FACULTY OF HEALTH

AARHUS UNIVERSITY

DAIRY AND CARDIO-METABOLIC HEALTH: FROM INDIVIDUAL NUTRIENTS TO FOODS

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OUTLINE

- Contribution of dairy products to intake of saturated fatty acids (SFA)
- SFA and coronary heart disease (CHD) risk
- Dairy products and cardio-metabolic risk
- Summary and furture directions

DAIRY PRODUCTS

- Definition of dairy products
  - Milk or any food product derived from milk

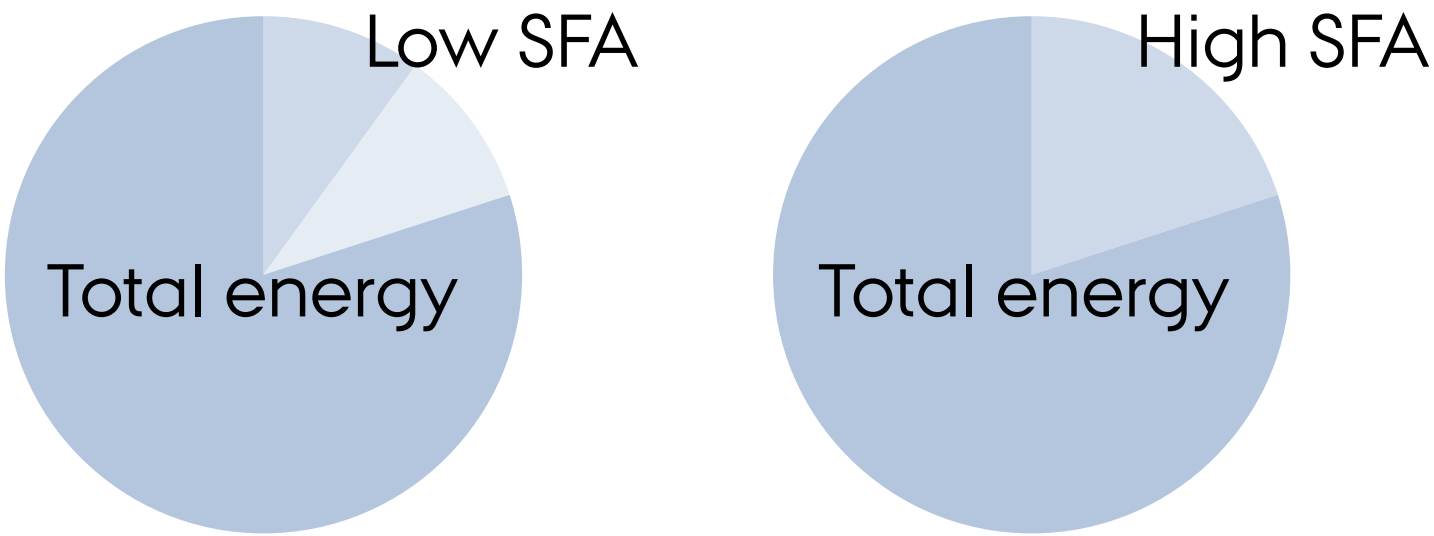
- Milk is a complex food containing a number of nutrients which may be associated with health

