Food Strategies to Reduce Health Care Costs Burdens from Cardiovascular Disease

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2001, Vol. 56A (Special Issue II):89–94

Nutrition, Physical Activity, and Quality of Life in Older Adults: Summary

Adam Drewnowski[1] and William J. Evans,[2] Co-Editors

Virtually no research has been done on how nutrition and dietary variables can best be integrated in the quality-of-life concept. The focus has been mostly on biomedical measures and health outcomes.

Epidemiological studies of diet and chronic disease risk have focused on the relationship between a single nutrient and the relevant health outcome

Perceived control, satisfaction, and enjoyment have been mentioned as potential variables mediating the link between physical performance and HRQL measures.

Assessments of diet quality have not taken control or satisfaction variables into account.

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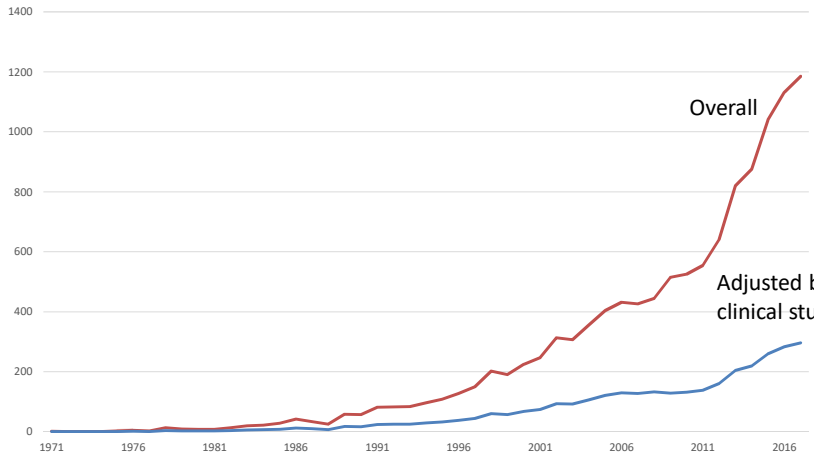

PubMed entries (diet OR nutrition) AND "quality of life"

Domain	Potential Facets	Content Areas
Physical health	Dietary choices	Low-calorie diet
		Low-fat diet
		Low-cholesterol diet
		Low-sodium diet
		High-fiber diet
	Eating habits	Medically prescribed diets
		Meal replacements
	Dietary supplements	Vitamins
		Minerals
		Herbals
		Alternative medicine
	Medications	Diuretics
		Steroids
		Polypharmacy
	Physical activity	Assistance with eating
		Access to food and shopping
		Walking
		Exercise program
Psychological well-being	Sense of control	Body image
		Satisfaction with diet quality
		Satisfaction with fitness level
		Perceived health benefits
Social relationships	Social support	Company at meals
	Marital status	Social interactions
Environment	Financial resources	Food security
	Education	
Life satisfaction		Satisfaction measures

Drewnowski, A., and Evans, W.J. (2001). Nutrition, Physical Activity, and Quality of Life in Older AdultsSummary. The Journals of Gerontology: Series A 56, 89–94.

Total diet score according to Quality of Life (SF-36)

Gopinath, B., Russell, J., Flood, V.M., Burlutsky, G., and Mitchell, P. (2014). Adherence to dietary guidelines positively affects quality of life and functional status of older adults. Journal of the Academy of Nutrition and Dietetics 114, 220–229.

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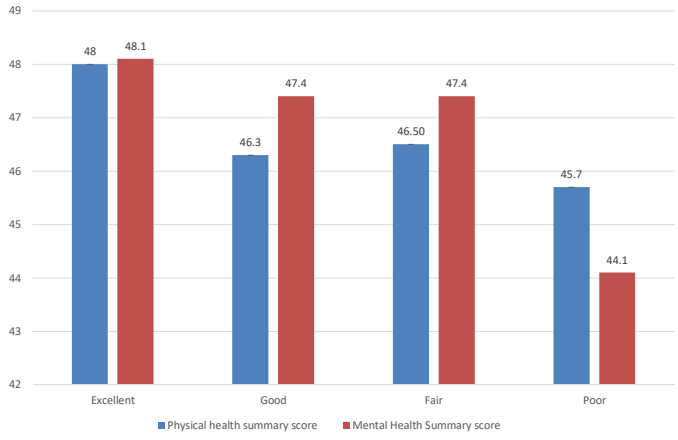
Diet quality index according to mental and physical health in elderly breast cancer survivors



Wayne, S.J., Baumgartner, K., Baumgartner, R.N., Bernstein, L., Bowen, D.J., and Ballard-Barbash, R. (2006). Diet quality is directly associated with quality of life in breast cancer survivors. Breast Cancer Research and Treatment 96, 227–232.

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	Description of high score	Excellent diet quality Adjusted Mean (SE)	Poor Diet Quality Adjusted Mean (SE)	*p*-value
Physical health sub-scales				
Physical functioning	Able to perform physical activities without limitations due to health	45.5 (0.9)	42.4 (1.3)	0.02
Role – Physical	No problems with work or other daily activities as a result of physical health	44.4 (1.4)	40.5 (1.9)	0.07
Bodily pain	No pain or limitations due to pain	52.7 (1.0)	48.9 (1.3)	0.01
General health	Evaluates personal health as excellent	49.1 (0.9)	47.8 (1.3)	0.33
Mental health sub-scales				
Vitality	Feels full of pep and energy	50.2 (1.0)	47.8 (1.4)	0.10
Social functioning	Performs normal social activities without interference due to physical or emotional problems	47.7 (1.0)	44.9 (1.3)	0.05
Role – Emotional	No problems with work or other daily activities as a result of emotional problems	41.9 (1.6)	36.1 (2.2)	0.02
Mental health	Feels peaceful, happy, and calm	51.5 (0.9)	47.8 (1.2)	0.01

Scores are adjusted for age, body mass index, race/ethnicity, stage of disease, education, and time between diagnosis and SF-36 questionnaire.

Wayne, S.J., Baumgartner, K., Baumgartner, R.N., Bernstein, L., Bowen, D.J., and Ballard-Barbash, R. (2006). Diet quality is directly associated with quality of life in breast cancer survivors. Breast Cancer Research and Treatment 96, 227–232.

