are being met.	Fish is part of a healthy diet for pregnant women. Pregnant women should eat two to three serves of low mercury fish a week for good health.	Fish	Pregnant women	• GP • CHN • Dietitian • Midwife	5
Pregnancy – risks	Web[46]/ Child and Youth Health, Children, Youth and Women's Health Service (SA)/ Aug 2007	During your pregnancy it is very important to avoid some things that can harm your developing baby.	There are several nutritional benefits from eating fish, it is an excellent source of protein and is rich in important vitamins and minerals such as vitamin D and iodine and is high in unsaturated fat and omega-3 fatty acids. Pregnant women should eat two to three serves of fish a week, but ensure that the fish that they eat has low levels of mercury.	Fish	Pregnant women	• GP • CHN • Dietitian • Midwife	5
Healthy eating a various life stages – pregnant women	Web[47]/ Dept of Health and Ageing/ Aug 2006	Healthy eating is important for pregnant women and their unborn babies.	Fish is a nutritious food that is part of a healthy diet for pregnant women. Seafood is a good source of zinc.	Fish and seafood	Pregnant women	• GP • CHN • Dietitian • Midwife	5

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Healthy eating your prescrip-tion for pre-pregnancy, pregnancy and breastfeeding Pregnancy Lifescripts (GP)	HC/Dept of Health & Ageing/Apr 2007	Healthy eating is especially important when a woman is planning a pregnancy, pregnant or breastfeeding	Fish is part of a healthy diet during preconception, pregnancy or breastfeeding. Fish and seafood are good sources of iodine.	Fish and seafood	Women that are planning a pregnancy, pregnant or breastfeeding	• GP	5
Healthy eating your prescription for pre-pregnancy, pregnancy and breastfeeding Pregnancy Lifescripts (consumer)	HC/Dept of Health & Ageing/Apr 2007	Healthy eating is especially important when a woman is planning a pregnancy, pregnant or breastfeeding.	Fish is a good source of iron. Seafood is a good source of iodine.	Fish and seafood	Women that are planning a pregnancy, pregnant or breastfeeding	• GP	4
SA Department of Health - Pregnancy website	Web[48]/ Dept of Health (SA)/ unknown	If you are thinking about having a baby or are already pregnant, there are some things you can do to help. A healthy lifestyle may mean that it is easier to conceive (get pregnant) and it will also help your baby to develop.	Eating fish regularly is part of a healthy diet when you are trying to get pregnant or are already pregnant. Fish is a good source of calcium, iron and protein.	Fish	Women preparing for pregnancy and those that are pregnant	• GP • CHN • Dietitian • Midwife	5
Having a baby in Victoria – website	Web[49]/ Dept of Human Services (Vic) /unknown	Planning your pregnancy should include getting the best available information before you conceive. It is possible to improve your health before conception, minimise the risk to your baby and for some women increase the likelihood of conceiving. It is also important to get the best possible information once you are pregnant so that you can stay in the best possible condition for your baby.	Fish is part of a healthy diet when you are trying to conceive or are pregnant as it has a number of nutritional benefits. Where possible eat a verity of fish whenever you like, as long as the mercury levels of the fish are low.	Fish	Women preparing for pregnancy and those that are pregnant	• GP • CHN • Dietitian • Midwife	5