CONTRIBUTION OF DAIRY PRODUCTS TO SFA INTAKE

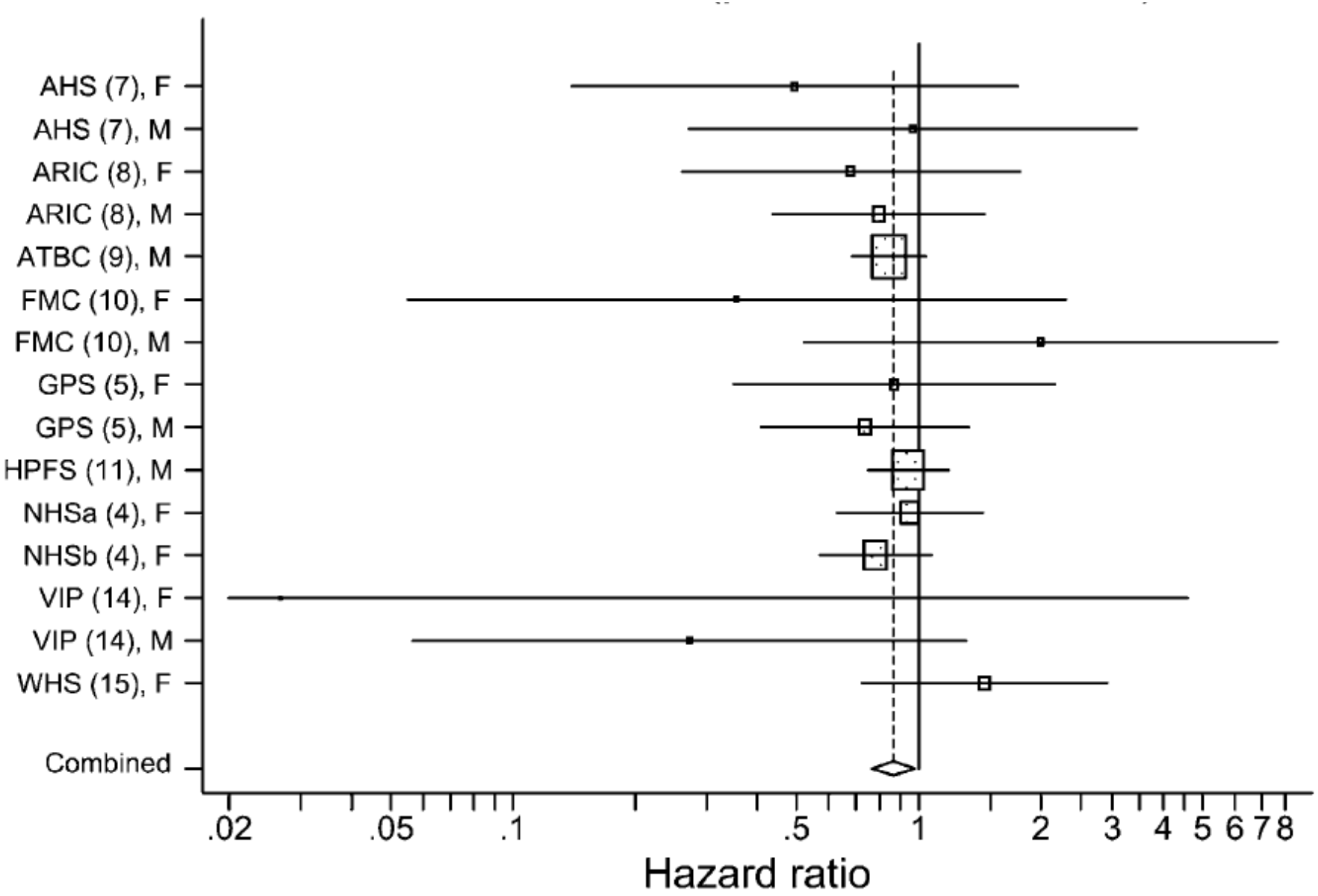
- Dairy products are a major source of SFA
  - In Denmark, for example, dairy products contribute with 44% of SFA intake (The National Food Institute, Technical University Denmark 2015)
- SFA can adversely influence the risk of CHD, depending on the source of calories replaced by SFA

SFA AND CHD RISK

- Meta-analysis of follow-up studies on SFA and cardiovascular disease (Siri-Tarino et al. Am J Clin Nutr 2010)
  - No association between intake of SFA and risk of CHD
- To what are SFA being compared?


Low SFA
Total energy
High SFA
Total energy

Polyunsaturated fatty acids for SFA (per 5% energy) and risk of CHD



P value, test for heterogeneity=0.70; combined hazard ratio (95% CI)=0.87 (0.77, 0.97)

Jakobsen et al. Am J Clin Nutr 2009

Different types of carbohydrates for SFA (per 5% energy) and risk of CHD

	All participants	
Tertiles of dietary GI[2]	Median dietary GI (80% central range)	HR (95% CI)
Carbohydrates with low-GI values (first tertile)	82 (77, 85)	0.88 (0.72, 1.07)
Carbohydrates with medium-GI values (second tertile)	88 (86, 90)	0.98 (0.80, 1.21)
Carbohydrates with high-GI values (third tertile)	93 (91, 98)	1.33 (1.08, 1.64)

GI, glycemic index.

Jakobsen et al. Am J Clin Nutr 2010

Follow-up studies on intake of trans fatty acids (TFA) and CHD risk

First author	Sex	Age (y)	Results		
			Total TFA	Industrial TFA	Ruminant TFA
Willett, 1993	F	-	↑	↑	(↓)
Pietinen, 1997	M	50-69	↑	↑	↓
Oomen, 2001	M	64-84	↑	(↑)	(↑)
Jakobsen, 2008	F	30-71	-	-	(↓)
	M	30-71	-	-	→
Laake, 2012	F	20-49	-	↑	↑
	M	20-49	-	↑	→

A bracket indicates that the association was not statistically significant.

