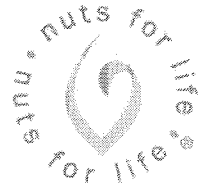




**Response to Parliament of Australia
House of Representatives Standing Committee on Health and Ageing
Inquiry into Obesity in Australia**

Prepared by Australian Nut Industry Council and Nuts for Life

16th May 2008



This submission was authorised by Mr Brenton Woolston, President of the Australian Nut Industry Council and Mr Christopher Joyce, Chair of Nuts for Life and Director of the Australian Nut Industry Council.

Executive summary

The Australian Nut Industry Council (ANIC) represents the Australian nut growing industries (almonds, chestnuts, hazelnuts, macadamias, pecans, pistachios and walnuts) and supports the activities of the Nuts for Life health education campaign.

Nuts for Life is a generic nutrition communications/ education initiative by the Australian Nut Industry (Australian nut growers as well as processors, packers and importers of nuts) to provide generic, useful, credible and up-to-date information about the nutrition and health benefits of eating nuts. It is funded through voluntary contributions from the Australian Nut Industry as well as government matched funds for R&D activities through Horticulture Australia.

ANIC and Nuts for Life is pleased the House of Representatives Standing Committee on Health and Ageing is investigating the obesity epidemic in Australia. We would like to offer the following submission for consideration when the Committee considers its terms of reference for this inquiry - *inquires into and reports on the increasing prevalence of obesity in the Australian population, focusing on future implications for Australia's health system*. This hopefully will impact on their recommendations as to what governments, industry, individuals and the broader community can do to prevent and manage obesity epidemics in children, youth and adults.

ANIC and Nuts for Life feel strongly that nuts should be seen as part of the solution to controlling body weight rather than a cause of overweight and obesity and there is much research to support this argument. For many years nuts were seen to be a rich source of fat and so should be limited as eating less fat was argued as a method to control body weight. However perpetuating the "eat less fat" message is no longer best practice when research shows that the body requires healthy monounsaturated and polyunsaturated fats to maintain its health and nuts are rich in these healthy fats.

We accept that eating large quantities of any energy dense food can lead to excessive energy being consumed, and if this energy is not expended through exercise, can lead to weight gain. However the Australian Nut Industry is recommending and promoting a conservative serving size for nuts - 30-50g or a handful - most days a week. Nuts as a whole plant food are nutrient dense as well and are required in a healthy balanced diet to achieve the recommended daily intakes of other nutrients such as vitamins and minerals.

Research suggests that nuts can be included in kilojoule controlled weight loss diets and contribute to weight loss. There are many possible mechanisms for this. Nuts are high in protein and fibre which have a satiating effect so substituting a handful of nuts in place of snacks high in saturated fat can assist with weight management. Nuts can also slow the passage of carbohydrate foods through the gut which lowers the glycaemic index of a meal leading to greater satiety and better control of blood glucose levels.

Obesity is a risk factor for many chronic diseases such as heart disease and Type 2 diabetes. Over the last 14 years numerous research papers have shown that nuts can help lower total and LDL cholesterol, a risk factor for heart disease, as well as reduce heart disease risk directly.

Nuts make a valuable contribution to a healthy balanced diet and no one food will cause obesity. Any food selection guides, dietary guidelines or food labelling initiatives eg Traffic Light Systems should ensure that healthy high fat foods such as nuts are not ostracised because of their fat and energy content but should be encouraged for the health benefits they provide.

Contents

Executive summary	Page 1
Introduction	Page 3
Nutrient composition of nuts	Page 4
The Role of Nuts in Weight Management	Page 6
The Role of Nuts in Heart Health	Page 7
The Role of Nuts in Type 2 Diabetes Management	Page 8
Nut consumption recommendations by key health authorities	Page 9
Recommended serving size for nuts	Page 10
Who are Nuts for Life, ANIC and Horticulture Australia	Page 10
Correspondence	Page 10
References	Page 10
Appendix 1 Nutrient composition of nuts	Page 13

Introduction

Overweight and obesity are a major public health concern. Population health statistics show that obesity in Australia, and in other industrialised countries including the UK and the USA, is continuing to rise. In Australia 67% of males and 52% of females are overweight or obese, and the direct costs are estimated to be over \$840 million yearly.¹ There is currently no specific dietary or lifestyle intervention that is effective at reducing weight in the long term. Traditional prescriptions for weight loss include high carbohydrate, low fat diets¹, which often exclude or minimise food sources of unsaturated fats like vegetable oils, avocados and nuts.² More recently, alternative approaches that include moderate protein intakes are receiving more attention for their role in weight management³, however these diets still tend to restrict foods high in unsaturated fats. People on weight loss diets and those aiming to prevent weight gain may avoid certain nutrient dense foods in the belief that those foods will contribute to weight gain.² Consumer research on behalf of *Nuts for Life* shows 44% of Australian GP's surveyed in 2006 recommend patients either avoid nuts or limit consumption to once a week if they are aiming to lose weight.⁴

