The Mediterranean Diet: Definition and Validation

Edwin Cox, M.D.

OLLI Symposia

May 14, 2019

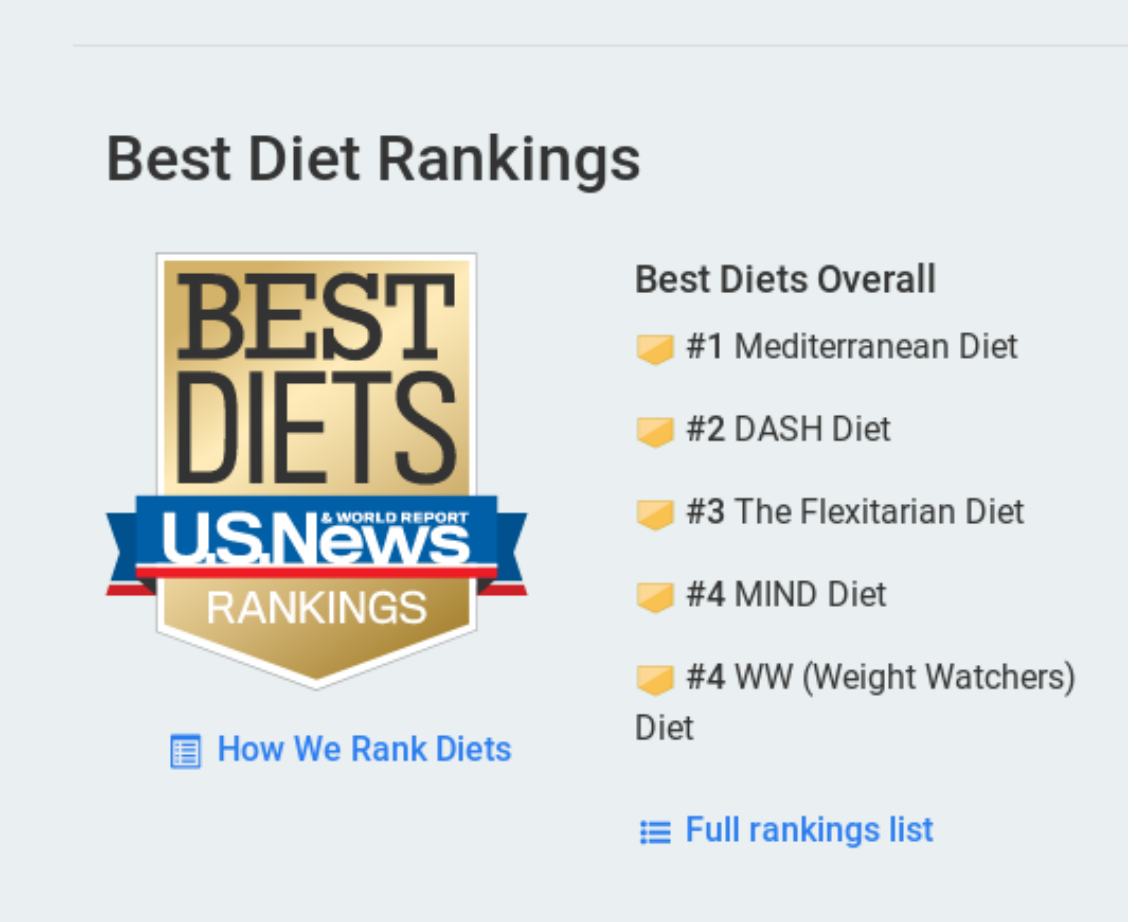
Refining the Med Diet

Use the Med Diet as the foundation of the ideal healthy diet

Use research findings to understand the value of Med Diet components

Explore opportunities to improve upon the Med Diet

Why emphasize the Med Diet? It's the current gold standard!



The Mediterranean Diet

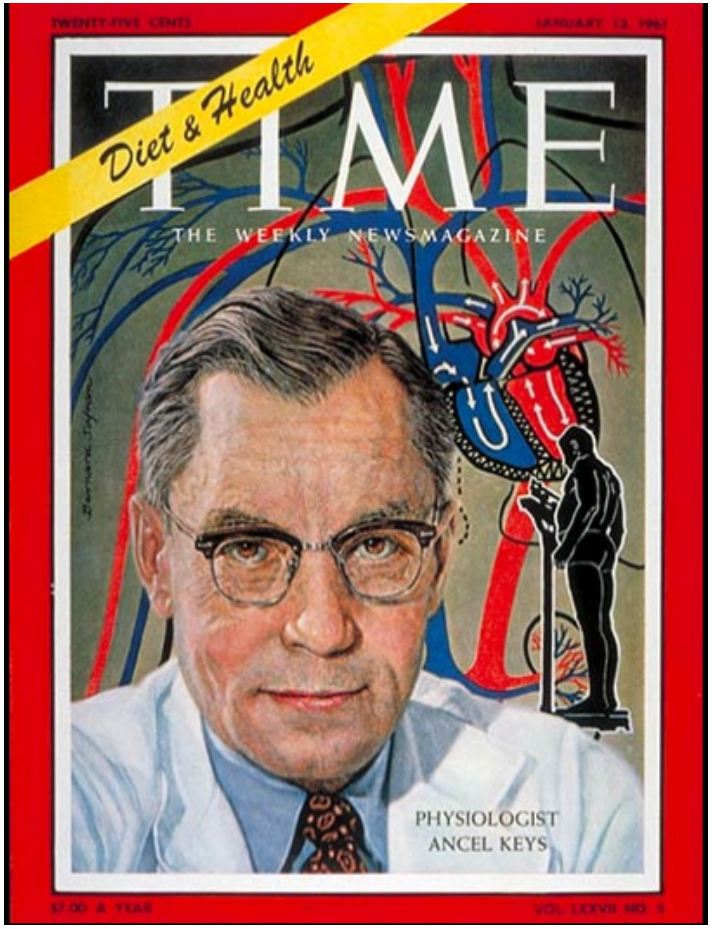
Unique Distinction

- The only major diet whose effectiveness has been demonstrated in controlled trials
- In subjects with a first heart attack, rate of additional cardiac events reduced (secondary prevention of coronary heart disease - CHD)
- In subjects at high risk of CHD (diabetes, smoking, hypertension, elevated LDL-C, decreased HDL-C, obese, family history of premature CHD), rate of CHD events reduced

The Mediterranean Diet

Origins

- Ancel Keys observed exceptional longevity and low rate of CHD in southern Italy – 1950s
- Related differing rates of CHD to differences in cholesterol levels
- Further related cholesterol levels to diet, in particular saturated fat content
- Advocated for changes in dietary fat consumption, away from saturated fats (meat & dairy) toward mono- and polyunsaturated fats (vegetable oil, fish, nuts), and limit total to 30% of fuel
- Promoted increased consumption of vegetables, fruits, nuts, legumes, seafood



OLDWAYS
HEALTH THROUGH HERITAGE

Mediterranean Diet Pyramid

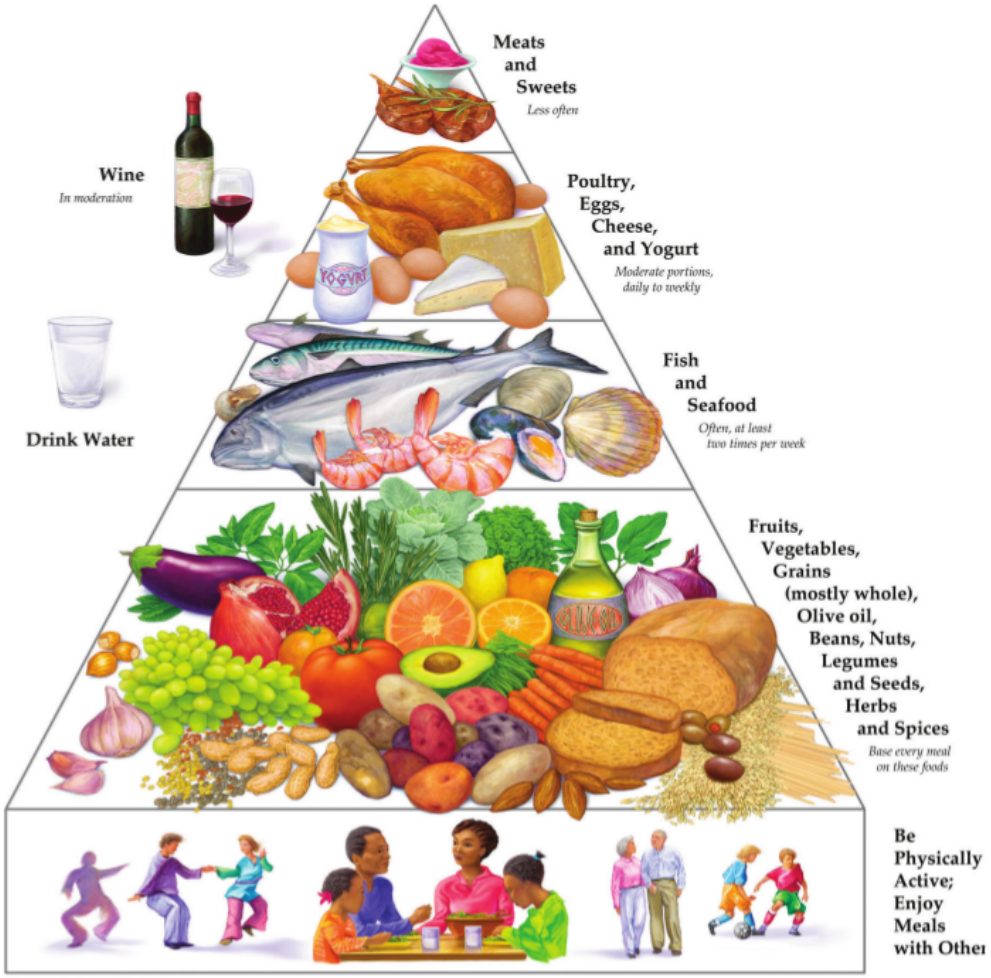


Illustration by George Middleton

www.oldwayspt.org

OLDWAYS MEDITERRANEAN FOODS ALLIANCE

Mediterranean Diet

Food	Goal
Mediterranean diet	
Recommended	
Olive oil*	≥4 tbsp/day
Tree nuts and peanuts†	≥3 servings/wk
Fresh fruits	≥3 servings/day
Vegetables	≥2 servings/day
Fish (especially fatty fish), seafood	≥3 servings/wk
Legumes	≥3 servings/wk
Sofrito‡	≥2 servings/wk
White meat	Instead of red meat
Wine with meals (optionally, only for habitual drinkers)	≥7 glasses/wk
Discouraged	
Soda drinks	<1 drink/day
Commercial bakery goods, sweets, and pastries§	<3 servings/wk
Spread fats	<1 serving/day
Red and processed meats	<1 serving/day

Sofrito, Soffritto, Mirepoix

A sauce used as a base in southern Italian cooking

Aromatic ingredients minced and sauteed in oil

- Typically celery, onions, carrots
- Garlic, paprika, peppers, tomatoes common
- Cooked in olive oil or butter

Also found, with variations, in French, Spanish, Portugese and Latin American cuisine

nutrients

Review

Definition of the Mediterranean Diet: A Literature Review

Courtney Davis [1,†], Janet Bryan [2,†], Jonathan Hodgson [3,†] and Karen Murphy [1,†,*]

Received: 14 October 2015 ; Accepted: 30 October 2015 ; Published: 5 November 2015

Med Diet issues

Originally defined from observing traditional practices in Mediterranean region

- Food growth, harvest, preparation, presentation, social environment; choice of foods

"Modernized" by incorporating Western food practices and results from nutrition research

- Is something vital gained - or lost - in translation?