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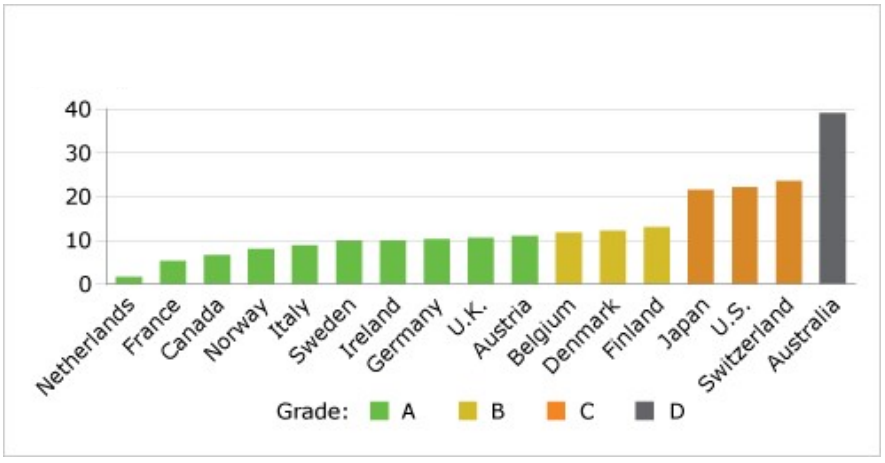
Poverty rates among elderly people 2000-2010 (%)



Source: The Conference Board of Canada

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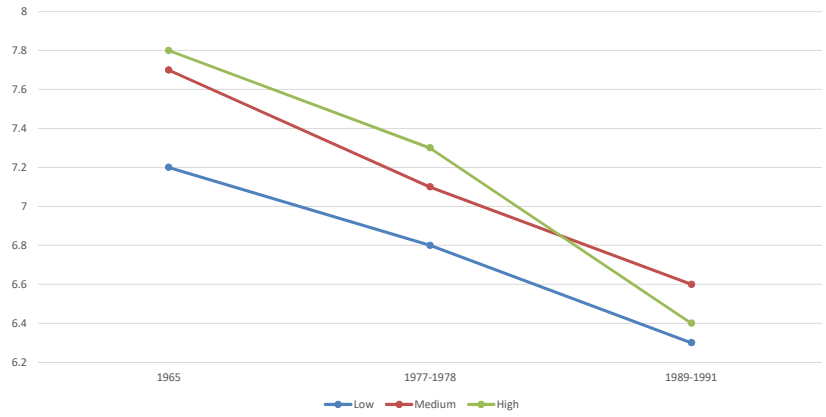
Socio-Economic Status and Diet quality (Diet Quality Index)



Popkin, B.M., Siega-Riz, A.M., and Haines, P.S. (1996). A comparison of dietary trends among racial and socioeconomic groups in the United States. New England Journal of Medicine *335*, 716–720.

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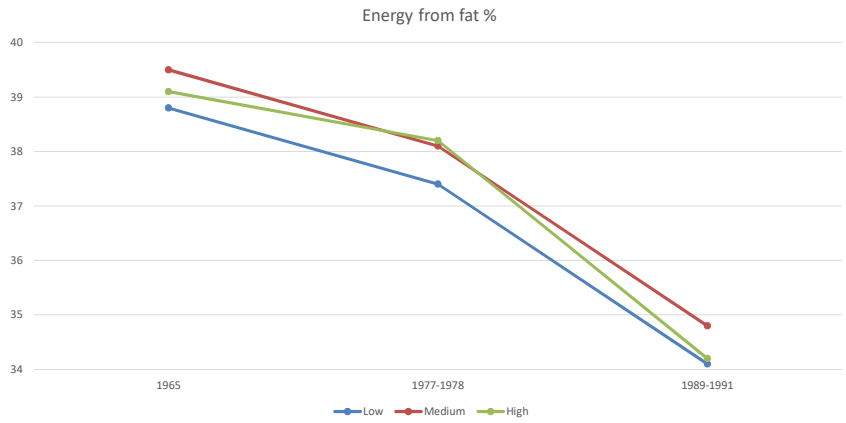
Energy intake from fat according with socio-economic status



Popkin, B.M., Siega-Riz, A.M., and Haines, P.S. (1996). A comparison of dietary trends among racial and socioeconomic groups in the United States. New England Journal of Medicine *335*, 716–720.

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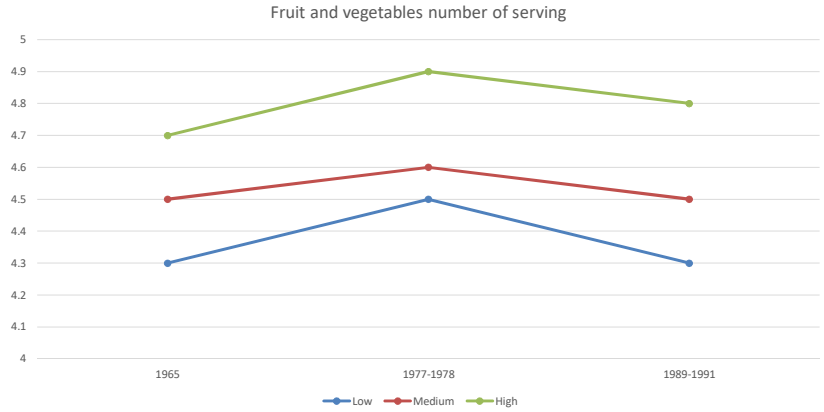
Fruit and vegetables intake according with socio-economic status



Popkin, B.M., Siega-Riz, A.M., and Haines, P.S. (1996). A comparison of dietary trends among racial and socioeconomic groups in the United States. New England Journal of Medicine *335*, 716–720.

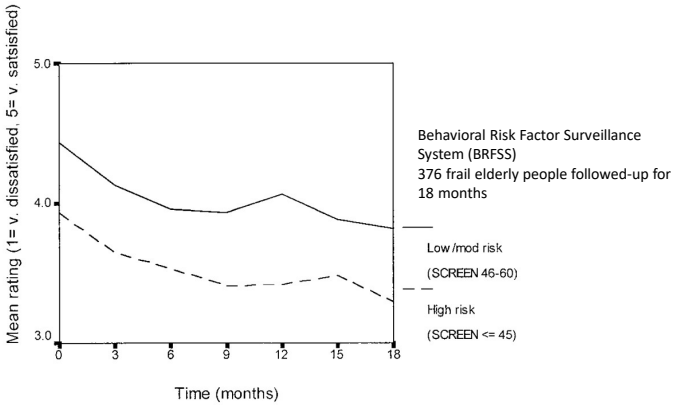
Table 5. Longitudinal association between baseline total diet score and 5-year incidence of impaired instrumental activities of daily living (IADL) and basic activities of daily living (BADL) in the Blue Mountains Eye Study from 2002 to 2004 to 2007 to 2009 (N=895)

	Impaired IADL (n=173) Odds Ratio (95% CI)		Impaired BADL (n=101) Odds Ratio (95% CI)	
	No. of cases/at risk	Multivariable-adjusted[a]	No. of cases/at risk	Multivariable-adjusted[a]
Total diet score				
First quartile (≤8.77)	53/151	1.0 (reference)	22/185	1.0 (reference)
Second quartile (8.80-10.23)	42/164	0.64 (0.37-1.11)	26/197	1.02 (0.53-1.95)
Third quartile (10.25-11.70)	34/152	0.55 (0.31-0.98)	23/187	1.03 (0.53-2.00)
Fourth quartile (≥11.73)	44/170	0.50 (0.28-0.87)	30/197	1.33 (0.70-2.51)
P value for trend		0.03		0.41

[a]Multivariable logistic regression analyses was used to calculated odds ratio (95% CI) adjusted for age, sex, living alone, self-rated poor health, current smoker, hypertension, diabetes, hospital admissions during the past year, walking disability, and cognitive impairment.