However, nuts are a highly nutritious food that contain many useful vitamins, minerals and healthy monounsaturated and polyunsaturated fats. Although nuts contribute to energy (kilojoule) intake, nut consumers have been shown to have a nutrient intake consistent with recommendations to prevent chronic disease in both healthy adults⁵, and in those with Type 2 Diabetes.⁶ Dietary patterns that include nuts, along with other healthy foods such as whole grains, reduced fat dairy products and plant foods, are inversely related to BMI.⁷ Nuts are also a source of dietary fibre⁸ and protein, two factors that are known to increase the satiety of meals and prolong feelings of fullness after consumption.⁹ Choosing nutrient dense foods that can help manage hunger levels is particularly useful when trying to restrict food intake in order to reduce or control body weight.

While nuts are high in fat (ranging from 49% to 76% fat, with the exception of chestnuts which contain around 0.6% fat), which therefore contributes to energy (kilojoule) intake, research indicates they may not limit a person's ability to lose weight. This submission offers the House of Representatives Standing Committee on Health and Ageing insight into the vital role nut consumption has for those wanting to prevent weight gain, as well as those already overweight and obese and with likely risk factors for heart disease and diabetes.

Nutrient composition of nuts

The nutrient composition of raw nuts can be found in Appendix 1. Just like other plant foods nuts are nutrient dense and provide a wide range of nutrients such as protein, healthy fats, fibre, vitamins, minerals and antioxidants to the diet. ANIC and Nuts for Life have been consulting with Food Standards Australia New Zealand regarding the importance of nuts in the diet and FSANZ have now ensured that all raw nuts pass their Nutrient Profile Scoring Calculator which allows them to make general level health claims and makes them eligible for high level health claims.¹⁰

Energy

Nuts are energy dense foods with most on average providing 2800 kJ per 100g. While we know this is how much energy nuts contain when tested in a laboratory there is some interesting research indicating that we may not be absorbing all that energy from nuts in the gut. Some of the fat in nuts is not absorbed and is excreted from the body.^{11,12,13,14}

Our concern is that any food selection guides, dietary guidelines or food labelling initiatives eg Traffic Light Systems may categorise foods based on energy and fat only without considering the other important nutrients and health benefits that high energy/ high fat whole plant foods such as nuts provide.

Fat

All nuts contain all three types of fat in the diet: saturated, monounsaturated and polyunsaturated fats as shown in Tables 1 and 2 below per 100g and per 30g serve. It is important to note that all nuts contain a lower proportion of unhealthy saturated fats and a higher proportion of healthy monounsaturated and polyunsaturated fats. It is their healthy fat content which helps nuts lower blood cholesterol - a risk factor for heart disease.¹⁵ Those already overweight and obese have a higher risk of cardiovascular disease¹⁶ and they should be encouraged to consume foods such as nuts which will lower their risk of a primary or secondary event.^{21-23,34} We are pleased to see that Food Standards Australia New Zealand have acknowledged this by incorporating a "lower proportion of saturated fat" nutrient content claim in the final report for P293 Nutrient, health and related claims.¹⁰

Table 1: Percentage of fats as a proportion of total fats for all nuts per 100g

Nut type	Total fat (g) per 100g	SFA (g) per 100g	% of total fat as SFA	MUFA (g) per 100g	% of total fat as MUFA	PUFA (g) per 100g	% of total fat as PUFA
Almond	55.2	3.6	7	36	65	13.1	24
Brazil nut	68.5	14.8	22	21.8	32	29.0	42
Cashew	49.2	8.4	17	31.1	63	7.5	15
Chestnut	0.6	NA		Na		Na	
Hazelnut	61.4	2.7	4	48.6	80	7.1	12
Macadamia	74.0	10	13.5	59.8	81	3.8	5
Pecan	71.9	4.5	6	39.1	54	24.8	34
Pine nut	70.0	4.2	6	23.0	33	39.8	57
Pistachio	50.6	5.8	11	26.6	53	15.8	31
Walnut	69.2	4.4	6	12.1	17	49.4	71
Mixed tree nut	57.3	6.5	11	33.3	58	20.8	36