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Mercury in Fish	PDF on web[50]/ Food Standards Australia and New Zealand/ Mar 2004	Fish is an excellent source of protein, is low in saturated fat and contains polyunsaturated fatty acids such as essential omega-3 polyunsaturates. It is also a good source of some vitamins, particularly vitamin D and iodine. It is recommended to eat one to two serves per week. All fish contains small amounts of mercury, some more than others. Eating too much fish with 'high' mercury levels is bad, especially for those planning pregnancy, those that are pregnant and children under six because of the harmful effects.	Fish is part of a varied and healthy diet it is low in saturated fat, an excellent source of protein, essential omega-3 fatty acids and iodine. Eat fish one to two times a week.	Fish	Those planning to become pregnant, those that are pregnant Parents of children under six.	• GP • CHN • Dietitian • Midwife • Child health nurse	5
A healthy fish message for women planning pregnancy and mums to be	HC/ NSW Food Authority/ Mar 2005	Fish are full of many nutritional benefits for pregnant women and young children. Too much of a good thing can be bad – especially for fish with high levels of mercury.	Fish is a good source or protein, iodine, vitamin B12 and omega-3 fatty acids which are all good for a developing baby. Aim to eat two to three serves per week of fish or seafood with low mercury levels.	Fish and seafood	Women planning a pregnancy or already pregnant	• GP • CHN • Dietitian • Midwife	5
Fish and mercury FAQs	Web[51]/ NSW Food Authority/ Jul 2006	Fish is part of a healthy diet – you just need to be careful with how much and what types you eat.	Fish is part of healthy diet and has many health benefits including that it is low in saturated fat and is an excellent source of protein, omega-3 fatty acids, iodine and some vitamins. You need to be careful to only eat fish that have low levels of mercury when you are pregnant.	Fish	Pregnant or breastfeeding women. Parents of young children.	• GP • CHN • Dietitian • Midwife • Child health nurse	5
Pregnancy and food	PDF on web[52]/ NSW Food Authority/ Mar 2005	It is important that you select a nutritious diet from a wide variety of foods. Food safety is also very important with the foods that you eat, especially in pregnancy.	Fish is rich in protein and minerals, low in saturated fat and contains omega-3 fatty acids. Be careful what fish you choose to eat as some have high levels of mercury.	Fish	Pregnant women	• GP • CHN • Dietitian • Midwife	4
Having a baby	HC/NSW Health/2006	There are many questions that you have in pregnancy about the different stages of pregnancy – this book is here to help provide the answers.	Fish is a healthy food for you and your baby.	Fish	Pregnant women	• GP • CHN • Dietitian	5

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Best food choices for breastfeeding mothers	PDF on web[52]/QLD Health/ Jan 2007	Healthy eating is important when you are breastfeeding.	Fish is a healthy food choice in pregnancy.	Fish	Breastfeeding mothers	• GP • Midwife • Dietitian	5
Iron for pregnant women	PDF on web[53]/QLD Health/ Jan 2007	When you are pregnant your body needs more blood because you and the baby are growing. Iron is needed to make the blood healthy.	Coloured flesh fish has higher levels of iron than light flesh fish. Fish is a good source of iron.	Fish	Pregnant women	• GP • Midwife • Dietitian	5
Nutrition guidelines for pregnancy	PDF on web[53]/QLD Health/ Jan 2007	Nutrition requirements are increased in pregnancy, but you only need a small amount of extra energy. It is important that you and your baby get everything you need through good nutrition.	Fish is a healthy food choice in pregnancy. It is an excellent source of protein, low in saturated fat, high in omega-3 fish oils and an excellent source of iodine.	Fish	Pregnant women	• GP • Midwife • Dietitian	4
Healthy eating for pregnancy and breastfeeding	Web[54]/ QLD Govt – Townsville Health Service District /July 2007	Good nutrition is always essential for good health. It is particularly important during pregnancy.	Fish is part of a healthy diet. Seafood is an excellent food to eat regularly during pregnancy as it provides lots of nutrients, including omega-3 fats.	Fish and seafood	Pregnant and breastfeeding women	• GP • Midwife • Dietitian	5
Eating fish during pregnancy	Web[55]/ Royal Hospital for Women (NSW)/2006	In general, eating fish is an important part of a healthy diet and should continue to be part of your diet during pregnancy. However, some fish may contain high levels of mercury and it is important not to eat too much of these.	A typical serving of fish is between 80 and 170 grams and pregnant women can safely eat two serves a week of most fish and only 170 grams a week of large fish such as tuna.	Fish	Pregnant women	• GP • Midwife • Dietitian • CHN	5
Food safety in pregnancy	Web[56]/ Women's Royal Hospital – Vic /Mar 2008	You need to be careful about the foods that you eat and what you drink during pregnancy to ensure that your baby has the best start in life.	Fish is a good source of omega-3 fatty acids, which are needed for brain and nervous tissue development in the baby. Oily fish such as salmon, sardines, herring, mackerel and tuna are the best sources. In general one to three serves per week of fish are recommended for all members of the population. However due to possible higher mercury levels, certain types of fish should be limited during pregnancy and breastfeeding.	Fish	Pregnant women	• GP • Midwife • CHN	5
Eating for two: Healthy eating and pregnancy	HC/WA Dept of Health/ 2004	Contrary to popular belief, eating for two is not an excuse to fill up on just any food that takes your fancy. You do have increased nutrition because your food must provide all the nutrients for the baby as well. It is important to eat the right amounts of healthy foods.	Fish is part of a healthy diet during pregnancy. Eat fish two to three times a week.	Fish	Pregnant women	• GP • Midwife • Dietitian	5