Defining Med Diet

Authors reviewed three diet pyramids

- Oldway's Preservation and Trust
- Mediterranean Diet Foundation
- Greek Dietary Guidelines

Reviewed 12 observation studies of traditional eating patterns

- Greek – 5
- Spanish – 4
- Italian – 3

Reviewed three intervention studies

Food or food group as found in Med Diet

Grains (aka *cereals*)

- 305 g / day (range: 145-488)
- 7.5 serves/day
- Mostly bread
- Whole grain emphasized
- Major source of fiber

Food or food group as found in Med Diet

Olive oil

- 44 g/day (range: 20-68)
- 400 Calories (18% of total)
- Monounsaturated fatty acid – oleic acid
- Rich in polyphenols with anti-oxidant properties

Food or food group as found in Med Diet

Vegetables

- 374 g/day (range: 210-682)
- 5 servings/day
- Important source of micronutrients
- Have high percent water content and little caloric value

Food or food group as found in Med Diet

Fruits and nuts

- 268 g/day (range: 76-393)
- 1.5 servings/day
- Fruits have high percentage of water
- Some have considerable sugar, balanced by substantial fiber content

Food or food group as found in Med Diet

Fish

- 50 g/day (range: 26-100)
- 3.5 servings/week
- Oily, non-oily and shellfish
- Source of long-chain omega-3 fatty acids

Food or food group as found in Med Diet

Dairy

- 213 g/day (range: 48-398)
- Cheese 21 g/day (range: 12-32)
- 1 serve/day

Food or food group as found in Med Diet

Potatoes

- 125 g/day (range: 43-300)
- No standard serving definition

Food or food group as found in Med Diet

Meat

- 105 g/day (range: 29-190)
- One serving every other day
- Red meat vs white meat not distinguished

Nutrients as found in Med Diet

Protein: 15% of calories

Fat: 37% of calories

Carbohydrates: 43% of calories

Fiber: 31 g/day

Med Diet - Summary

Olive oil: Every meal, main added fat

Bread and cereals: Every meal, 6-8 serves/d

Vegetables: Every meal, 6 serves/d

Fruits: 3 serves/d

Nuts: 3-6 serves/wk

Fish: 2-5 serves/wk

Poultry: 2-4 serves/wk

Legumes: 2-4 serves/wk

Eggs: 2-4 serves/wk

Dairy: 2 serves/d

Red meat: Sparing, <2 serves/wk

Sweets: Sparing, <2 serves/wk

Red wine: Daily, in moderation, if acceptable

Food as medicine: the Lyon Study

Mediterranean Diet, Traditional Risk Factors, and the Rate of Cardiovascular Complications After Myocardial Infarction

Final Report of the Lyon Diet Heart Study

Michel de Lorgeril, MD; Patricia Salen, BSc; Jean-Louis Martin, PhD; Isabelle Monjaud, BSc; Jacques Delaye, MD; Nicole Mamelle, PhD

de Lorgeril Circulation 1999

Mediterranean Diet randomized clinical trial (RCT)

Lyon Diet Heart Study

- Patients surviving a first MI, age < 70, clinically stable
- Allocated to one of two diets
  - Mediterranean diet
  - "Prudent" diet, as advised by personal MD
  - 423 patients accessioned from 1988-92
  - Well-matched on all pertinent risk factors
- Lyon, France

Lyon Diet Heart Study

Outcomes Studied

- Composite 1 (CO1): MI or CVD death
- Composite 2 (CO2): MI, CVD death, or major secondary event (e.g., unstable angina)
- Composite 3 (CO3): CO2, or minor secondary event

Lyon Diet Heart Study

Intermediate Analysis 1993

- Highly significant difference between groups favoring experimental group
- Scientific Committee of Study decided to terminate the trial

Final Analysis

- Based on mean follow-up of ~4 years

Lyon Diet Heart Study

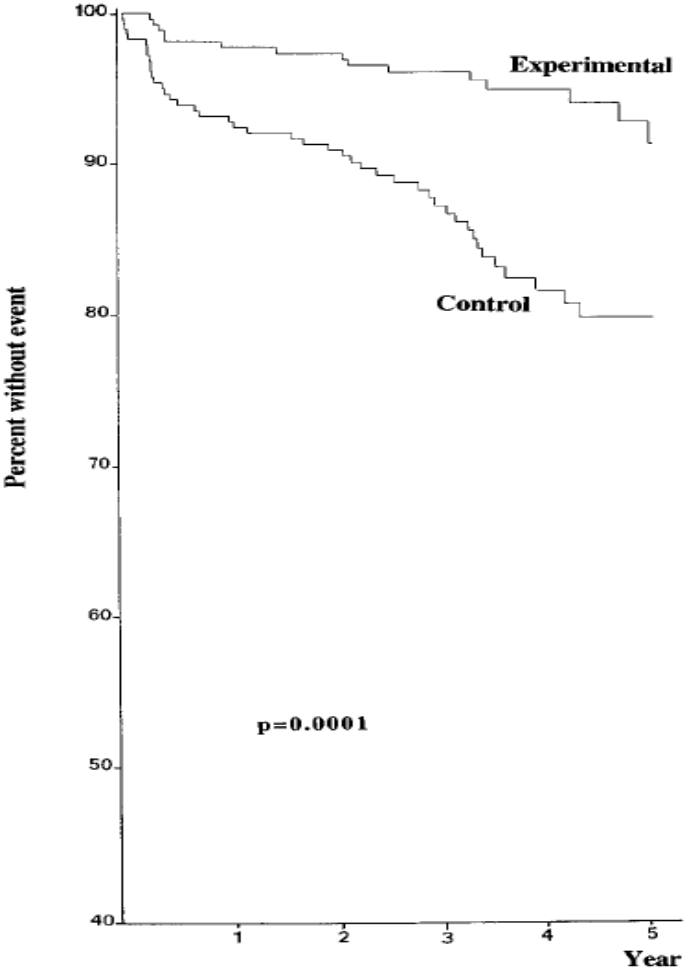


Figure 1. Cumulative survival without nonfatal myocardial infarction (CO 1) among experimental (Mediterranean group) patients and control subjects.

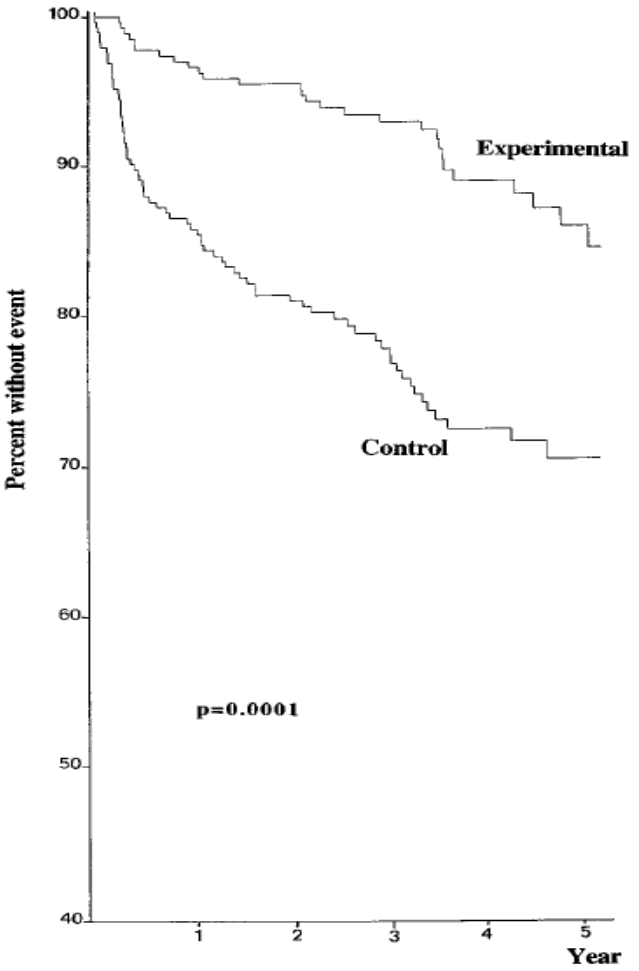


Figure 2. Cumulative survival without nonfatal infarction and without major secondary end points (CO 2).

Lyon Diet Heart Study

Results

- Cardiac deaths: 6:19 (MedDiet:Control)
- Non-fatal MI: 8:25 " "
- 72% reduction in CO1
- 67% reduction in CO2
- 47% reduction in CO3
- P < 0.0002, except cardiac death p=0.01

Mediterranean Diet - PREDIMED

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 APRIL 4, 2013 VOL. 368 NO. 14

Primary Prevention of Cardiovascular Disease with a Mediterranean Diet

Ramón Estruch, M.D., Ph.D., Emilio Ros, M.D., Ph.D., Jordi Salas-Salvadó, M.D., Ph.D., Maria-Isabel Covas, D.Pharm., Ph.D., Dolores Corella, D.Pharm., Ph.D., Fernando Arós, M.D., Ph.D., Enrique Gómez-Gracia, M.D., Ph.D., Valentina Ruiz-Gutiérrez, Ph.D., Miquel Fiol, M.D., Ph.D., José Lapetra, M.D., Ph.D., Rosa Maria Lamuela-Raventos, D.Pharm., Ph.D., Lluís Serra-Majem, M.D., Ph.D., Xavier Pintó, M.D., Ph.D., Josep Basora, M.D., Ph.D., Miguel Angel Muñoz, M.D., Ph.D., José V. Sorlí, M.D., Ph.D., José Alfredo Martínez, D.Pharm, M.D., Ph.D., and Miguel Angel Martínez-González, M.D., Ph.D., for the PREDIMED Study Investigators*

Prevención con Dieta Mediterránea - Spain

PREDIMED

Primary prevention of cardiovascular events in high-risk subjects

- 7557 persons, age 55-80, 57% women, accessioned 2003-09
- No pre-existing CVD
- Type 2 diabetes mellitus or at least three of the following:
  - smoking,
  - hypertension,
  - elevated LDL-C,
  - low HDL-C,
  - overweight or obese,
  - family history of premature CHD.