NA – not available data not tested

NFS - No further specification

SFA – saturated fatty acids

MUFA - monounsaturated fatty acids

PUFA - polyunsaturated fatty acids

Nut data based on Nuts for Life 2007 ready reckoner, other foods data based on NUTTAB 2006 FoodWorks software

Table 2 Amount and percentage of fats as a proportion of total fats per serve

Nut type (Nutrients per 30g serve)	Total fat (g) per serve	SFA (g) per serve	% of total fat as SFA	MUFA (g) per serve	% of total fat as MUFA	PUFA (g) per serve	% of total fat as PUFA	Combined (g) MUFA and PUFA per serve	Combined % of total fat as PUFA and MUFA
Almond	16.6	1.1	7	10.8	65	3.9	24	14.7	89
Brazil nut	20.6	4.4	22	6.5	32	8.7	42	15.2	74
Cashew	14.8	2.5	17	9.3	63	2.3	15	11.6	78
Chestnut	0.2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hazelnut	18.4	0.8	4	14.6	80	2.1	12	16.7	92
Macadamia	22.2	3	14	17.9	81	1.1	5	19	86
Pecan	21.6	1.4	6	11.7	54	7.4	34	19.1	88
Pine nut	21	1.3	6	6.9	33	11.9	57	18.8	90

Pistachio	15.2	1.7	11	8.0	53	4.7	31	12.7	84
Walnut	20.8	1.3	6	3.6	17	14.8	71	18.4	88
Mixed tree nut	17.2	2	11	10	58	6.2	36	16.2	94

NA – not available/ data not tested NFS - No further specification
SFA – saturated fatty acids MUFA - monounsaturated fatty acids PUFA - polyunsaturated fatty acids
Nut data based on Nuts for Life 2007 ready reckoner, other foods data based on NUTTAB 2006 FoodWorks software

Our concern is that the emphasis on “eating less fat or saturated fats” without considering the proportion of healthy fats will delegate nuts as an “eat less” food rather than an “eat more” food thus impacting the health of overweight and obese Australians.

Protein

Nuts are rich in plant protein (on average 13g per 100g) and it is thought the high protein content may assist with satiety since protein switches off the appetite faster than fat or carbohydrate.¹⁷

Fibre

Nuts are also rich in fibre (on average 8g per 100g) and both soluble and insoluble fibre can assist weight management by physically increasing the volume in the gut and causing a feeling of fullness.

Antioxidants

Nuts contain a number of antioxidant nutrients such as vitamin E, copper, manganese, selenium and zinc which are likely to reduce lipid oxidation in the body and so prevent cholesterol from building up on artery walls causing atherosclerosis.

Plant sterols

Nuts are a natural source of plant sterols which prevent the reabsorption of cholesterol salts from bile in the gut. This forces cholesterol to be excreted from the body and may be one mechanism to explain how nuts help lower blood cholesterol levels.¹⁸

Arginine

Nuts contain arginine, an amino acid or building block of protein, which plays a role in the relaxation of the endothelium (smooth muscle in blood vessel walls). This amino acid is converted to nitric oxide in the body which causes blood vessels to dilate and remain elastic and is involved in preventing blood clotting. Hardening of the arteries and blood clotting can lead to heart disease.¹⁹

Folate

Nuts contain small quantities of folate which help control homocysteine levels. High homocysteine levels (another amino acid) are indicative of heart disease.

Sodium and potassium

Nuts are low in sodium and contain potassium - two nutrients involved in hypertension or raise blood pressure another risk factor for heart disease and stroke.

The unique combination of all these nutrients and bioactives found in nuts ensures they play a vital role in heart disease prevention and blood cholesterol lowering but also help control body weight.

The Role of Nuts in Weight Management

We acknowledge that research in the area of nuts and body weight is limited. However epidemiological evidence indicates that people consuming five servings or more of nuts a week do not weigh more than people that consume less than one serving of nuts a week. The evidence suggests that there is a trend toward frequent nut consumers having a lower BMI than non-consumers.²⁰⁻²³

Up to 80g of nuts, as part of a *kilojoule controlled weight loss plan* may assist weight loss.²⁴⁻²⁹ By adding 35-50g of nuts daily to the *existing diet* without adjusting for energy intake or increasing physical activity levels, body weight may increase, but to a lesser extent than theoretically predicted.³⁰⁻³¹

Consumption of up to 100g of nuts daily as part of a *cholesterol lowering diet* does not affect body weight, and may possibly assist with weight management.

For people with Type 2 Diabetes there is limited evidence, but the available evidence indicates that nuts as part of a healthy diet do not cause weight gain and can assist in achievement of optimal fatty acid profiles.³²

Our concern is government authorities will suggest restricting the intake of nuts for obesity management. There is a lack of evidence to support the restriction of nut consumption. Nuts can be included as part of a healthy balanced diet for weight maintenance, and included as part of a kilojoule controlled diet for weight loss, particularly in diets designed for cholesterol lowering and diabetes management.