Resource title	Format/ Source/ Date	Key Message	Key information	Healthy diet description	Target audience	Likely to be used by	Cred.
Eating well in pregnancy	HC/ Women's and Children's Hospital, Children, Youth and Women's Health Service (SA)/ Feb 2004	Healthy eating during pregnancy is important to give your baby a healthy start.	Fish is a good source of iron and fish with bones are a good source of calcium. Eating two to three serves of most types of fish a week is recommended.	Fish	Pregnant women	• GP • Midwife • Dietitian	5
Preparing for pregnancy	HC/ Women's and Children's Hospital, Children, Youth and Women's Health Service (SA)/ Dec 2002	There are things that you can do before and during pregnancy to give your baby a healthier start. The sooner you start the better.	Fish is part of a healthy diet when planning to get pregnant.	Fish	Women planning to get pregnant	• GP	5
Preconception Health	PDF on web[57]/ Women's Health QLD Wide/May 2007	Pregnancy is a major life event and places many demands on a woman's body. The time before pregnancy is therefore an ideal period to prepare for pregnancy and parenthood. Making changes to one's life at this time can help reduce problems during pregnancy and assist in recovery from birth.	While women planning a pregnancy can include fish as a part of a healthy diet they do need to limit their intake of fish types that may have higher levels of mercury. Fish is a good source of iron and calcium.	Fish	Women planning to get pregnant	• GP • Midwife • Dietitian • CHN	5

5.7 Websites associated with resources reviewed in Section 5.

1. www.arthritisaustralia.com.au
2. www.betterhealthchannel.vic.gov.au
3. http://www.mydr.com.au/default.asp?article=3105
4. http://www.mhcs.health.nsw.gov.au/mhcs/index.html
5. www.qldcancer.com.au
6. www.actcancer.org
7. http://www.cancercouncil.com.au/editorial.asp?pageid=361
8. www.cancervic.org.au
9. http://www.dhsv.org.au/content.asp?z=3&c=9&p=159
10. www.diabetesaustralia.com.au
11. www.diabetes.com.au
12. http://www.health.qld.gov.au/nutrition
13. http://www.csiro.au/resources/ps8k.html
14. www.heartfoundation.com.au
15. http://www.goredforwomen.com.au/care_for_your_heart/nourish_your_heart.htm
16. http://www.mydr.com.au/default.asp?article=3105
17. http://www.mydr.com.au/default.asp?article=3102
18. http://www.mydr.com.au/default.asp?Article=4119
19. http://www.mydr.com.au/default.asp?article=2468
20. http://nrdgp.org.au/directory/documents/23/cholesterol.pdf
21. http://www.health.nsw.gov.au/topics/bloodpressure.html
22. http://www.health.nsw.gov.au/topics/cardiovascular.html
23. http://www.mhcs.health.nsw.gov.au/
24. http://www.nutritionaustralia.org/food_facts/faq/summary_cholesterol_faq.asp
25. http://www.victorchang.com.au/public/HelpingYourHeart.cfm?cid=34
26. www.chdf.org.au
27. http://www.cyh.com/HealthTopics/HealthTopicDetails.aspx?p=240&np=297&id=1998
28. http://www.choice.com.au/viewArticle.aspx?id=103594&catId=100406&tid=100008&p=1&title=Healthy+eating+guidelines+(archived)
29. www.adgp.com.au
30. http://www.dhhs.tas.gov.au/healthyliving/nutrition/
31. http://www.daa.asn.au/index.asp?PageID=2145834407
32. http://www.daa.asn.au/index.asp?PageID=2145834482
33. www.jeanhailes.org.au
34. http://www.mydr.com.au/default.asp?Article=382
35. http://www.49.com.au/index.php?option=com_content&task=view&id=66&Itemid=19
36. http://www.mhcs.health.nsw.gov.au/
37. http://www.nutritionaustralia.org/Food_Facts/FAQ/omega3_faq.asp
38. http://raisingchildren.net.au/articles/choosing_good_food.html
39. www.racgp.org.au
40. http://www.wafic.org.au/enjoy_seafood/health_benefits.phtml
41. http://www.womhealth.org.au/studentfactsheets/nutrition.htm

