FRUTOS SECOS Y SALUD

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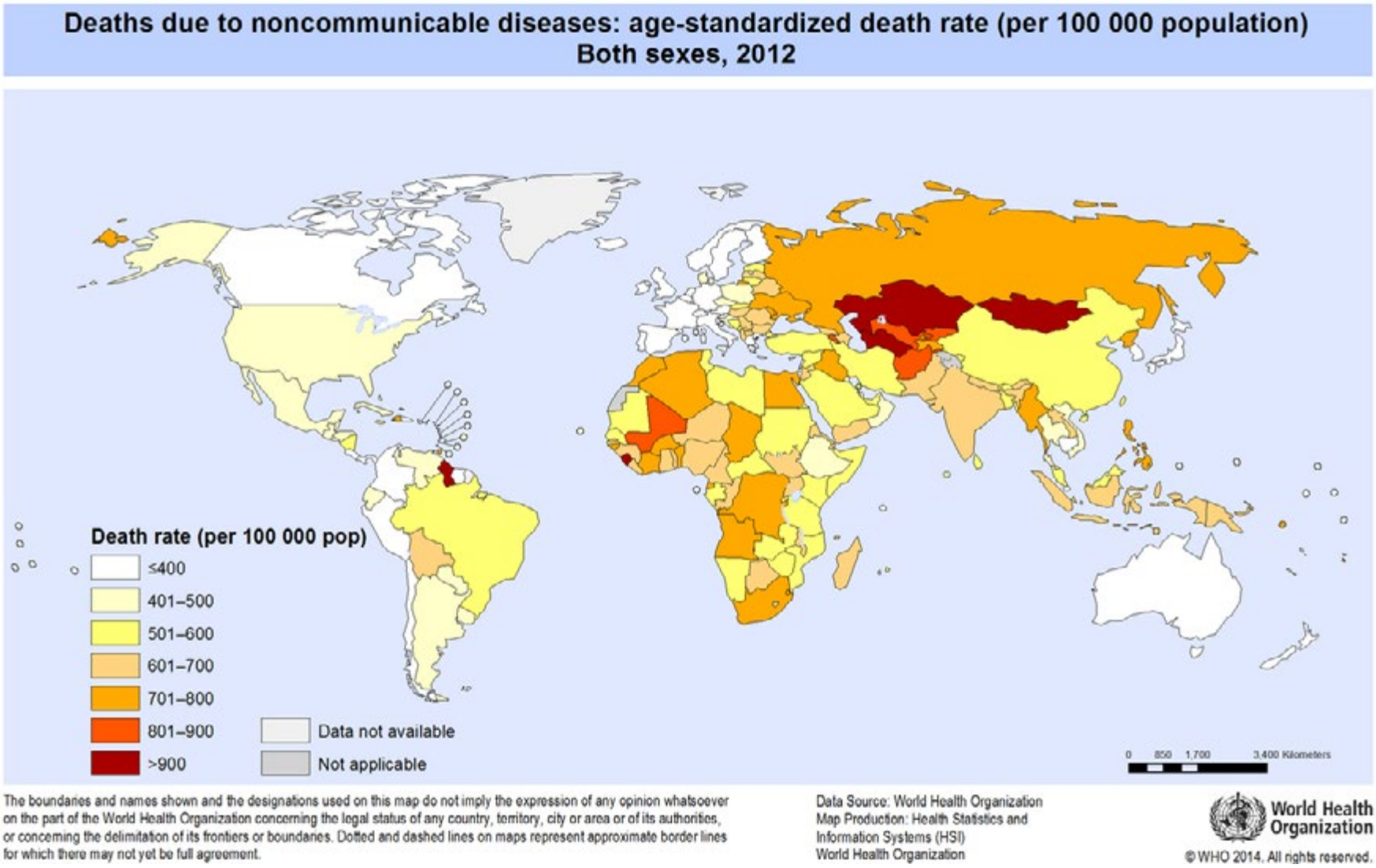
Presenter Disclosure

Presenter: Mònica Bulló, PhD

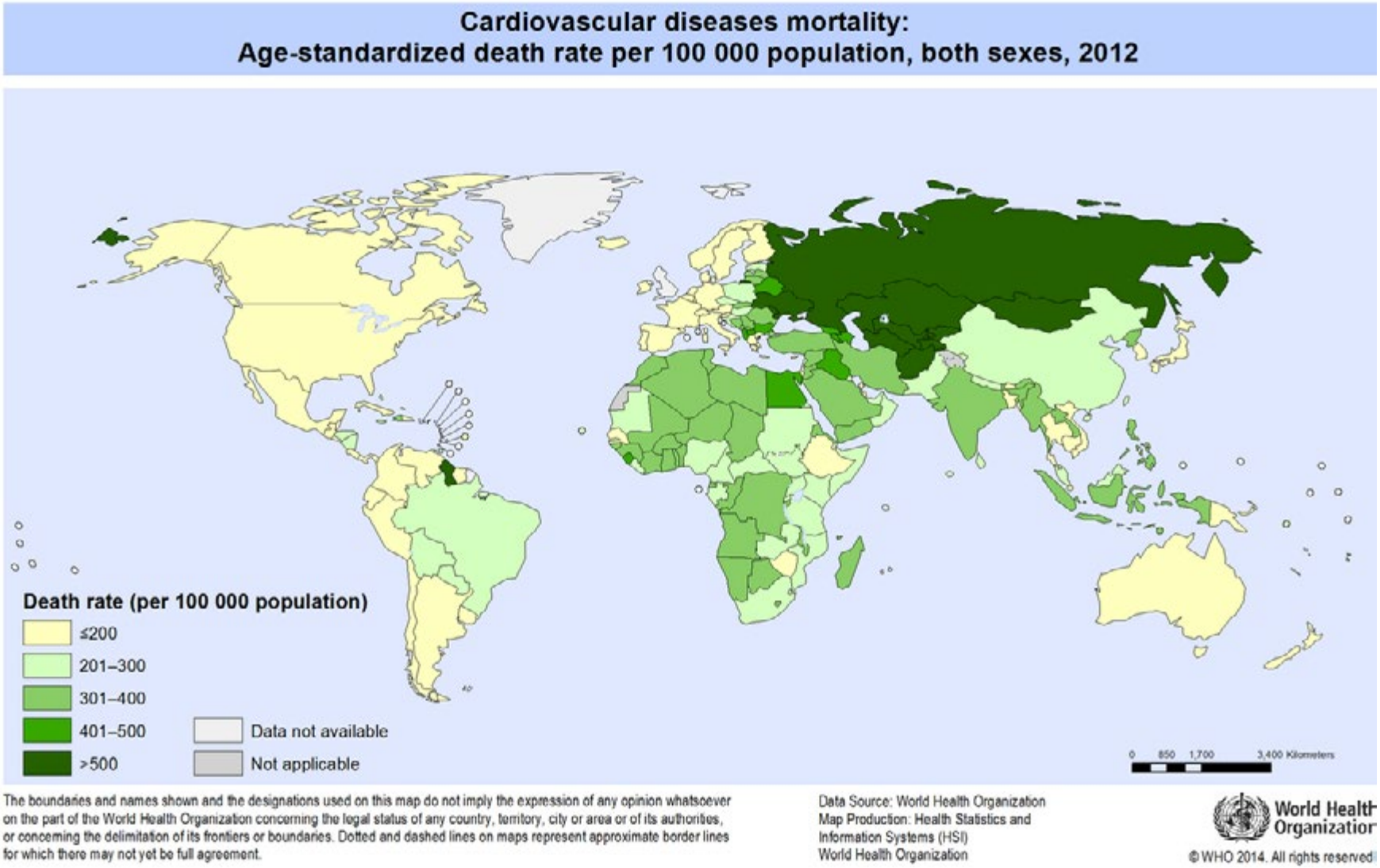
Relationships with commercial interest:

- -Grants/Research Support: My Institution has received funding for research from APG, PF, INC
- -Consulting Fees: None
- -Other: None

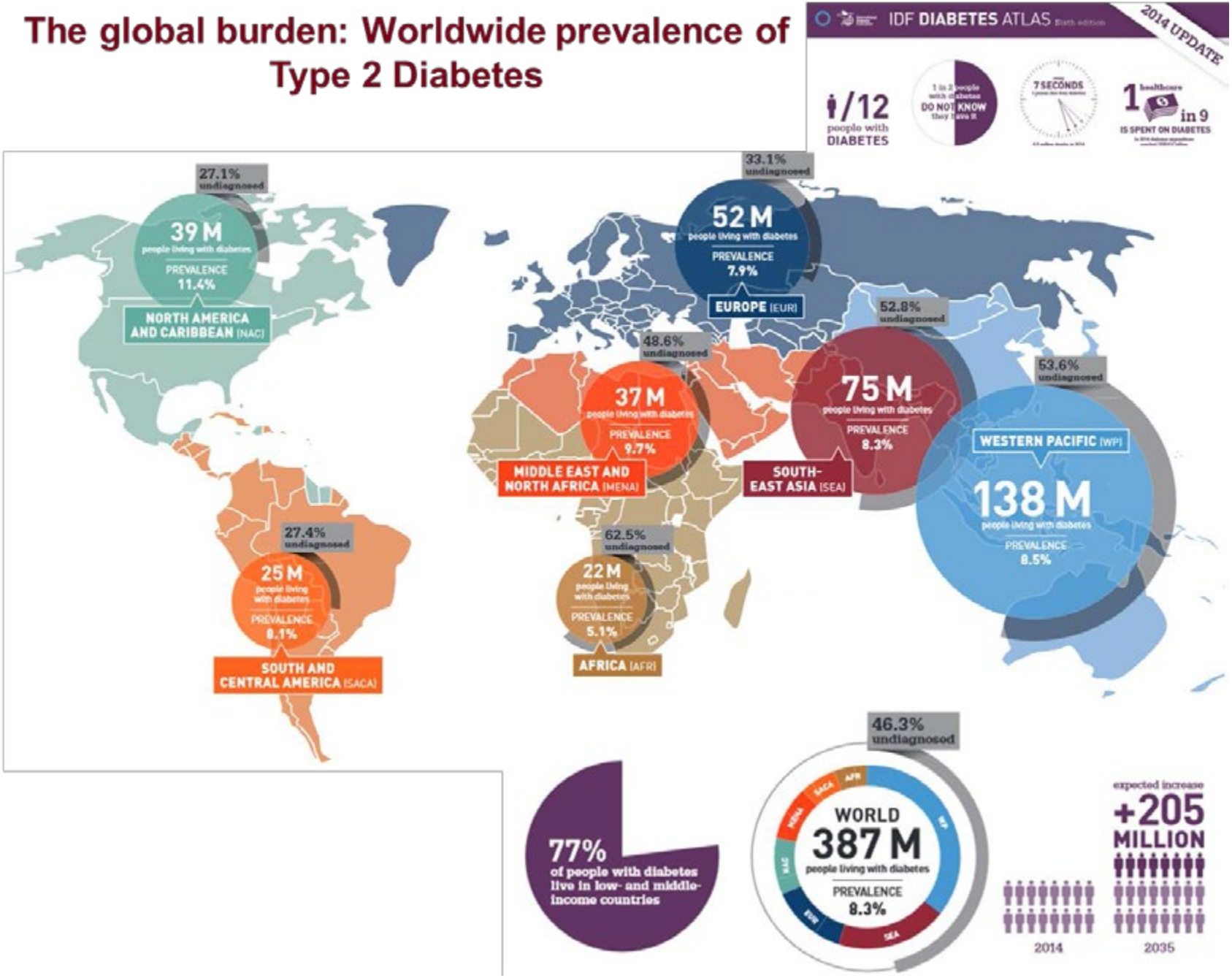
The Global Burden of Noncommunicable Diseases



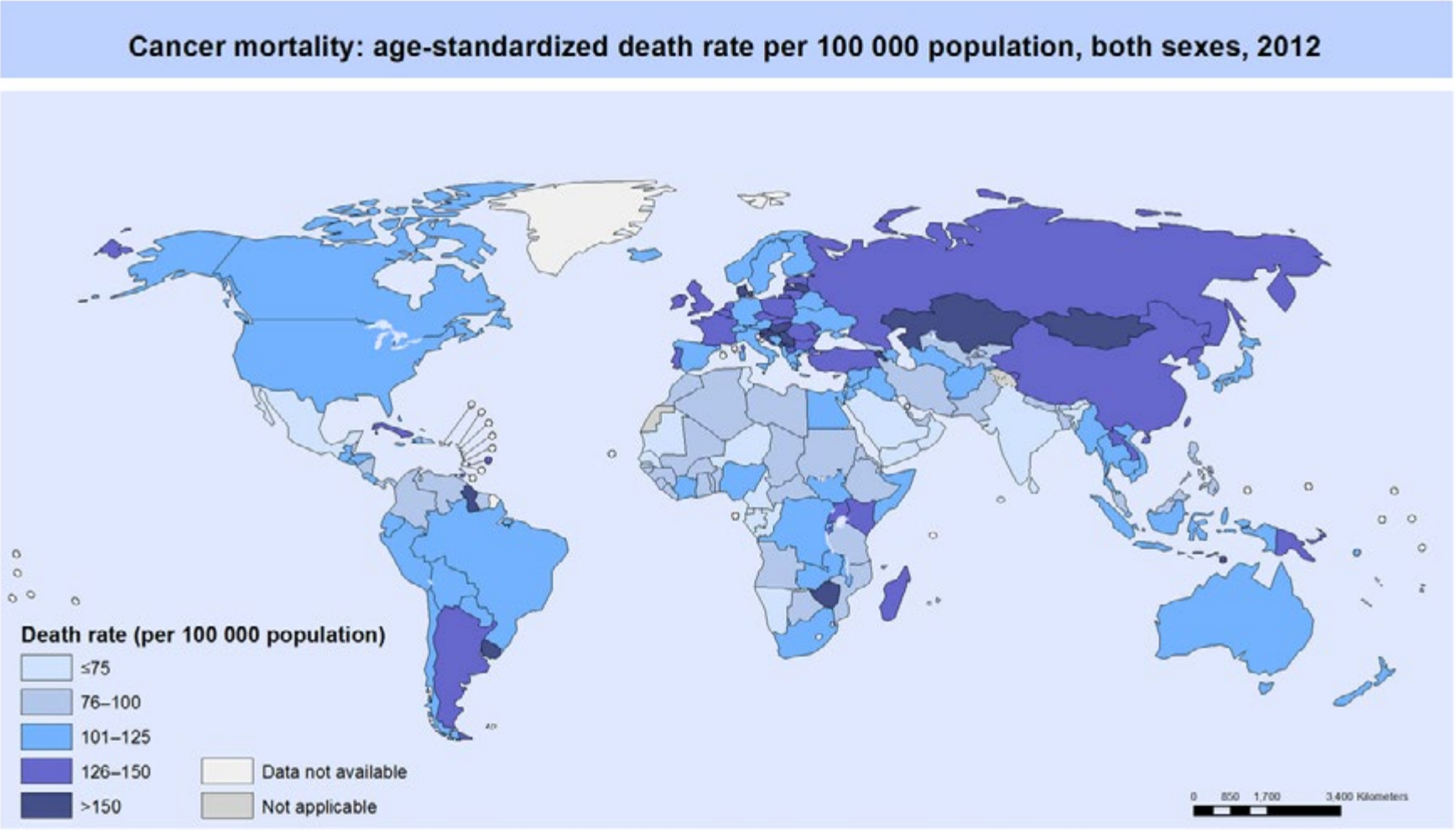
The Global Burden of Cardiovascular Diseases