Further information on nuts and weight management can be found in the attached document *The Role of Nuts in Weight Management*.

The Role of Nuts in Heart Health

Cardiovascular disease (CVD) is the leading cause of death in Australia, affecting more than 3.5 million Australians and accounting for 36 per cent of all deaths in 2004. CVD kills one Australian every ten minutes. According to the Heart Foundation³³, 90% of Australian adults have at least one risk factor for cardiovascular disease and 25% have three or more risk factors. Of these risk factors, more than 50% have high cholesterol, almost one-third have high blood pressure and 60% are overweight and obese. And despite the increased use of cholesterol-lowering medications, the prevalence of high blood cholesterol has not fallen in the past 20 years.

Nuts comprise of a range of nutrients which can contribute to a reduced risk of coronary heart disease and maintaining heart health. These include healthy fats, dietary fibre, arginine, plant sterols and range of vitamins and minerals known to be important for heart health, including vitamin E, folate, magnesium, potassium, selenium, zinc and copper as outlined previously.

There is now extensive evidence from a number of large population studies that nut consumption is protective against CVD.^{21-23,34} These epidemiological studies have found that eating 1 ounce (~30g) of nuts 5 or more times per week could reduce the risk of both Myocardial Infarction and death from CHD by 30-50%. Particularly The Physicians Health Study found the greatest benefit for the prevention of sudden cardiac death, which was almost halved in those who had the highest nut intake.³⁴

More than 50 research studies have been conducted looking at the beneficial effects of nuts on cardiovascular risk factors, in particular blood fats and endothelial function. Regular inclusion of nuts in the diet can lower both total and LDL cholesterol.^{15,35} Despite many different study designs, diverse population groups, variation in the length of the studies and the quantity of nuts consumed, the research has *consistently* shown that the inclusion of nuts in a diet low in saturated fat and cholesterol has benefits on blood fats when compared to a low fat or typical Western diet.¹⁵

Our concern – any advice to reduce nut consumption on the basis of weight management is likely to affect the risk of CVD in obese and overweight people given the strong and consistent evidence that eating nuts regularly can lower heart disease risk and blood cholesterol levels while maintaining endothelial function.

Further information on nuts and heart health can be found in the attached document The Role of Nuts in Heart Health.

The Role of Nuts in Type 2 diabetes management

The research into the effect of nuts on diabetes management specifically is limited however we do know that:

Obesity is a risk factor for Type 2 diabetes.³⁶ And those with obesity and diabetes have an increased risk of heart disease.

Those who eat nuts regularly reduce their risk of developing type 2 diabetes by around 20 percent.²¹

Nuts are a rich source of the mineral magnesium and magnesium intake is associated with a reduced risk of diabetes.³⁷

Postprandial glycemia (high blood glucose levels following a meal) are now recognised as an important risk factor for CVD and a meta-analysis of 38 studies found a positive relationship between postprandial glycemia and cardiovascular disease risk, even in the normal range (below the level at which diabetes is diagnosed).³⁸ One study has found that the addition of almonds to a meal can reduce blood glucose and insulin levels following the meal thus lowering the glycaemic effect of the meal.³⁹ An Australian Study found that adding walnuts to a diabetic diet ensured those with diabetes had improved blood lipid levels³² and since those with diabetes are twice as likely to die from heart disease as those without diabetes this offered them more protection.³⁶

Unlike other nuts which contain little carbohydrate chestnuts are rich low glycaemic index carbohydrates which also help control blood glucose levels.

Our concern is that with rising rates of obesity are rising rates of diabetes and recommendations to control weight and diabetes will exclude consumption of nuts. Nuts make a valuable contribution to the overall health of those with obesity and diabetes by reducing their already increased risk of heart disease.

Nut consumption recommendations by key health authorities

National Heart Foundation of Australia⁴⁰

Snack on plain unsalted nuts and fruit.

American Heart Association⁴¹

Limit the intake of foods with a high content of saturated fatty acids and cholesterol. Substitute grains and unsaturated fatty acids from vegetables, fish, legumes and nuts.

World Health Organisation⁴²

Strength of evidence for a role of nuts in reducing cardiovascular risk ranked as 'probable'.

National Cholesterol Education Program Expert Panel⁴³

Nuts included in the 'food items to choose more often' column of the Guide to Therapeutic Lifestyle Changes diet.

