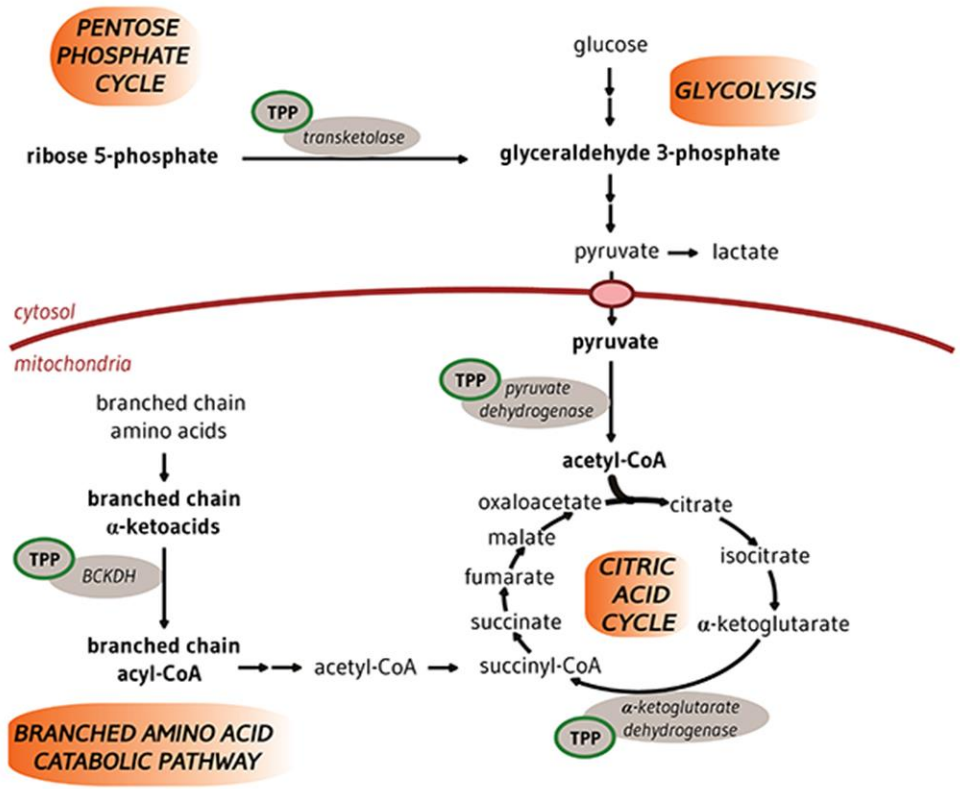
Food as Medicine

Nutrition to Prevent Chronic Disease

Lyndi Schwartz, MD, FACP
Program Director, Internal Medicine Residency
Kettering Medical Center
Kettering, OH

Figure 1. Metabolic Pathways Requiring Thiamin Pyrophosphate



BCKDH, branched chain α-ketoacid dehydrogenase complex; CoA, coenzyme A; TPP, thiamin pyrophosphate.