PREDIMED

Intervention

- Two experimental groups, one control group
  - Mediterranean diet supplemented with extra-virgin olive oil (EVOO) 50 g (~4 tbsp)
  - Mediterranean diet supplemented with nut (30 g, ½ walnuts, ¼ each almonds and hazelnuts)
  - Control group: Low-fat diet, including low-fat dairy, lean fish & seafood, bread, potatoes, pasta, rice, fruits, vegetables, and discouraging vegetable oils, nuts, desserts, red meats, spread fats

PREDIMED – Control diet

Low-fat diet (control)	
Recommended	
Low-fat dairy products	≥3 servings/day
Bread, potatoes, pasta, rice	≥3 servings/day
Fresh fruits	≥3 servings/day
Vegetables	≥2 servings/wk
Lean fish and seafood	≥3 servings/wk
Discouraged	
Vegetable oils (including olive oil)	≤2 tbsp/day
Commercial bakery goods, sweets, and pastries§	≤1 serving/wk
Nuts and fried snacks	≤1 serving /wk
Red and processed fatty meats	≤1 serving/wk
Visible fat in meats and soups¶	Always remove
Fatty fish, seafood canned in oil	≤1 serving/wk
Spread fats	≤1 serving/wk
Sofrito‡	≤2 servings/wk

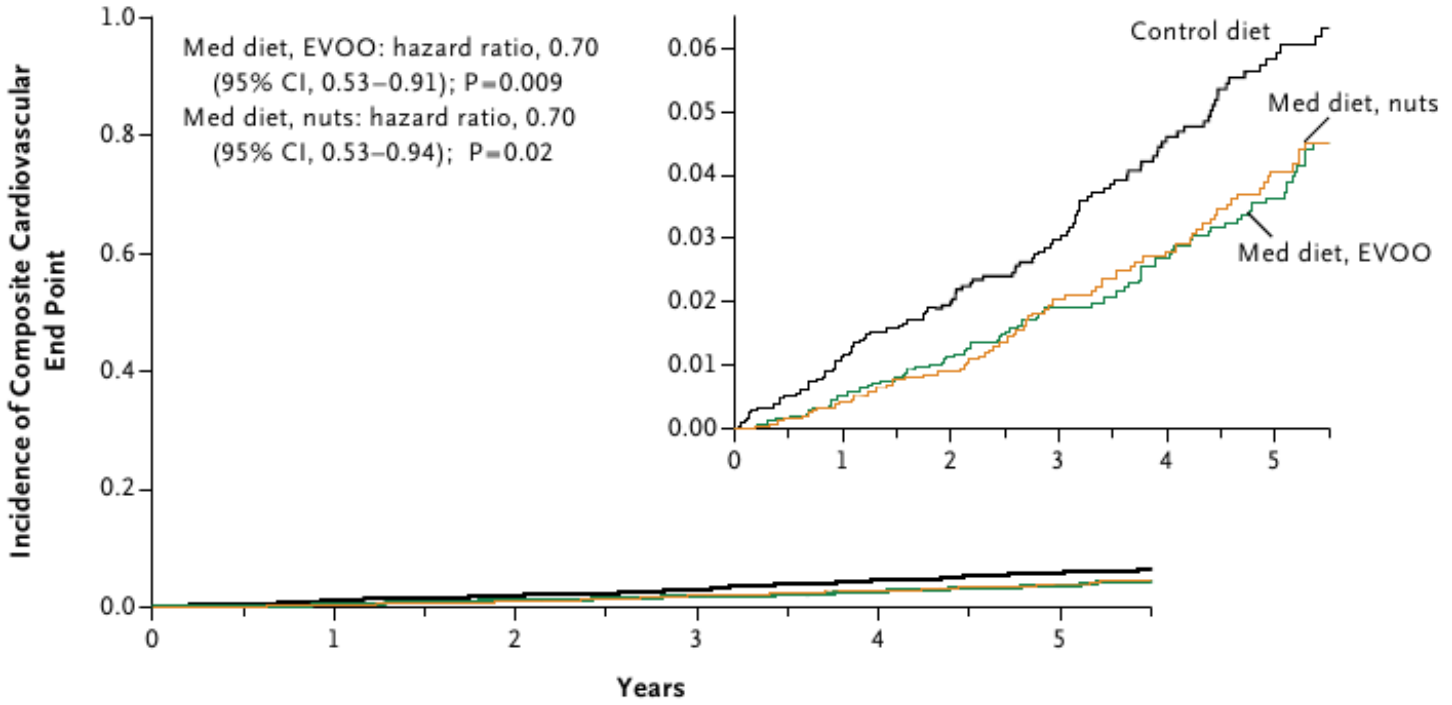
PREDIMED

Results

- Interim analyses after 2 years of follow-up
  - Stopping boundary reached 2011
- Median follow-up: 4.8 years
- Good adherence to diet: score 8.7/14
- Primary end point (MI or CVA or CVD death)
  - 8.1% : 8.0% : 11.2% (MedEVOO:MedNuts:Control)
  - RR 0.70 for both Med groups vs. Control ($p<0.01$)

PREDIMED

A **Primary End Point (acute myocardial infarction, stroke, or death from cardiovascular causes)**



No. at Risk

Control diet	2450	2268	2020	1583	1268	946
Med diet, EVOO	2543	2486	2320	1987	1687	1310
Med diet, nuts	2454	2343	2093	1657	1389	1031

Mediterranean Diet - Conclusions

People who have had their first MI, or who have not had CVD but have strong risk factors, may reduce their risk of having an MI or death from CHD by following a Mediterranean diet by comparison to following a low-fat diet

These conclusions were demonstrated in RCT; therefore, one may draw valid conclusions about causality

However, follow-ups are short in both Lyon Diet Heart Study and PREDIMED study; watch for future developments

Mediterranean Diet

Food	Goal
Mediterranean diet	
Recommended	
Olive oil*	≥4 tbsp/day
Tree nuts and peanuts†	≥3 servings/wk
Fresh fruits	≥3 servings/day
Vegetables	≥2 servings/day
Fish (especially fatty fish), seafood	≥3 servings/wk
Legumes	≥3 servings/wk
Sofrito‡	≥2 servings/wk
White meat	Instead of red meat
Wine with meals (optionally, only for habitual drinkers)	≥7 glasses/wk
Discouraged	
Soda drinks	<1 drink/day
Commercial bakery goods, sweets, and pastries§	<3 servings/wk
Spread fats	<1 serving/day
Red and processed meats	<1 serving/day

Survival analysis

Area of statistical analysis

Duration of time until an event happens

- Death
- Onset of disease
- Relapse from remission
- Industrial - Failure of component

Developed for life insurance

- Rate individuals, set premiums
- Base predictions on risk factors (BP, smoking)

Survival analysis - example

Mortality in British physicians re: smoking

Conducted by UK epidemiologist Richard Doll

Study included 35,000 male doctors

Study began 1948, last follow-up 2000

25,000 died, 5,000 remained alive, 4,000 withdrew

Cohort: Doctors aged 30-39

Doctors born 1921-1930: 7,385

1,713 never smoked up to age at entry

- 51 had died by age 50 (3.0%)
- Average annual mortality = 3.0%/15 yr = 0.2%/yr (2.0/1000/yr)

2,252 currently smoked at entry

- 158 had died by age 50 (7.0%)
- Average annual mortality = 7.0%/15 yr = 0.48%/yr (4.8/1000/yr)

3,420 former smokers

- Excluded from analysis

Mortality rates and ratios

Mortality rates

- Current smokers: 4.8/1000/yr
- Never smokers: 2.0/1000/yr

Mortality ratio (AKA relative risk, risk ratio, hazard ratio)

- MR = RR = HR = 4.8/2.0 = 2.4
- RR > 1: factor has adverse effect on mortality
- RR < 1: factor has beneficial effect on mortality
- RR = 1: factor has no effect on mortality

Interpretation

- "Current smokers at age 35 die 2.4 times as fast in the next 15 years compared to never-smokers"
- "Current smokers have 140% higher mortality rate than never-smokers"

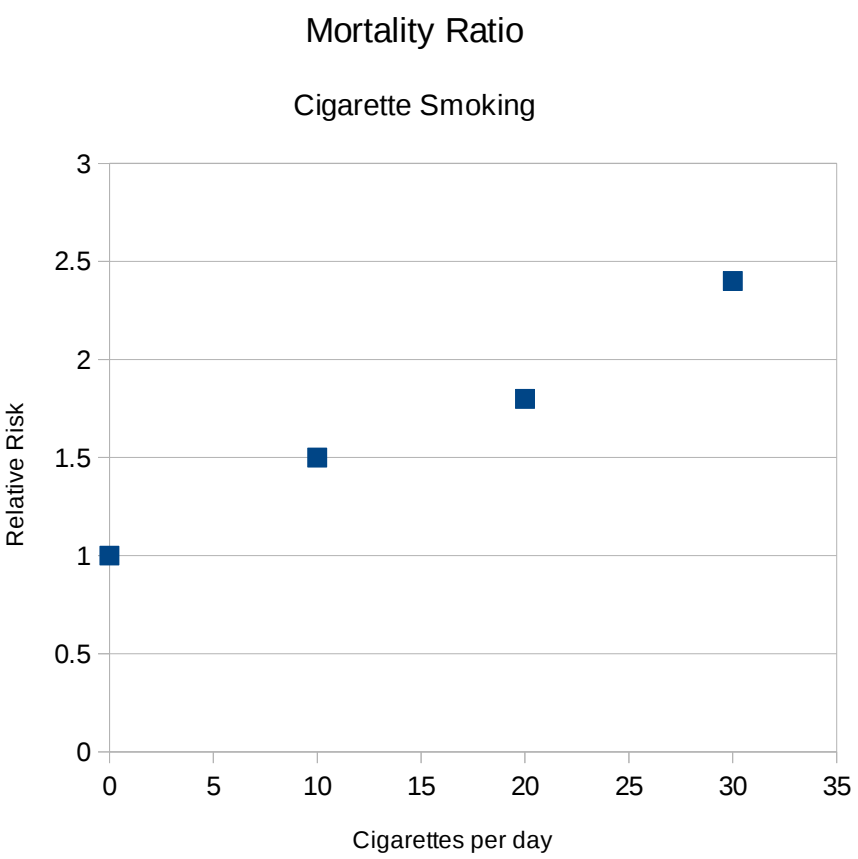
Dose-response: Smoking

Addressing the question: "Is smoking all-or-none, or does the harm increase with dose (number of cigarettes smoked per day)?"