The global burden: Worldwide prevalence of Type 2 Diabetes



The Global Burden of Cancer

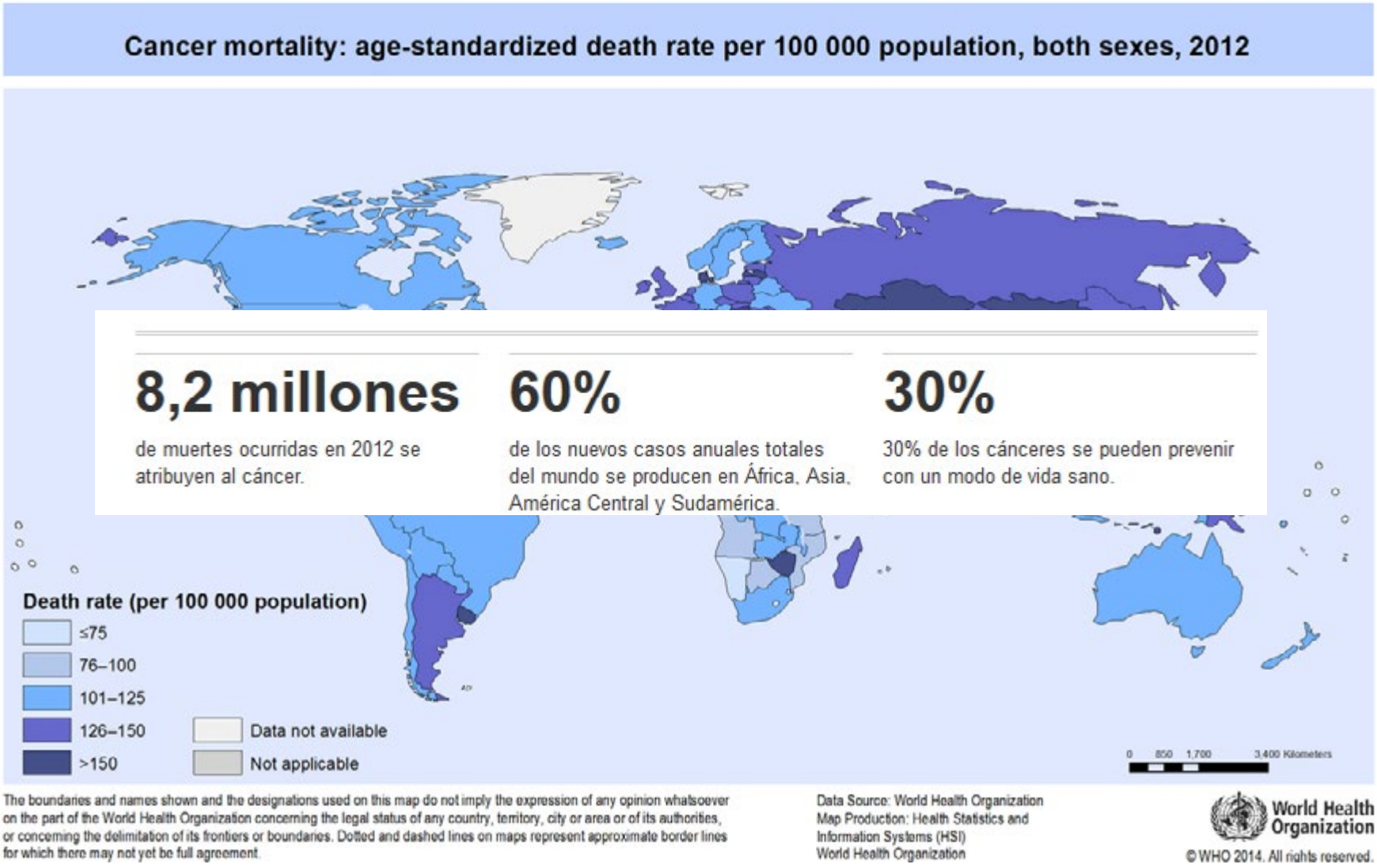


The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

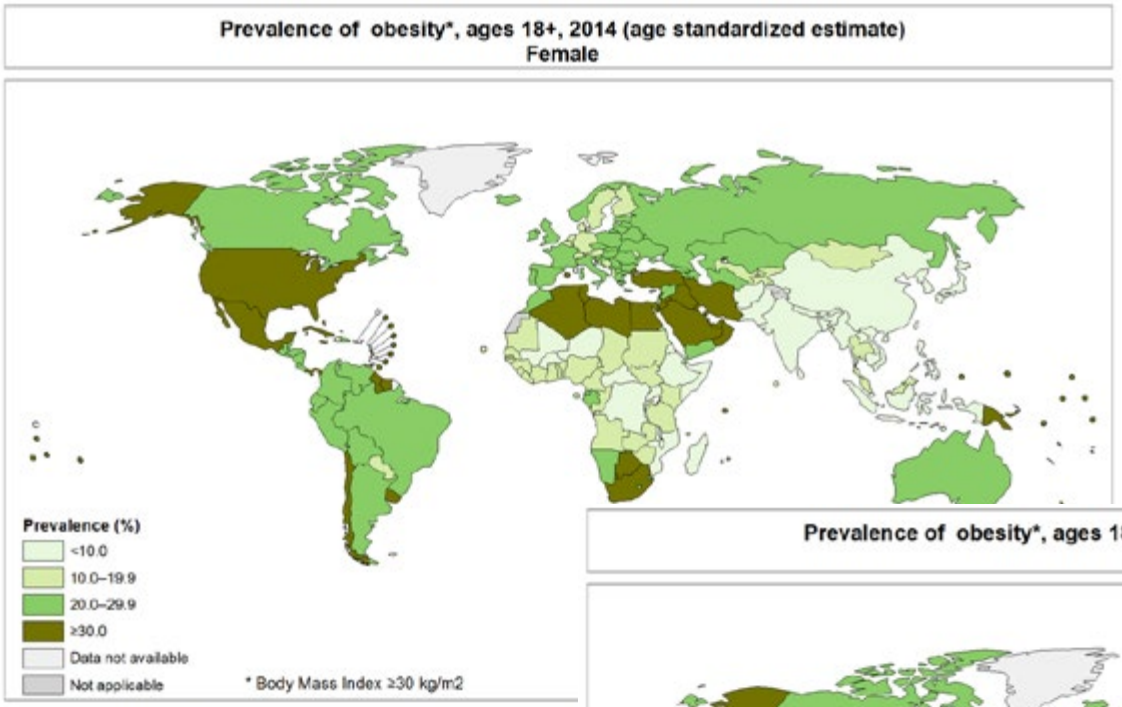
Data Source: World Health Organization
Map Production: Health Statistics and Information Systems (HSI)
World Health Organization

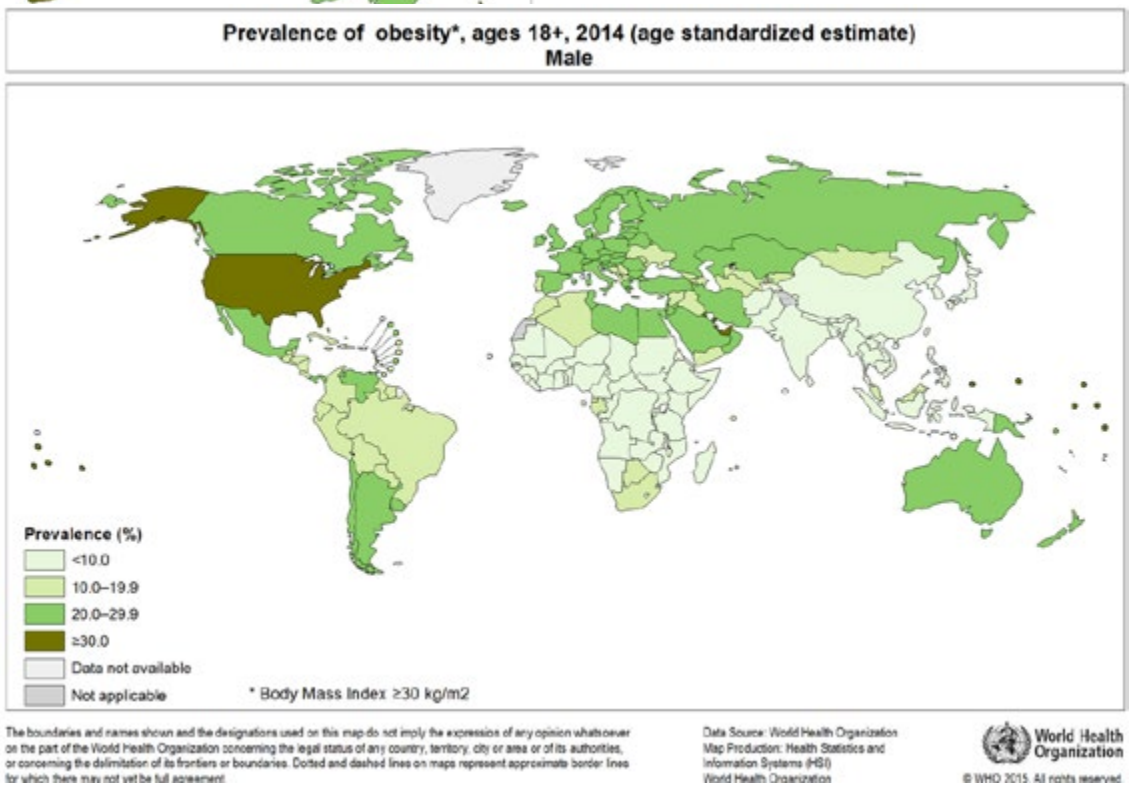
World Health Organization

The Global Burden of Cancer



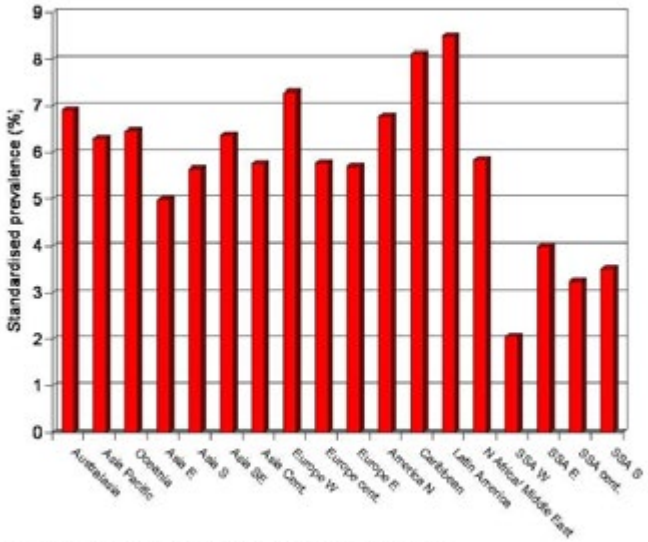
The Global Burden of Obesity



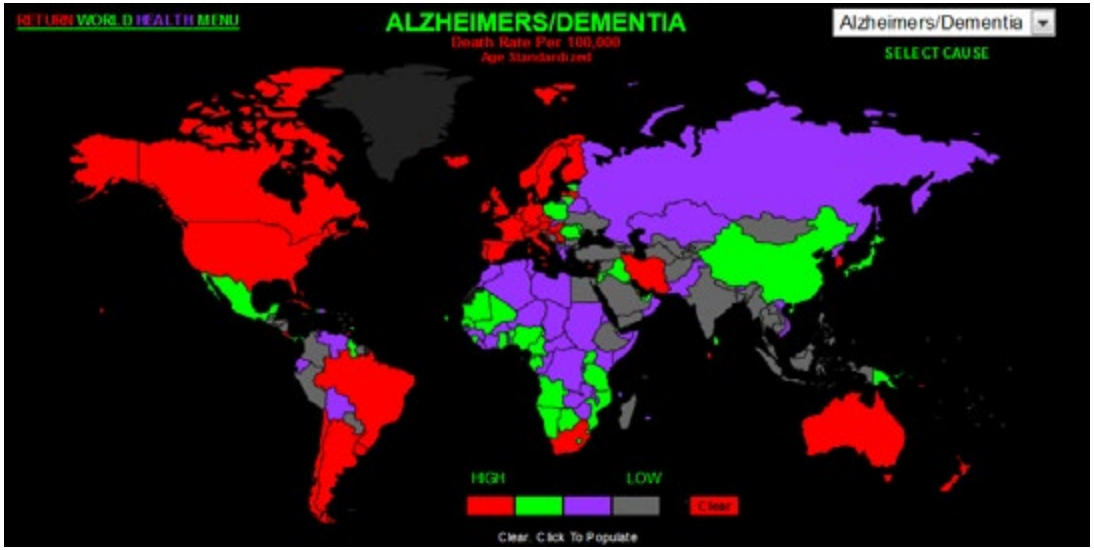


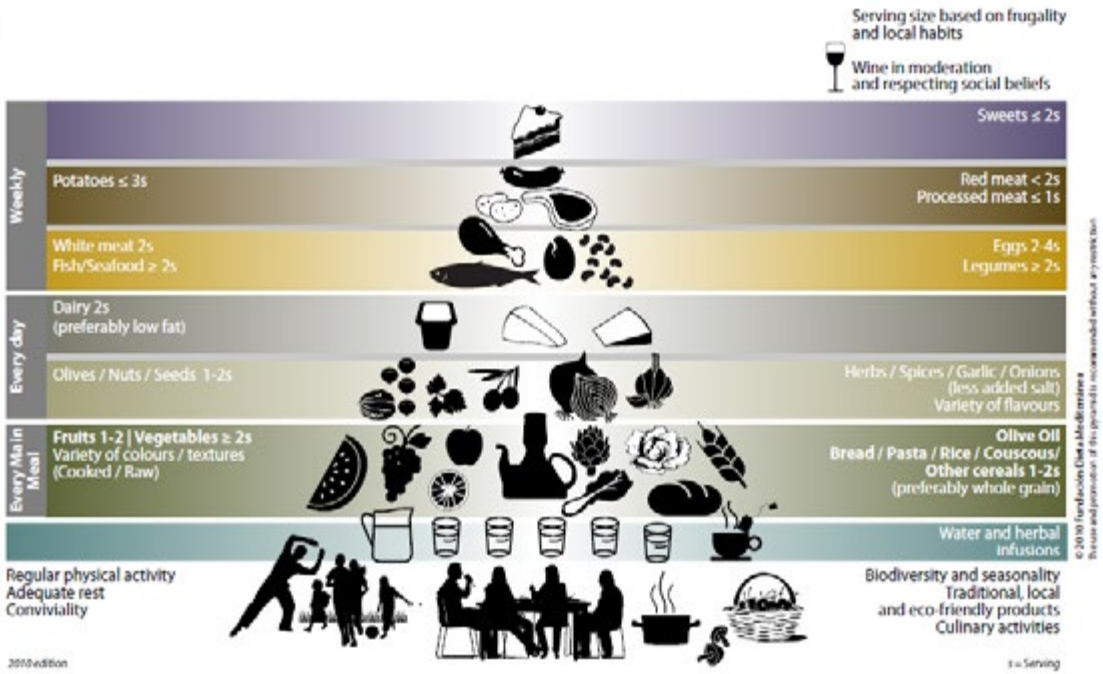
The Global Burden of Alzeheimer

Figure 6.11.2: Estimated prevalence of dementia for persons aged 60 and over, standardized to Western Europe population, by Global Burden of Disease region