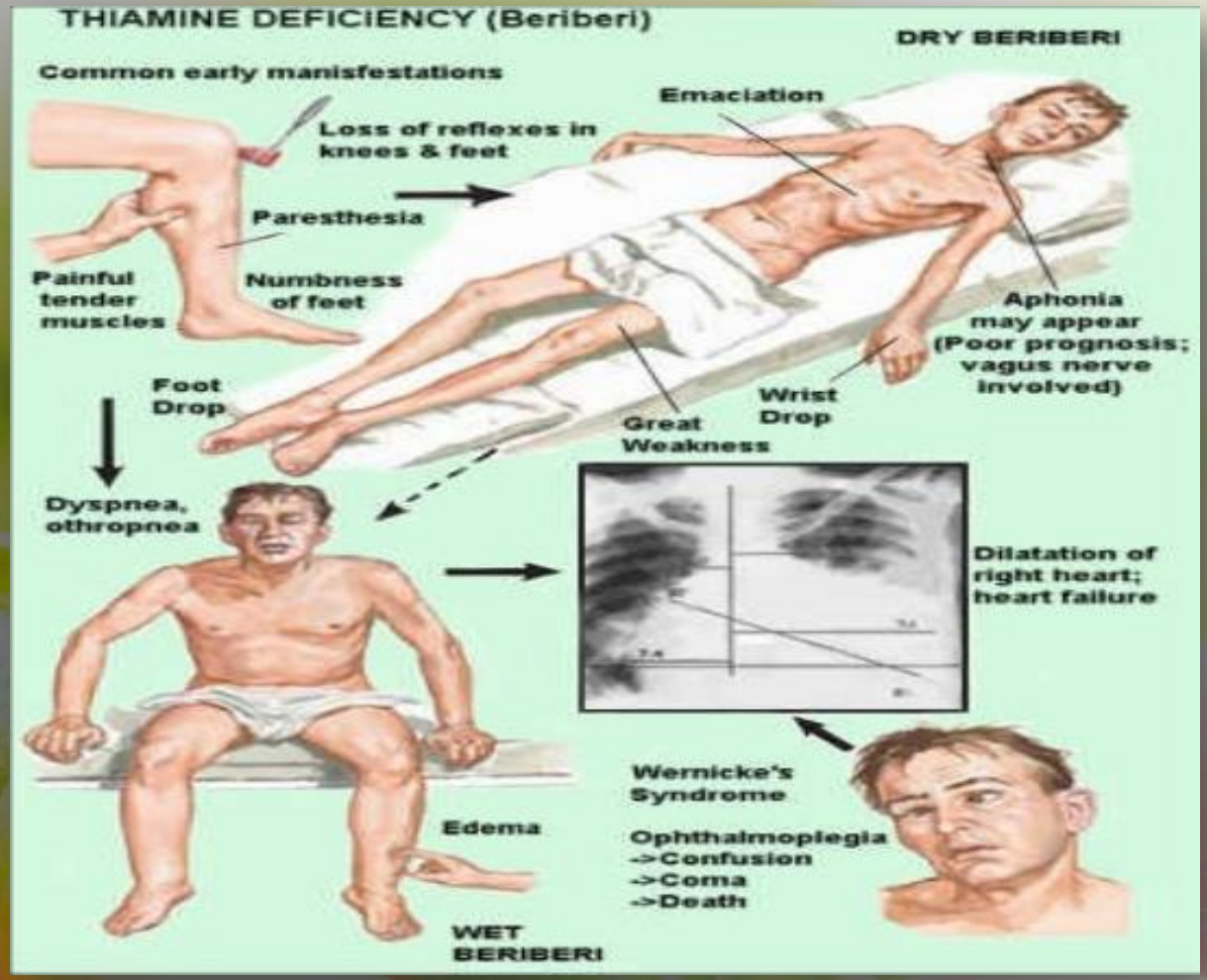
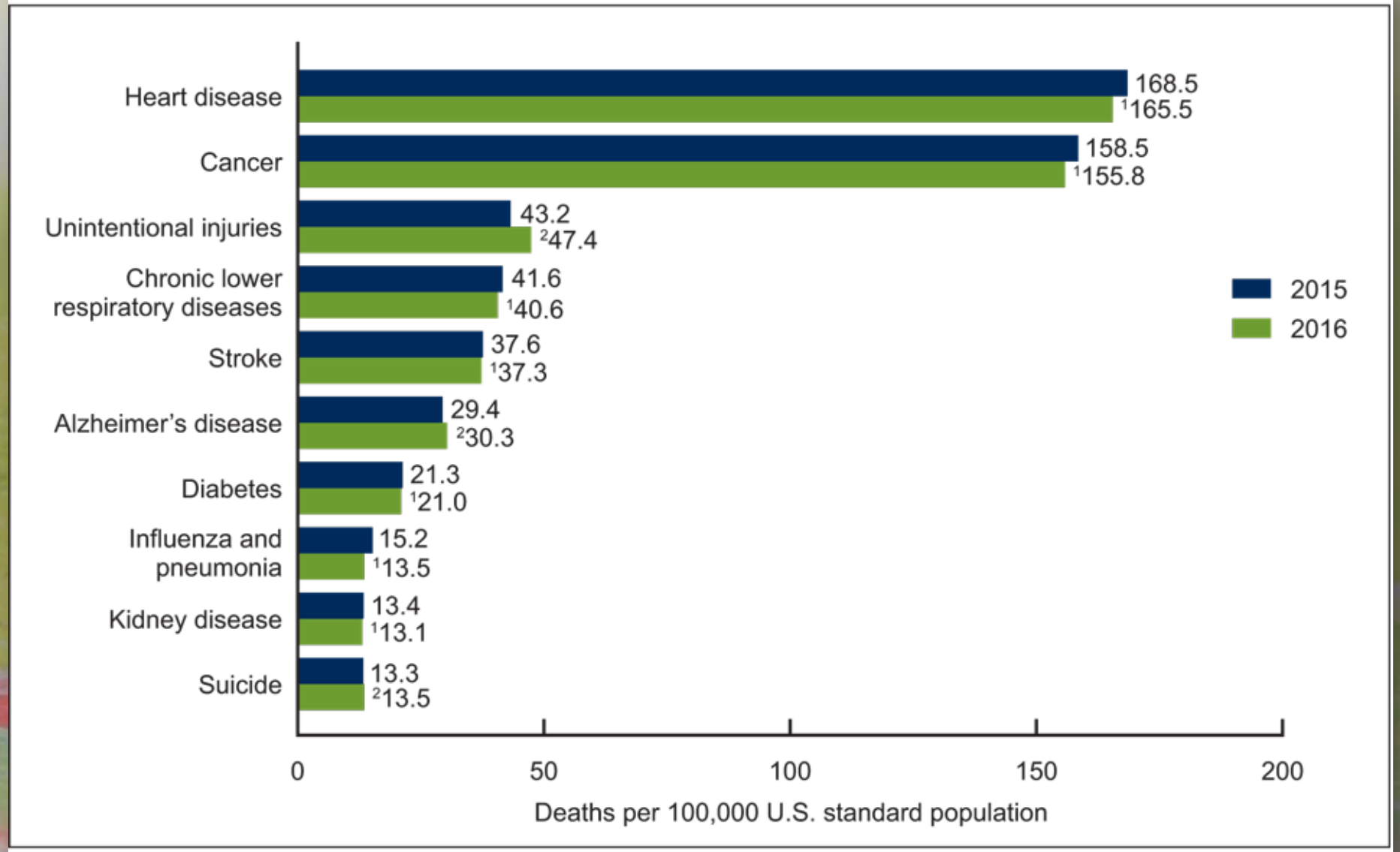
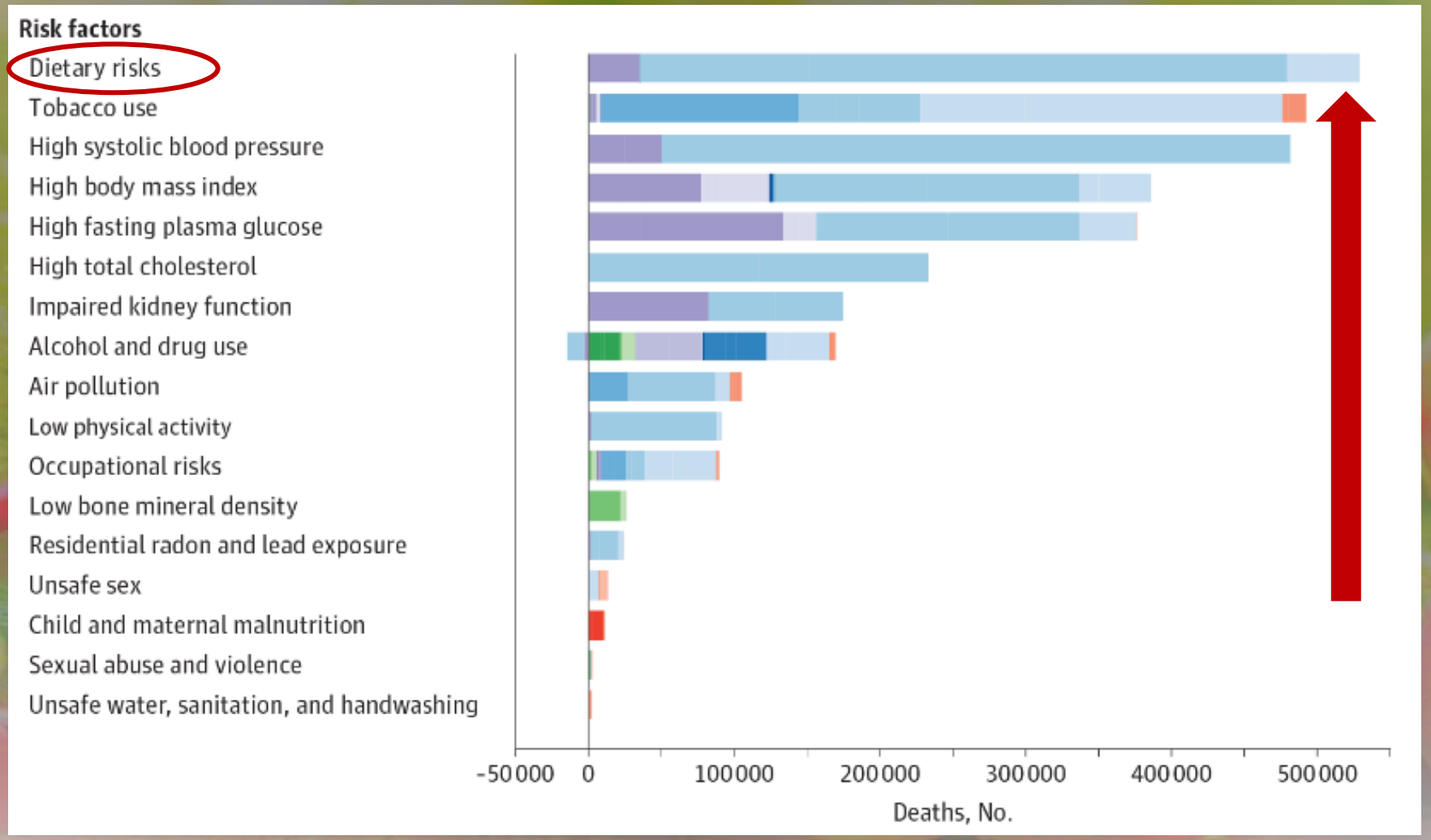