Reference (comparison) is non-smokers

Cigarettes/day	0	1-14	15-24	>24
Mortality rate	19	29	35	45
Mortality ratio	1.0	1.5	1.8	2.4

Dose-response analysis: graphical



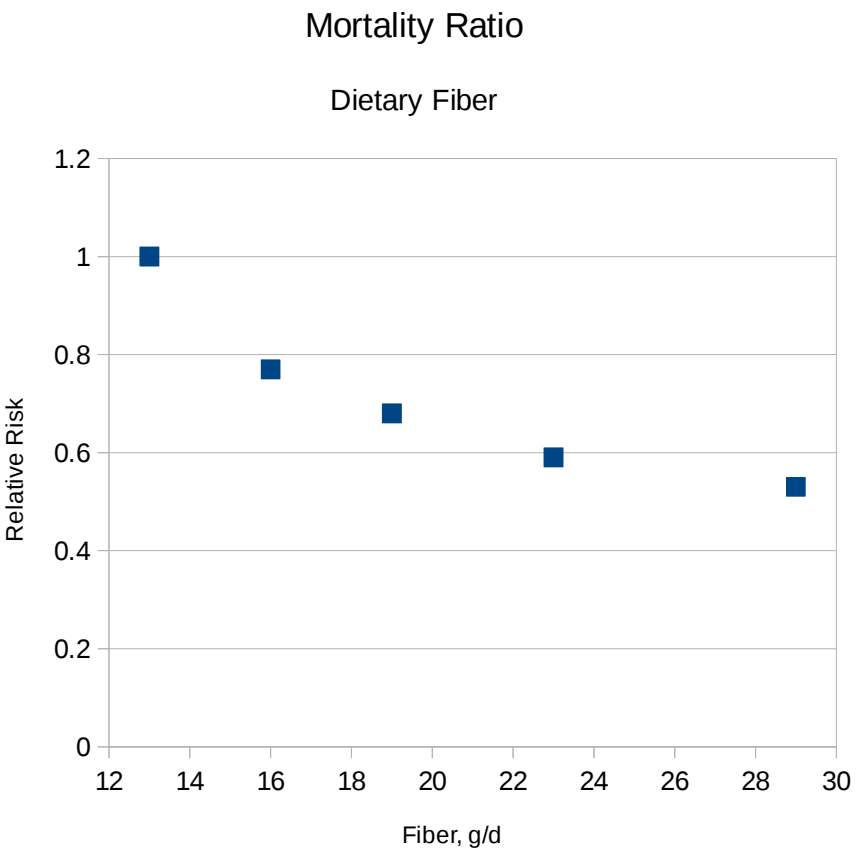
How does outcome (mortality, disease incidence) relate to level of exposure to factor?

Smoking has a direct (adverse) effect on mortality

Dose-response analysis

How does outcome (mortality, disease incidence) relate to level of exposure to factor?

Dietary fiber has a inverse (beneficial) effect on mortality



Mortality and dietary fiber

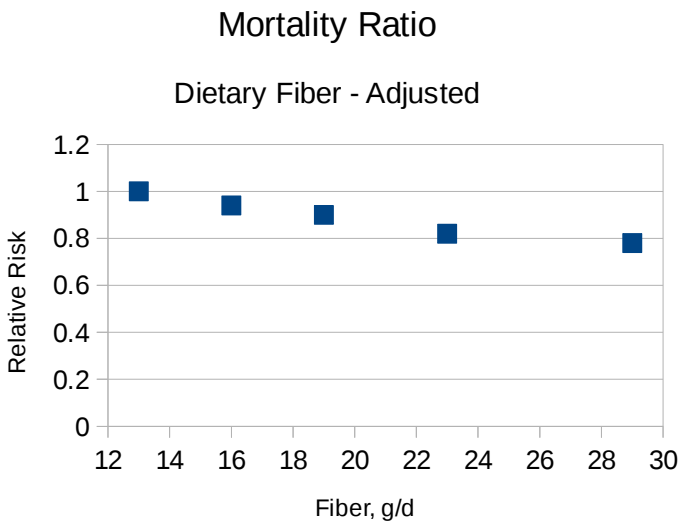
You can cut your mortality rate in half just by doubling your fiber intake?!?

But wait! Those eating less fiber are more likely to smoke cigarettes, are less likely to exercise, have higher body mass index, i.e., have additional risk factors

How do you take the effects of these co-factors into account?

- Multivariable statistical methods
- Proportional hazards survival analysis
- Multiple linear regression

Dose-response, adjusted for risk factors



Dietary fiber and mortality					
Quintile	1	2	3	4	5
Fiber, g/d	13	16	19	23	29
RR	1.00	0.77	0.68	0.59	0.53
Adjusted RR	1.00	0.94	0.90	0.82	0.78

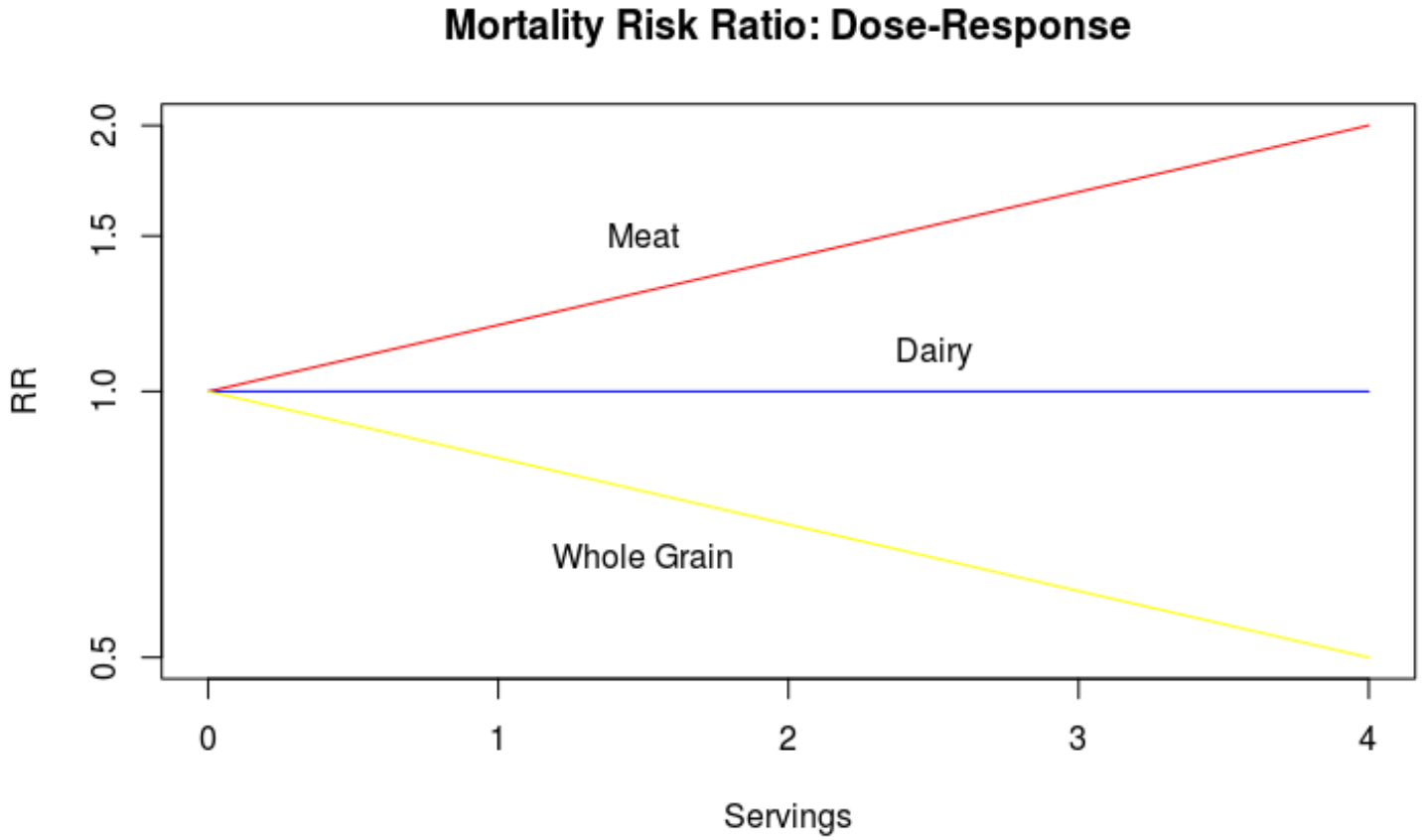
Multiple regression analysis

Estimates effect of main factor after taking effects of other co-factors into account

Fiber effect falls from 47% reduction in mortality to 22% after accounting for co-factors

Dose-response curve

Plotting mortality ratio vs. magnitude of the exposure

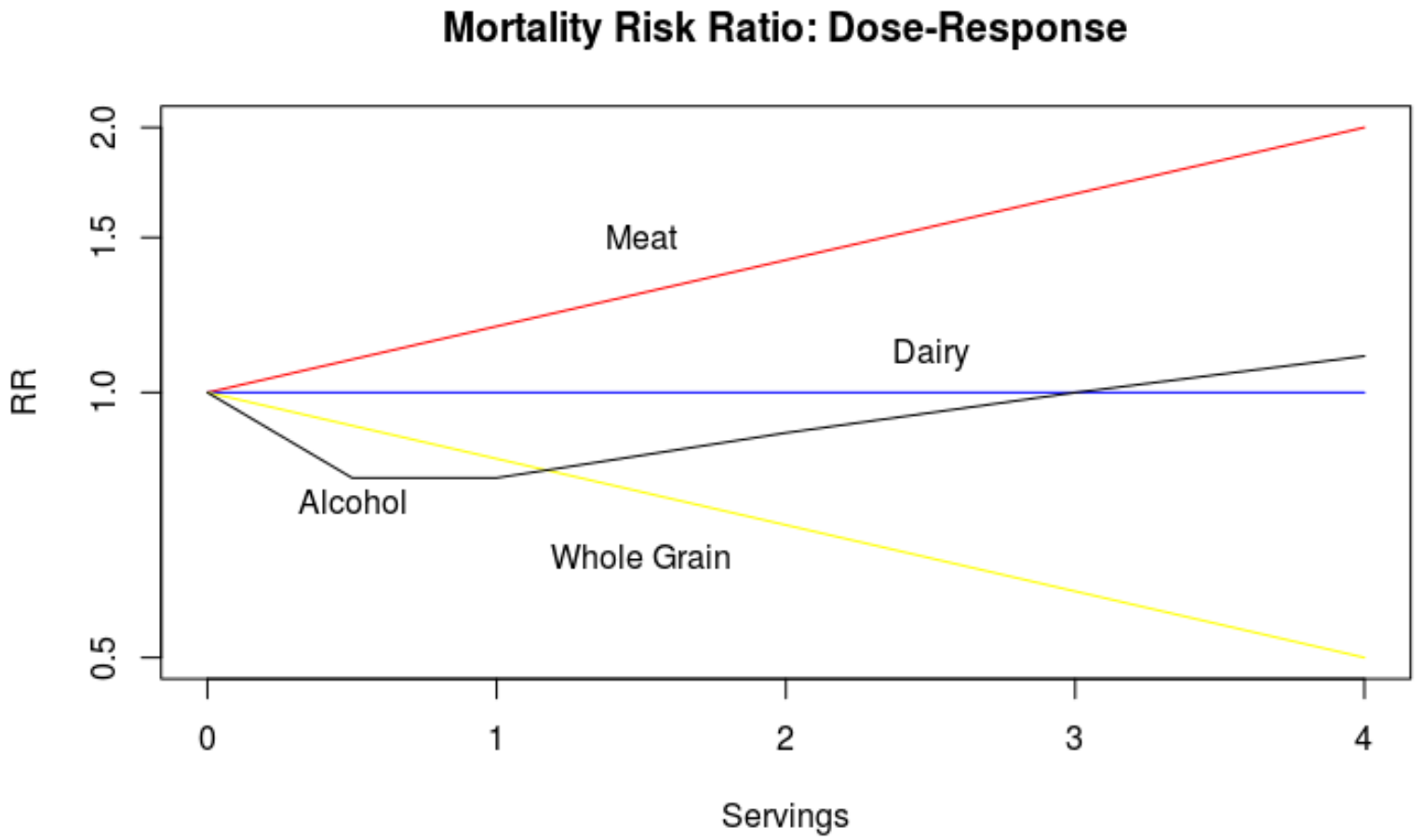


Dose-response curve

Rising D-R → higher risk of death; harmful

Falling D-R → lower risk of death; beneficial

U-shaped D-R → beneficial at low dose, but harm with increasing dose



Med Diet Pillar #1: Meat

Restrict meat – especially red meat – to two serves a week

Was this merely a reflection of scarcity of meat in that region?