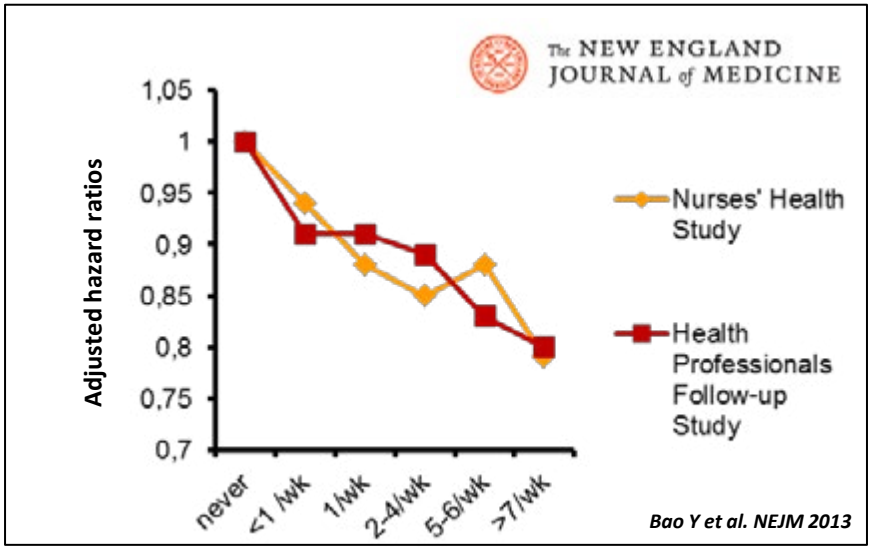


Source: Source: Dementia: a public health priority. WHO, 2012.
Note: *Regions used here are those used in the Global Burden of Disease 2010 Study.



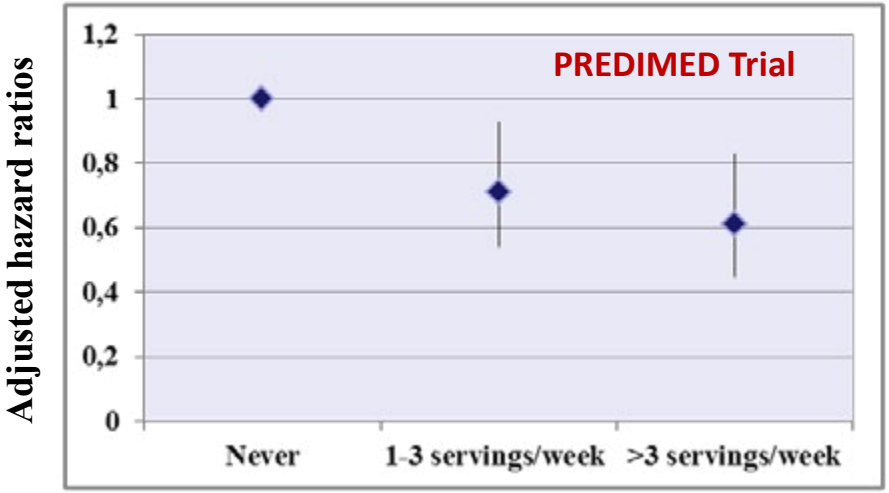

Serving size based on frugality and local habits
Wine in moderation and respecting social beliefs
Weekly
Sweets ≤ 2s
Potatoes ≤ 3s
Red meat < 2s
Processed meat ≤ 1s
White meat 2s
Fish/Seafood ≥ 2s
Eggs 2-4s
Legumes ≥ 2s
Every day
Dairy 2s
(preferably low fat)
Olives / Nuts / Seeds 1-2s
Herbs / Spices / Garlic / Onions
(less added salt)
Variety of flavours
Every Main Meal
Fruits 1-2 | Vegetables ≥ 2s
Variety of colours / textures
(Cooked / Raw)
Olive Oil
Bread / Pasta / Rice / Couscous/
Other cereals 1-2s
(preferably whole grain)
Water and herbal infusions
Regular physical activity
Adequate rest
Conviviality
Biodiversity and seasonality
Traditional, local
and eco-friendly products
Culinary activities
2010 edition
1 = Serving

Total mortality according to the frequence of nut consumption



Meta-analysis.
76,464 women in the Nurses' Health Study (1980–2010) and 42,498 men in the Health Professionals Follow-up Study (1986–2010).
3,038,853 person-years of follow-up

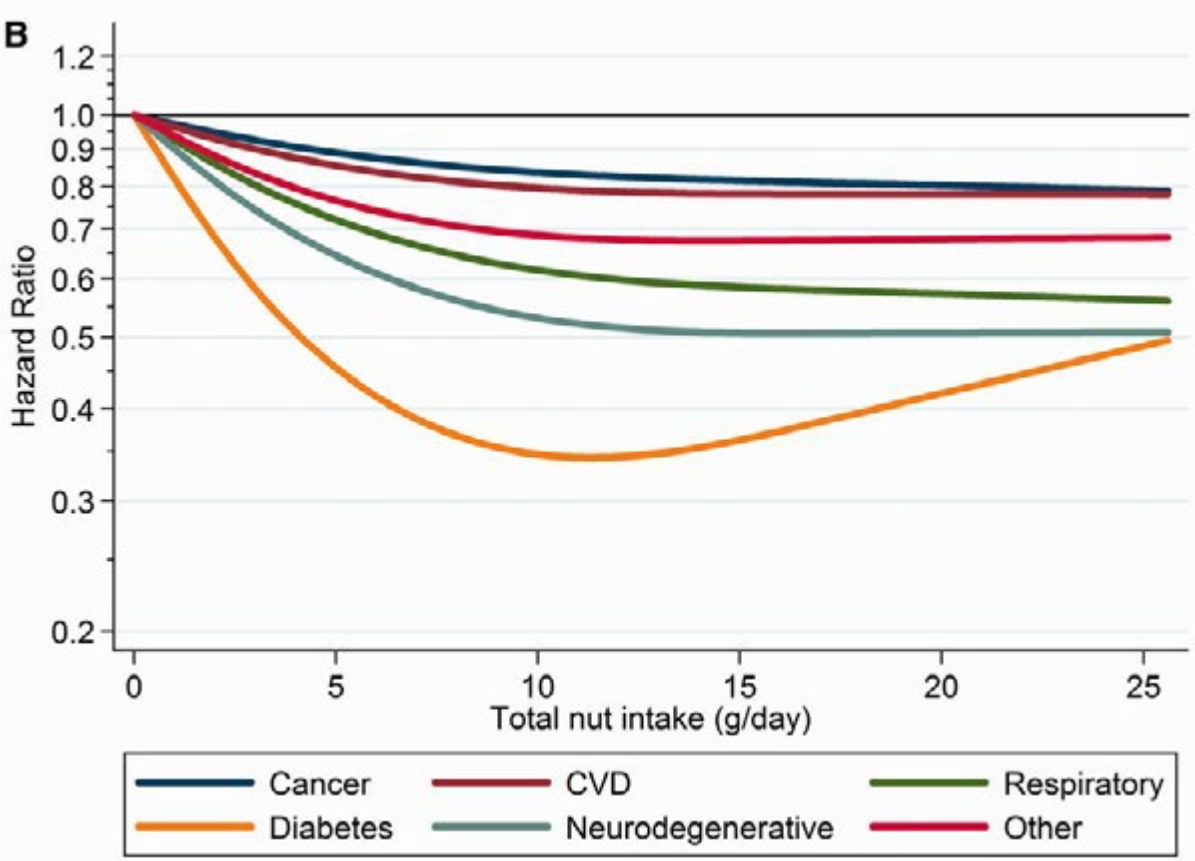
7,216 subjects aged 55 to 80 years, follow-up 4.8y



Guasch-Ferré M et al. BMC Med 2013

Relationship of tree nut, peanut and peanut butter intake with total and cause-specific mortality: a cohort study and meta-analysis

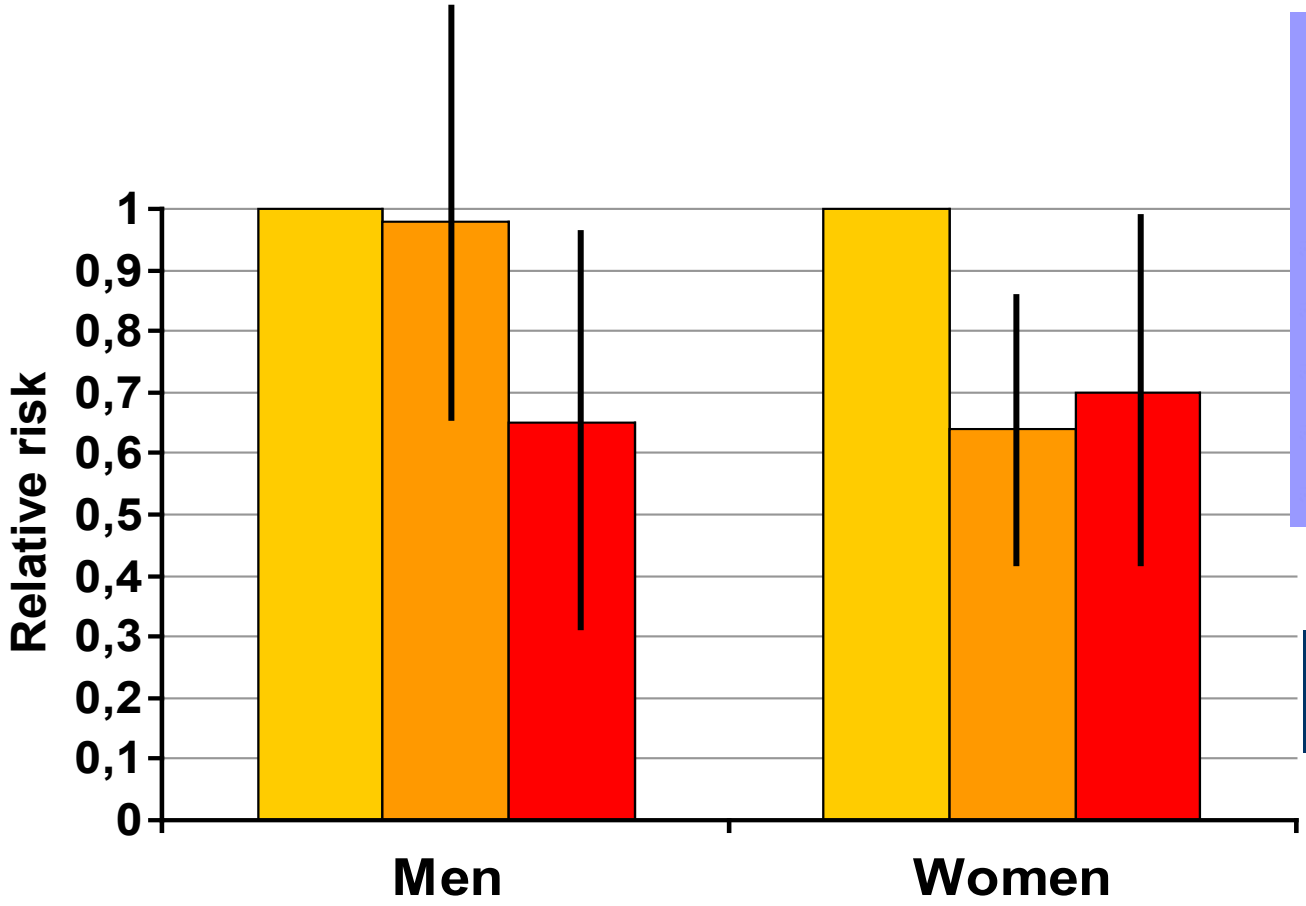
Netherlands Cohort Study
N= 120 852 men and women aged 55–69 years



Nonparametric regression curves for the association between **total nut intake** and **cause-specific mort**ality (cancer, CVD, respiratory disease, diabetes, neurodegenerative disease, other causes excluding **external injuries)**

Sex-specific hazard ratios for coronary heart disease associated with three levels of nut consumption

The Adventist Health Study



n=31.208

Adjusted by:

- age
- smoking
- exercice
- relative weight
- hypertension
- food consumption

CHD mortality 0.52 (0.36-0.76)

Fraser GE et al, Arch Intern Med 1992.