Heart and Stroke Foundation of Canada⁴⁴

Choose unsalted nuts, seeds and soy nuts for snacks instead of chips, cheesies and other high fat, salty snack foods.

FDA Ruling⁴⁵

Scientific evidence suggests but does not prove that eating 1.5oz (45g) per day of most nuts as part of a diet low in saturated fat and cholesterol may reduce the risk of heart disease.

NHMRC Nuts in the Dietary Guidelines for Australians Adults and Children

Nuts fit well within the dietary guidelines for Australian adults, children and adolescents, specifically within the guideline that recommends to *include lean meat, fish, poultry and/or alternatives*. Nuts are high in protein and provide useful amounts of iron and zinc, three key nutrients provided by this food group. The Dietary Guidelines for Australian adults⁴⁶ and the Dietary Guidelines for Children and Adolescents⁴⁷ state *Legumes, nuts and certain seeds, along with other plant foods, have been shown to offer specific health benefits and their inclusion in the diet is recommended for everyone*.

Whole nuts are not suitable for very young children due to the potential to cause choking, however they can be included in the diet in paste form.

The Australian Guide to Healthy Eating recommends 1-1½ serves of lean meat, fish, poultry or alternatives daily for most children and adults.⁴⁸ This equates to 7-11 serves a week. The message to enjoy a handful (30g) of nuts 5 times a week equates to 3 servings from this food group weekly. In terms of frequency and amount, this message fits well with other public health messages to consume red meat 3-4 times a week and fish twice a week for good health.

Recommended Serving size for nuts

While there is evidence that higher intakes of nuts are acceptable ANIC and Nuts for Life has taken the position to recommend and promote a conservative serving size for nuts - a handful (30-50g) most days a week.

Our own market research suggests that health professionals are more likely to recommend this level to clients and scientific research presented here suggests health benefits can be achieved at this level.

Who are ANIC, Nuts for Life and Horticulture Australia

Horticulture Australia (HAL) is a national research, development and generic marketing organisation that works in partnership with the horticulture sector and government to invest in programs such as dissemination of nutrition and health information that provide benefit to the Australian horticultural industry.

One of the HAL member organisations is the Australian Nut Industry Council (ANIC) – the representative body for the Australian Tree Nut industry - and one such project funded through voluntary contributions by the Tree Nut industry and supported by Australian Government funds through HAL is the Nuts for Life program. Another is the *Go for 2 and 5* generic fruit and vegetable promotional campaign.

Nuts for Life is a generic nutrition communications/ education initiative by the Australian Nut industry (Australian nut growers as well as processors, packers and importers of nuts) to provide generic, useful, credible and up-to-date information about the nutrition and health benefits of eating nuts, such as the positive association between nut consumption and the reduction of heart disease. Nuts for Life are committed to providing nutrition information that is based on sound science and that is consistent with Government health and nutrition messages and recommendations.

Correspondence

Lisa Yates

Program Manager and Dietitian, Nuts for Life

Suite 3, Level 18, 122 Arthur St, North Sydney NSW 2060

Ph: 02 9460 0111, Fax: 02 9460 0555, Mobile: 0422 735 718, Email: admin@nutsforlife.com.au

References

1. National Health and Medical Research Council. Clinical Practice Guidelines for the Management of Overweight and Obesity in Adults. Canberra, 2003.
2. Webb Y, Dear W. Slimmers' knowledge, beliefs and practices about fat, cholesterol and egg intake. *Food Australia* 1996;48(8):375-8.
3. Noakes M, Keogh JB, Foster PR, Clifton PM. Effect of an energy-restricted, high-protein, low-fat diet relative to a conventional high-carbohydrate, low-fat diet on weight loss, body composition, nutritional status, and markers of cardiovascular health in obese women. *American Journal of Clinical Nutrition* 2005;81(6):1298-306.
4. Consumer Insights Research. Nuts for Health Benchmarking Study: Benchmarking the usage and attitudes of health professionals and consumers. Victoria, 2003.
5. Jaceldo-Siegl K, Sabate J, Rajaram S, Fraser GE. Long-term almond supplementation without advice on food replacement induces favourable nutrient modifications to the habitual diets of free-living individuals. *British Journal of Nutrition* 2004;92(3):533-40.
6. Gillen LJ, Tapsell LC, Patch CS, Owen A, Batterham M. Structured dietary advice incorporating walnuts achieves optimal fat and energy balance in patients with type 2 diabetes mellitus. *Journal of the American Dietetic Association* 2005;105(7):1087-96.
7. Newby PK, Muller D, Hallfrisch J, Andres R, Tucker KL. Food patterns measured by factor analysis and anthropometric changes in adults. *American Journal of Clinical Nutrition* 2004;80(2):504-13.
8. Lairon D, Arnault N, Bertrais S, Planells R, Clero E, Hercberg S, *et al.* Dietary fiber intake and risk factors for cardiovascular disease in French adults. *American Journal of Clinical Nutrition* 2005;82(6):1185-94.
9. Holt SH, Miller JC, Petocz P, Farmakalidis E. A satiety index of common foods. *European Journal of Clinical Nutrition* 1995;49(9):675-90.
10. FSANZ P293 Final report Nutrient, Health and Related Claims cited May 2008 available from www.foodstandards.gov.au