Gopinath, B., Russell, J., Flood, V.M., Burlutsky, G., and Mitchell, P. (2014). Adherence to dietary guidelines positively affects quality of life and functional status of older adults. Journal of the Academy of Nutrition and Dietetics 114, 220–229.

Whole-life satisfaction over time by nutritional risk. SCREEN Seniors in the Community: Risk Evaluation for Eating and Nutrition.



Keller, H.H., Østbye, T., and Goy, R. (2004). Nutritional risk predicts quality of life in elderly community-living Canadians. The Journals of Gerontology Series A: Biological Sciences and Medical Sciences 59, M68–M74.

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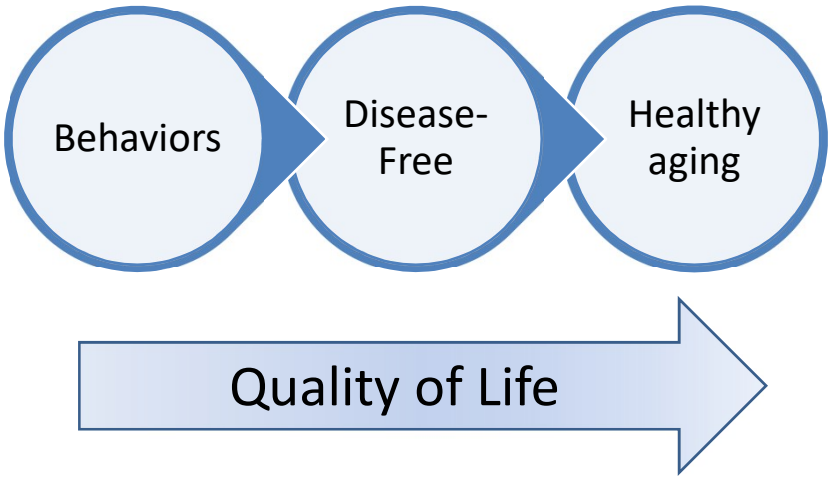

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Healthy aging

Healthy aging defined as maintenance of health at old age (being alive and remaining functionally independent) Haveman-Nies, 2003

Successful aging defined as remaining free of major, life-threatening disease and having normal physical and cognitive functioning Newman, 2003

Successful aging defined as survival to older age with a high level of well-being in domains of physical, mental, and social functioning Vaillant, 2001

Successful aging defined as sustained independent living in the community Ford, 2000

Aging successfully defined as living to an advanced old age and having little or no disability prior to death Leveille, 1999

Healthy aging defined as surviving to late life free of major life-threatening illnesses andmaintaining the ability to function physically and mentally. Reed, 1998

Successful aging defined as having minimal interruption of usual a functioning in basic activities and physical performance measures. Strawbridge, 1996

Healthy aging defined as surviving to late life with a high level of functioning Guralnik, 1989

Peel, N.M., McClure, R.J., and Bartlett, H.P. (2005). Behavioral determinants of healthy aging. American Journal of Preventive Medicine 28, 298–304.

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	Behavioral factor
Haveman-Nies 2009	Physical Activity
	Dietary Quality
	Smoking
Newman, 2003	Smoking
	Physical Activity
Vaillant, 2001	Smoking
	Alcohol abuse
	Regular exercise
	BMI
Ford, 2000	Smoking
	Alcohol abuse
	Exercise
Leveeille, 1999	Smoking
	Alcohol abuse
	Activity level
	BMI
Reed, 1998	Smoking
	Physical Activity
	BMI
	Diet Score
Strawbridge, 1996	Smoking
	Alcohol abuse
	Exercise
Guralnik, 1989	Smoking
	Alcohol abuse
	Weight
	Eating habits
	Sleep

Peel, N.M., McClure, R.J., and Bartlett, H.P. (2005). Behavioral determinants of healthy aging. American Journal of Preventive Medicine 28, 298–304.

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TABLE 2 HR and 95% CI for the MDS, HDS, and RFS and all-cause mortality among adults aged ≥65 y[1]

		Model 1[2]			Model 2[3]			Model 3[4]		
	n	HR	95% CI	*P*-trend	HR	95% CI	*P*-trend	HR	95% CI	*P*-trend
MDS										
Q1	337	1.00		0.001	1.00		0.007	1.00		0.006
Q2	230	1.05	(0.86, 1.28)		1.05	(0.86, 1.28)		1.04	(0.85, 1.27)	
Q3	194	0.71	(0.57, 0.89)		0.77	(0.62, 0.97)		0.77	(0.61, 0.97)	
Q4	211	0.75	(0.60, 0.95)		0.78	(0.62, 0.98)		0.78	(0.62, 0.98)	
RFS[5]										
Q1	371	1.00		<0.001			0.001			0.001
Q2	224	0.87	(0.72, 1.07)		0.90	(0.74, 1.10)		0.90	(0.74, 1.10)	
Q3	190	0.72	(0.58, 0.91)		0.76	(0.61, 0.96)		0.76	(0.61, 0.96)	
Q4	187	0.62	(0.48, 0.79)		0.68	(0.53, 0.87)		0.67	(0.52, 0.86)	
RFS (median)[6]										
Q1	278	1.00		<0.001	1.00		0.003	1.00		0.003
Q2	319	0.75	(0.62, 0.92)		0.78	(0.64, 0.95)		0.78	(0.64, 0.94)	
Q3	203	0.80	(0.64, 1.00)		0.86	(0.68, 1.08)		0.85	(0.68, 1.07)	
Q4	172	0.58	(0.45, 0.76)		0.64	(0.49, 0.83)		0.63	(0.48, 0.83)	
HDS										
Q1	348	1.00		0.6	1.00		0.9	1.00		0.8
Q2	230	1.07	(0.87, 1.30)		1.09	(0.89, 1.34)		1.10	(0.90, 1.35)	
Q3	190	0.96	(0.77, 1.19)		0.98	(0.79, 1.22)		0.98	(0.79, 1.22)	
Q4	204	0.95	(0.76, 1.19)		1.00	(0.80, 1.25)		0.99	(0.79, 1.24)	

[1] HDS, Healthy Diet Score; MDS, Mediterranean Diet Score; RFS, Recommended Food Score.

McNaughton, S.A., Bates, C.J., and Mishra, G.D. (2012). Diet quality is associated with all-cause mortality in adults aged 65 years and older. The Journal of Nutrition 142, 320–325.