Risk reduction for coronary heart disease associated with nut consumption

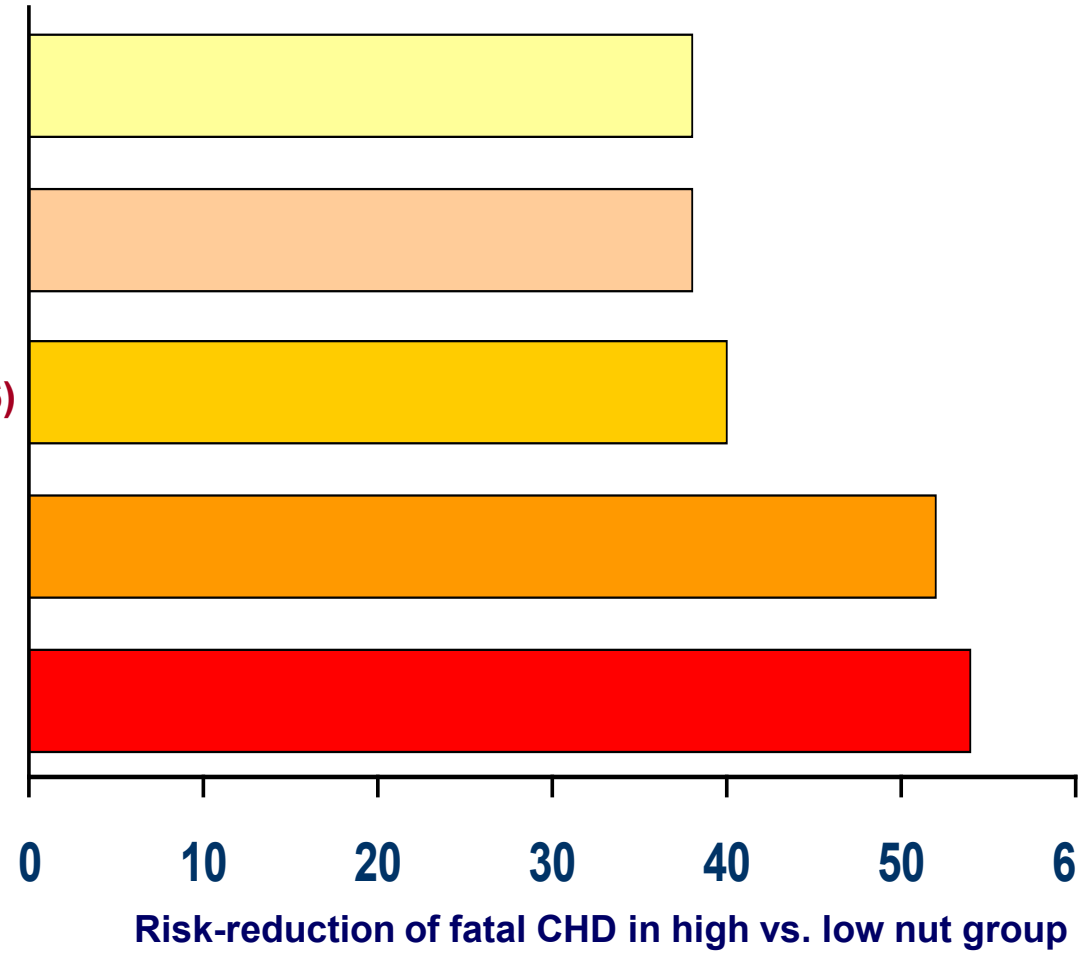
Nurses' Health Study (1998)
n = 86,016; 14 yr follow-up

Adventist Health Study (1992)
n=31,000; 12 yr follow-up

Iowa Women's Health Study (1996)
n= 34,486 post-menopausal, 7 yr

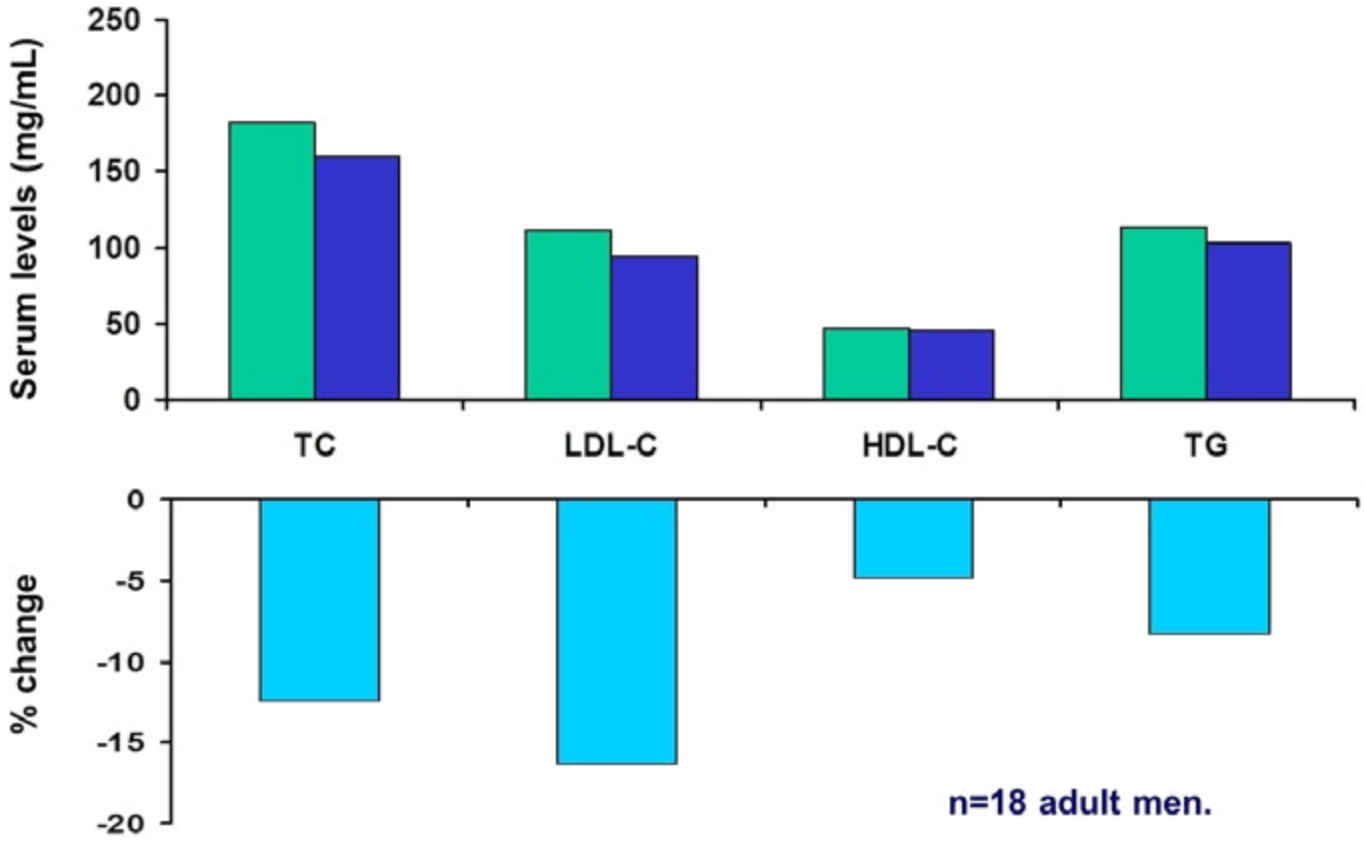
Adventist Health Study (1997)
n= 27,321, 6yr follow-up

Physicians' Health Study (2002)
n= 21,454 men; 17 yr follow-up



Effects of walnuts on serum lipid levels and blood pressure in normal men

Serum lipid and lipoprotein levels at the end of each intervention period



Sabaté et al. NEJM 1993

Crossover trials of walnuts vs reference diets
Effects on serum LDL cholesterol

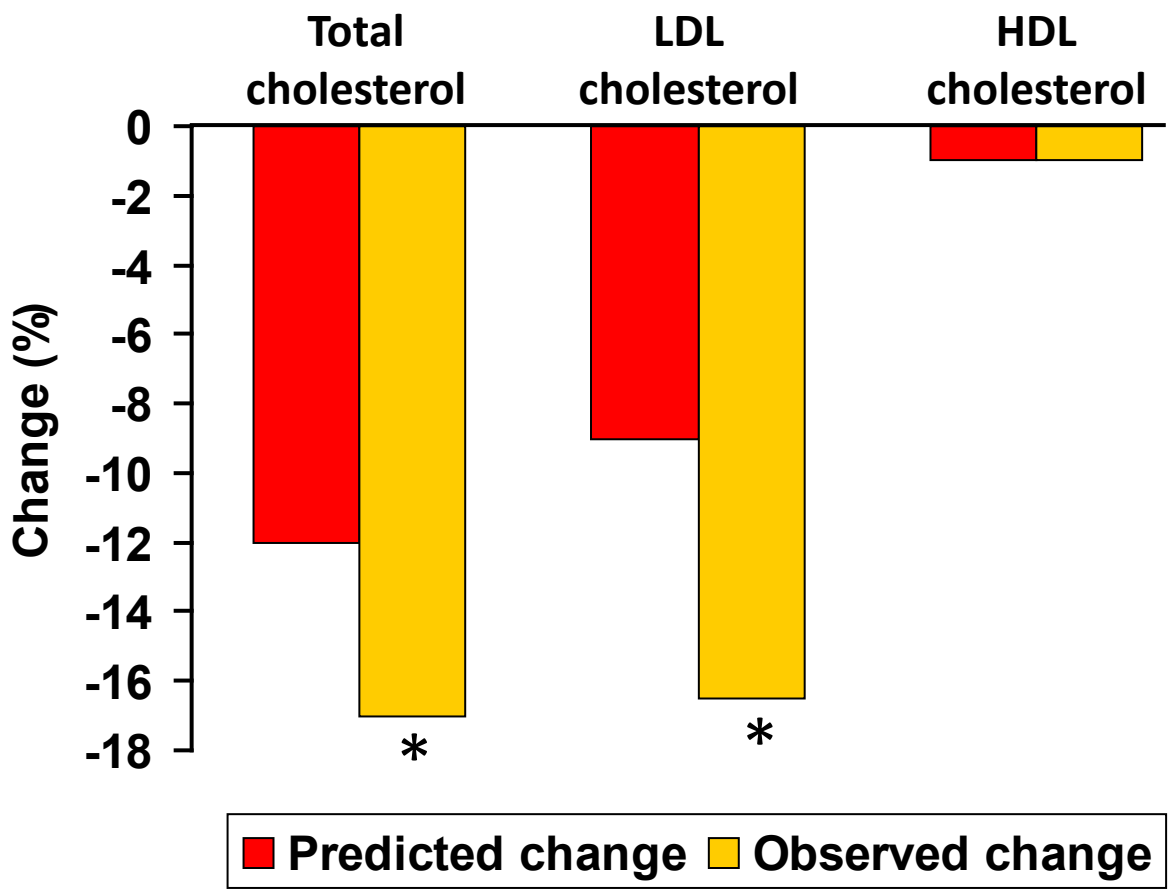
Authors	Subjects	Weeks	Ref diet	Daily doses (g)	Δ LDL-C*
Sabaté 1993	18 M	4	Step I	84	**-16**
Abbey 1994	16 M	6	Australian	68	**-9**
Chisholm 1998	21M	4	Step I	78	**-4**
Zambón 2000	48 HC	6	Mediterranean	41-56	**-6**
Almario 2001	48 FCH	6**	20% fat	48	**-12**
Iwamoto 2002	40M/4W	4	Japanese	44-58	**-10**
Ros 2004	21 HC	4	Mediterranean	40-65	**-6.4**
Tapsell 2004	58 DM2	24***	Modified fat	30	**-10**

Average -9 mg/dL

Average LDL-C change ranged from -6 to -18 mg/dL

****Sequential design; ***Parallel design**

Predicted and observed lipid changes (means of 6 controlled trials with nuts based on predictive equations)



Kris-Etherton et al. Am J Clin Nutr 1999;70(Supl):504-511.

Nuts and emerging cardiovascular risk factors

Effects of walnut consumption on plasma fatty acids and lipoproteins in combined hyperlipidemia

Almario RU et al, Am J Clin Nutr 2001

Crossover study on 18 hyperlipidemic subjects following a habitual diet (HD, 4weeks) or a low-fat diet (LFD, 20%fat, 6 weeks) free and supplemented with 48g/d of walnuts

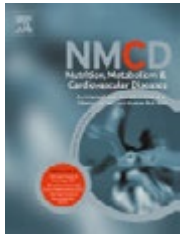
Walnut effect on lipoprotein size after interventions

	HD	HD+W	LFD	LFD+W	P
Lipids (mmol/L)					
TG	2.47±0.22	2.22±0.22	2.31±0.18	2.28±0.18	0.362
Total Cholesterol	5.97±0.29	5.79±0.31	5.84±0.31	5.39±0.31[1,2]	0.009
LDLc	3.57±0.28	3.63±0.31	3.67±0.31	3.22±0.27 [2]	0.014
HDLc	1.27±0.07	1.14±0.07[1]	1.11±0.08[1]	1.13±0.04	<0.001
Particle size (nm)					
VLDL	48.1±1.1	46.2±1.3	49.7±1.2	47.9±1.2	0.015
LDL	20.4±0.2	20.9±0.1	20.5±0.2	20.7±0.2	0.034
HDL	8.6±0.1	8.6±0.1	8.5±0.1	8.5±0.1	0.227

Mean ± SEM
[1] Significantly different from HD
[2] Significantly different from LHD

Effect of pistachio consumption on plasma lipoprotein subclasses in pre-diabetic subjects

Bulló M et al, Nutr Metab Cardiovasc Dis, 2015



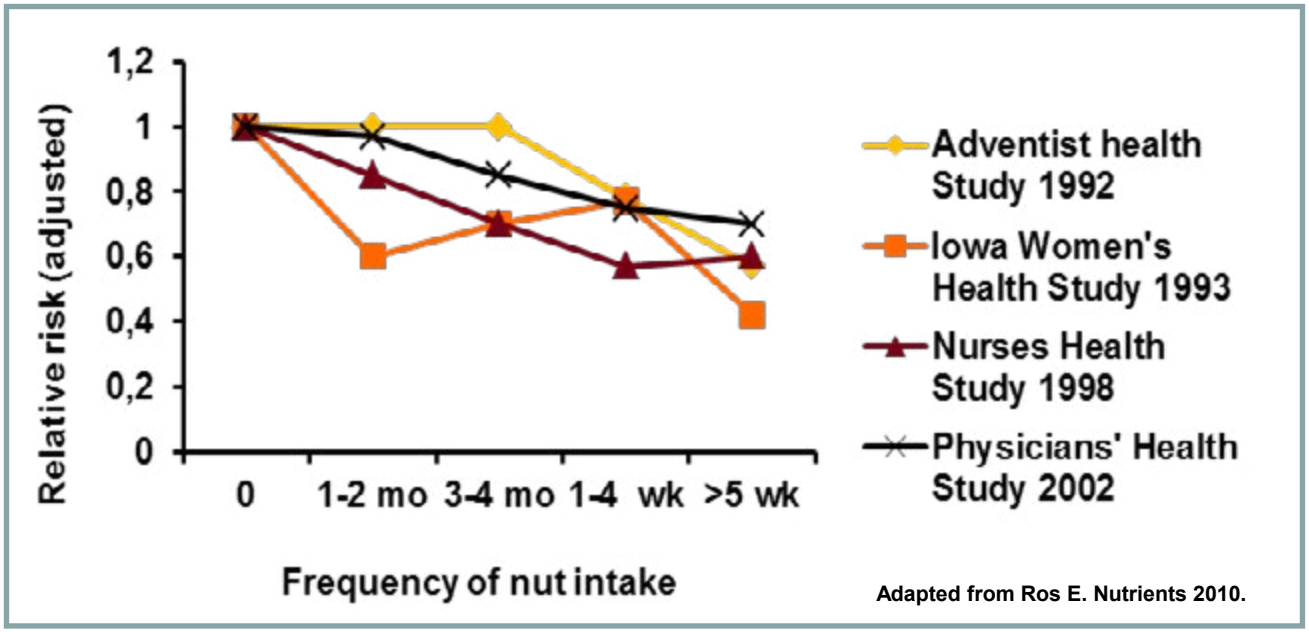
Total and subclasses concentration of lipoproteins

	Pistachio Diet		Control Diet		Treatment Effect
Characteristics	**Baseline**	**Change**	**Baseline**	**Change**	**P-value**
Total VLDL-P (nM)	46.24 (39.74, 52.73)	-0.58 (-5.12, 3.95)	42.12 (36.61, 47.64)	2.27 (-3.36, 7.90)	0.326
Large VLDL-P (nM)	1.42 (1.06, 1.78)	-0.06 (-0.33, 0.21)	1.10 (0.87, 1.34)	0.22 (-0.20, 0.65)	0.229
Medium VLDL-P (nM)	7.09 (5.64, 8.54)	-0.11 (-1.09, 0.87)	6.04 (4.89, 7.18)	0.75 (-0.47, 1.97)	0.251
Small VLDL-P (nM)	37.72 (32.93, 42.51)	-0.41 (-3.81, 2.98)	34.98 (30.73, 39.22)	1.35 (-2.73, 5.43)	0.394
Total LDL-P (nM)	1236.37 (1160.70, 1312.04)	-46.67 (-88.22, -5.12)	1219.11 (1154.56, 1283.67)	20.66 (-23.62, 64.94)	0.103
Large LDL-P (nM)	131.36 (113.49, 149.23)	-8.15 (-18.99, 2.69)	133.98 (120.49, 147.47)	1.80 (-8.13, 11.73)	0.303
Medium LDL-P (nM)	463.62 (421.63, 505.62)	-10.45 (-31.39, 10.49)	462.91 (431.15, 494.68)	2.37 (-21.26, 26.01)	0.490
Small LDL-P (nM)	647.68 (604.74, 690.61)	-28.07 (-60.43, 4.29)	620.60 (581.13, 660.06)	16.49 (-14.19, 47.18)	0.023
Total HDL-P (µM)	30.32 (29.02, 31.62)	1.18 (-0.33, 2.70)	30.72 (29.46, 31.98)	0.70 (-0.28, 1.68)	0.549
Large HDL-P (µM)	1.14 (0.83, 1.44)	-0.08 (-0.18, 0.03)	1.04 (0.79, 1.29)	0.05 (-0.06, 0.17)	0.094
Medium HDL-P (µM)	6.69 (5.77, 7.61)	-0.28 (-0.76, 0.20)	6.44 (5.73, 7.15)	0.13 (-0.25, 0.51)	0.132
Small HDL-P (µM)	22.58 (21.24, 23.91)	1.57 (0.22, 2.91)	23.34 (22.19, 24.49)	0.56 (-0.53, 1.65)	0.183

Intention-to-treat analysis, n=54. All values are means (95% CI). Intra-group analysis was assessed by the paired t-test. Basal-adjusted changes between groups were analysed using adjusted ANOVA of repeated measurements.