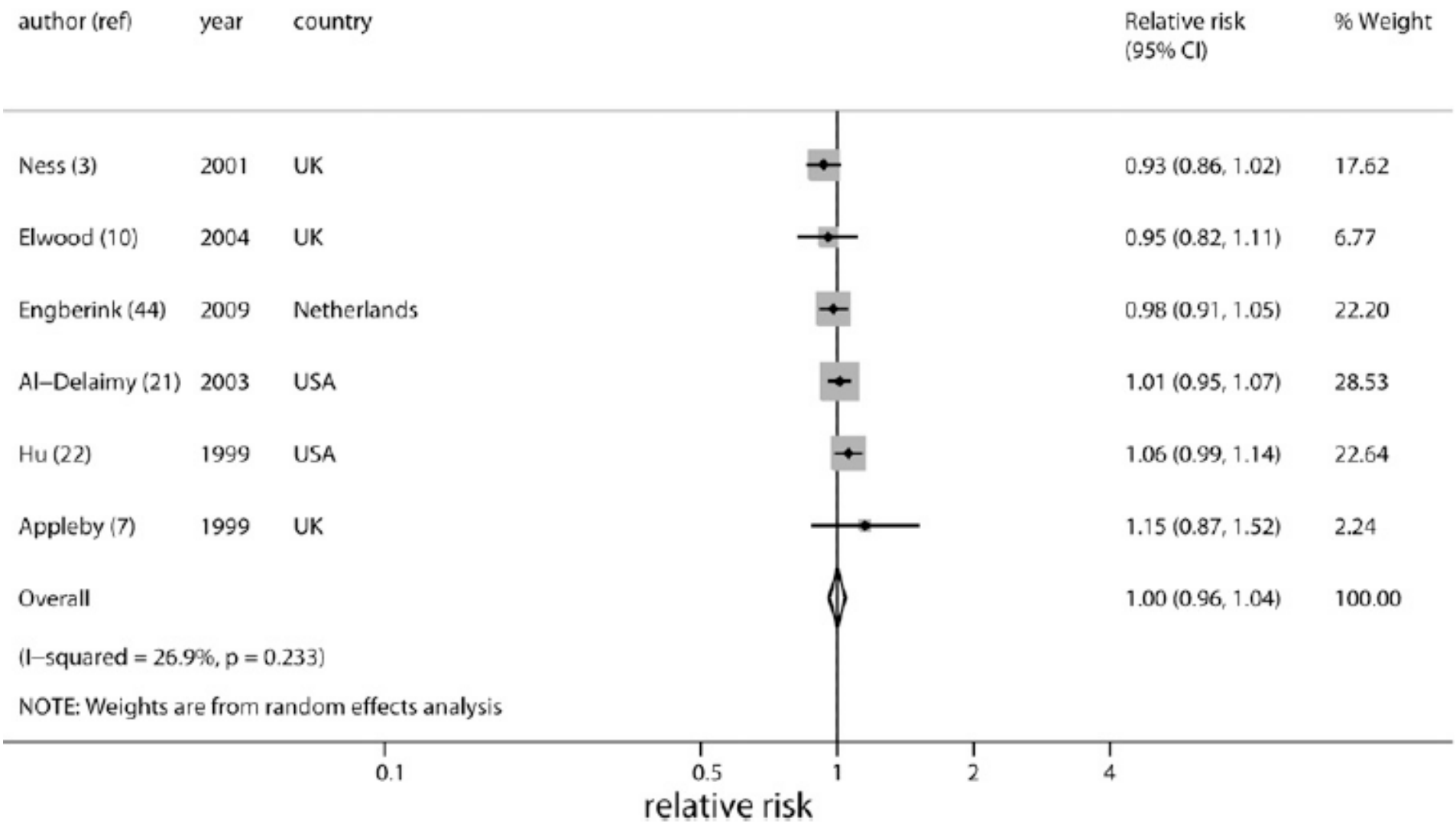
LIMITATIONS OF NUTRIENT ANALYSES

› People do not eat isolated nutrients but foods with complex combinations of nutrients