The Three-City Study on nutrition and mortality in the elderly

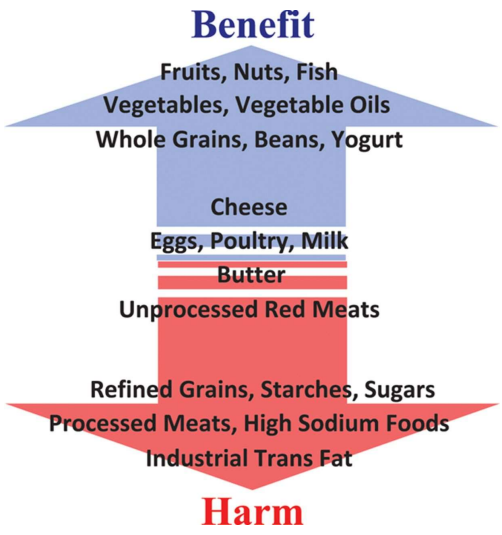
	Alive (*n* 6921) (77 %)		Dead (*n* 2016) (23 %)	
	n	%	*n*	%
At least 1 fruit and 1 vegetable, cooked or raw/d	2782	40	663	33
Cooked fruits/vegetables: ≥4–6 servings/week	6162	89	1715	85
Meat: ≥1 serving/d	1689	24	558	28
Fish: ≥2 servings/week	3569	52	923	46
Diversity diet score ≥4	4986	72	1371	68
Olive oil use				
None	1543	23	644	32
Moderate	2768	40	755	37
Intensive	2610	38	617	31
Different fats >3	1523	22	345	17
Caffeine (mg/d)				
<250	4781	69	1489	74
250–375	1441	21	370	18
>375	699	10	157	8
Self-rated diet quality				
Bad	589	9	171	9
Good	6174	91	1790	91

	n	Crude	95 % CI	*P*	Model 1†	95 % CI	*P*	Model 2‡	95 % CI	*P*
At least 1 fruit and 1 vegetable, cooked or raw/d	8937	0·82	0·75, 0·90	***	0·84	0·77, 0·93	***	0·90	0·82, 0·99	*
Cooked fruits or vegetables: ≥4–6/week	8937	0·73	0·65, 0·83	***	0·78	0·69, 0·89	***	0·80	0·70, 0·90	***
Meat: ≥1 servings/d	8937	1·22	1·11, 1·34	***	1·16	1·05, 1·28	**	1·12	1·01, 1·24	*
Fish: ≥2 servings/week	8937	0·83	0·76, 0·91	***	0·87	0·80, 0·96	**	0·89	0·81, 0·97	**

Diet diversity	*n*	Crude	95 % CI	*P*	Model 1†	95 % CI	*P*	Model 2‡	95 % CI	*P*
Diversity diet score (4–5 *v.* 0–3)	8937	0·89	0·81, 0·98	*	0·90	0·82, 0·99	*	0·94	0·85, 1·04	NS
Various fats (>3 *v.* ≤3)	8937	0·84	0·75, 0·95	**	0·86	0·76, 0·97	*	0·90	0·80, 1·01	NS

Letois, F., Mura, T., Scali, J., Gutierrez, L.-A., Féart, C., and Berr, C. (2016). Nutrition and mortality in the elderly over 10 years of follow-up: the Three-City study. British Journal of Nutrition 116, 882–889.

Evidence-based dietary priorities for cardiometabolic health.



Dariush Mozaffarian Circulation. 2016;133:187-225

American Heart Association.

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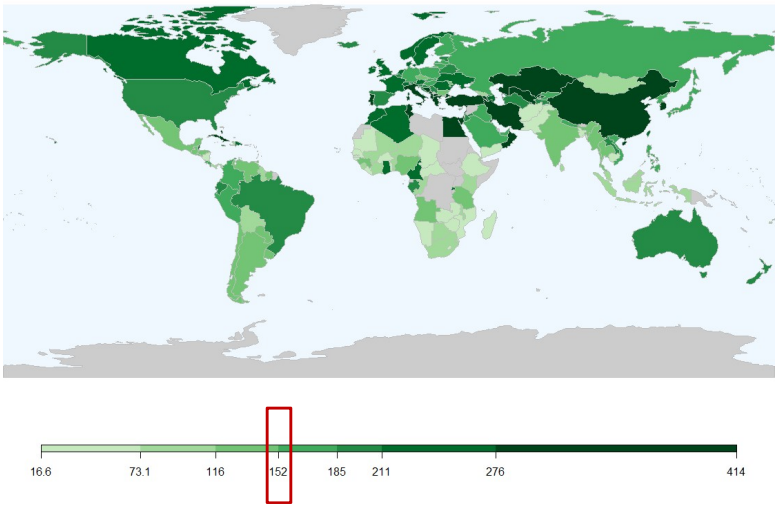
Per capita fruit and vegetables consumption (Kg) in 2010



WHO recommended Fruit/vegetable yearly intake (Kg)

Source: Helgi library (2010). Data are in Kg per capita on the year

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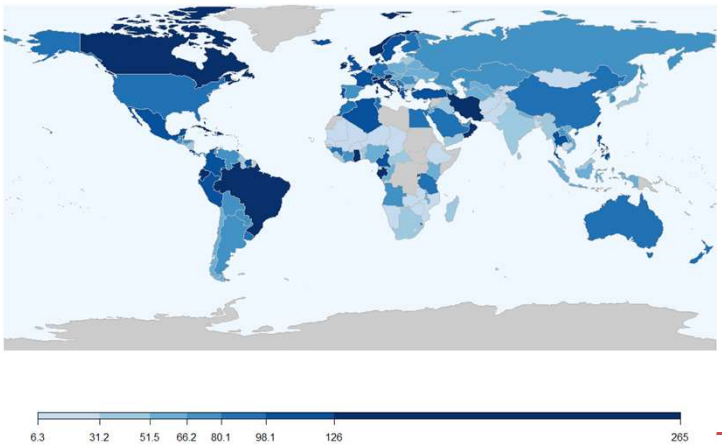
Yearly per capita fruit consumption (Kg)



Source: Helgi library (2010). Data are in Kg per capita on the year

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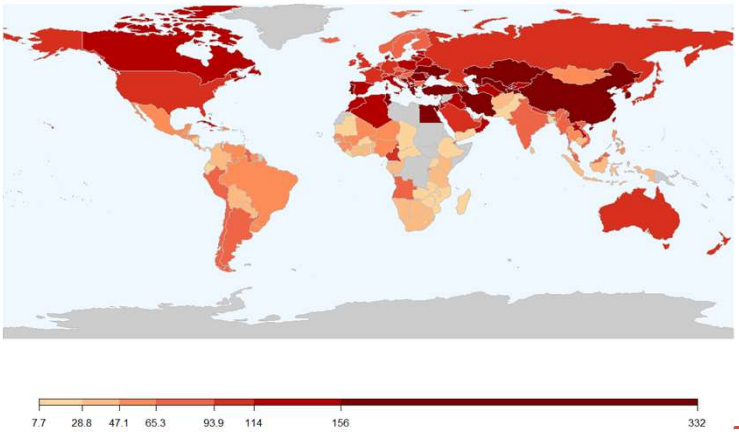
Yearly per capita vegetables consumption (Kg)