Figure 4. Age-adjusted death rates for the 10 leading causes of death in 2016: United States, 2015 and 2016

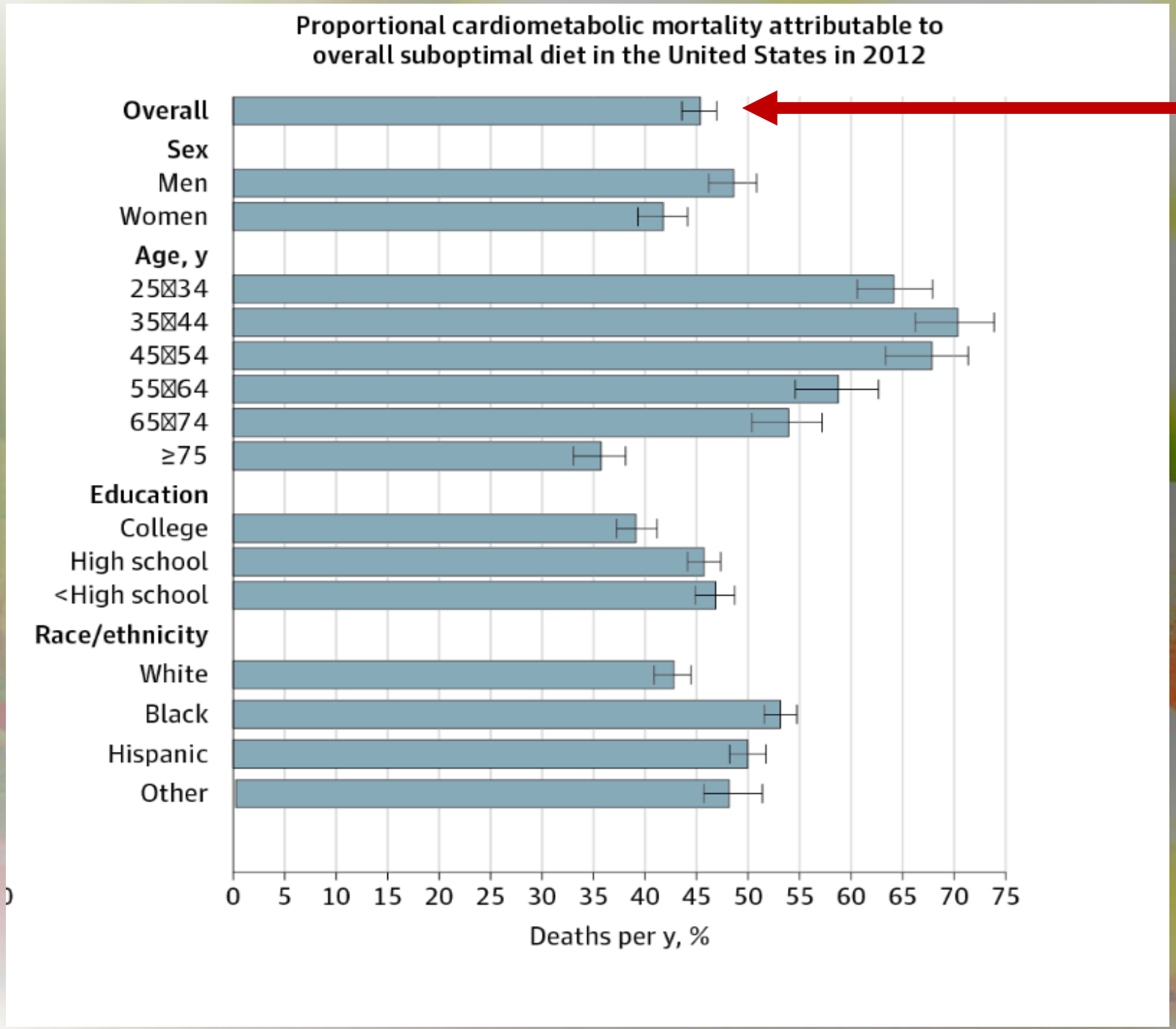


[1]Statistically significant decrease in age-adjusted death rate from 2015 to 2016 ($p < 0.05$).
[2]Statistically significant increase in age-adjusted death rate from 2015 to 2016 ($p < 0.05$).
NOTES: A total of 2,744,248 resident deaths were registered in the United States in 2016. The 10 leading causes accounted for 74.1% of all deaths in the United States in 2016. Rankings for 2015 data are not shown. Causes of death are ranked according to number of deaths. Access data table for Figure 4 at: https://www.cdc.gov/nchs/data/databriefs/db293_table.pdf#4.
SOURCE: NCHS, National Vital Statistics System, Mortality.