11. Traoret CJ, Lokko P, Cruz AC, Oliveira CG, Costa NM, Bressan J, Alfenas RC, Mattes RD. Peanut digestion and energy balance. *Int J Obes (Lond)*. 2008;32(2):322-8.
12. Rajaram S, Burke K, Connell B, Myint T, Sabaté J. A monounsaturated fatty acid-rich pecan enriched diet favorably alters the serum lipid profile of healthy men and women. *J Nutr* 2001;131:2275-9
13. Haddad E, Sabaté J. Effect of pecan consumption on stool fat. *FASEB J* 2000;14:A294 (abstr).
14. Zemaitis J, Sabaté J. Effect of almond consumption on stool weight and stool fat. *FASEB J* 2001;15:A602 (abstr).
15. Griel AE, Kris-Etherton PM. Tree nuts and the lipid profile: a review of clinical studies. *Br J Nutr*. 2006;96 Suppl 2:S68-78. Review. Erratum in: *Br J Nutr*. 2008;99(2):447-8.
16. AIHW. 2004 Cardiovascular disease Series No 23 The Relationship Between Overweight, Obesity and Cardiovascular Disease cited available from www.aihw.gov.au/publications/index.cfm/title/10078
17. Westerterp-Plantenga MS. Protein intake and energy balance. *Regul Pept*. 2008 Mar 25.
18. Segura R, Javierre C, Lizarraga MA, Ros E. Other relevant components of nuts: phytosterols, folate and minerals. *Br J Nutr*. 2006;96 Suppl 2:S36-44. Erratum in: *Br J Nutr*. 2008;99(2):447-8.
19. Coates AM, Howe PR. Edible nuts and metabolic health. *Curr Opin Lipidol*. 2007;18(1):25-30.
20. Jiang R, Manson JE, Stampfer MJ, Liu S, Willett WC, Hu FB. Nut and peanut butter consumption and risk of type 2 diabetes in women. *Journal of the American Medical Association* 2002;288(20):2554-60.
21. Hu FB, Stampfer MJ, Manson JE, Rimm EB, Colditz GA, Rosner BA, et al. Frequent nut consumption and risk of coronary heart disease in women: prospective cohort study. *British Medical Journal* 1998;317(7169):1341-5.
22. Ellsworth JL, Kushi LH, Folsom AR. Frequent nut intake and risk of death from coronary heart disease and all causes in postmenopausal women: the Iowa Women's Health Study. *Nutrition Metabolism and Cardiovascular Disease* 2001;11(6):372-7.
23. Fraser GE, Sabate J, Beeson WL, Strahan TM. A possible protective effect of nut consumption on risk of coronary heart disease. The Adventist Health Study. *Archives of Internal Medicine* 1992;152(7):1416-24.
24. Alper CM, Mattes RD. Effects of chronic peanut consumption on energy balance and hedonics. *International Journal of Obesity & Related Metabolic Disorders: Journal of the International Association for the Study of Obesity* 2002;26(8):1129-37.
25. Wien MA, Sabate JM, Ikke DN, Cole SE, Kandeel FR. Almonds vs complex carbohydrates in a weight reduction program. *International Journal of Obesity & Related Metabolic Disorders: Journal of the International Association for the Study of Obesity* 2003;27(11):1365-72.
26. Almaro RU, Vonghavaravat V, Wong R, Kasim-Karakas SE. Effects of walnut consumption on plasma fatty acids and lipoproteins in combined hyperlipidemia. *American Journal of Clinical Nutrition* 2001;74(1):72-9.
27. Garg ML, Blake RJ, Wills RB. Macadamia nut consumption lowers plasma total and LDL cholesterol levels in hypercholesterolemic men. *Journal of Nutrition* 2003;133(4):1060-3.
28. Jenkins DJ, Kendall CW, Marchie A, Parker TL, Connelly PW, Qian W, et al. Dose response of almonds on coronary heart disease risk factors: blood lipids, oxidized low-density lipoproteins, lipoprotein(a), homocysteine, and pulmonary nitric oxide: a randomized, controlled, crossover trial. *Circulation* 2002;106(11):1327-32.
29. Rajaram S, Burke K, Connell B, Myint T, Sabate J. A monounsaturated fatty acid-rich pecan-enriched diet favorably alters the serum lipid profile of healthy men and women. *Journal of Nutrition* 2001;131(9):2275-9.
30. Fraser GE, Bennett HW, Jaceldo KB, Sabate J. Effect on body weight of a free 76 Kilojoule (320 calorie) daily supplement of almonds for six months. *Journal of the American College of Nutrition* 2002;21(3):275-83.
31. Sabate J, Cordero-Macintyre Z, Siapco G, Torabian S, Haddad E. Does regular walnut consumption lead to weight gain? *British Journal of Nutrition* 2005;94(5):859-64.
32. Tapsell LC, Gillen LJ, Patch CS, Batterham M, Owen A, Bare M, et al. Including walnuts in a low-fat/modified-fat diet improves HDL cholesterol-to-total cholesterol ratios in patients with type 2 diabetes. *Diabetes Care* 2004;27(12):2777-83.
33. Foundation, H. *Statistics on Cardiovascular Disease in Australia*. [cited; Available from: [www.heartfoundation.org.au/Heart Information/Statistics.htm](http://www.heartfoundation.org.au/Heart%20Information/Statistics.htm)].
34. Albert C.M. et al. Nut consumption and decreased risk of sudden cardiac death in the Physicians Health Study. *Arch Intern Med* 2002;162(12):1382-7.
35. Mukuddem-Petersen, J., W. Oosthuizen, and J.C. Jerling, A systematic review of the effects of nuts on blood lipid profiles in humans. *J Nutr*, 2005. 135(9): p. 2082-9.
36. Cameron AJ, Welborn TA, Zimmet PZ, Dunstan DW, Owen N, Salmon J, Dalton M, Jolley D, Shaw JE. Overweight and obesity in Australia: the 1999-2000 Australian Diabetes, Obesity and Lifestyle Study (AusDiab). *Med J Aust*. 2003;5;178(9):427-32. Erratum in: *Med J Aust*. 2004;180(8):418.
37. Larsson SC, Wolk A. Magnesium intake and risk of type 2 diabetes: a meta-analysis. *J Intern Med*. 2007;262(2):208-14.