- Salazar, dictator of Portugal, did not want the Med Diet linked to Portugal because it was typical of the diet of peasants
- If so, it was good fortune to be poor

As it happens...

Red meat kills!

Red meat kills

Regular beef and/or pork consumption is a lethal habit

- Multiple studies agree: eating more red meat = higher mortality
- Unprocessed and processed meats (bacon, lunch meats, hot dogs, etc) both convey risk

NIH-AARP Diet & Health Study

Mortality from different causes associated with meat, heme iron, nitrates, and nitrites in the NIH-AARP Diet and Health Study: population based cohort study

Arash Etemadi, Rashmi Sinha, Mary H Ward, Barry I Graubard, Maki Inoue-Choi, Sanford M Dawsey, Christian C Abnet

British Medical Journal, 2017

Meat & Mortality

NCI-AARP Diet & Health Study

- 1995 – Invitations sent to 3.5 million AARP members in six U.S. states
- 536,969 subjects (59% male, 41% female)
- Ages 50-71 at intake
- Predominantly white, more education than U.S. population, with fewer smokers, less fat and red meat, more fruits and vegetables consumed

NIH-AARP Study

Methods

- Prospective cohort – observational study
- FFQ 124 items, validated by 24 hr recall
- Meat intake categorized as total, processed, and unprocessed red meat
- White meat evaluated but will be presented separately
- 15 year follow-up with cause of death ascertainment
- Multivariate statistical analysis

NIH-AARP Meat and Mortality

Characteristics of NIH-AARP Diet and Health Study				
	Subjects	Deaths	Deaths CVD	Deaths Cancer
Males	316,505	84,848 (27%)		
Females	220,464	43,676 (20%)		
Total	536,969	128,524 (24%)	34,723	45,740

NIH-AARP Meat & Mortality

Table 1. All-cause Mortality vs. Daily Red Meat Consumption					
Quintile	1	2	3	4	5
Subjects	107,393	107,393	107,393	107,393	107,393
Red Meat consumed (oz/day)	0.6	1.5	2.2	3.1	4.7
Deaths expected	22,075	22,075	22,075	22,075	22,075
Deaths observed	22,075	23,765	25,532	27,321	29,831
Excess deaths (%)	0%	7.7%	16%	24%	35%

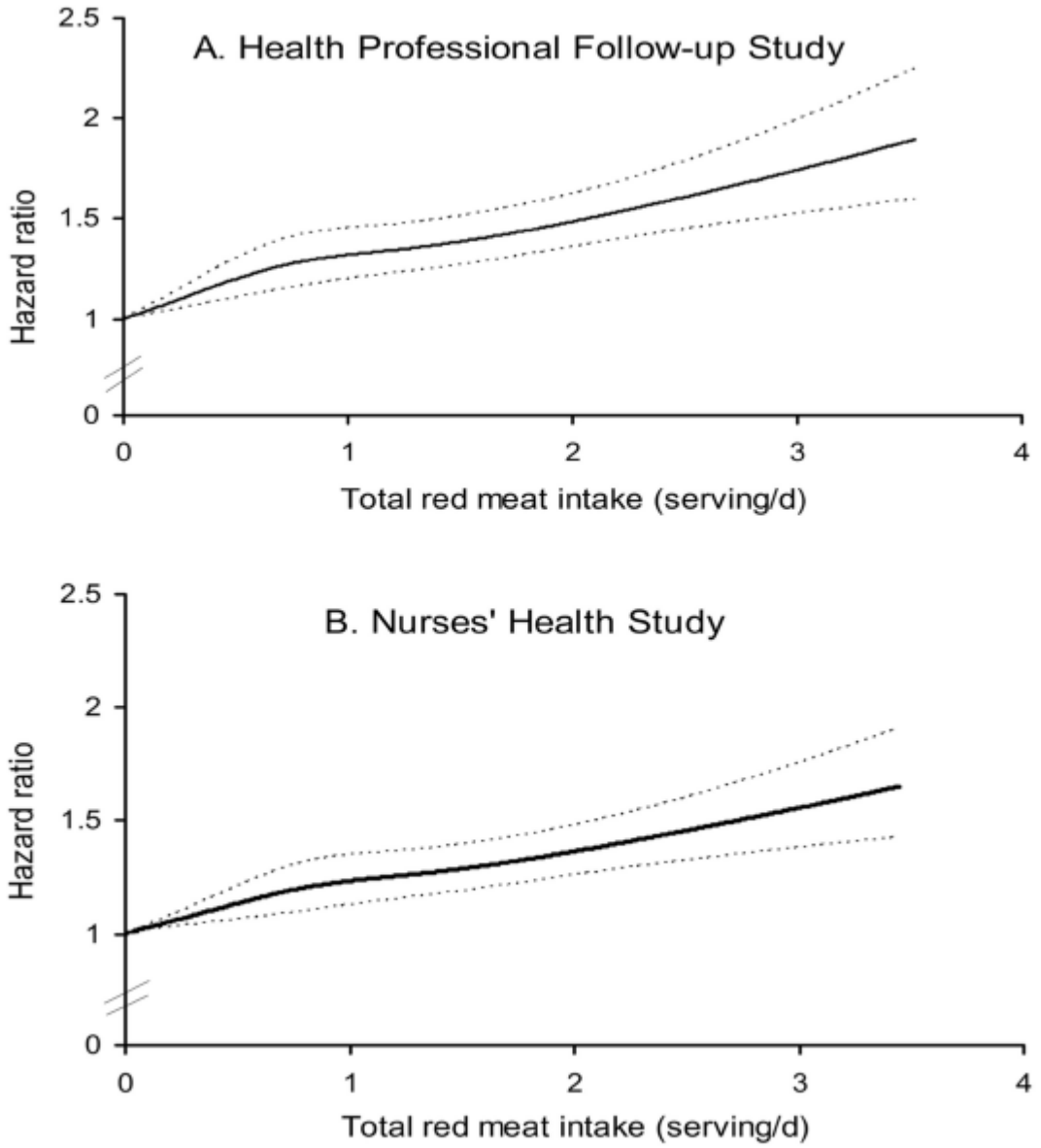


Figure 1. Dose-response relationship between red meat intake and risk of all-cause mortality in (A) Health Professionals Follow-up Study and (B) Nurses' Health Study

White meat and mortality

Relative Risk of mortality per 20 g per 1,000 kcal per day increase in meat			
	All-cause	CVD	Cancer
Total white meat	0.92	0.92	0.93
Unprocessed white meat	0.92	0.92	0.94
Processed white meat	0.95	0.96*	0.92

$P < 0.001$, except * NS

NIH-AARP Meat and Mortality Study

Bottom line on meat

There is no nutritional requirement for meat

- Plant-sourced protein is fully adequate, as long as care is taken to get all essential amino acid

White meat (poultry) has no associated health threats that have been reported

- Except for rare bacterial contamination of raw product

Red meat (beef, pork) kills!

- Multiple high-quality studies are now in agreement, that excess mortality is highly associated with dietary red meat
- Processed meats (bacon, lunch meats, hot dogs, etc) are especially lethal

What is the mechanism of red meat harm (pathogenesis)?

- Branched chain amino acids, carnitine, heme iron, saturated fat?

Why haven't we heard this?

If red meat is so dangerous, why haven't the health authorities and the media informed us?

1) The definitive data are hot off the press

- Published in 2017

2) Unclear why the media has missed it

- Too complicated, not sexy enough

3) Meat industry infiltrates USDA and other committees that generate guidelines

4) Some think it is "old news" → saturated fats

- WRONG!

What about low-carb, meat-dominant diets?

The Atkins diet and similar weight-control programs rely heavily on meat

This approach may be safe and effective as a short-term strategy to preserve muscle mass while shedding excess fat

But…

A long-term maintenance diet based on red meat is risky business, based on best current evidence

The carb skeptics

Dr. Robert Atkins was the vanguard in the "carbs are bad" revolution

The Atkins diet, with marked restriction of carb consumption, allowed liberal protein and fat

His followers did lose weight, at least for a while

- Placeholder: the ketogenic diet, not to be confused with the "Keto Diet", is an important development in addressing obesity; discussed in another session

Atkins diet went "viral"

Atkins was joined by Paleo and a host of others, basically claiming you could be fit and healthy, as long as you kicked carbs to the curb

No systematic trials to assess long-term effects on health; it was tacitly "accepted" that the weight loss was the "canary in the coal mine", proving its benefits

Med Diet Pillar #2: Olive oil

Olive oil is the main added fat in the Med Diet

Used for everything from cooking to salad dressing

Makes up about one-fifth of calories!