Risk Factors for Chronic Disease Deaths

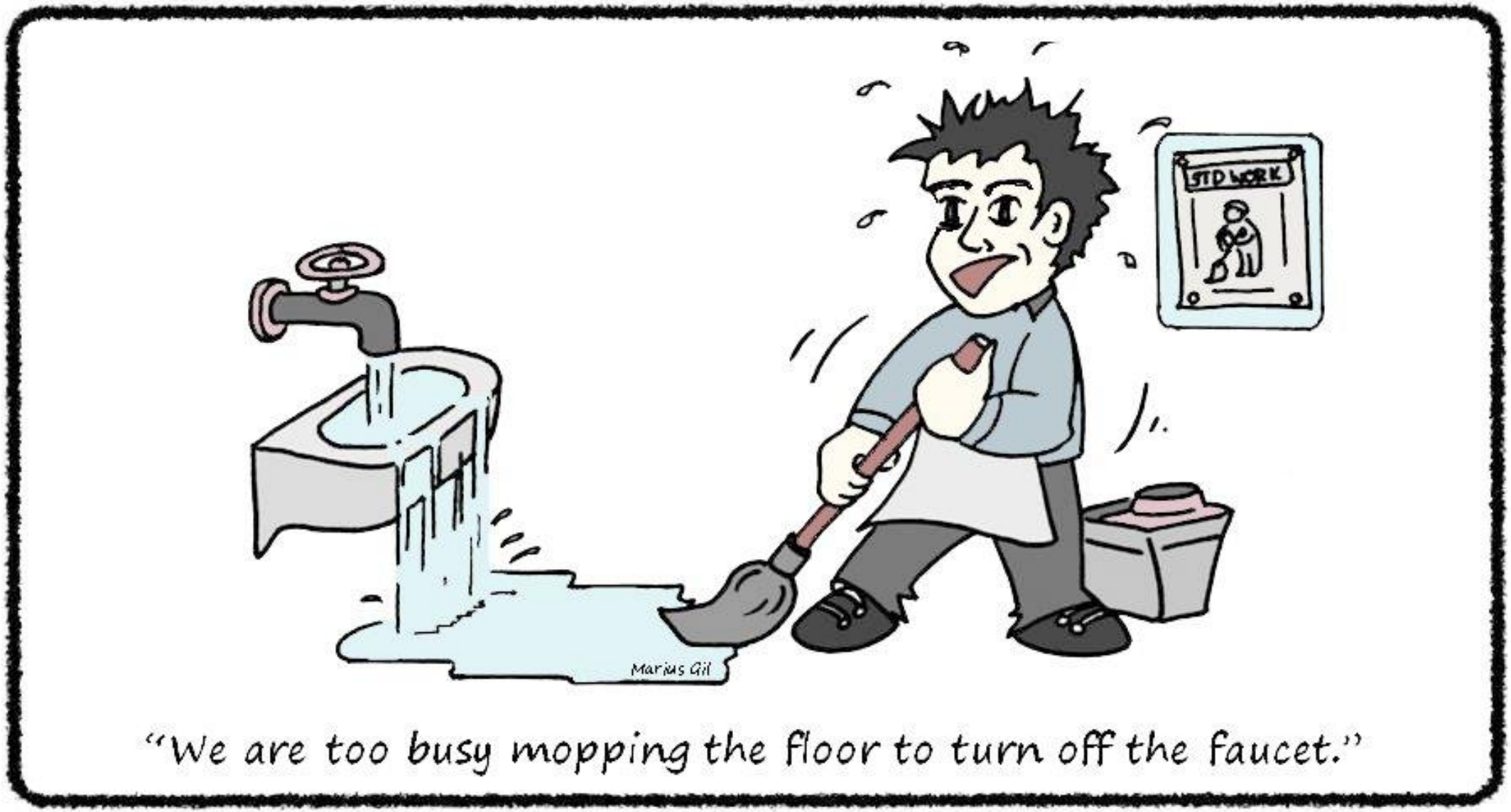


JAMA 2018



45% of deaths due to heart disease, stroke, & diabetes are directly caused by poor diet.

Micha et al
JAMA 2018



"We are too busy mopping the floor to turn off the faucet."

What I'll Cover

- Consensus views on nutrition
- What do Americans and Filipinos eat?
- CV disease, insulin resistance, cancer, & obesity: what does the science suggest we should eat?
- Key points about macronutrients (carbs, fats, protein)

Making sense of nutrition studies: What does the overall skyline show?

Healthful

Whole Grains
Legumes
Fruits
Vegetables
Nuts
Seeds

Debatable

Poultry
Eggs
Dairy
Fish

Unhealthful

Processed meat
Red meat
Added sugar
Refined grains
Ultraprocessed foods

Healthful

Wh
Leg
Fru
Veg
Nut
See

Debatable

Any meat that has been cured, smoked, fermented, or added preservatives.

Bacon, hot dogs, bologna, sausage, salami, pepperoni, ham, cold cuts, deli slices, chicken nuggets