DAIRY AND CARDIO-METABOLIC RISK

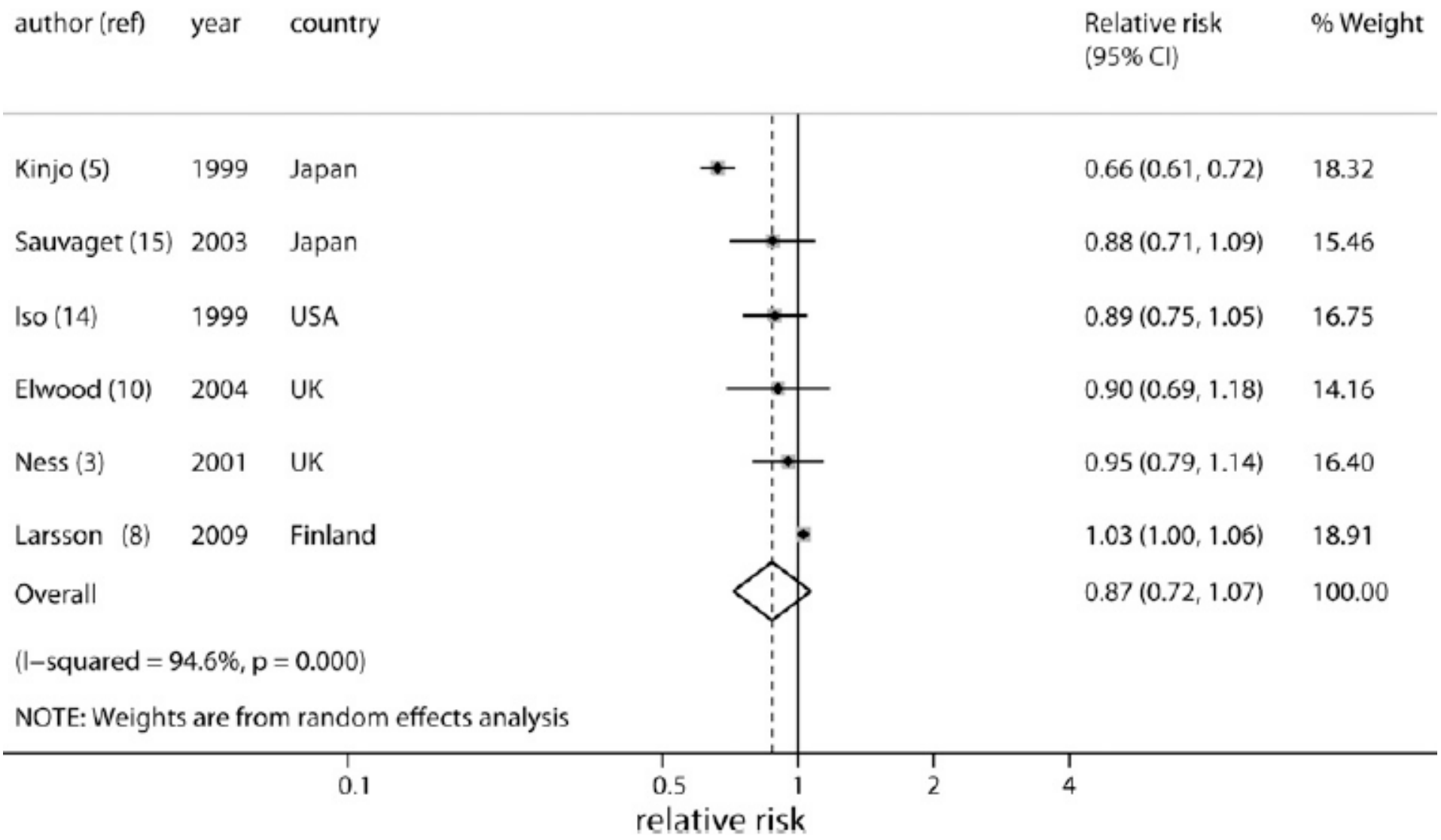
› Recent findings on intake of dairy products in relation to cardio-metabolic risk are reviewed

Association between intake of milk (per 200 mL/d) and CHD



Soedamah-Muthu et al. Am J Clin Nutr 2011

Association between intake of milk (per 200 mL/d) and stroke



Soedamah-Muthu et al. Am J Clin Nutr 2011

DAIRY AND CARDIO-METABOLIC RISK

- Following the meta-analysis by Soedamah-Mutuh et al. (Am J Clin Nutr 2011) a number of follow-up studies on dairy products and risk of CHD or stroke have been published
  - 9 follow-up studies on dairy products and CHD risk
  - 7 follow-up studies on dairy products and stroke risk

Follow-up studies on dairy products and risk of CHD

First author	Sex	Results		
		Total	High-fat	Low-fat
Goldbohm, 2011	F	-	-	→
	M	-	-	→
Dalmeijer, 2013	F&M	→	→	→
Kondo, 2013	F	(↓)	-	-
	M	(↑)	-	-
Louie, 2013	F&M	↓	(↓)	(↓)
Pattersen, 2013	F	↓	-	-
Soedamah-Muthu, 2013	F&M	(↓)	→	(↓)
Praagman, 2014	F&M	→	→	→

A bracket indicates that the association was not statistically significant.