Composed mostly of the monounsaturated fatty acid oleic acid

Mortality: Fats vs. Carbs

Association of Specific Dietary Fats With Total and Cause-Specific Mortality

Dong D. Wang, MD, MSc; Yanping Li, PhD; Stephanie E. Chiuve, ScD; Meir J. Stampfer, MD, DrPH; JoAnn E. Manson, MD, DrPH; Eric B. Rimm, ScD; Walter C. Willett, MD, DrPH; Frank B. Hu, MD, PhD

JAMA Internal Med. 2016

Mortality: Fats vs. Carbs

NHS

- Subjects: 83,349
- Events: 20,314 (deaths)
- Follow up: 32 yrs

HPFS

- Subjects: 42,884
- Events: 12,990 (deaths)
- Follow up: 26 yrs

Factors:

- Age, race, marital status, BMI, physical activity, smoking, alcohol, vitamin use, aspirin use, family history (CHD, DM, Ca), personal history (Htn, lipids), menopause, HRT
- Dietary (FFQ including macronutrients, cholesterol)

Mortality: Fats vs. Carbs

Total fats (TF)

Trans fats (TransF)

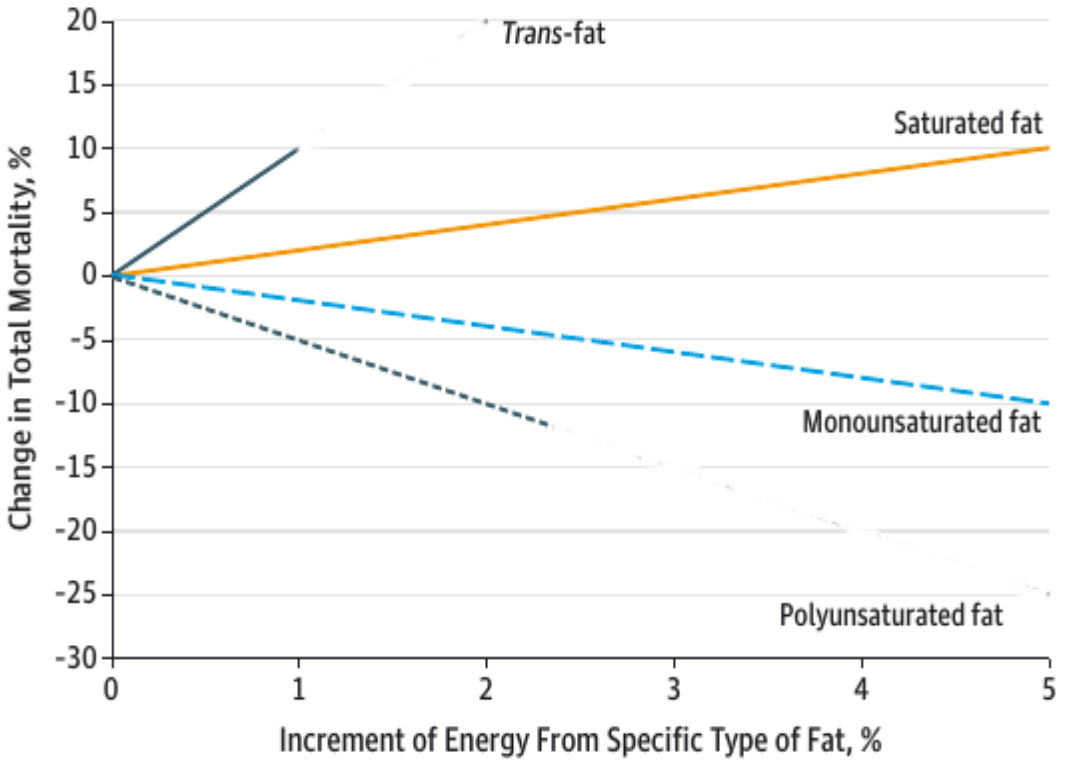
Saturated fats (SFA)

Unsaturated fats (UFA)

- Monounsaturated fats (MUFA)
- Polyunsaturated fats (PUFA)
  - ω-6 (LA, AA)
  - ω-3 (ALA)
  - ω-3 (EPA+DHA)

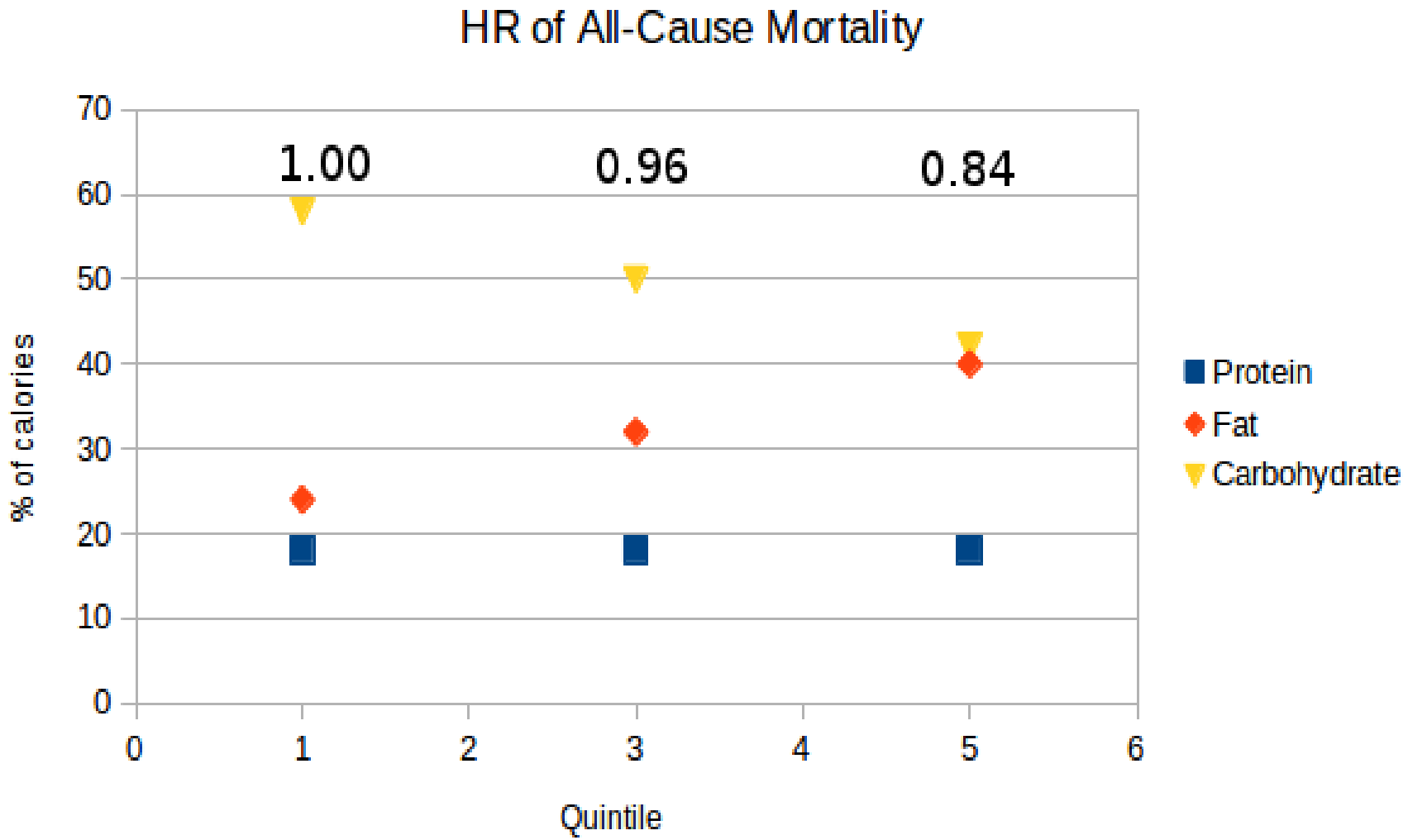
Total mortality: Fats vs. Carbs

Figure 1. Change in Total Mortality Associated With Increases in the Percentage of Energy From Specific Types of Fat



Multivariable hazard ratios of total mortality associated with replacing the percentage of energy from total carbohydrates by the same energy from specific types of fat ($P < .001$ for trend for all) were used. The model was

NHS/HPFS Fats & Mortality



NHS/HPFS Fats & Mortality

Carbohydrates offer a slight advantage over saturated fats in calorie-for-calorie exchange

However, consuming larger amounts of monounsaturated and polyunsaturated fats is better than either SF or carb

The best strategy appears to be aiming for 40% fat, with the majority (2/3) coming from mono- and polyunsaturated FA

Remaining calories come from 42% carbs and 18% protein

Fat Finale

Dietary fat is not a pariah, contrary to what we were taught for decades

- We do not become obese or sick as a result of excessive dietary fat
- In fact, the exact opposite is observed

We would do well to eat more fat than is customary, in place of carbohydrates

- Granted, of course, that we favor fats with the desirable outcomes (PUFA, MUFA) and go easy on the others (SF, transF, and foods containing them, especially red meats and processed meats)

Med Diet Pillar #3: Grains

Grains make up the major source of fuel in the diet (carbs)

Also provide the most valuable type of fiber

Grains (cereals)

"Cereal grains are grown in greater quantity and provide more food energy worldwide than any other crop" - Wikipedia

Corn, rice and wheat are the leading types, at 1016, 745, and 713 million metric tonnes of production annually

Corn is mostly used for animal feed, so rice and wheat are the main grains used for human consumption

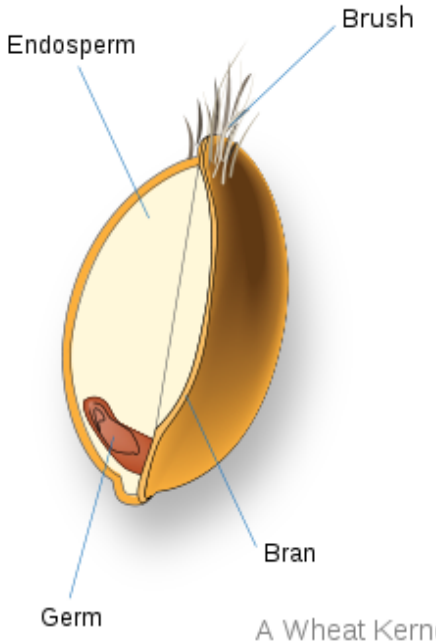
Grains are fruits

"Fruit" in this context refers to the part of a plant responsible for reproduction

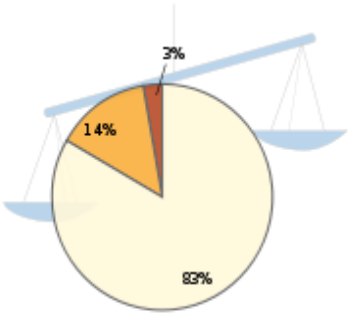
Endosperm is the starch in cereals that provides fuel as a plant germinates, before it can gather energy through photosynthesis

The fruit is the part that is readily used for animal nutrition

Grinding, cooking, etc. partially disrupt the starch to make it more digestible



A Wheat Kernel



Composition by Weight

	Carb./g	Protein/g	Fat/g	Fiber/g	Iron (% daily req.)	Others
Bran	63	16	3	43	59	vitamin Bs
Endosperm	79	7	0	4	7	
Germ	52	23	10	14	35	vitamin Bs omega-3/6 lipids

Nutritional Value (per 100g)

Grain use history

Humans were hunter-gathers until civilization brought agriculture

Planting & harvesting grains gave more certainty and used less time & effort

- Freed up labor for construction, etc.