Unhealthful

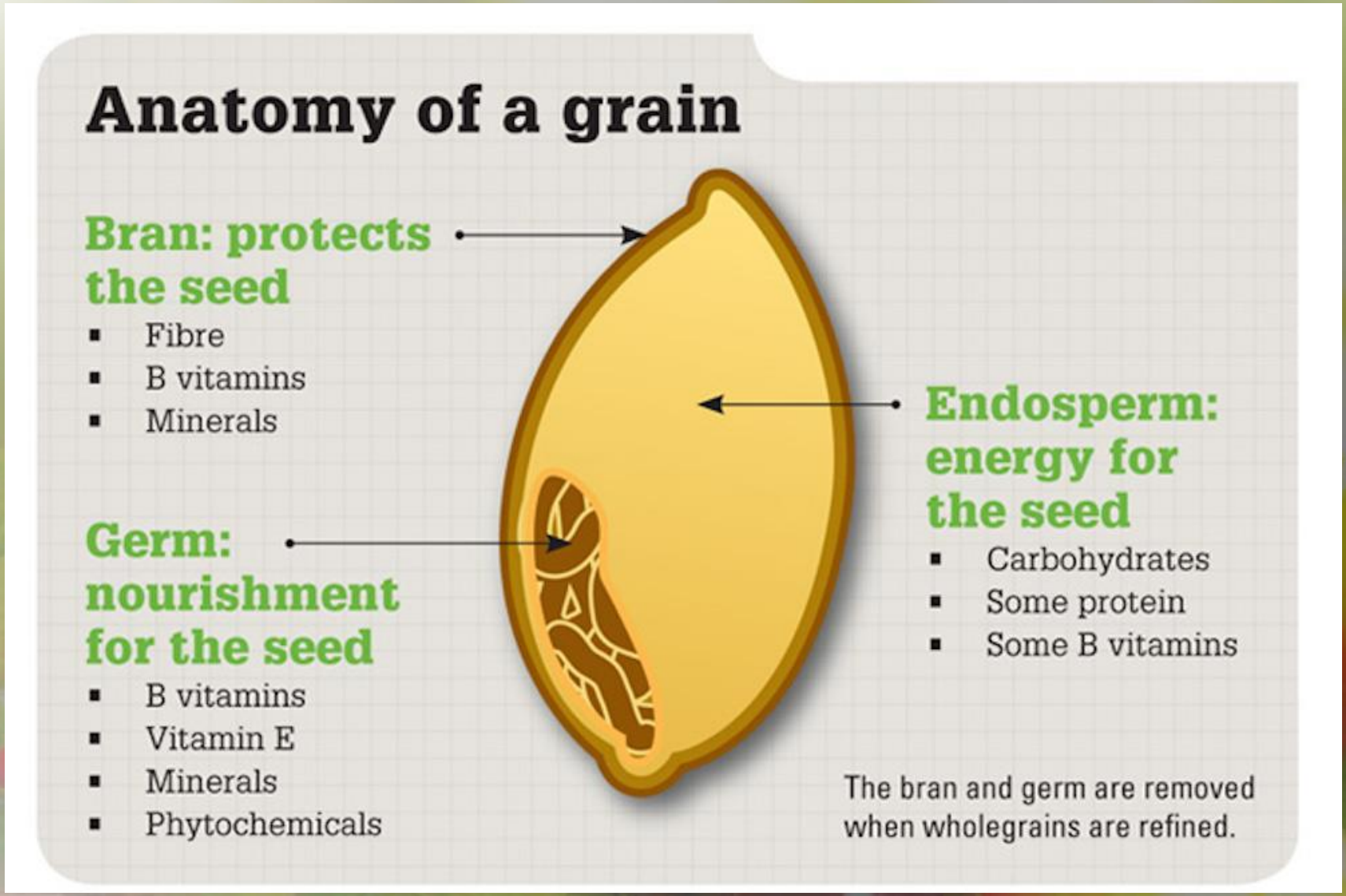
Processed meat
Red meat
Added sugar
Refined grains
Ultraprocessed foods

Healthful	Debatable	Unhealthful
Whole Grains Legumes Fruits Vegetables Nuts Seeds	Poultry	Processed meat Red meat Added sugar Refined grains Ultraprocessed foods

Beef, pork, lamb, goat, veal, venison

Healthful	Debatable	Unhealthful
Whole Grains	Poultry	Processed meat
Legumes	Eggs	Red meat
Fruits	Dairy	Added sugar
Vegetables		Refined grains
Nuts		Ultraprocessed foods
Seeds		

Whole grains that have been stripped of most fiber and nutrients.



Whole Grains:

Whole wheat

Oats

Rye

Corn

Brown rice

Barley

Kamut

Spelt

Millet

Teff

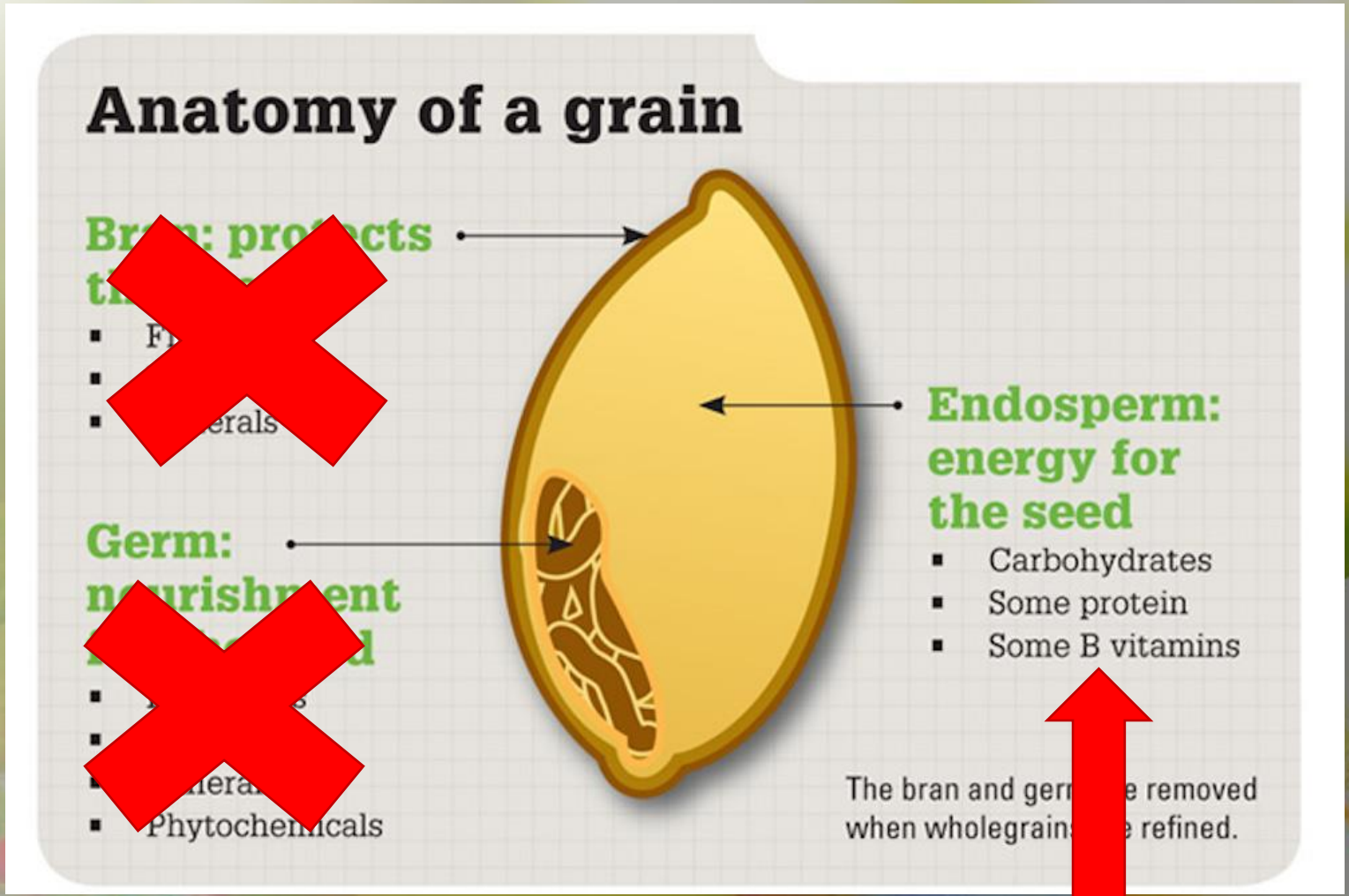
Wild rice

Pseudograins:

Quinoa

Amaranth

Buckwheat



Refined Grain
Lose 80% of fiber & nutrients

Whole Grains:

- Whole wheat
- Oats
- Rye
- Corn
- Brown rice
- Barley
- Kamut
- Spelt
- Millet
- Teff
- Wild rice

Pseudograins:

- Quinoa
- Amaranth
- Buckwheat

INGREDIENTS: UNBLEACHED ENRICHED **WHEAT FLOUR** [FLOUR, MALTED BARLEY FLOUR, REDUCED IRON, NIACIN, THIAMIN MONONITRATE (VITAMIN B1), RIBOFLAVIN (VITAMIN B2), FOLIC ACID], WATER, SUGAR, YEAST, SOYBEAN OIL, SALT, MONOGLYCERIDES, CALCIUM PROPIONATE (PRESERVATIVE), DATEM, CALCIUM SULFATE, NATURAL FLAVOR, SOY LECITHIN, CALCIUM CARBONATE, CITRIC ACID, WHEAT GLUTEN, **SOY FLOUR**. R12-233

“Wheat bread”
“Multigrain”
“7-Grain”

WHOLE VS REFINED CARBS

Whole Carbohydrates (Containing Natural Sugars)


FRUITS


LEAFY GREENS & VEGGIES


STARCHY VEGGIES (POTATOES, SWEET POTATOES)


BEANS, LENTILS, PEAS


WHOLE GRAINS (BROWN RICE, QUINOA, OATS)


CORN


PASTA MADE FROM 100% WHOLE WHEAT, BROWN RICE, LENTILS, QUINOA, BEANS & CHICKPEAS

High in Fiber
High in Water
High in Antioxidants

High in Minerals
High in Vitamins
Minimally Processed

Refined Carbohydrates (Often With Refined Sugars)


CANDY

SODA


PASTRIES (DONUTS, SCONES, CROISSANTS)


SUGARY CEREALS


WHITE RICE


WHITE FLOUR PASTA


WHITE BREADS

Low in Fiber
Low in Macronutrients
Highly Processed

FORKSOVERKNIVES.COM

Healthful

Whole Grains
Legumes
Fruits
Vegetables
Nuts
Seeds

Debatable

Industrially produced foods

- Physical, biological, or chemical processing
- Industrial/chemical additives (flavors, colors, sweeteners, emulsifiers etc)
- Highly palatable

Unhealthful

Processed meat
Red meat
Added sugar
Refined grains
Ultraprocessed foods

"...a diet higher in plant-based foods, such as vegetables, fruits, whole grains, legumes, nuts, and seeds, and *lower in calories and animal-based foods* is more health promoting and is associated with less environmental impact than is the current U.S. diet."

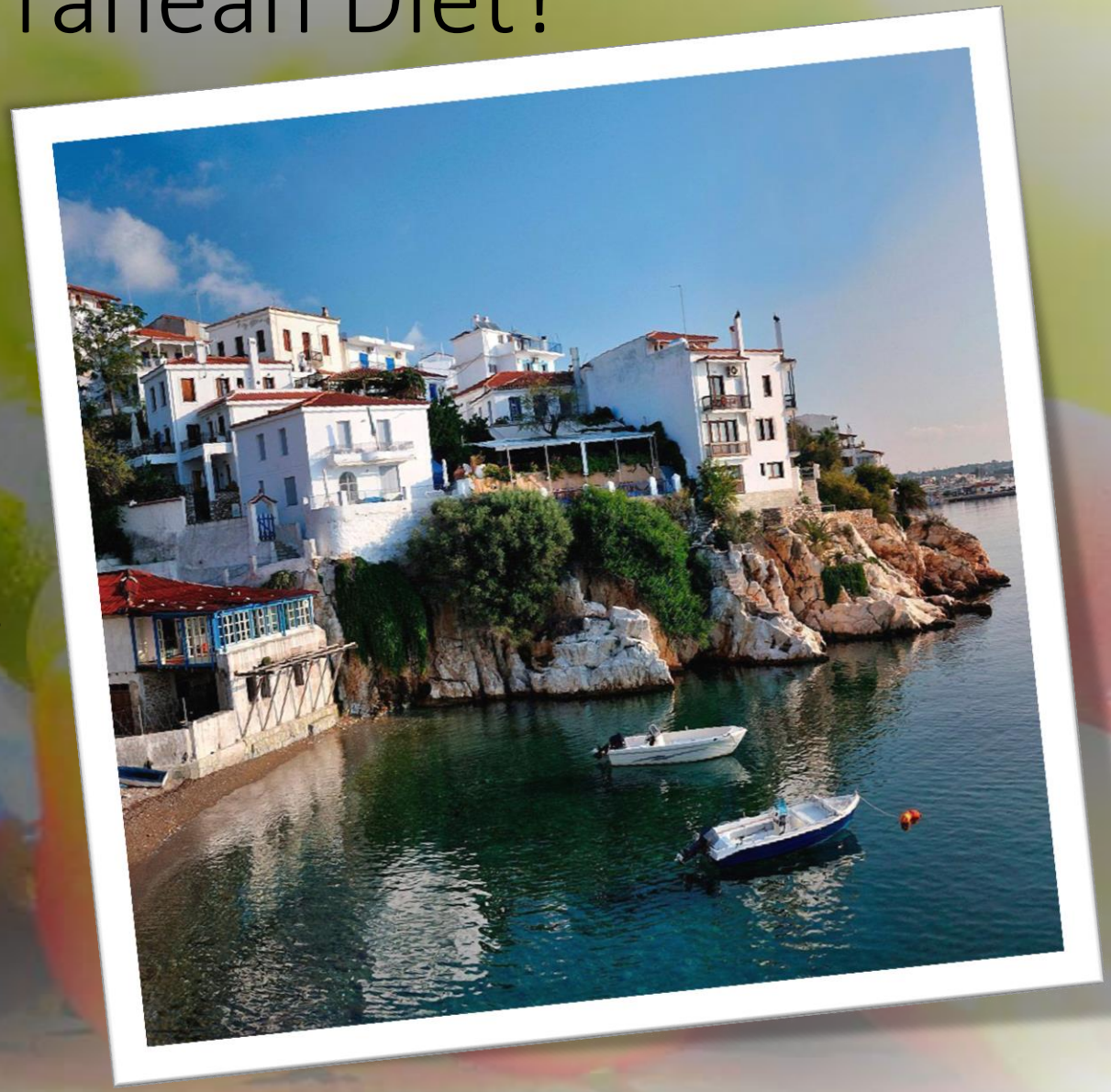
Scientific Report of the 2015 Dietary Guidelines Advisory Committee