Abbreviations: -P, particle; -C, cholesterol; VLDL, very low-density lipoprotein; LDL, low-density lipoprotein; HDL, high-density lipoprotein.

El consumo regular de frutos secos se asocia a una reducción del 37% de muerte por enfermedad cardiovascular

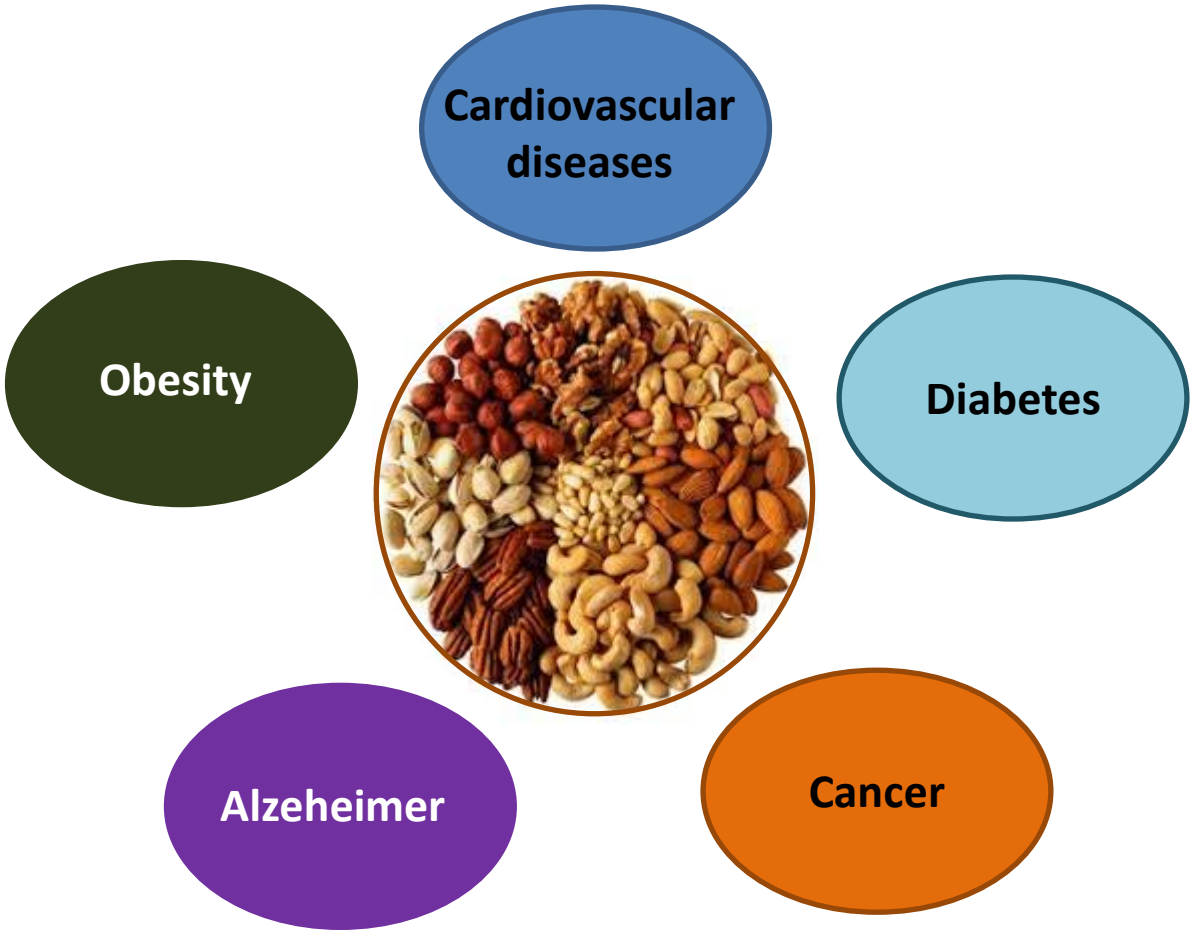


Adapted from Ros E. Nutrients 2010.

Potential role of nuts in the prevention or management of NCD

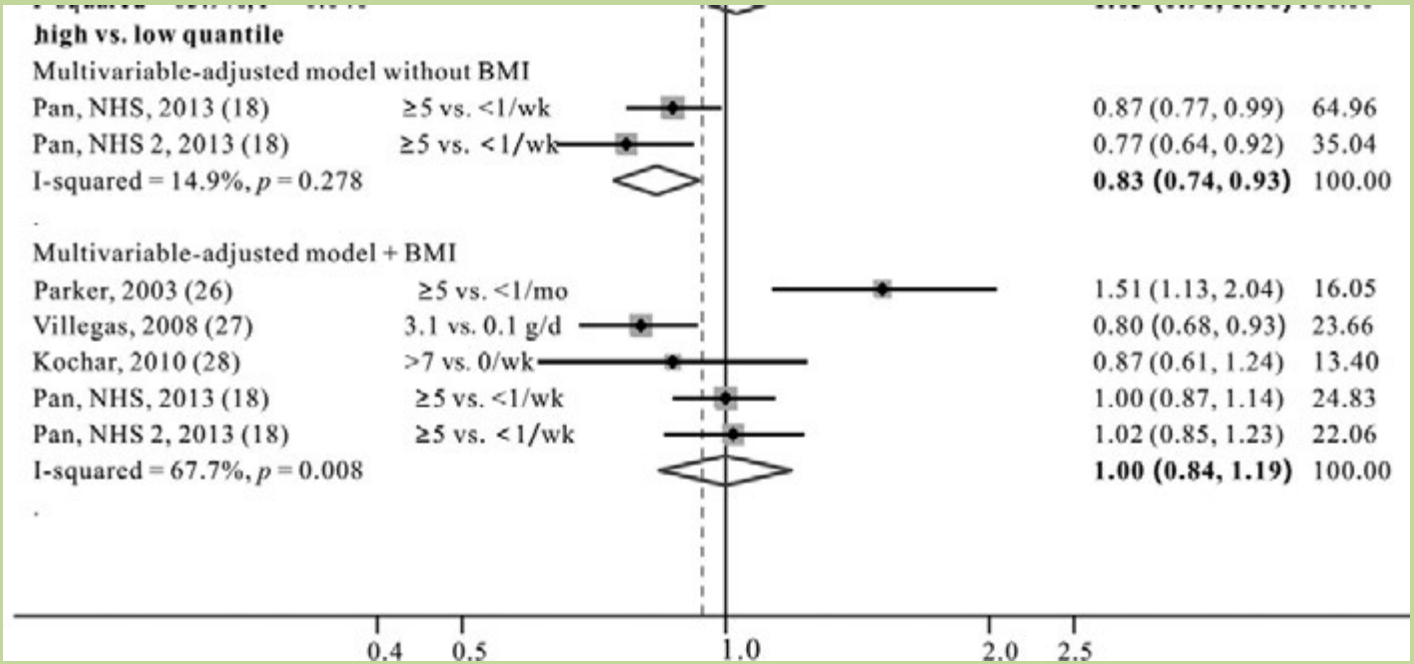
Cardiovascular diseases

Potential role of nuts in the prevention or management of NCD



Nuts and diabetes. Meta-analisis of prospective studies

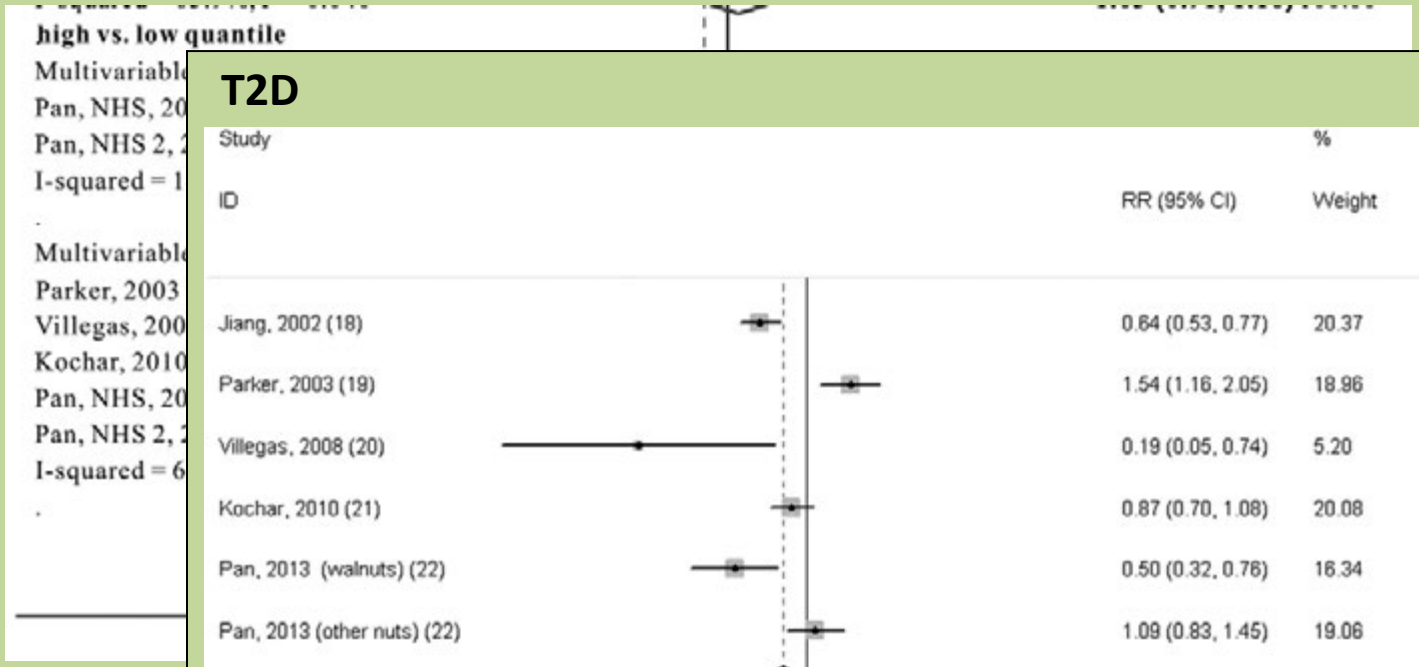
T2D



Luo C et al. Am J Clin Nutr 2014;100:256-269

Nuts and diabetes. Meta-analisis of prospective studies

T2D



Luo C et al. Am

T2D

Zhou et al. Am J Clin Nutr 2014;100:270-277

Nuts and diabetes. Meta-analisis of prospective studies

T2D

high vs. low quantile
Multivariable
Pan, NHS, 20
Pan, NHS 2,
I-squared = 1
Multivariable
Parker, 2003
Villegas, 200
Kochar, 2010
Pan, NHS, 20
Pan, NHS 2,
I-squared = 6

Luo C et al. Am

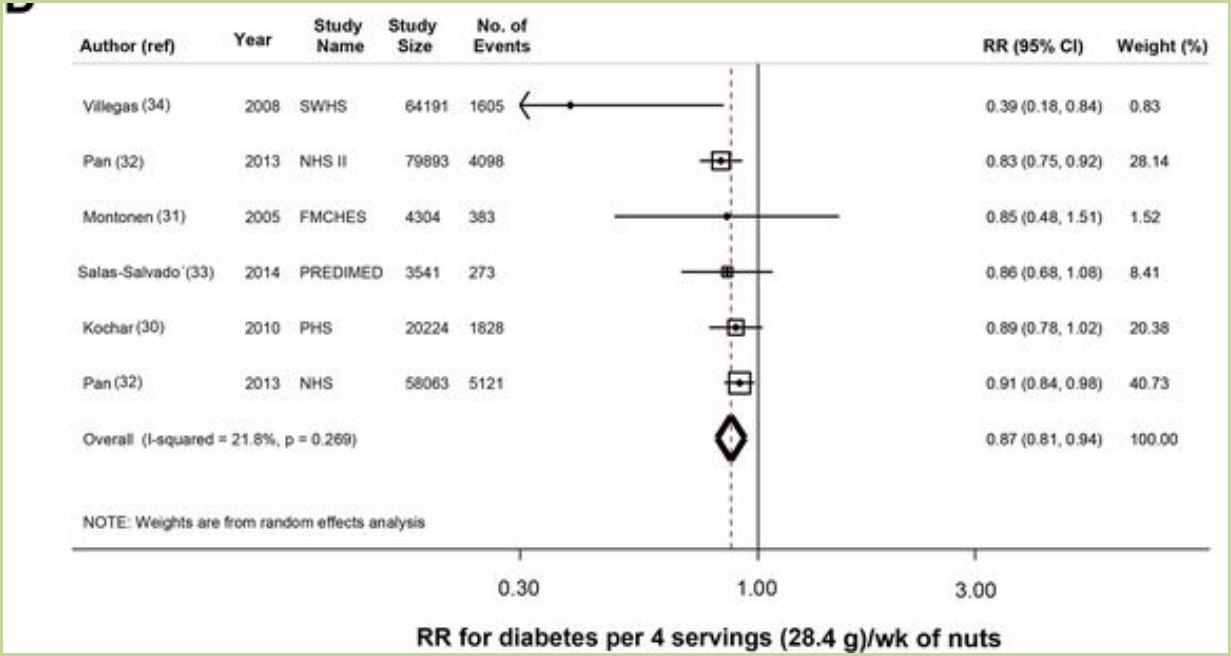
T2D

Study
ID
%
Weight

Jiang, 2002 (18)
Parker, 2003 (19)
Villegas, 2008 (20)
Kochar, 2010 (21)
Pan, 2013 (walnuts
Pan, 2013 (other nu
Overall (I-squared =
NOTE: Weights are

Zhou et al. Am J

T2D



Afshin A et al Am J Clin Nutr 2014

Nuts and diabetes. Meta-analisis of prospective studies

T2D

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Luo C et al. Am

T2D

Study
ID
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Weight

Jiang, 2002 (18)
Parker, 2003 (19)
Villegas, 2008 (20)
Kochar, 2010 (21)
Pan, 2013 (walnuts
Pan, 2013 (other nu
Overall (I-squared =
NOTE: Weights are

Zhou et al. Am J

T2D

Author (ref)	Year	Study Name	Study Size	No. of Events	RR (95% CI)	Weight (%)
Villegas (34)	2008	SWHS	64191	1605	0.39 (0.18, 0.84)	0.83
Pan (32)	2013	NHS II	79893	4098	0.83 (0.75, 0.92)	28.14
Montonen						
Salas-Salv						
Kochar (30						
Pan (32)						
Overall (I-						

NOTE: We

Afshin A et al Am

Nut consumption and risk of cancer and type 2 diabetes: a systematic review and meta-analysis

Table 5 **Summary risk estimates for the association between nut consumption and risk of cancer or type 2 diabetes**

Disease	RR (95%CI)	*P* value	I^2 (%)	Heterogeneity *P* value
Type 2 diabetes (5 studies)	0.98 (0.84–1.14)	0.774	74.2	0.004

Abbreviations: NA, not applicable; RR, relative risk.