Refining wheat to remove germ and bran was developed BCE, but was so labor intensive that only wealthy families could afford it

- White baked goods were a status symbol

Industrial revolution brought white flour to the masses

- White flour foods became dominant
- Whole grain cereals and baked goods were "off the table"

We have come full circle: whole grains are back among the cognoscenti

Examples of whole grain

Table 3 Examples of whole grain foods and flours

Amaranth
Barley
Buckwheat
Corn *(whole cornmeal, popcorn)*
Millet
Oats *(oatmeal)*
Qinoa
Rice *(brown rice)*
Rye
Sorghum *(or milo)*
Teff
Triticale
Wheat *(varieties include spelt, emmer, farro, einkorn, Kamut®, durum; forms include bulgur, cracked wheat, and wheatberries)*
Wild rice

When consumed in a form retaining the bran, germ, and endosperm components. Source: The Whole Grains Council (http://www.wholegrainscouncil.org).

WG & Mortality Meta-analysis

Whole grain consumption and risk of cardiovascular disease, cancer, and all cause and cause specific mortality: systematic review and dose-response meta-analysis of prospective studies

Dagfinn Aune,[1, 2] NaNa Keum,[3] Edward Giovannucci,[3, 4, 5] Lars T Fadnes,[6] Paolo Boffetta,[7] Darren C Greenwood,[8] Serena Tonstad,[9] Lars J Vatten,[1] Elio Riboli,[2] Teresa Norat[2]

BMJ 2016; 353:i2716

WG & Mortality Meta-analysis

Studies: 45 cohorts – 20 EU, 16 US, 9 Asia

Subjects: 245,012-705,253

Events: 100,726 deaths; 34,346 cancer cases, 26,243 CVD cases, 7,068 CHD cases, 2,337 CVA cases

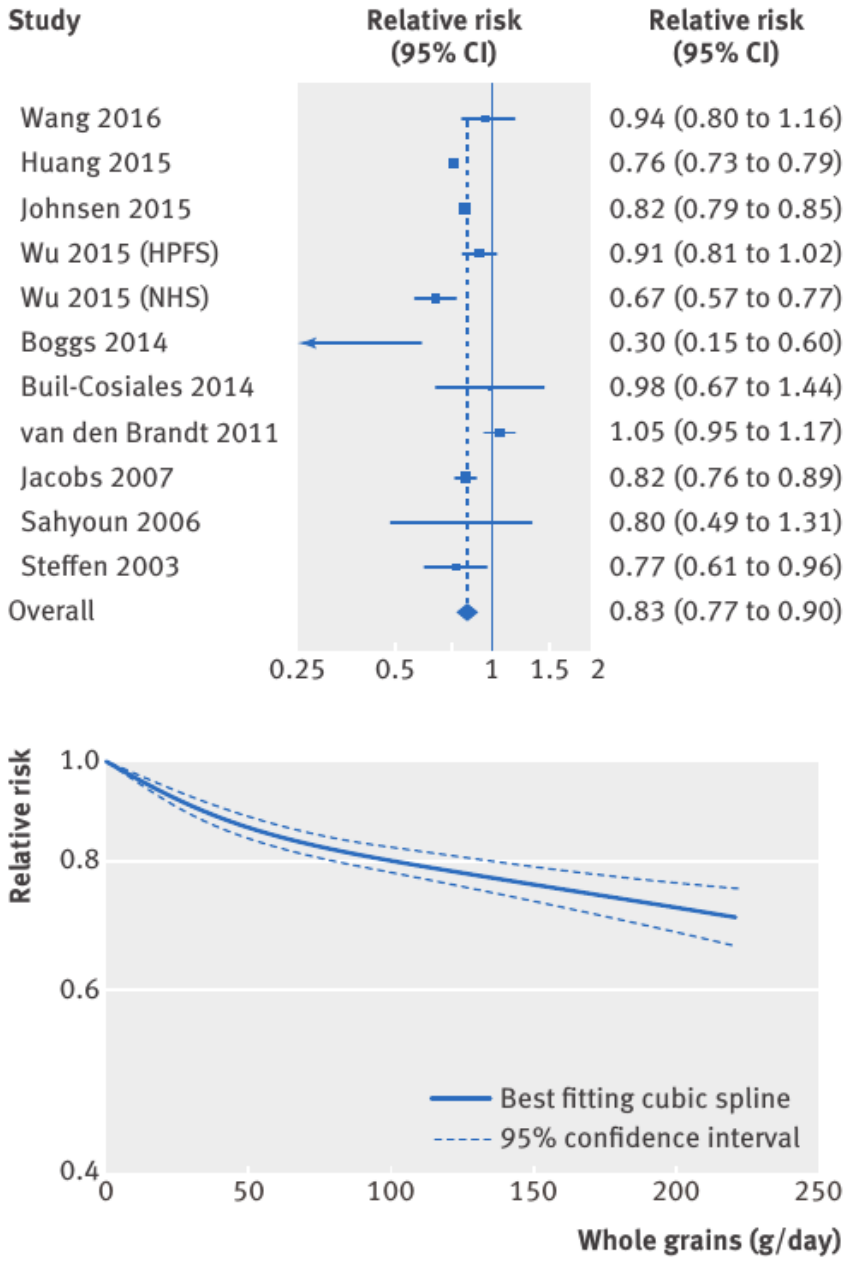


Fig 6 | Forest plot for consumption of whole grains (per 90 g/day) and risk of all cause mortality, with graph illustrating non-linear response

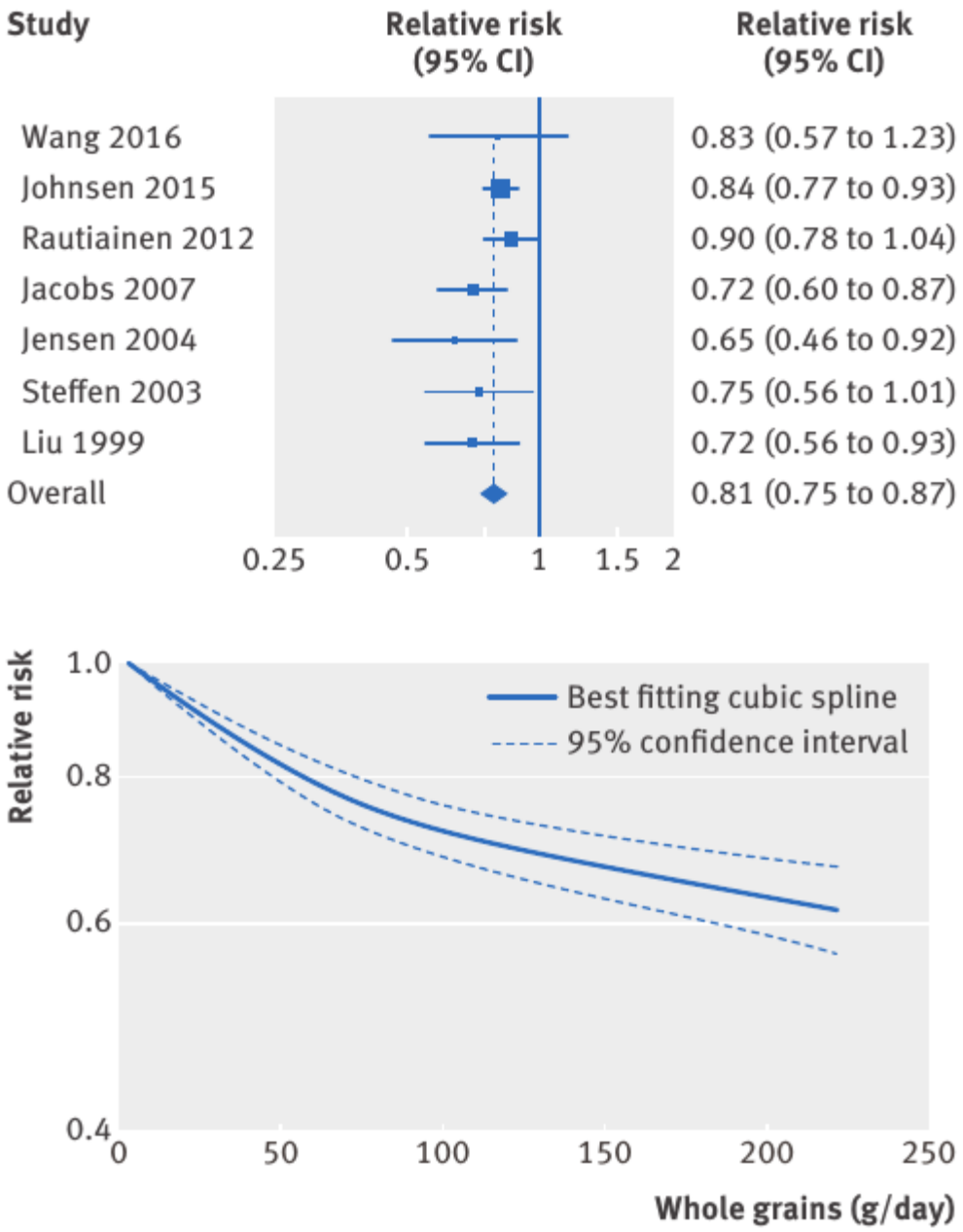


Fig 2 | Forest plot for consumption of whole grains (per 90 g/day) and risk of coronary heart disease, with graph illustrating non-linear response