Follow-up studies on specific dairy products and risk of CHD

First author	Sex	Results				
		Milk			Cheese	Yogurt
		Total	Full-fat	Low-fat		
Goldbohm, 2011	F	–	–	–	(↓)	–
	M	–	–	–	(↓)	–
Avalos, 2013	F	–	→	↑	→	→
	M	–	→	→	→	→
Dalmeijer, 2013	F&M	–	–	–	→	–
Pattersen, 2013	F	(↑)	→	→	↓	→
Soedamah-Muthu, 2013	F&M	(↓)	–	–	(↓)	(↑)
Praagman, 2014	F&M	–	–	–	→	→

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	M	–	→	→	→	→
Dalmeijer, 2013	F&M	–	–	–	→	–
Pattersen, 2013	F	(↑)	→	→	↓	→
Soedamah-Muthu, 2013	F&M	(↓)	–	–	(↓)	(↑)
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Follow-up studies on dairy products and risk of stroke

First author	Sex	Results		
		Total	High-fat	Low-fat
Goldbohm, 2011	F	-	-	(↓)
	M	-	-	→
Larsson, 2012	F&M	(↓)	(↓)	↓
Dalmeijer, 2013	F&M	(↓)	→	(↓)
Kondo, 2013	F	(↓)	-	-
	M	→	-	-
Louie, 2013	F&M	→	→	→
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Dalmeijer, 2013	F&M	–	–	–	→	–
Praagman, 2014	F&M	–	–	–	→	→

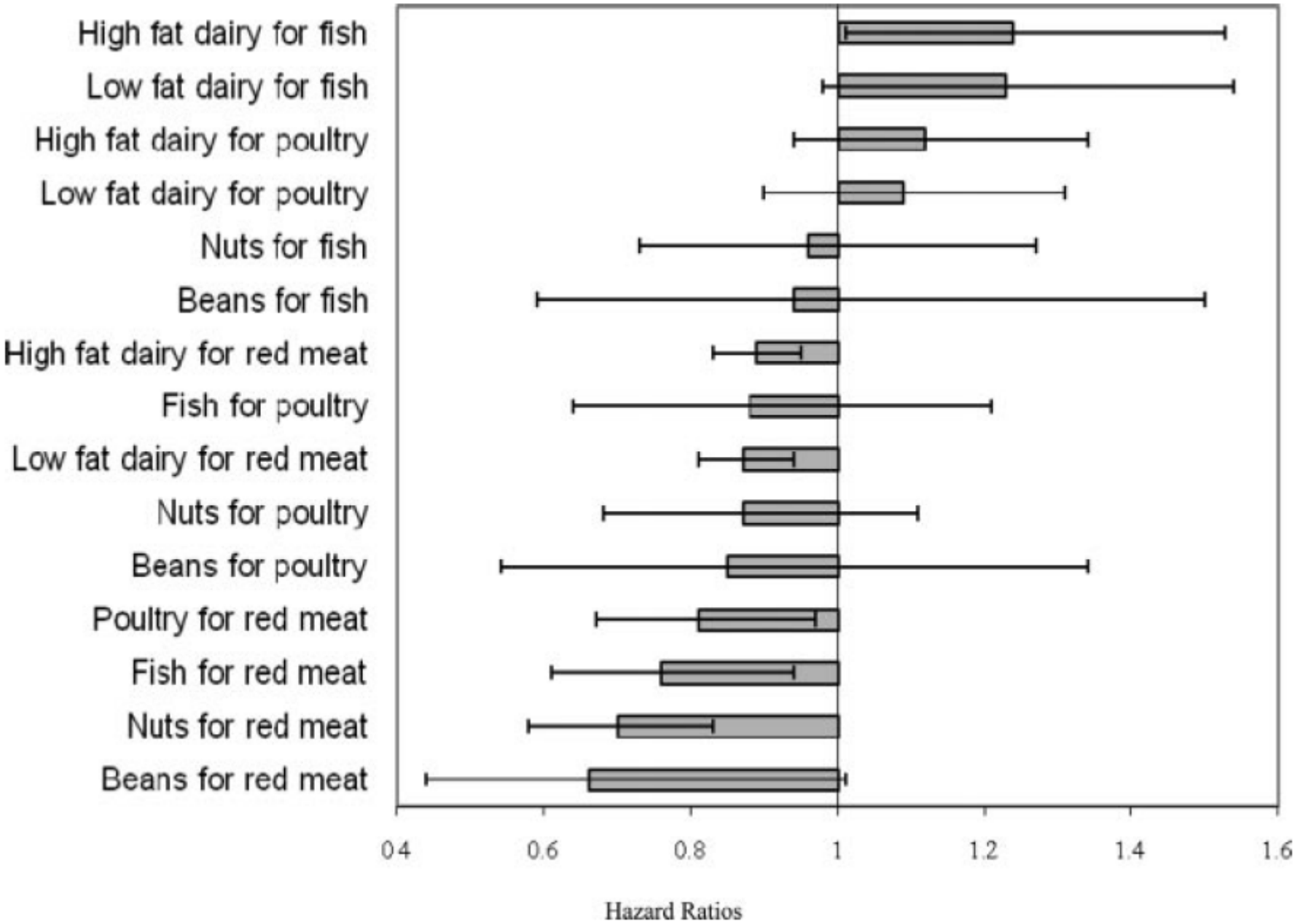
A bracket indicates that the association was not statistically significant.