38. Levitan E. et al. Is nondiabetic hyperglycemia a risk factor for postchallenge blood glucose levels? A meta-analysis of prospective studies. *Arch Intern Med* 2004;164:2147-2155.
39. Jenkins D.J. et al. Almonds decrease postprandial glycemia, insulinemia, and oxidative damage in healthy individuals. *J Nutr* 2006;136(12):2987-92.
40. Lipid management guidelines--2001. National Heart Foundation of Australia, The Cardiac Society of Australia and New Zealand. *Med J Aust* 2001;175 Suppl:S57-85.
41. Krauss RM, Eckel RH, Howard B, Appel LJ, Daniels SR, Deckelbaum RJ, et al. AHA Dietary Guidelines: revision 2000: A statement for healthcare professionals from the Nutrition Committee of the American Heart Association. *Circulation* 2000;102(18):2284-99.
42. World Health Organisation. Diet, Nutrition and the Prevention of Chronic Diseases. Geneva: Report of a Joint WHO/FAO Expert Consultation, 2003:148.
43. Adult Treatment Panel III report: National Cholesterol Education Program Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults, 2001.
44. Heart and Stroke Foundation of Canada. Fats and Healthy Eating. Accessed 25/11/04 at <http://ww1.heartandstroke.ca/images/english/Fat&Cholesterol.pdf>
45. US Food and Drug Administration. Qualified Health Claims: Letter of Enforcement Discretion - Nuts and Coronary Heart Disease. Maryland, 2003:Accessed: 25/11/04 at <http://vm.cfsan.fda.gov/~dms/qhcnuts2.html>.
46. Food for Health. Dietary Guidelines for Australian Adults. Canberra: Commonwealth Department of Health and Ageing & National Health and Medical Research Council, 2003.
47. Food for Health. Dietary Guidelines for Children and Adolescents in Australia. Canberra: Department of Health and Ageing, 2003.
48. Smith A, Kellett E, Schmerlaib Y. *The Australian Guide To Healthy Eating*: Commonwealth of Australia, 1998