Source: Helgi library (2010). Data are in Kg per capita on the year

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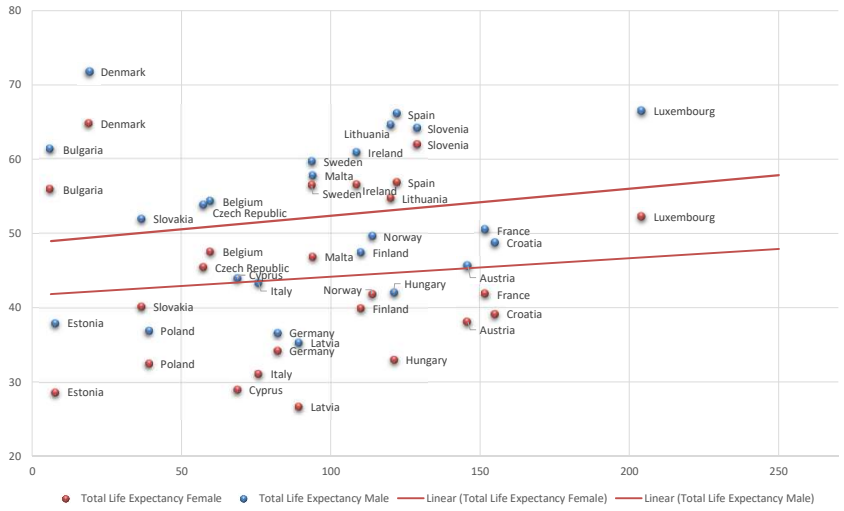
Total life expectation according with fruit consumption

Life expectancy above 65 years as % of total life expectancy



Source: Helgi library (2010). Data are in Kg per capita on the year

Total life expectation according with vegetables consumption

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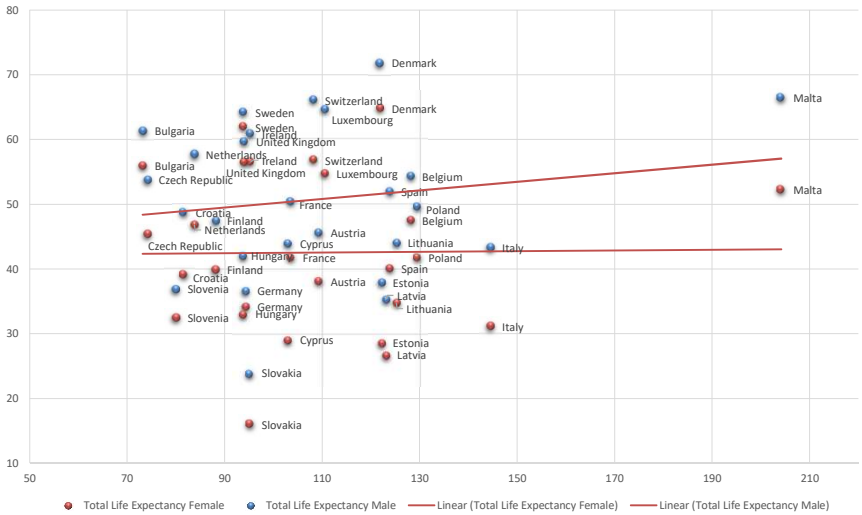
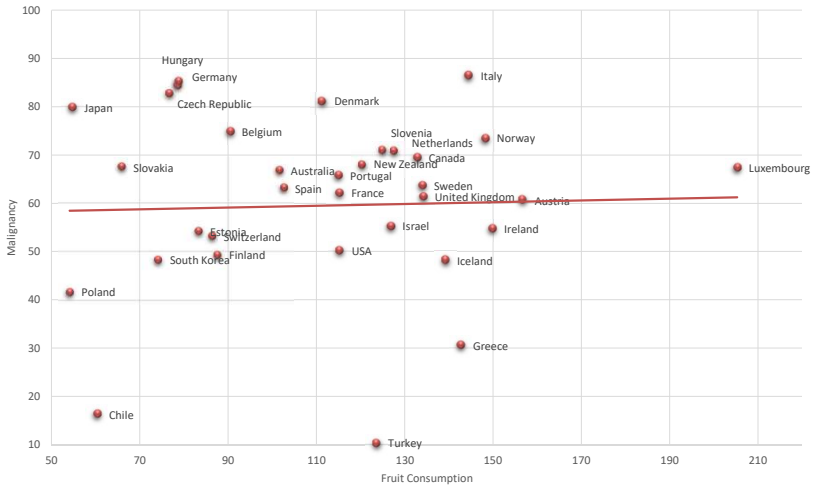


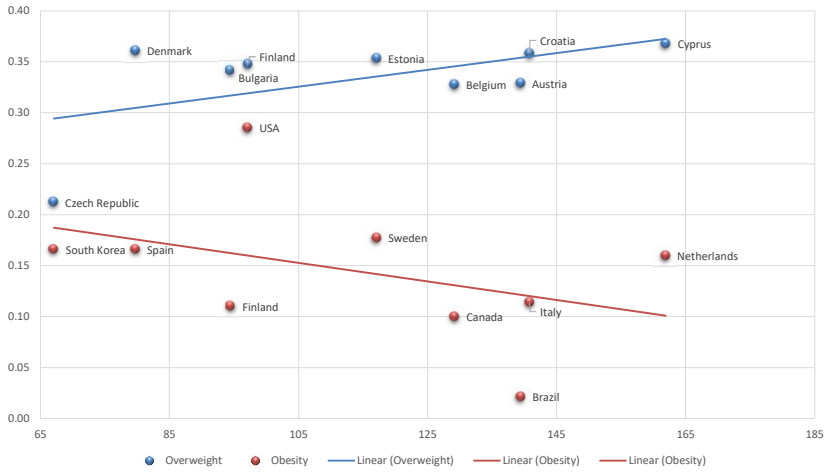
Source: Helgi library (2010). Data are in Kg per capita on the year

Incidence of colorectal neoplasm according with fruit consumption



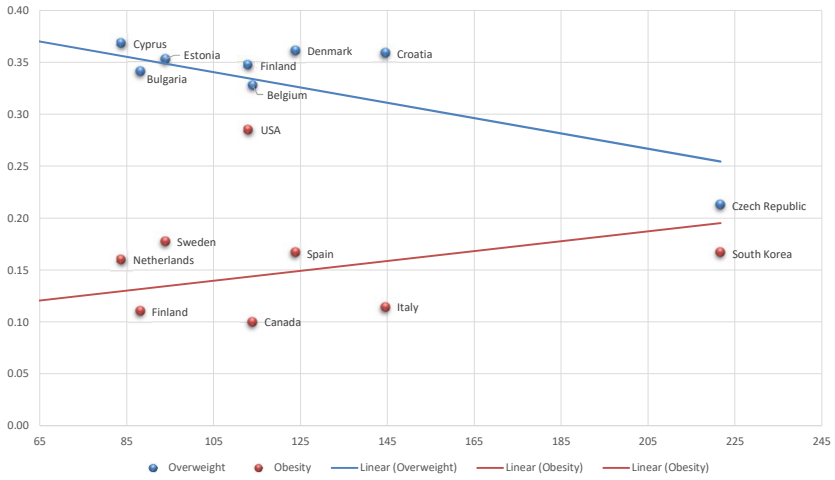
Source: Helgi library (2010). Data are in Kg per capita on the year

Prevalence of self-reported overweight/obesity according with fruit consumption



Source: Helgi library (2010). Data are in Kg per capita on the year

Prevalence of self-reported overweight/obesity according with vegetables consumption



Source: Helgi library (2010). Data are in Kg per capita on the year

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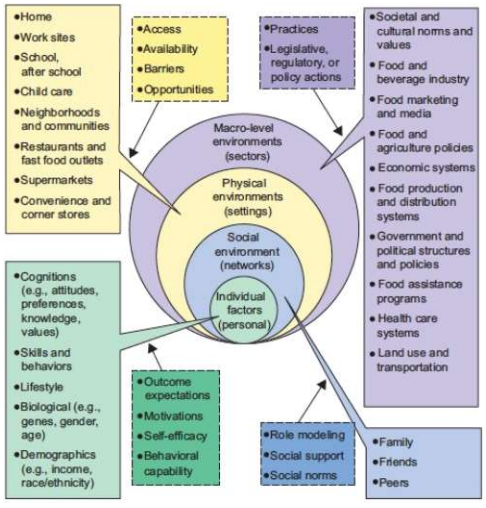
An ecological framework depicting multiple influences on what people eat



Story et al. Annu Rev Public Health 2008;29:253-272 (4)

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How to fill the gap: the case of supplementation

Fruits and vegetables provide a wide variety of different micronutrients and bioactive compounds with a risk-reducing effect both in morbidity and mortality.