Risk for CHD according to fifths of intake of dairy products

	Fifths					*P* for trend
	1	2	3	4	5	
High-fat dairy						
Servings/d	0.33	0.69	1.07	1.57	3.00	
Hazard ratio (95% CI)	1.00	0.86 (0.77, 0.96)	0.91 (0.81, 1.02)	0.93 (0.83, 1.04)	1.09 (0.97, 1.22)	<0.01
Low-fat dairy						
Servings/d	0.07	0.32	0.69	1.14	2.32	
Hazard ratio (95% CI)	1.00	0.79 (0.71, 0.89)	0.81 (0.73, 0.91)	0.83 (0.75, 0.93)	0.90 (0.80, 1.01)	0.66

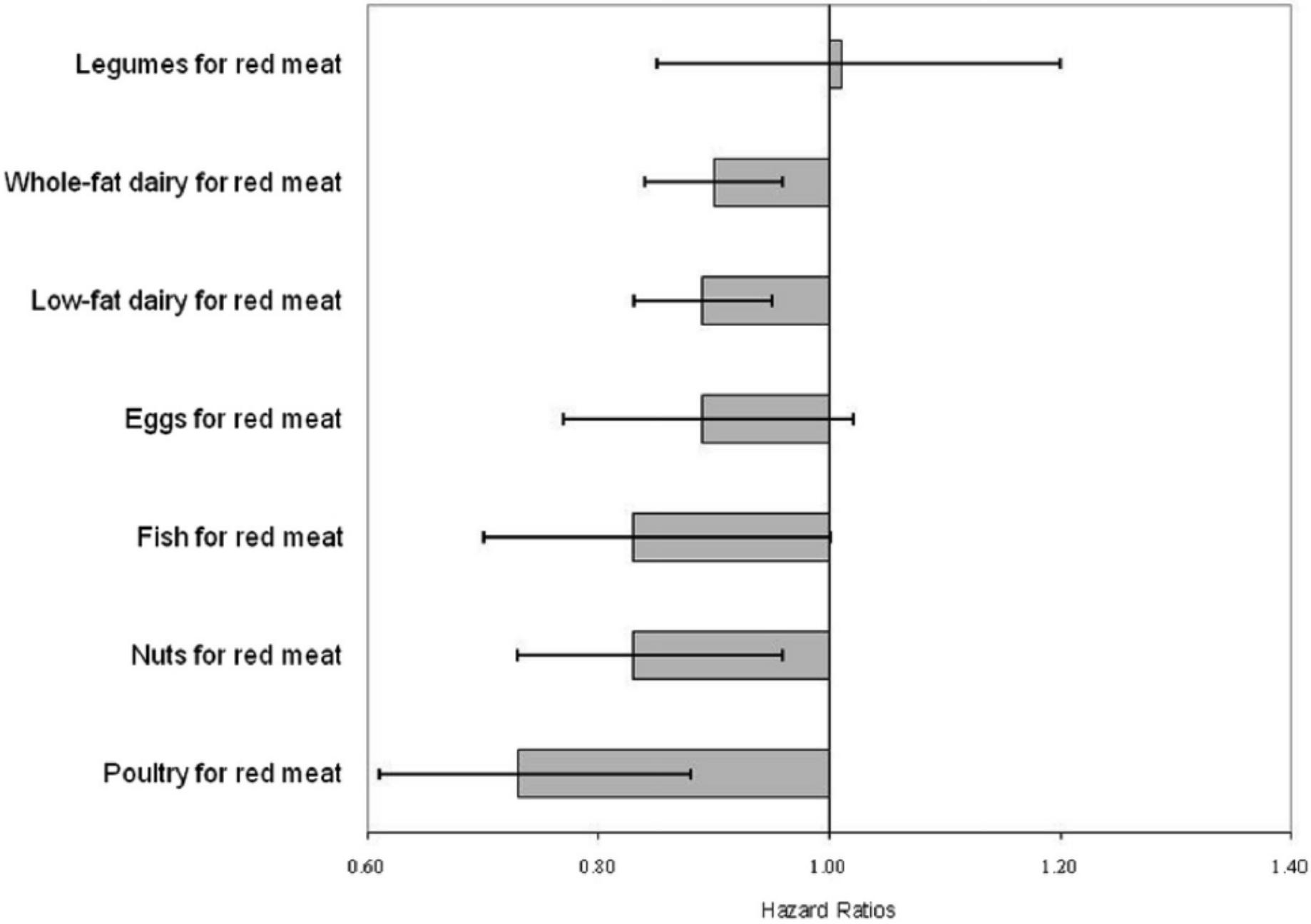
Bernstein et al. Circulation 2010

Risk for CHD associated with substitution of one major protein source/d with another