Appendix 1 – Nutrient composition of raw nuts

Nutritional Analysis of Raw, Unsalted Tree Nuts

Per 100 g ¹	Energy (kJ)	Protein (g)	Fat Total (g)	Fat Saturated (g)	Fat Monounsaturated (g)	Fat Polyunsaturated (g)	Fat Omega-3 (mg) (ALA) (mg)	Trans Fats (g)	Carbohydrate Total (g)	Carbohydrate Sugars (g)	Dietary Fibre (g)	Sodium (mg)	Potassium (mg)	Magnesium (mg)	Calcium (mg)	Iron (mg)	Zinc (mg)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Folate (µg)	Pantothenic acid (mg) ²	Vitamin B6 (mg) ²	Vitamin A (µgRE)	Vitamin E (mg) ²	Copper (mg) ²	Manganese (mg) ²	Selenium (µg) ²	Arginine (g) ²	Plant sterols (mg) ²
Almond	2526	20.0	55.2	3.6	36.0	13.1	0	0	4.4	4.4	8.8	5.0	690	260	235	3.5	3.6	0.17	1.15	3.80	49	0.35	0.13	2.0	25.9	1.11	2.53	2.8	2.47	120
Brazil Nut	2888	14.4	68.5	14.8	21.8	29.0	0	0	2.4	2.1	8.5	2.0	560	350	150	2.2	4.1	0.60	0.43	0.60	21	0.18	0.10	2.0	5.7	1.74	1.22	1917	2.15	DU
Cashew	2437	17.0	49.2	8.4	31.1	7.5	0	0	16.8	5.5	5.9	11.0	550	250	34.0	5.0	5.5	0.64	0.19	1.80	68	0.86	0.42	1.0	0.9	2.20	1.66	20	2.12	DU
Chestnut ³	797	3.4	0.6	DU	DU	DU	DU	DU	34.3	3.8	8.1	0.7	574	33*	13.4	0.8	0.5	0.28	0.09	1.97	70	0.55*	0.50*	1.0*	0.5*	0.51*	1.18*	1.2*	0.23*	DU
Hazelnut	2693	14.8	61.4	2.7	48.6	7.1	120 (120)	0	5.1	4.4	10.4	3.0	680	160	86.0	3.2	2.2	0.39	0.17	2.20	72	0.92	0.56	1.0	15.0	1.73	6.18	2.4	2.21	96
Macadamia ³	3080	9.2	74.0	10.0	59.8	3.8	99 (99)	0	7.9	4.6	6.4	1.4	410	95#	64.0	3.7#	1.3#	1.20 #	0.16 #	2.50 #	11#	0.76 #	0.28 #	0#	0.5#	0.76 #	4.13 #	3.6#	1.40 #	116 #
Pecan	2977	9.8	71.9	4.5	39.1	24.8	620 (620)	0	4.9	4.3	8.4	3.0	500	110	51.0	2.4	3.9	0.42	0.18	1.30	39	0.86	0.21	4.0	1.4	1.20	4.50	3.8	1.18	102
Pine nuts	2921	13.0	70.0	4.2	23.0	39.8	0	0	4.5	3.4	5.1	3.0	600	230	11.0	4.1	5.3	0.57	0.19	4.30	60	0.31	0.09	2.0	9.3	1.32	8.80	0.7	2.41	141
Pistachio	2530	19.7	50.6	5.8	26.6	15.8	0	0	15.1	5.9	9.0	7.0	950	100	90.0	3.9	2.3	0.58	0.29	1.50	67	0.52	1.70	22.0	2.3	1.30	1.20	7.0	2.03	214
Walnut	2901	14.4	69.2	4.4	12.1	49.4	6260 (6260)	0	3.0	2.7	6.4	3.0	440	150	89.0	2.5	2.5	0.33	0.18	1.40	66	0.57	0.54	4.0	0.7	1.58	3.41	4.9	2.28	72
Mixed Tree Nuts ⁴	2773	13.4	57.3	6.5	33.3	20.8	789	0	9.5	4.1	7.7	4.1	587	189	80.7	3.4	3.4	0.54	0.33	2.16	50.3	0.59	0.45	4.2	6.9	1.44	3.77	218	2.23	123

DU = Data Unavailable

Figures from AusNut Revision 18, Foodworks 2007 Version 5.00, Xyris Software unless otherwise indicated.

1. Fatty acid database Revision 6.0 RMIT Lipid Research Group, Foodworks 2007 Version 5.00, Xyris Software
2. United States Department of Agriculture National Nutrient Database for Standard Reference Release 19, ASCII
3. Australian data for dry roasted chestnuts www.chestnutgrowers.com.au *US data for European roasted chestnuts
4. Average quantities excluding those nuts with unavailable data and chestnuts
5. Macadamia data taken from 2002 lab analysis provided by Australian Macadamia Society except where indicated #US data for raw macadamias

© All rights reserved Nuts for Life 2007