Nowadays, population intake levels of fruits and vegetables are suboptimal

Supplementation can be viewed as a nutrition-improvement approach transversal to the environmental and behavioral factors

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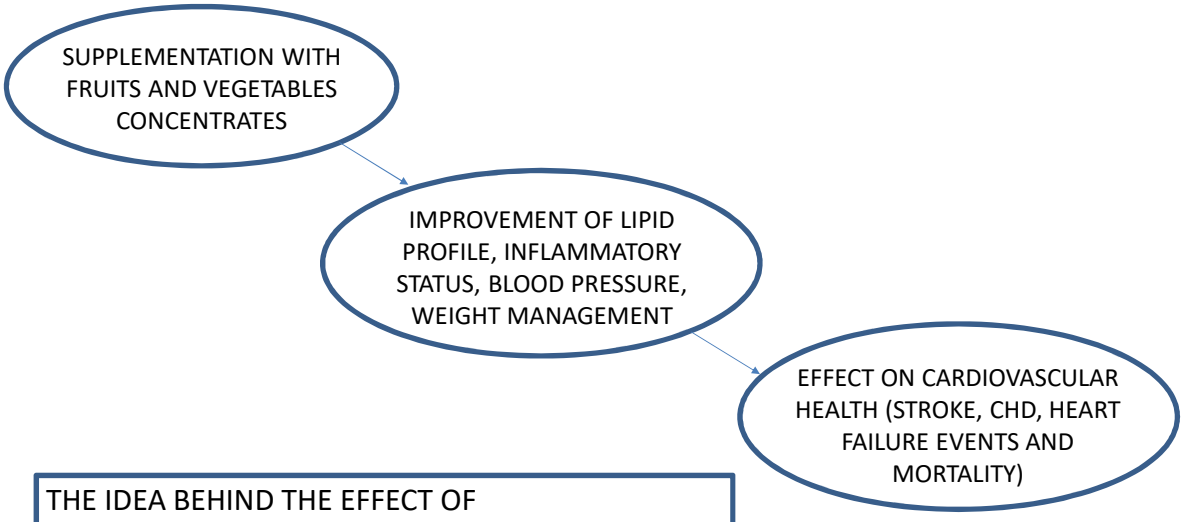

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Supplementation Type	Effect of supplementation of biological parameters	Effect of changes in biological parameters (resulting from the supplementation) on cardiovascular diseases and deaths
Orange juice	Total Cholesterol (TC)	Stroke
	Low Densisty Lipoprotein (LDL cholesterol)	Coronary Heart Disease (CHD) events and deaths
Artichoke Leaf Juice	Total Cholesterol (TC)	Stroke
	Sistolic Blood Pressure (SBP)	Coronary Heart Disease (CHD), Stroke, Heart Failure (HF), Major Adverse Cardiovascular Events (MACE)
Cherry juice	C-Reactive Protein (CRP)	Stroke
Juice powder concentrates (Juice Plus+®)	Total Cholesterol (TC)	Stroke
	Tumor Necrosis Factor (TNFα)	Coronary Heart Disease (CHD), Stroke
	Homocystein (HCY)	Coronary Heart Disease (CHD), Cardiovascular deaths

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EFFECT OF SUPPLEMENTATION WITH F&V CONCENTRATES ON TOTAL CHOLESTEROL (TC)

Author	Concentrate Type	Study Design	Mean effect size	Unit
Novembrino C. et al, 2011 [1]	Juice powder concentrates* (Juice Plus+®)	RCT	-20.9	mg/dL
Cesar TB. et al, 2010 [2]	Orange juice	RCT	-27	mg/dL
Roghani-Dehkord F. et al, 2009 [3]	Artichoke Leaf Juice	RCT	-22.7	mg/dL

*bilberry, blackberry, black currant, blueberry, cranberry, elderberry, grape (Concord), raspberry, and red currant

1. Novembrino C, Cighetti G, De Giuseppe R *et al.* Effects of encapsulated fruit and vegetable juice powder concentrates on oxidative status in heavy smokers. *Journal of the American College of Nutrition.* Vol 30. 2011:49-56

2. Cesar TB, Aptekmann NP, Araujo MP *et al.* Orange juice decreases low-density lipoprotein cholesterol in hypercholesterolemic subjects and improves lipid transfer to high-density lipoprotein in normal and hypercholesterolemic subjects. *Nutrition research (New York, NY).* Vol 30. 2010/11/09 ed2010:689-694

3. Roghani-Dehkordi F, Kamkhah AF. Artichoke leaf juice contains antihypertensive effect in patients with mild hypertension. *Journal of Dietary Supplements.* Vol 6 2009:328-341

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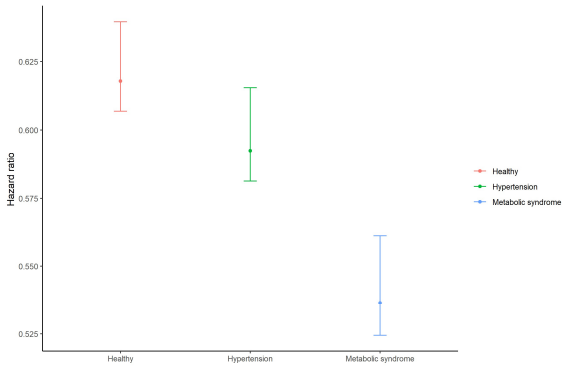
EFFECT OF TC REDUCTION (RESULTING FROM F&V SUPPLEMENTATION) ON STROKE

1% reduction of TC predicts a 0.8% RRR of stroke*



* Effect reported in: De Caterina, Raffaele, et al. "Cholesterol-lowering interventions and stroke: insights from a meta-analysis of randomized controlled trials." *Journal of the American College of Cardiology* 55.3 (2010): 198-211

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EFFECT OF SUPPLEMENTATION WITH F&V CONCENTRATES ON LOW DENSITY LIPOPROTEIN (LDL)

Author	Follow-up (days)	Concentrate Type	Dose	Study design	Mean effect size	Unit
Cesar TB. et al, 2010	60	Orange juice	1 bottle (900 ml) per week)	RCT	-24	mg/dL