Wu L A et al Nutr Rev 2015

Nuts and insulin resistance. Acute feeding studies

Effects of nuts on postprandial glycemia. Crossover acute studies.

Study	N	Age	Control	Test Meal	Outcomes
Jenkins et al. 2006	15 healthy	26 ± 8	97g white bread	**Almond** + bread Rice Mashed potatoes	**Low** Insulin AUC (4h) ($p<0.001$)
Josse et al. 2007	9 healthy	27 ± 7	50g white bread	50g bread + 30g/60g/90g of **almonds**	**Lower** glucose peak in 90gr almond (2h)
Kendall et al. 2011	10 healthy	48 ± 6	50g white bread Rice/pasta/ mashed potatoes	28g/56g/84g **pistachios** 50g bread + 28g/56g/84g **pistachios** rice/pasta/mashed potatoes + 56 g **pistachios**	**Lower** glycemic response after bread or other carbohydrate meal
Kendall et al. 2011	14 healthy 10 T2DM	36 ± 4 68 ± 2	50g white bread	50g bread + 30g/60g/90g of **mixed nuts**	**Low** glucose AUC **Lower** Glycemic response after bread consumption
Kendall et al. 2014	20 MetS	40-65	a) 50gr white bread b) white bread, butter, cheese c)12g white bread	50g white bread + 3oz **pistachios** 12g white bread+ 3oz **pistachios**	**Reduced** postprandial glycaemia Increased GLP-1

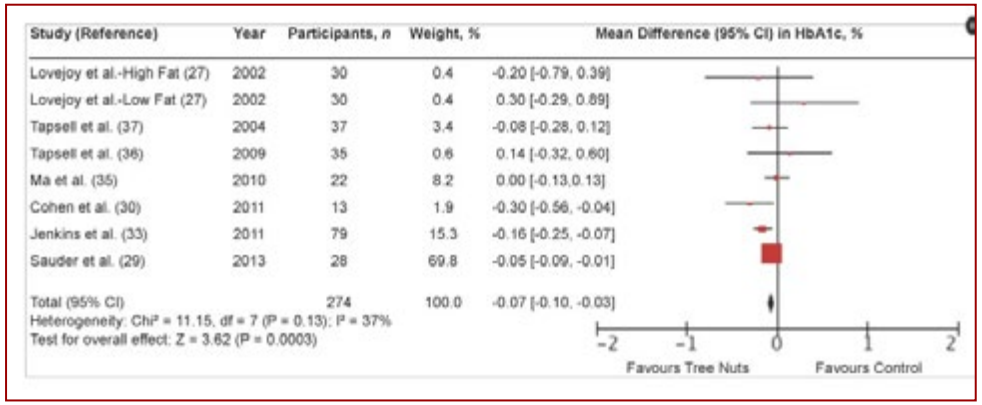
Nuts and insulin resistance. Long-term clinical trials

Effects of nuts on glycemia, insulinemia or glycemic control. Clinical trials

Author	Design/Subj	Lenght	N	Intervention	Results
Lovejoy et al.2002	Crossover Healthy	4 wk	30	**Almonds** (10% total energy: 57-113g) +HFA **Almonds** (10% total energy: 57-113g) + LFA	**No effect** (FPG, HbA1c insulin, 2h glucose, 2h insulin)
Wien et al. 2003	Parallel Ow/Obese	24 wk	65	LCD + 84 g **almonds** (39% total fat)	**No differences** FPG, insulin, HOMA-IR
Tapsell et al. 2004	Parallel T2DM	6 mo	58	Low fat diet + 30 g of **walnuts**	**No effect** in HbA1c
Tapsell et al. 2009	Parallel T2DM	12 mo	50	Low fat diet + 30g of **walnuts**	**Low** Fasting insulin No effect in HbA1c
Ma et al. 2009	Crossover T2DM	8 wk	24	Ab libitum + 56g of **walnuts**	**No effect** (HbA1c, insulin, HOMA-IR)
Li et al. 2009	Parallel Obese	12 wk	70	LCD + 53g **pistachios**	**No effect** (Insulin, glucose)
Wien et al. 2010	Parallel Pre-diabetes	60 wk	65	ADA diet (20% energy from **almonds**)	**Low** Insulin, HOMA-IR, HOMA-BCF
Jenkins et al. 2011	Parallel T2DM	3 mo	117	Diet advice + 75g of **mixed nuts**	**Low** HbA1c

Effect of Tree Nuts on Glycemic Control in Diabetes: A Systematic Review and Meta-Analysis of Randomized Controlled Dietary Trials

Viguiliouk E et al, Plos One 2014

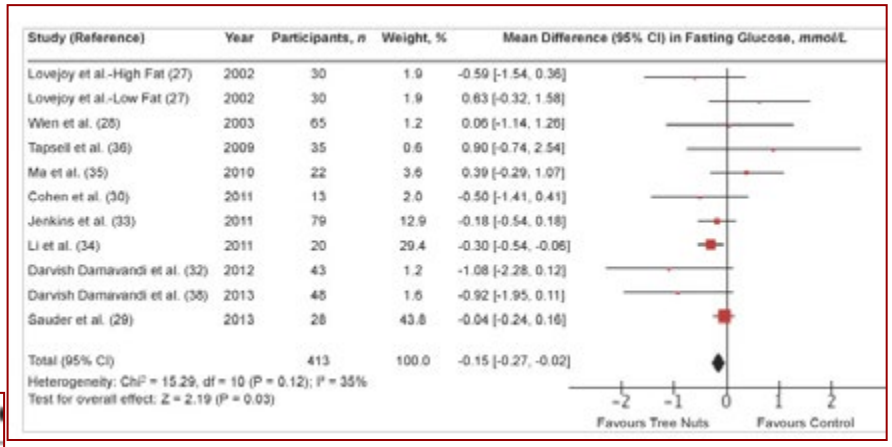


Study (Reference)	Year	Participants, n	Weight, %	Mean Difference (95% CI) in HbA1c, %
Lovejoy et al.-High Fat (27)	2002	30	0.4	-0.20 [-0.79, 0.39]
Lovejoy et al.-Low Fat (27)	2002	30	0.4	0.30 [-0.29, 0.89]
Tapsell et al. (37)	2004	37	3.4	-0.08 [-0.28, 0.12]
Tapsell et al. (36)	2009	35	0.6	0.14 [-0.32, 0.60]
Ma et al. (35)	2010	22	8.2	0.00 [-0.13, 0.13]
Cohen et al. (30)	2011	13	1.9	-0.30 [-0.56, -0.04]
Jenkins et al. (33)	2011	79	15.3	-0.16 [-0.25, -0.07]
Sauder et al. (29)	2013	28	69.8	-0.05 [-0.09, -0.01]
Total (95% CI)		274	100.0	-0.07 [-0.10, -0.03]

Heterogeneity: Chi² = 11.15, df = 7 (P = 0.13); I² = 37%
Test for overall effect: Z = 3.62 (P = 0.0003)

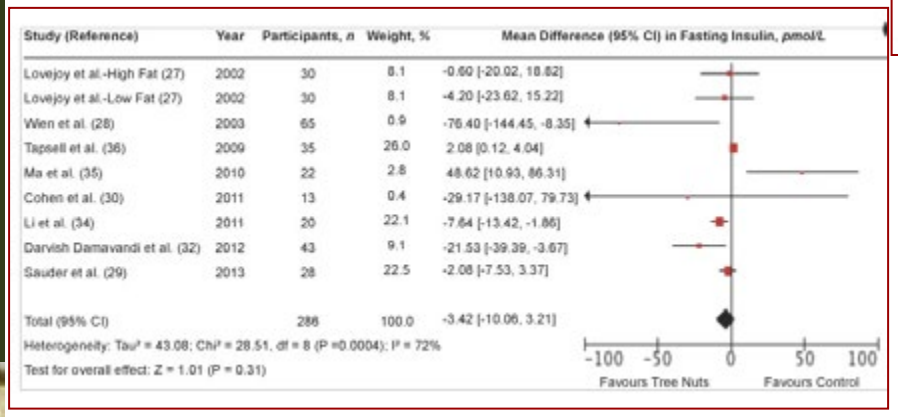
Forest plot of randomized controlled trials investigating the effect of diets supplemented with tree nuts on HbA1c in individuals with type 2 diabetes.

Forest plot of RCTs investigating the effect of diets supplemented with tree nuts on fasting GLUCOSE in individuals with type 2 diabetes.



Study (Reference)	Year	Participants, n	Weight, %	Mean Difference (95% CI) in Fasting Glucose, mmol/L
Lovejoy et al.-High Fat (27)	2002	30	1.9	-0.59 [-1.54, 0.36]
Lovejoy et al.-Low Fat (27)	2002	30	1.9	0.63 [-0.32, 1.58]
Wien et al. (28)	2003	65	1.2	0.06 [-1.14, 1.26]
Tapsell et al. (36)	2009	35	0.6	0.90 [-0.74, 2.54]
Ma et al. (35)	2010	22	3.6	0.39 [-0.29, 1.07]
Cohen et al. (30)	2011	13	2.0	-0.50 [-1.41, 0.41]
Jenkins et al. (33)	2011	79	12.9	-0.18 [-0.54, 0.18]
Li et al. (34)	2011	20	29.4	-0.30 [-0.54, -0.06]
Darvish Damavandi et al. (32)	2012	43	1.2	-1.08 [-2.28, 0.12]
Darvish Damavandi et al. (38)	2013	46	1.6	-0.92 [-1.95, 0.11]
Sauder et al. (29)	2013	28	43.8	-0.04 [-0.24, 0.16]
Total (95% CI)		413	100.0	-0.15 [-0.27, -0.02]

Heterogeneity: Chi² = 15.29, df = 10 (P = 0.12); I² = 35%
Test for overall effect: Z = 2.19 (P = 0.03)



Study (Reference)	Year	Participants, n	Weight, %	Mean Difference (95% CI) in Fasting Insulin, pmol/L
Lovejoy et al.-High Fat (27)	2002	30	8.1	-0.60 [-20.02, 18.82]
Lovejoy et al.-Low Fat (27)	2002	30	8.1	-4.20 [-23.62, 15.22]
Wien et al. (28)	2003	65	0.9	-76.40 [-144.45, -8.35]
Tapsell et al. (36)	2009	35	26.0	2.08 [0.12, 4.04]
Ma et al. (35)	2010	22	2.8	48.62 [10.93, 86.31]
Cohen et al. (30)	2011	13	0.4	-29.17 [-138.07, 79.73]
Li et al. (34)	2011	20	22.1	-7.64 [-13.42, -1.86]
Darvish Damavandi et al. (32)	2012	43	9.1	-21.53 [-39.39, -3.67]
Sauder et al. (29)	2013	28	22.5	-2.08 [-7.53, 3.37]
Total (95% CI)		286	100.0	-3.42 [-10.06, 3.21]

Heterogeneity: Tau² = 43.08; Chi² = 28.51, df = 8 (P =0.0004); I² = 72%
Test for overall effect: Z = 1.01 (P = 0.31)

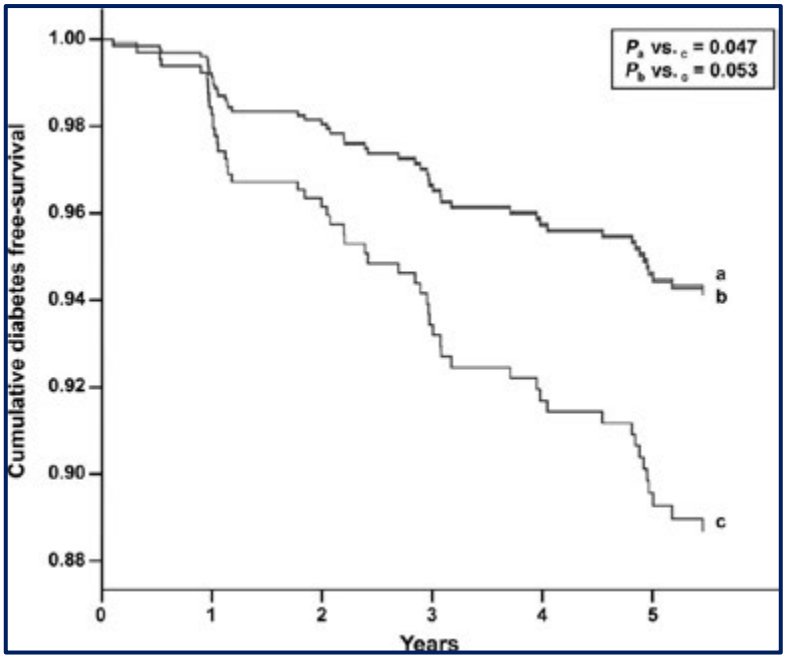
Forest plot of RCTs investigating the effect of diets supplemented with tree nuts on fasting INSULIN in individuals with type 2 diabetes.