“Eat food. Not too much.
Mostly plants.”
Michael Pollan

What is a Plant-Based Diet?

What About a Mediterranean Diet?

- Based on traditional dietary patterns in Mediterranean; varies by place
- Mediterranean diet scoring system:
  - ✓Get points for eating grains, beans, fruits, vegetables, olive oil, fish, & small amount of wine
  - ✓Lose points for eating dairy, poultry, & red meat
- Benefits for reduction of cardiovascular, cancer, diabetes risk
  - ✓Lyon Heart Study
  - ✓PREDIMED Study



- **More plants → better outcomes**
- **More meats → worse outcomes**
- **Fish, olive oil, alcohol → not the primary benefit**

ORIGINAL ARTICLE

Primary Prevention of Cardiovascular Disease with a Mediterranean Diet Supplemented with Extra-Virgin Olive Oil or Nuts

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 M. Lamuela-Raventos, D.Pharm., Ph.D., Lluís Serra-Majem, M.D., Ph.D., et al., for the PREDIMED Study Investigators*

Article Figures/Media Metrics

June 21, 2018
N Engl J Med 2018; 378:e34
DOI: 10.1056/NEJMoa1800389

Adherence to the Mediterranean Diet and Risk of Coronary Heart Disease in the Spanish EPIC Cohort Study

FREE

Genevieve Buckland, Carlos A. González ✉, Antonio Agudo, Mireia Vilardell, Antoni Berenguer, Pilar Amiano, Eva Ardanaz, Larraitz Arriola, Aurelio Barricarte, Mikel Basterretxea ... Show more

American Journal of Epidemiology, Volume 170, Issue 12, 15 December 2009, Pages 1518–1529, https://doi.org/10.1093/aje/kwp282
Published: 10 November 2009 **Article history** ▾

Research

Anatomy of health effects of Mediterranean diet: Greek EPIC prospective cohort study

BMJ 2009 ; 338 doi: https://doi.org/10.1136/bmj.b2337 (Published 24 June 2009)
Cite this as: *BMJ* 2009;338:b2337

Which of the following is the #1 source of calories among Americans ages 2 and up?

A.Sugar-sweetened beverages
B.Desserts
C.Breads, bagels & rolls
D.Cheese & cheese products

Top Sources of Calories Among Americans ≥ 2 Yrs Old

#1 Grain-based desserts

Cake, cookies, pie, cobbler, sweet rolls, pastries, donuts

#2 Breads

White bread and rolls, mixed-grain bread, flavored bread, bagels

#3 Chicken and chicken mixed dishes

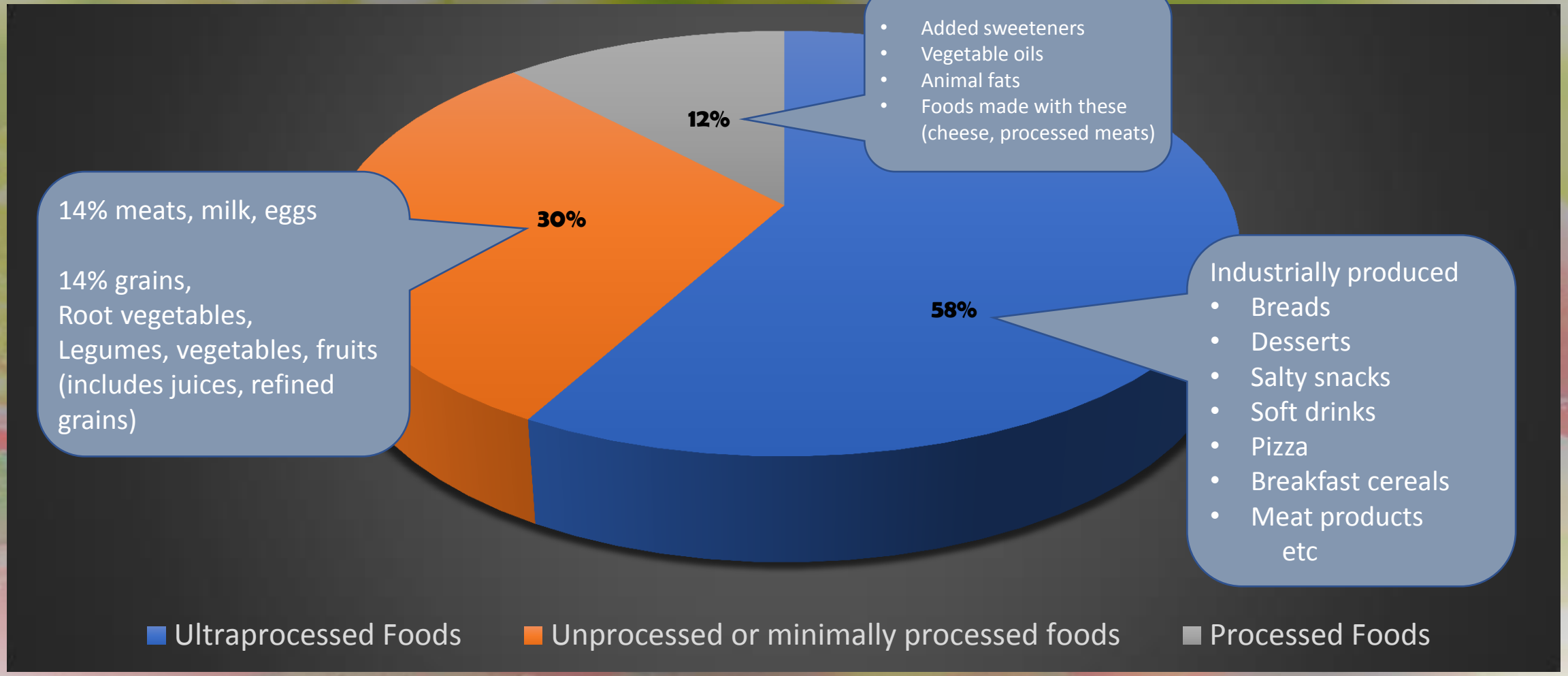
Fried and baked chicken parts, chicken strips/patties, stir-fries, casseroles, sandwiches, salads, other chicken dishes