Cesar TB, Aptekmann NP, Araujo MP *et al.* Orange juice decreases low-density lipoprotein cholesterol in hypercholesterolemic subjects and improves lipid transfer to high-density lipoprotein in normal and hypercholesterolemic subjects. *Nutrition research (New York, NY).* Vol 30. 2010/11/09 ed2010:689-694

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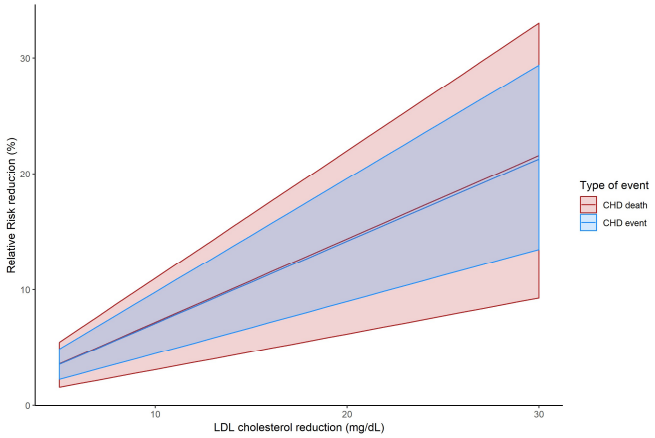
EFFECT OF LDL REDUCTION (RESULTING FROM ORANGE JUICE CONCENTRATE SUPPLEMENTATION) ON CHD EVENTS AND DEATHS

10 mg/dl reduction in LDL: 1) RRR of 7.2% (95% CI 3.1% to 11%) for CHD deaths 2) RRR of 7.1% (4.5% to 9.8%) for CHD events*



* Effect reported in: Briel M, Ferreira-Gonzalez I, You JJ *et al.* Association between change in high density lipoprotein cholesterol and cardiovascular disease morbidity and mortality: systematic review and meta-regression analysis. *Bmj.* Vol 338 2009:b92

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EFFECT OF SUPPLEMENTATION WITH F&V CONCENTRATES ON SISTOLIC BLOOD PRESSURE (SBP)

Author	Follow-up (days)	Concentrate Type	Dose	Study design	Mean effect size	Unit
Roghani-Dehkord F. et al, 2009	84	Artichoke Leaf Juice	100 mg twice a day	RCT	-2.96	mmHg

Roghani-Dehkordi F, Kamkhah AF. Artichoke leaf juice contains antihypertensive effect in patients with mild hypertension. *Journal of Dietary Supplements.* Vol 6 2009:328-341

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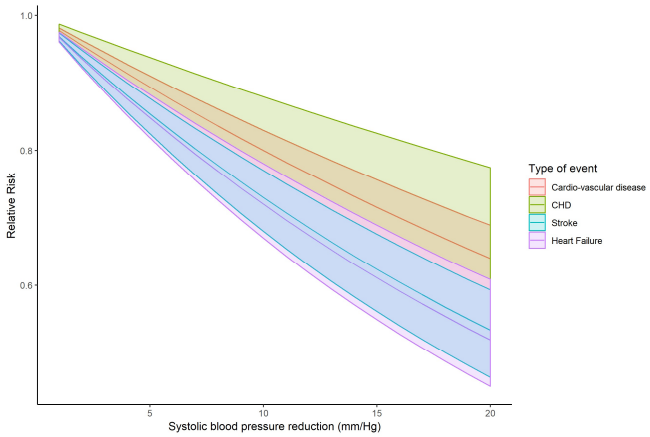
EFFECT OF SBP REDUCTION (RESULTING FROM ARTICHOKE LEAF JUICE SUPPLEMENTATION) ON CHD, STROKE, HF, and MACE

10 mmHg reduction in SBP: 1) RR of 0.80 (95% CI 0.77–0.83) for MACE 2) RR of 0.83 (95% CI 0.78–0.88) for CHD 3) RR of 0.73 (95% CI 0.68–0.77) for stroke 3) RR of 0.72 (95% CI 0.67-0.78) for HF*



* Effect reported in: Ettehad D, Emdin CA, Kiran A *et al.* Blood pressure lowering for prevention of cardiovascular disease and death: a systematic review and meta-analysis. *The Lancet.* Vol 387 2016:957-967

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EFFECT OF SUPPLEMENTATION WITH F&V CONCENTRATES ON *TUMOR NECROSIS FACTOR* (TNFα)

Author	Follow-up (days)	Concentrate Type	Dose	Study design	Mean effect size	Unit
Lamprecht M. et al, 2013	56	Juice powder concentrates* (Juice Plus+®)	6 capsules per week	RCT	-10.98	pg/ml

* Acerola cherry, apple, bilberry, blackberry, black currant, blueberry, beetroot, broccoli, cabbage, carrot, Concord grape, cranberry, elderberry, kale, orange, peach, papaya, parsley, pineapple, raspberry, red currant, spinach and tomato

Lamprecht M, Obermayer G, Steinbauer K *et al.* Supplementation with a juice powder concentrate and exercise decrease oxidation and inflammation, and improve the microcirculation in obese women: randomised controlled trial data. *The British journal of nutrition.* Vol 110. 2013/04/18 ed2013:1685-1695

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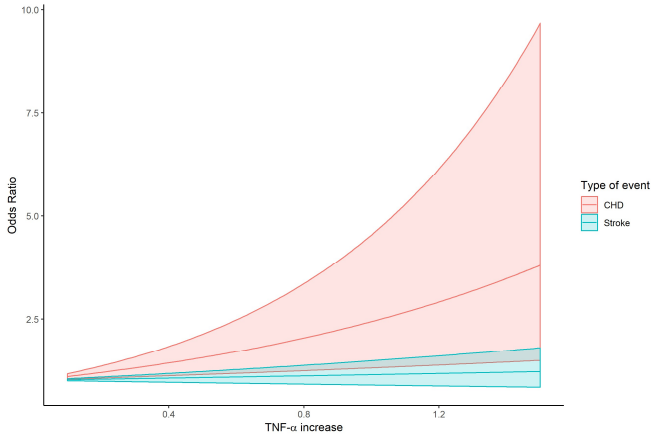
EFFECT OF TNFα ON CHD AND STROKE

* 0.668 pg/ml increase in TNFα: 1) OR of 1.81 (95% CI 1.19-2.74) for stroke 2) HR of 1.09 (95% 0.92-1.30) for CHD



* Effect reported in: Dong L, Hou R, Xu Y *et al.* Analyzing the correlation between the level of serum markers and ischemic cerebral vascular disease by multiple parameters. *Computational and mathematical methods in medicine*
Kaptoge S, Seshasai SR, Gao P *et al.* Inflammatory cytokines and risk of coronary heart disease: new prospective study and updated meta-analysis. *European heart journal.* Vol 35. 2013/09/13 ed2014:578-589

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EFFECT OF SUPPLEMENTATION WITH F&V CONCENTRATES ON HOMOCYSTEIN (HCY)

Author	Follow-up (days)	Concentrate Type	Dose	Study design	Mean effect size	Unit
Panunzio MF. et al, 2003	28	Juice powder concentrates* (Juice Plus+®)	4 capsules per day (2 made of fruit extract and 2 made of vegetables extract)	RCT	-4.76	µmol/L