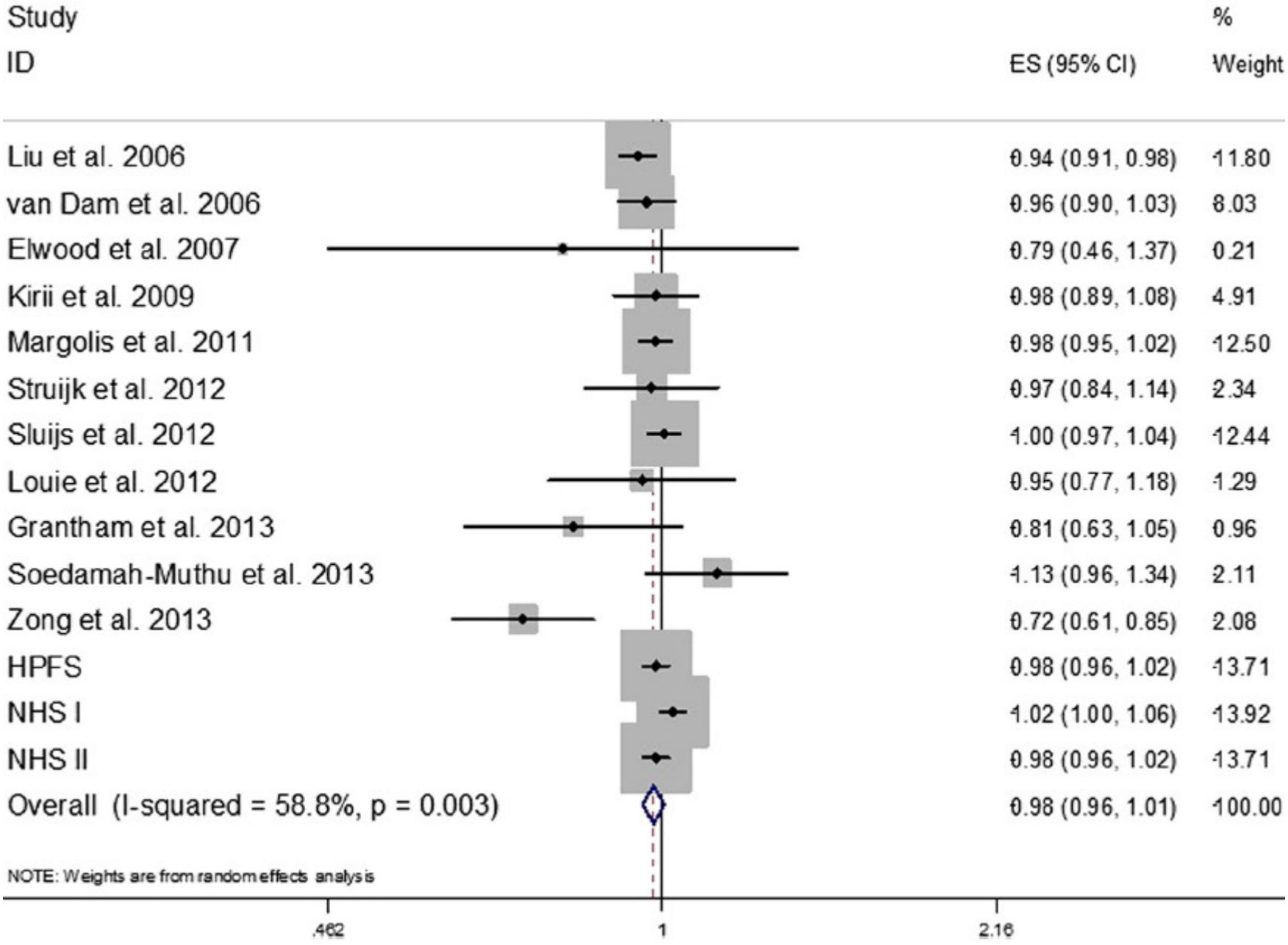
Bernstein et al. Circulation 2010

Risk for stroke associated with substitution of one major protein source/d with another