American Diabetes Association. Diabetes Care

Reduction in the Incidence of Type 2 Diabetes With the Mediterranean Diet Results of the PREDIMED-Reus nutrition intervention randomized trial

Salas-Salvadó J, Bulló M, Babio N, Martínez-González MA, Ibarrola-Jurado N, Basora J, Estruch R, Covas MI, Corella D, Arós F, Ruiz-Gutiérrez V, Ros E, for the PREDIMED Study Investigators

Diabetes Care January 2011 vol. 34 no. 1 14-19



a) MedDiet and virgin olive oil group
b) MedDiet and nuts group
c) Control diet

Hazard ratios (95% CI) of diabetes by intervention group

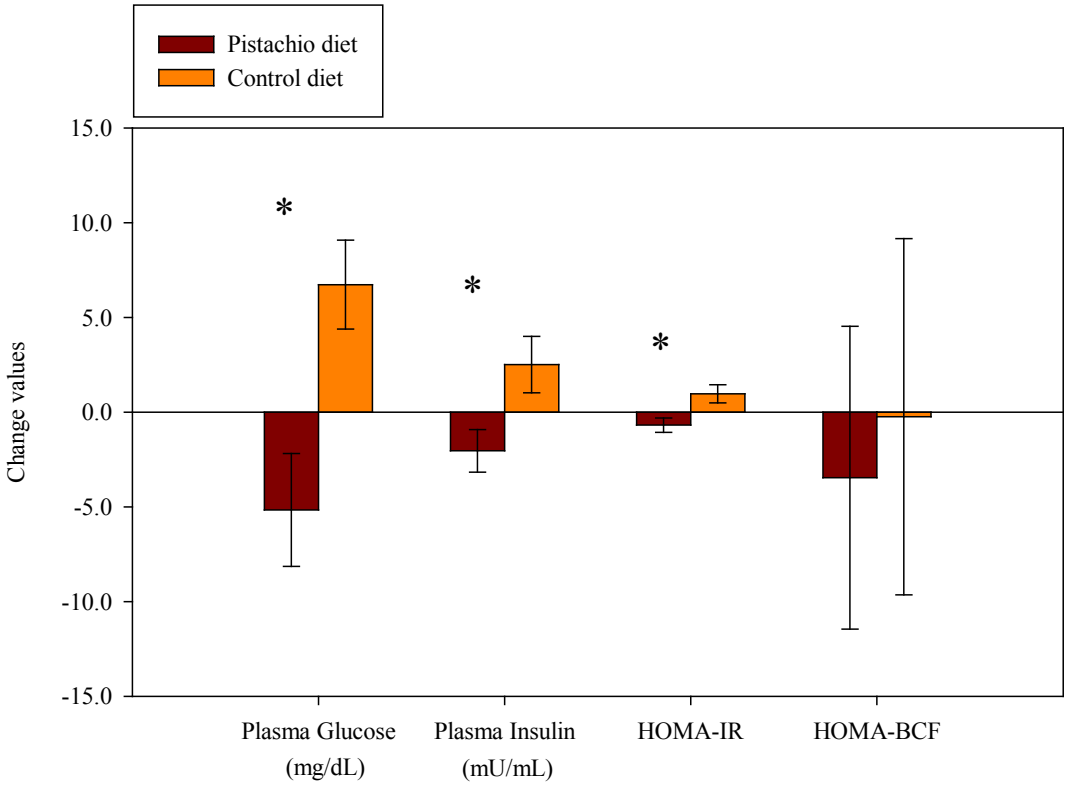
	MedDiet with VOO vs. control diet	MedDiet with nuts vs. control diet	Both MedDiets vs. control diet
Crude model	0.53 (0.27–1.09)	0.58 (0.31–1.10)	0.55 (0.32–0.95)
Age- and sex-adjusted model	0.52 (0.27–1.00)	0.55 (0.29–1.00)	0.53 (0.31–0.92)
Multivariate adjusted model*	**0.49 (0.25–0.97)**	**0.48 (0.24–0.96)**	**0.48 (0.27–0.86)**

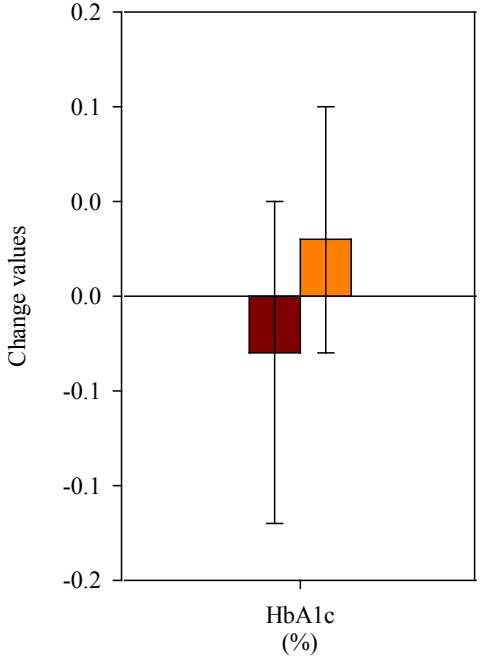
Cox regression models to assess the relative risk of diabetes by allocation group, estimating the hazard ratios (95% CI) *Adjusted for sex, age, baseline energy intake, BMI, waist circumference, physical activity, smoking status, fasting serum glucose, use of lipid-lowering drugs, Mediterranean diet score, and weight changes during the study.

Beneficial Effect of Pistachio Consumption on Glucose Metabolism, Insulin Resistance, Inflammation, and Related Metabolic Risk Markers: A Randomized Clinical Trial

Bulló M et all, Diabetes Care 2014

Glucose metabolism-related parameters



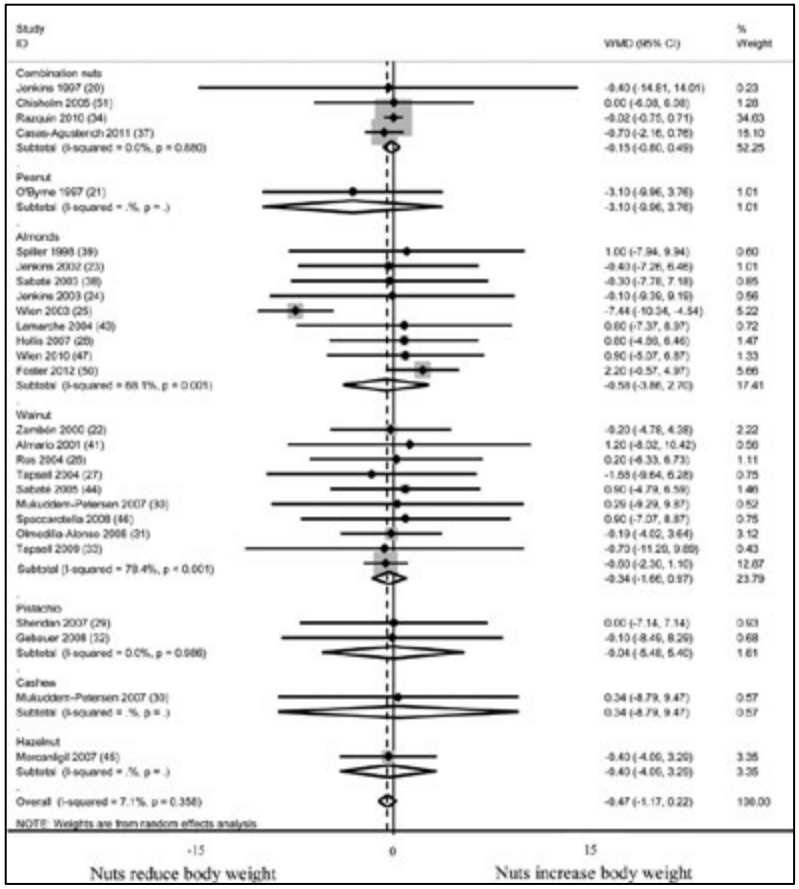


* Significant differences (P < 0.001) in changes between dietary interventions.

Nut intake and adiposity: meta-analysis of clinical trials

MEDLINE and Cochrane Central Register of Controlled Trials
Two independent investigators
31 clinical trials met the inclusion criteria

BODY WEIGHT



Flores-Mateo et al. Am J Clin Nutr 2013;97:1346-1355

Nut intake and adiposity: meta-analysis of clinical trials

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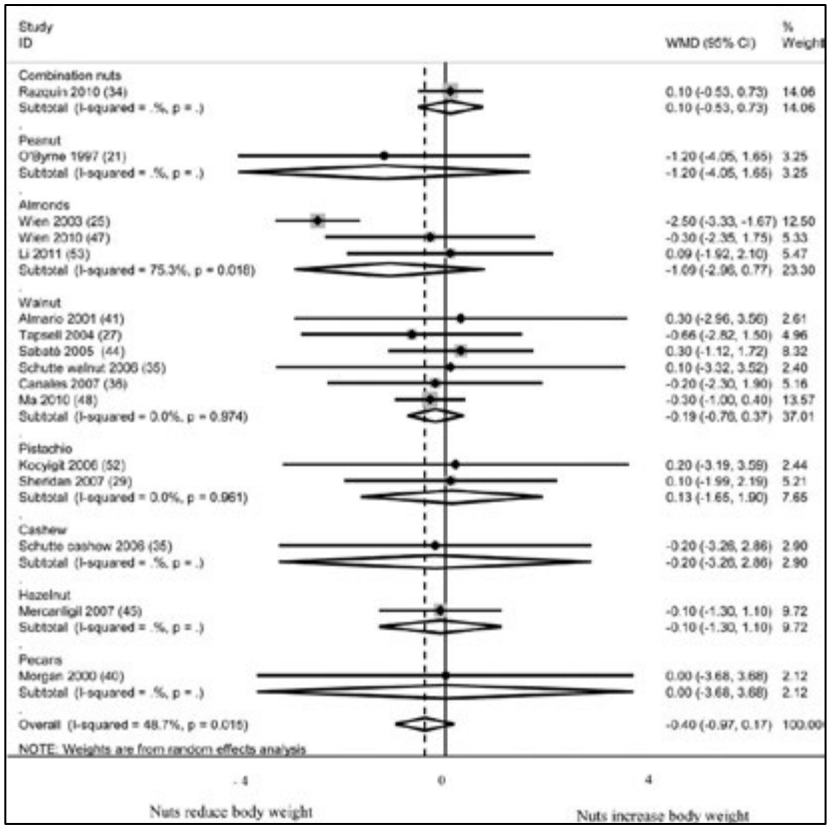
BODY MASS INDEX



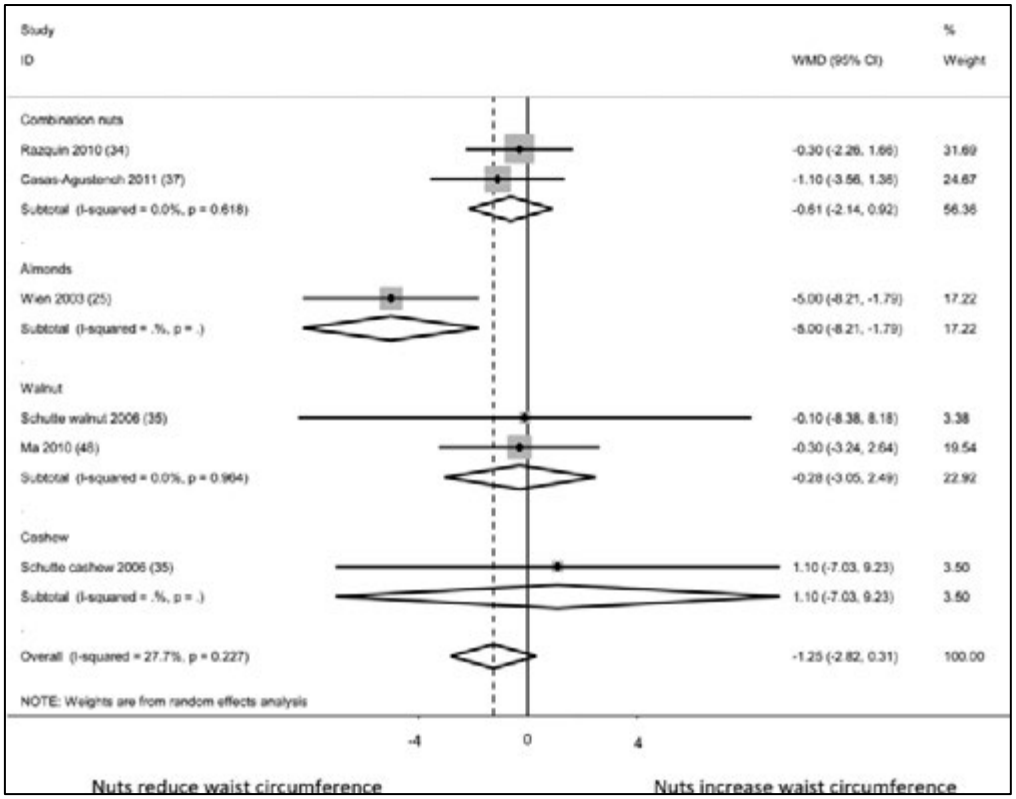
Flores-Mateo et al. Am J Clin Nutr 2013;97:1346-1355

Nut intake and adiposity: meta-analysis of clinical trials

MEDLINE and Cochrane Central Register of Controlled Trials
Two independent investigators
31 clinical trials met the inclusion criteria

Diets enriched with nuts did not increase body weight, body mass index, or waist circumference in controlled clinical trials.