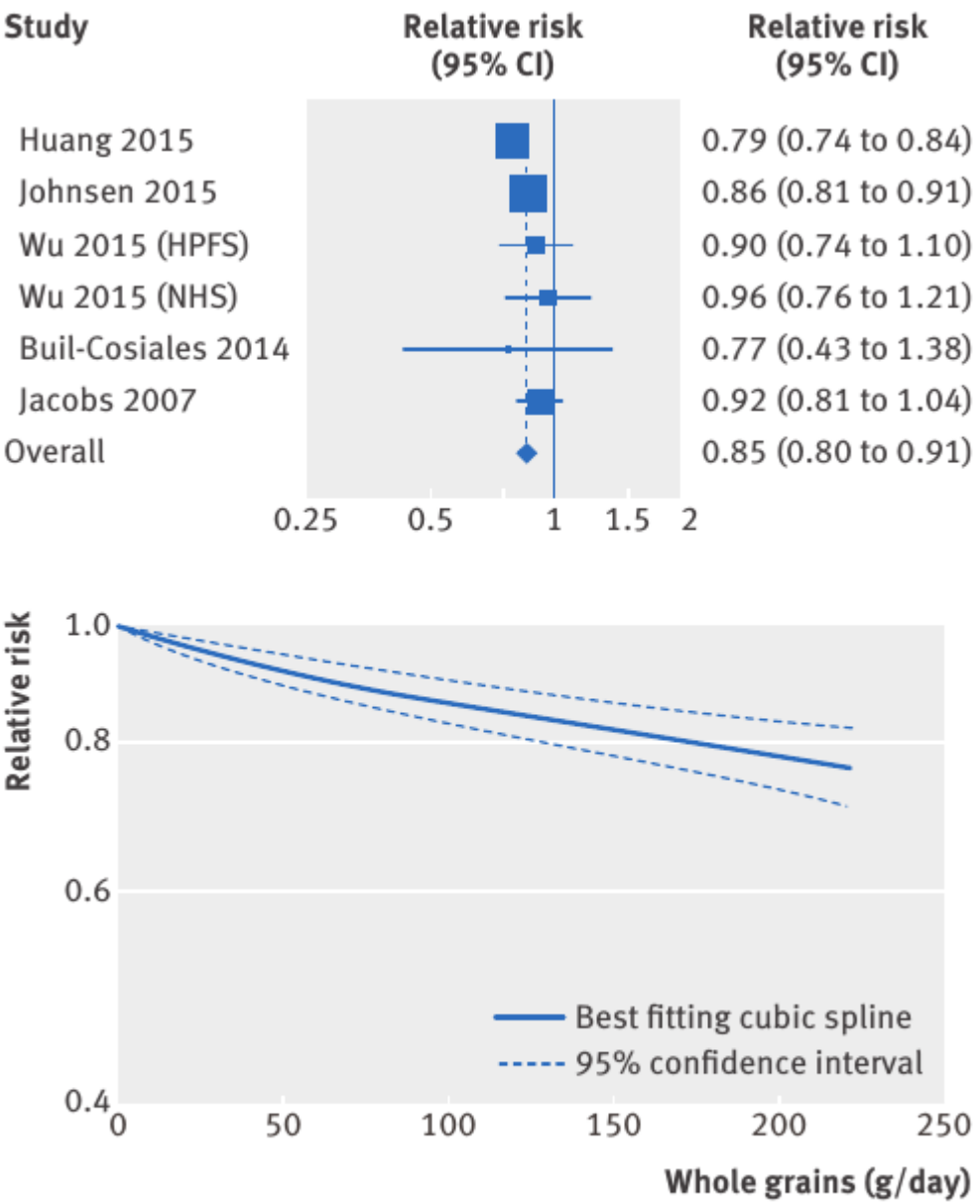


Fig 5 | Forest plot for consumption of whole grains (per 90 g/day) and risk of total cancer, with graph illustrating non-linear response

Whole grains & health: Conclusions

Increasing whole grain consumption has been correlated with lower rate of all cause mortality, CVD, primarily CHD, in men and women, cancer, respiratory, infectious and other death

Effectiveness seems concentrated in whole grain breakfast cereals and bran; brown rice and wheat germ to lesser extent

Short-term feeding studies demonstrating effect on CVD markers negative thus far

Fiber is the major contributor to health benefits of WG

Dose-response relation of lower mortality maintained out to 210 gm/d (7 servings) for most specific causes, as well as all cause mortality

Fiber Rule of 10%

We get about 1000 calories / day from carbs (50% of 2000 Kcal)

That's 250 g of carbs (1000 g / 4 cal per g)

We're aiming for 25 g of fiber / day

25/250 is 10%

If we eat carbs where fiber is 10% or more of total carbs, we will get 25 g of fiber / day

- White pasta has 2 g fiber, 40 g total carb per serving → 5% fiber
- Whole grain pasta has 5 g fiber, 40 g carb per serving → 12.5% fiber
- Whole grain pasta contributes a good share, white pasta not so much

Data needed is on Nutrition Facts label on package

Gluten

Gluten – protein in wheat and some other grains; responsible for elasticity of dough

Celiac disease and related diseases

- A disease due to immune cross-reactivity to gluten
- Celiac disease when the prominent symptoms are intestinal
- Dermatitis herpetiformis when skin is primarily involved
- Gluten ataxia when nervous system is primarily involved
- Cured / prevented by avoidance of gluten-containing foods, adhering to gluten-free diet

Gluten intolerance

Some individuals do not have celiac disease but don't tolerate gluten-containing foods

- Is it the gluten, or is gluten just a companion?
- Fiber is probably responsible for many; gluten is the scapegoat

Certain influential medical writers have promoted the idea that gluten is globally bad for health

- Based on anecdotes, not solid science

Response by the public, fanned by food producers, to prefer gluten-free foods, despite unproven benefits

Risks: Insufficient dietary fiber, extra expense

Med Diet Pillar #4: Fruits and vegetables

The goodness of plant based foods

What We Mean by F&V

Includes:

- Green leafy vegetables: lettuce, cabbage, spinach, kale
- Cruciferous vegetables: Broccoli
- Fruits – fresh, dried, canned, juices

Excludes:

- Grains, nuts, seeds
- Potatoes
- Legumes (possibly)

Virtues of veggies and fruits

Vitamins

Minerals

Phytosterols

Carotenoids

Antioxidants

Fiber

Satiety without adding calories

Limitations of F&V

Very low energy density

- It is cumbersome, time-consuming and expensive – and some would say unpleasant due to intestinal side effects – to obtain one's entire energy requirement from fruits and vegetables
- For example, to get 2000 Cal from iceberg lettuce, cabbage, spinach and snap beans, you would have to eat 20 cups – of each!

Role of F&V in diet

To provide micronutrients

To provide fiber

To slow absorption of accompanying starches and sugars, thereby reducing their glycemic index

To add interest to the diet

To promote satiety and thereby reduce unwitting intake of calorie-laden food

Mortality & fruits / vegetables

Fruit and vegetable consumption and mortality from all causes, cardiovascular disease, and cancer: systematic review and dose-response meta-analysis of prospective cohort studies


OPEN ACCESS

Xia Wang *instructor in nutrition*[1 2], Yingying Ouyang *research fellow*[2], Jun Liu *research fellow*[2], Minmin Zhu *instructor in biostatistics*[3], Gang Zhao *instructor in medicine*[4], Wei Bao *postdoctoral fellow*[5], Frank B Hu *professor*[6]

BMJ 2014 Meta-analysis

All-cause mortality, total F&V

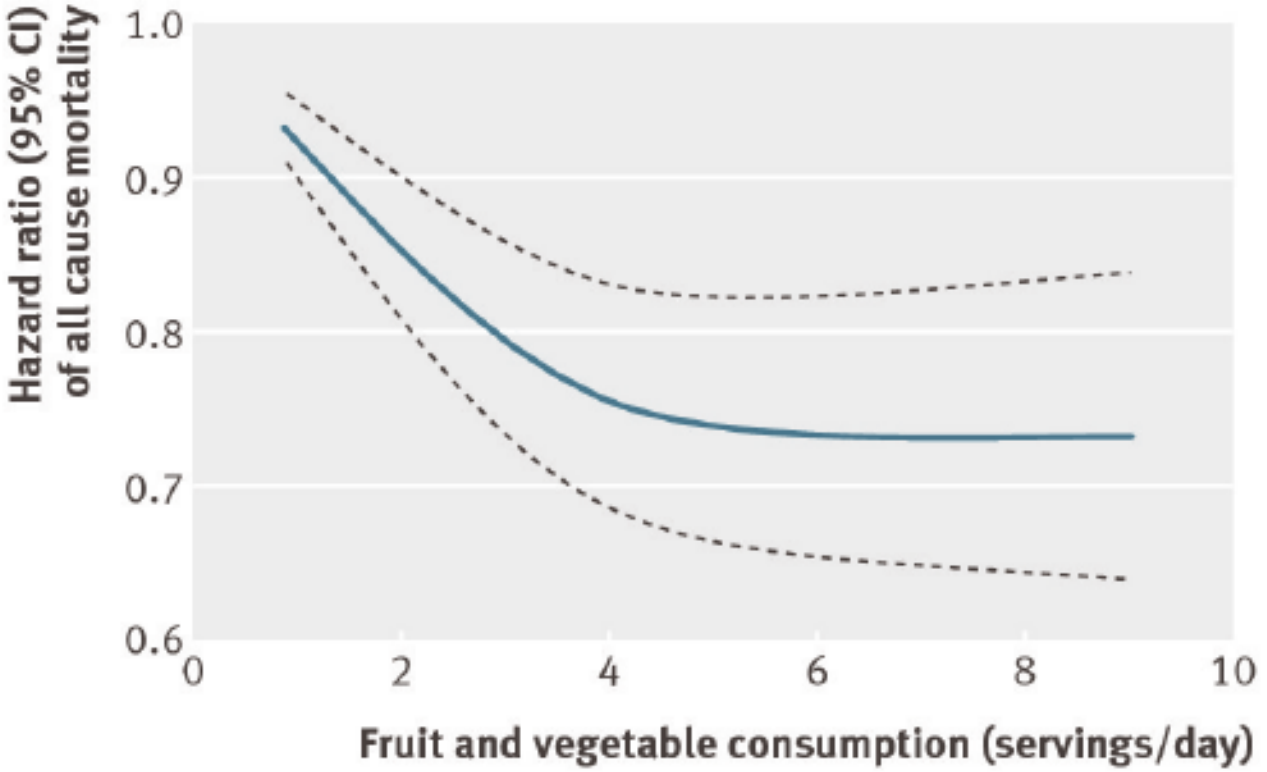


Fig 3 Dose-response relation between fruit and vegetable

Fruits & vegetables: Conclusions

Increasing consumption of fruits and vegetables is associated with lower mortality, up to about 5 total servings per day

Both are beneficial; some studies show one or the other superior, others show equal benefit

Benefit of F&V is mostly due to factors other than fiber content, though its fiber is beneficial

Increased consumption of frozen / canned fruit is associated with higher mortality (+17% Q5 vs. Q1)

Fruit juice consumption is not the same as eating intact fruit, and may be harmful if sugar content is high

Plant-based foods: Recommendations

Aim for regular inclusion of a variety of legumes, vegetable portions, salads, fresh fruits, and dried fruits in your diet

Fruits and vegetable fiber does not convey the full benefit of fiber; aim for the majority of fiber from grains (cereals, pasta, breads)

Restrain consumption of canned fruit, frozen fruit and fruit juices, sugar and refined grain foods

Nuts are an excellent source of fuel, healthy fats, and fiber

Additional Med Diet Pillars

Fish

- Good source of omega-3 fatty acids

Dairy

- Calcium, vitamin D

Eggs and poultry

- High quality protein

Legumes and nuts

- Fiber
- Good fats – monounsaturated, polyunsaturated

Red wine

- In moderation, if tolerated

Med Diet - Summary

Olive oil: Every meal, main added fat

Bread and cereals: Every meal, 6-8 serves/d

Vegetables: Every meal, 6 serves/d

Fruits: 3 serves/d

Nuts: 3-6 serves/wk

Fish: 2-5 serves/wk

Poultry: 2-4 serves/wk

Legumes: 2-4 serves/wk

Eggs: 2-4 serves/wk

Dairy: 2 serves/d

Red meat: Sparing, <2 serves/wk

Sweets: Sparing, <2 serves/wk

Red wine: Daily, in moderation, if acceptable