* Fruit: apples, oranges, pineapples, blueberries, peaches and papaya
Vegetables: carrots, parsley, beet-root, broccoli, black cauliflower, cabbage, spinach and tomato

Panunzio MF, Pisano A, Antoniciello A *et al.* Supplementation with fruit and vegetable concentrate decreases plasma homocysteine levels in a dietary controlled trial. *Nutrition Research.* Vol 23 2003:1221-1228

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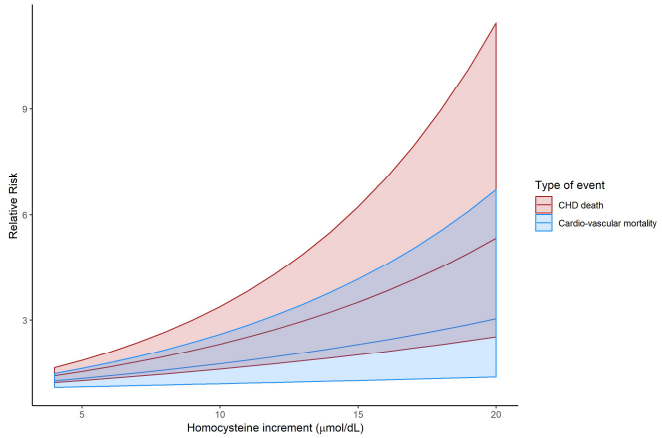
EFFECT OF HCY ON CHD AND CARDIOVASCULAR DEATHS

5 µmol/L increase in HCY: 1) RR 1.52 (95% 1.26–1.84) for CHD 2) RR of 1.32 (95% CI 1.08–1.61) for cardiovascular deaths*



* Effect reported in: Peng H-y, Man C-f, Xu J *et al.* Elevated homocysteine levels and risk of cardiovascular and all-cause mortality: a meta-analysis of prospective studies. *Journal of Zhejiang University Science B.* Vol 16 2015:78-86

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EFFECT OF SUPPLEMENTATION WITH F&V CONCENTRATES ON C-REACTIVE PROTEIN (CRP)

Author	Follow-up (days)	Concentrate Type	Dose	Study design	Mean effect size	Unit
Lynn A. et al, 2014	42	Cherry juice	30 ml per day	RCT	-0.12	mg/L

Lynn A, Mathew S, Moore CT *et al.* Effect of a Tart Cherry Juice Supplement on Arterial Stiffness and Inflammation in Healthy Adults: A Randomised Controlled Trial. *Plant Foods for Human Nutrition.* Vol 69 2014:122-127

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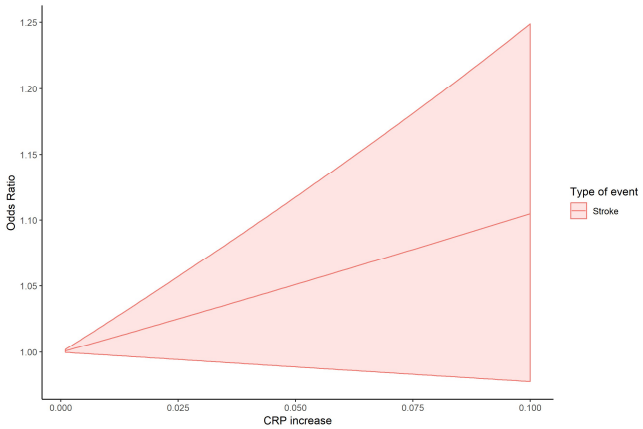
EFFECT OF CRP ON STROKE

* 0.066 increase in CRP: 1) OR of 1.06 (0.98-0.15) for stroke



* Effect reported in: Dong L, Hou R, Xu Y *et al.* Analyzing the correlation between the level of serum markers and ischemic cerebral vascular disease by multiple parameters. *Computational and mathematical methods in medicine*

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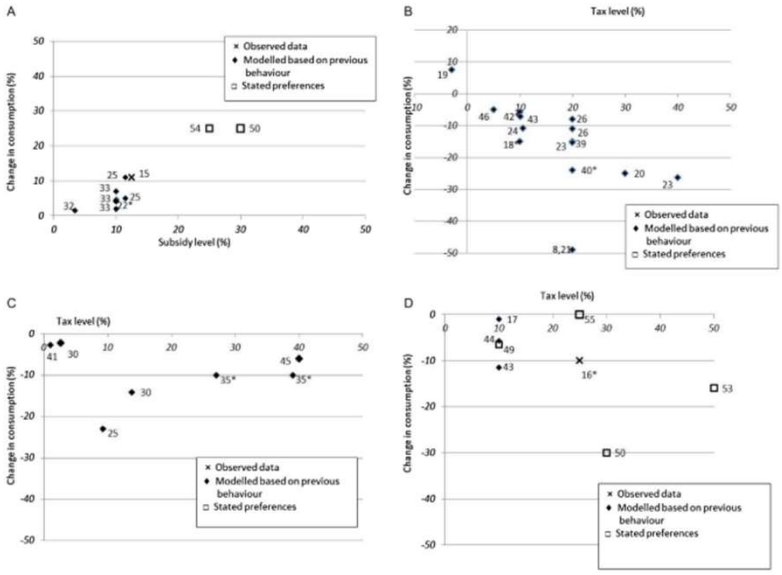

A systematic review of the effectiveness of food taxes and subsidies to improve diets: Understanding the recent evidence. Nutr Rev. 2014;72(9):551-565. doi:10.1111/nure.12123

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Fortification: the case of folates

- Folate was first identified as an important nutrient in preventing neural tube defects (NTDs), such as anencephaly and spina bifida, based on observational data from the United Kingdom in the 1970s
- Subsequent case-control studies in the 1980s suggested that women who supplemented with folate before pregnancy had a reduced risk of giving birth to infants with NTDs than those who did not.
- Randomized trials of folate supplementation confirmed this association.
- Calls began for government action with commentators proposing several strategies including the promotion of increased fruit and vegetable consumption, recommendation of supplementation to reproductive-aged women, and fortification.
- In 1996, the FDA authorized the enrichment of grain products with folate at the rate of 0.14 mg per 100-g flour, with mandatory compliance by 1998.
- Fortification had a dramatic effect, leading to a 19% reduction in incident NTDs in just 5 y.

Honein, M.A., Paulozzi, L.J., Mathews, T., Erickson, J.D., and Wong, L.-Y.C. (2001). Impact of folic acid fortification of the US food supply on the occurrence of neural tube defects. Jama 285, 2981–2986.

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Final remarks

- Research on nutrition and quality of life at population level is increasing
- Quality of life is an important part, together with disease-free living, of healthy aging
- Proper nutrition is heterogeneous in elderly people
- Fostering vitamin consumption via fruit and vegetables is mandatory
- Supplementation might be a cost-effective solution to overcome behavioral obstacles
- Subsidies for positive habits vs. taxation on negative approaches to nutrition

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THANK YOU!

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Alessia Buratin
Matteo Martinato

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