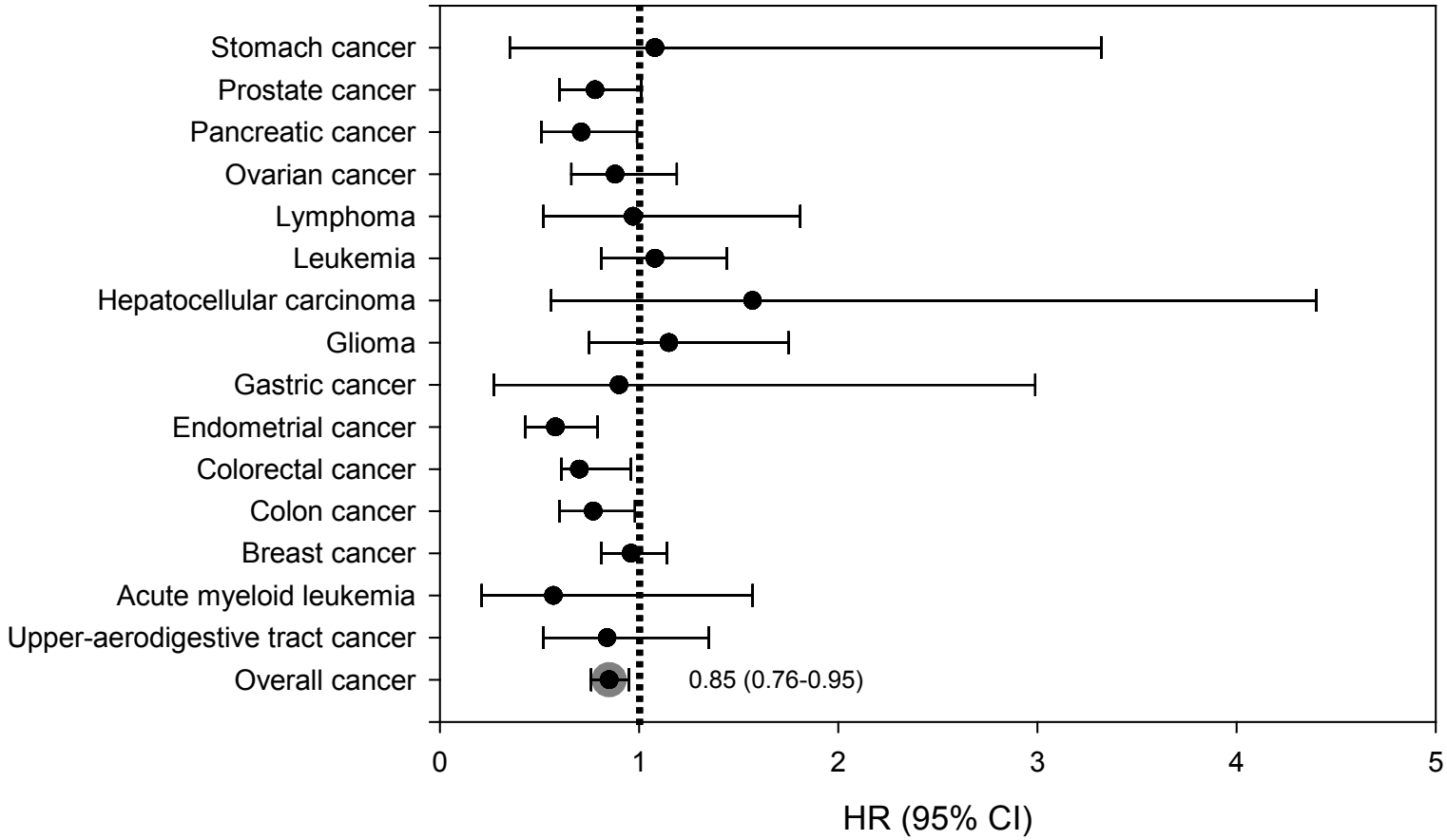
WAIST CIRCUMFERENCE



Flores-Mateo et al. Am J Clin Nutr 2013;97:1346-1355

Nut consumption and risk of cancer and type 2 diabetes: a systematic review and meta-analysis.

36 observational studies
N= 30,708 patients, follow-up ranged between 4.6y and 30y



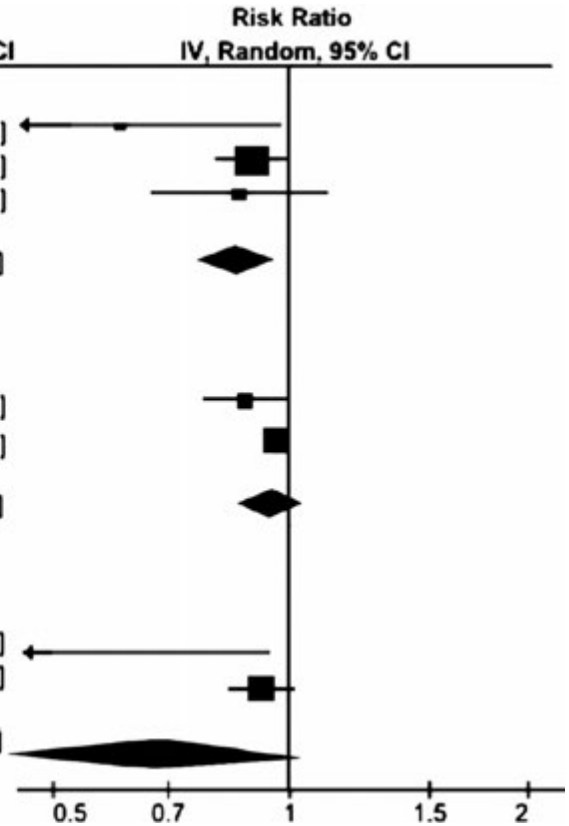
Nut consumption may play a role in reducing cancer risk.

Wu *et al.* (2015). Nutrition Reviews

Nut consumption on all-cause, cardiovascular, and cancer mortality risk: a systematic review and meta-analysis of epidemiologic studies

N=354,933 participants3, 746,534 cumulative person-years

Study or Subgroup	log log[Risk Ratio]		SE	Weight	Risk Ratio IV, Random, 95% CI
high vs. low quantile					
Guasch-Ferré 2013 (22)	never vs >3/wk	-0.510	0.250	6.9%	0.60 [0.37, 0.98]
Bao 2013 (23)	never vs >5/wk	-0.116	0.054	73.0%	0.89 [0.80, 0.99]
Djousse 2014 (24)	<1/mo vs >5/wk	-0.150	0.139	20.1%	0.86 [0.65, 1.13]
Total (95% CI)				**100.0%**	**0.86 [0.75, 0.98]**
Heterogeneity: Chi² = 2.38, df = 2 (P = 0.30); I² = 16%					
1-serving per week					
Guasch-Ferré 2013 (22)		-0.127	0.062	35.4%	0.88 [0.78, 0.99]
Bao 2013 (23)		-0.013	0.007	64.6%	0.99 [0.97, 1.00]
Total (95% CI)				**100.0%**	**0.95 [0.85, 1.05]**
Heterogeneity: Chi² = 3.34, df = 1 (P = 0.07); I² = 70%					
1-serving per day					
Guasch-Ferré 2013 (22)		-0.888	0.431	35.5%	0.41 [0.18, 0.96]
Bao 2013 (23)		-0.091	0.049	64.5%	0.91 [0.83, 1.01]
Total (95% CI)				**100.0%**	**0.69 [0.33, 1.45]**
Heterogeneity: Chi² = 3.37, df = 1 (P = 0.07); I² = 70%					



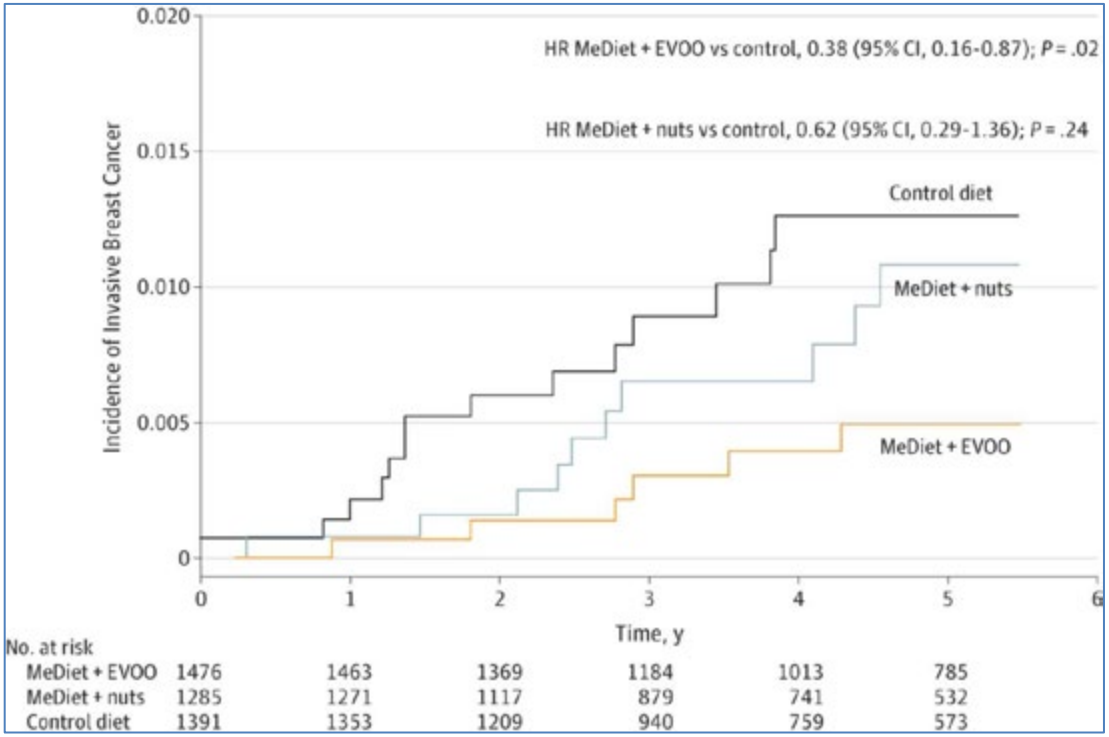
Nut consumption is associated with lower risk of and cancer mortality

Grosso et al. Am J Clin Nutr 2015;101:783-793

Mediterranean Diet and Invasive Breast Cancer Risk Among Women at High Cardiovascular Risk in the PREDIMED Trial: A Randomized Clinical Trial

PREDIMED Investigators
JAMA Intern Med. Published online September 14, 2015.1-9

4282 women aged 60 to 80 years



Participants in the MeDiet supplemented with nuts showed a non-significant risk reduction compared with women in the control group (hazard ratio [HR], 0.62 [95% CI, 0.29-1.36]).

Nuts and Alzeheimer Disease

In vitro/in vivo animal studies:

→ Walnut extract inhibits the fibrilization of amyloid beta-prot.: Antiox. polyphenols

Chauhan *et al.* 2004

→ Walnut extract amiliorate amyloid-beta-induced oxidative stress and citotoxicity in PC12 cells (rat medulla).

Muthaiyah et al. 2011.

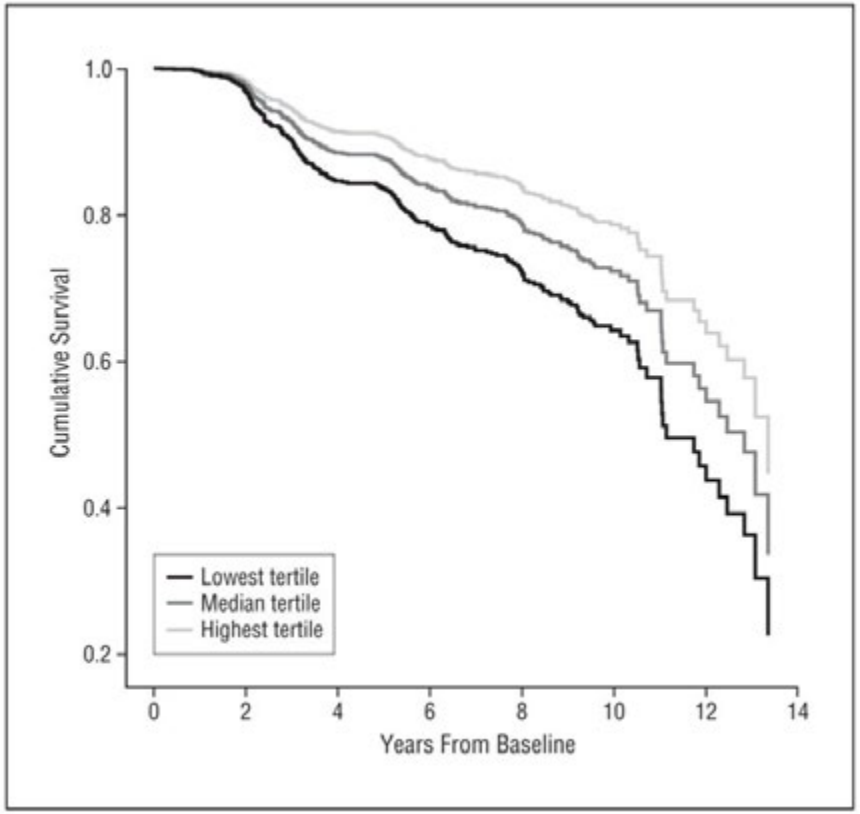
No feeding trials in humans have been conducted

Food Combination and Alzheimer Disease Risk

Dietary pattern (DP): salad, **nuts**, fish, tomatoes, among other food.

HR 0.62 (0.43-0.89) T3 vs T1

Cumulative Alzheimer disease incidence in subjects belonging to each dietary pattern tertile



Lowest tertile (black line) corresponds to the lowest adherence to DP 2; median tertile (dark-gray line), to median adherence; and highest tertile (light-gray line), to the highest adherence. The Figure was derived from a crude model that used all subjects (N=2148).

Gu *et al. Arch Neurol* 2010

Nutritional composition of nuts

Average nutrient composition of nuts (per 100 g)

Nuts	E (Kcal)	Fat (g)	SFA (g)	MUFA (g)	PUFA (g)	Prot (g)	Fiber (g)	Phytos (mg)	Ca^{2+} (mg)	Mg^{2+} (mg)	Na^{+} (mg)	K^{+} (mg)	Tocopherols (mg)	Carotenoids (mg)	Phenol (mg)	Flavonoi (mg)	Procyanidin (mg)
Almonds	575	50.6	3.9	32.2	12.2	21.3	8.8	120	248	275	1	728	25	2	287	15	184
Brazil nuts	656	66.4	15.1	24.5	20.6	14.3	8.5	N A	160	376	3	659	4	nd	244	nd	nd
Cashews	553	46.4	9.2	27.3	7.8	18.2	5.9	158	37	292	12	660	1	nd	137	2	9
Hazelnuts	628	60.8	4.5	45.7	7.9	15	10.4	96	114	163	0	680	33	106	687	12	500
Macadamias	718	75.8	12.1	58.9	1.5	7.9	6	116	85	130	5	368	4	nd	126	nd	nd
Peanuts	567	49.7	6.9	24.6	15.7	23.7	3.1	220	92	168	18	705	8	nd	406	0,7	16
Pecans	691	72	6.2	40.8	21.6	9.2	8.4	102	70	121	0	410	4	55	1284	34	494
Pine nuts	673	68.4	4.9	18.8	34.1	13.7	3.7	141	16	251	2	597	6	nd	32	0,5	nd
Pistachios	557	44.4	5.4	23.3	13.5	20.6	9	214	107	121	1	1025	7	332	867	14	237
Walnuts	654	65.2	6.1	8.9	47.2	15.2	6.4	72	98	158	2	441	6	nd	1576	3	67

Data from USDA Database

Nutritional composition of nuts

Average nutrient composition of nuts (per 100 g)

Nuts	E (Kcal)	Fat (g)	SFA (g)	MUFA (g)	PUFA (g)	Prot (g)	Fiber (g)	Phytos (mg)	Ca^{2+} (mg)	Mg^{2+} (mg)	Na^{+} (mg)	K^{+} (mg)	Tocopherols (mg)	Carotenoids (mg)	Phenol (mg)	Flavonoi (mg)	Procyanidin (mg)
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Data from USDA Database

Conclusiones

El consumo regular de frutos secos se ha demostrado efectivo en la prevención de la enfermedad cardiovascular y potencialmente efectivo en la prevención de la diabetes tipo 2.

A pesar de que algunas evidencias sugieren que los frutos secos podrían desempeñar un papel relevante en la prevención y/o tratamiento de otras enfermedades no transmisibles, la evidencia científica que existe en la actualidad es muy escasa.

Se requieren estudios de intervención bien diseñados que permitan establecer el posible beneficio del consumo de frutos secos sobre el control la salud humana, y que permitan delimitar los mecanismos bioquímicos y moleculares en pro a un mejor control nutricional de estas patologies y a una major aceptación del fruto seco como alimento saludable..