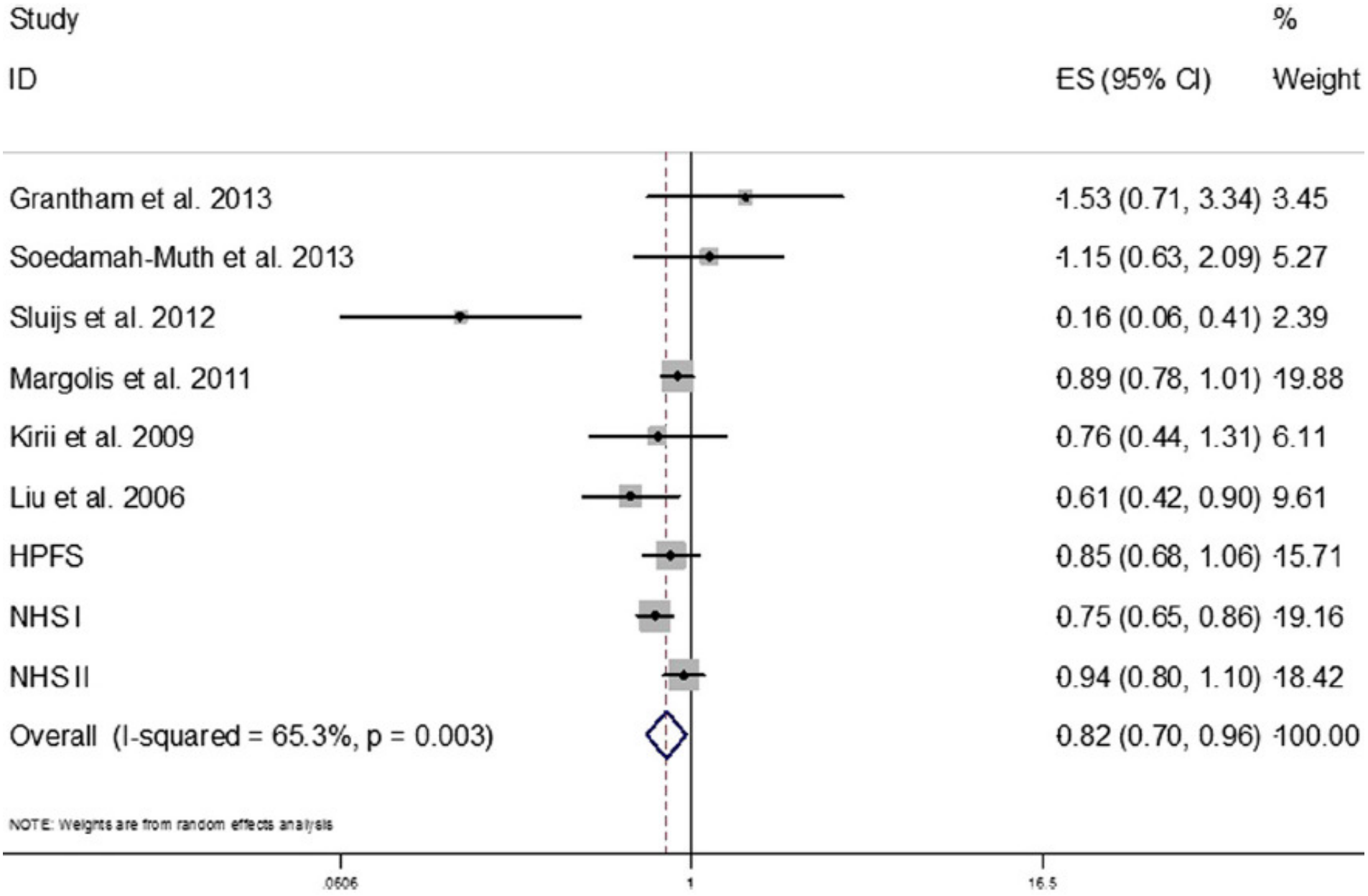
Bernstein et al. Stroke 2012

Association between total dairy intake (per 1 serving/d) and diabetes



Chen et al. BMC Medicine 2014

Association between yogurt intake (per 1 serving/d) and diabetes



Chen et al. BMC Medicine 2014

SUMMARY AND FUTURE DIRECTIONS

- Intake of milk is not associated with risk of CHD. However, no firm conclusions can be drawn regarding full-fat versus low-fat milk intake
- Recent studies suggest that intake of yogurt may not be associated with risk of CHD whereas intake of cheese may be associated with lower risk of CHD. However, these findings are based on a limited number of studies

SUMMARY AND FUTURE DIRECTIONS

- Intake of milk may be associated with lower risk of stroke
- Recent studies suggest that intake of cheese and yogurt may be associated with lower risk of stroke. However, these findings are based on a limited number of studies

SUMMARY AND FUTURE DIRECTIONS

› Intake of yogurt is associated with lower risk of diabetes

SUMMARY AND FUTURE DIRECTIONS

- Consider dairy products as a heterogenous group
  - Specific dairy products
    - Low-fat versus high-fat
    - Fermented versus nonfermented
- To what are dairy products being compared?
  - Specify substitutions

SUMMARY AND FUTURE DIRECTIONS

- Stroke subtypes
  - Ischemic
  - Hemmorhagic
- Dose-response associations
- Changes in intake of dairy products

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THANK YOU!