42. http://www.daa.asn.au/index.asp?PageID=2145834416
43. http://www.osteoporosis.org.au/osteo_prevention_calcium.php
44. www.osteoporosis.org.au
45. http://www.womhealth.org.au/ studentfactsheets/osteoporosis.htm
46. http://www.cyh.com/HealthTopics/HealthTopicDetails.aspx?p=114&np=304&id=1964
47. http://www.health.gov.au/internet/healthyactive/publishing.nsf/Content/pregnant-women
48. http://www.health.sa.gov.au/PREGNANCY/DesktopDefault.aspx?tabid=45
49. http://www.health.vic.gov.au/maternity/
50. http://www.foodstandards.gov.au/
51. http://www.foodauthority.nsw.gov.au/consumer/pregnancyanswers.asp
52. http://www.foodauthority.nsw.gov.au/
53. http://www.health.qld.gov.au/nutrition
54. http://www.health.qld.gov.au/townsville/tour_baby/pregnancy4.asp
55. http://www.sesiahs.health.nsw.gov.au/rhw/default.asp?page=449&template=6&leftnav=54
56. http://www.thewomens.org.au/Foodsafetyduringpregnancy
57. http://www.womhealth.org.au/factsheets/preconception.htm

6.0 Conclusions

There is increasing evidence to support regular seafood consumption (particularly fish) as being protective against all cause mortality. There is also differing levels of evidence (ranging from high to very low) to support regular seafood consumption as protective against various health issues.

Based on the available evidence, any interventions or campaigns to promote regular seafood consumption, particularly fish, as part of a healthy diet should be tailored towards specific health issues and well defined target groups. Depending upon the health issue and target group chosen, there may be a need to conduct further research to ensure there is sufficient evidence on which to base intervention or promotional messages.

There are many credible organisations, institutions and educational bodies promoting the healthy benefits of seafood as part of a healthy diet. The most pressing issue at hand is to provide these drivers with appropriate messages that are based on the highest level of evidence available. It should be noted that studies that follow a cohort over time may provide sufficient evidence to make some health claims around specific health issues.

Proven marketing and communication techniques used to effectively promote other foods should be considered as a basic framework for the communication of regular seafood consumption as being protective against all cause mortality and some specific health conditions. The framework should be well founded in behaviour change communication models in order to effect changes in behaviour within specific target groups chosen.

Resources available to general practitioners and allied health professionals for use with clients within a routine consultation, provide useful information around the health benefits of regular seafood consumption to prevent or manage common medical conditions. However, many of the resources are not targeted at a reading or comprehension level appropriate to the general population therefore should be revised accordingly with consultation from experts in the area and trialled with members of the various target groups.

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