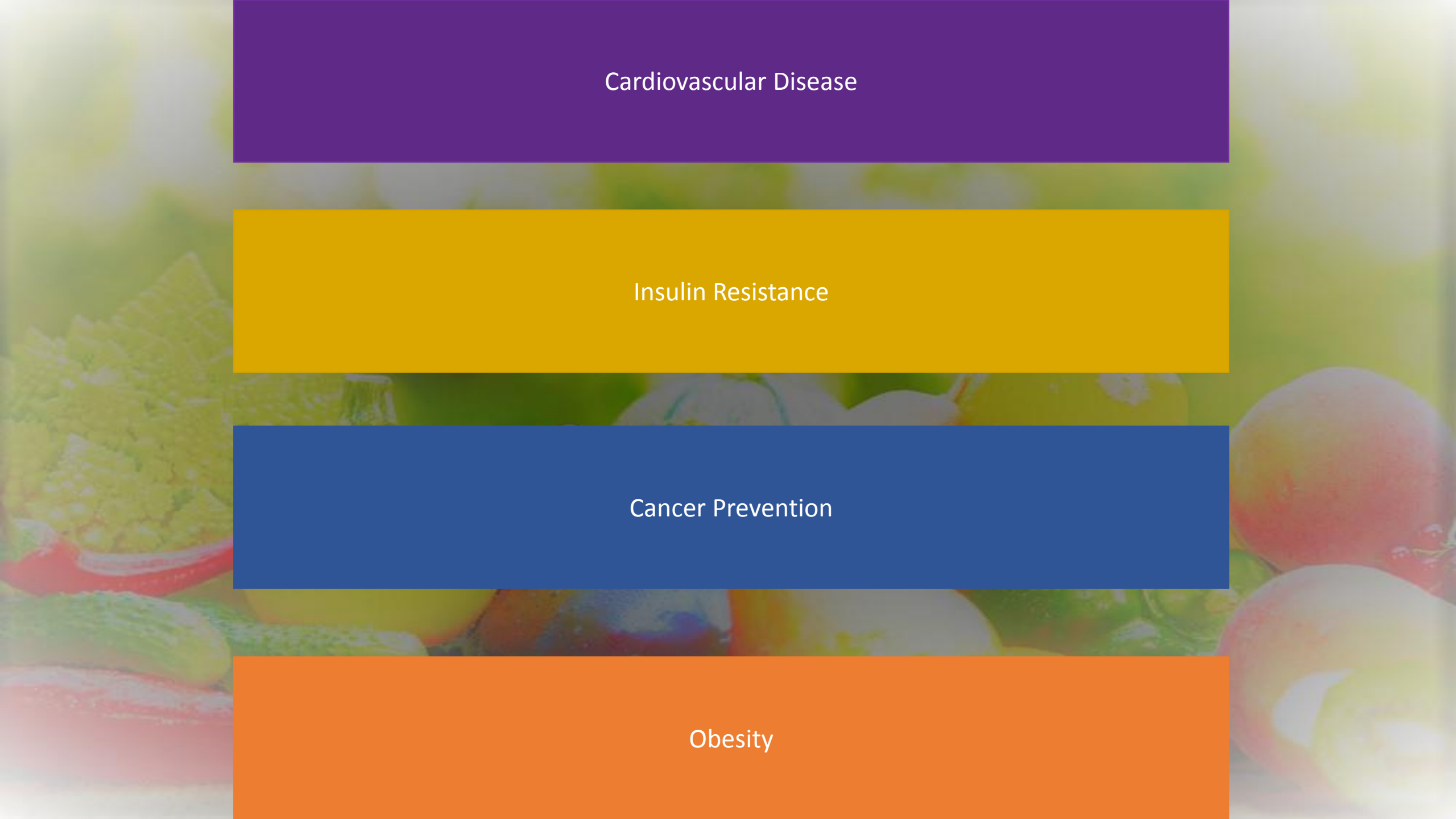
#4 Soda/energy/sports drinks

Sodas, energy drinks, sports drinks, sweetened bottled water

#5 Pizza

70% of our calories come from processed & ultraprocessed foods




Cardiovascular Disease
Insulin Resistance
Cancer Prevention
Obesity

Cardiovascular Disease

Insulin Resistance

Cancer Prevention

Obesity

CORONARY DISEASE AMONG UNITED STATES SOLDIERS KILLED IN ACTION IN KOREA

PRELIMINARY REPORT

Major William F. Enos, Lieut. Col. Robert H. Holmes (MC), U. S. Army
and
Capt. James Beyer (MC), Army of the U. S.

The purpose of this paper is to describe and analyze the gross lesions found in the coronary arteries of United States soldiers killed in action in Korea. The histology will be discussed in detail in a subsequent paper as will such pertinent data as race, body build, and personal habits.

MATERIAL

Recently 300 autopsies were performed on United States battle casualties in Korea. Most of these soldiers were killed in action or suffered accidental death in front line areas. The coronary arteries were carefully dissected in all cases. No case in which there was known clinical evidence of coronary disease was included in this series.

The average age in 200 cases was 22.1 years. The ages in the first 98 cases were not recorded except that the oldest patient was 33. In the entire series, the youngest recorded age was 18 and the oldest 48.

FINDINGS

In 77.3% of the hearts, some gross evidence of coronary arteriosclerosis was found. The disease process varied from "fibrous" thickening to large atheromatous plaques causing complete occlusion of one or more of the major vessels (table 1).

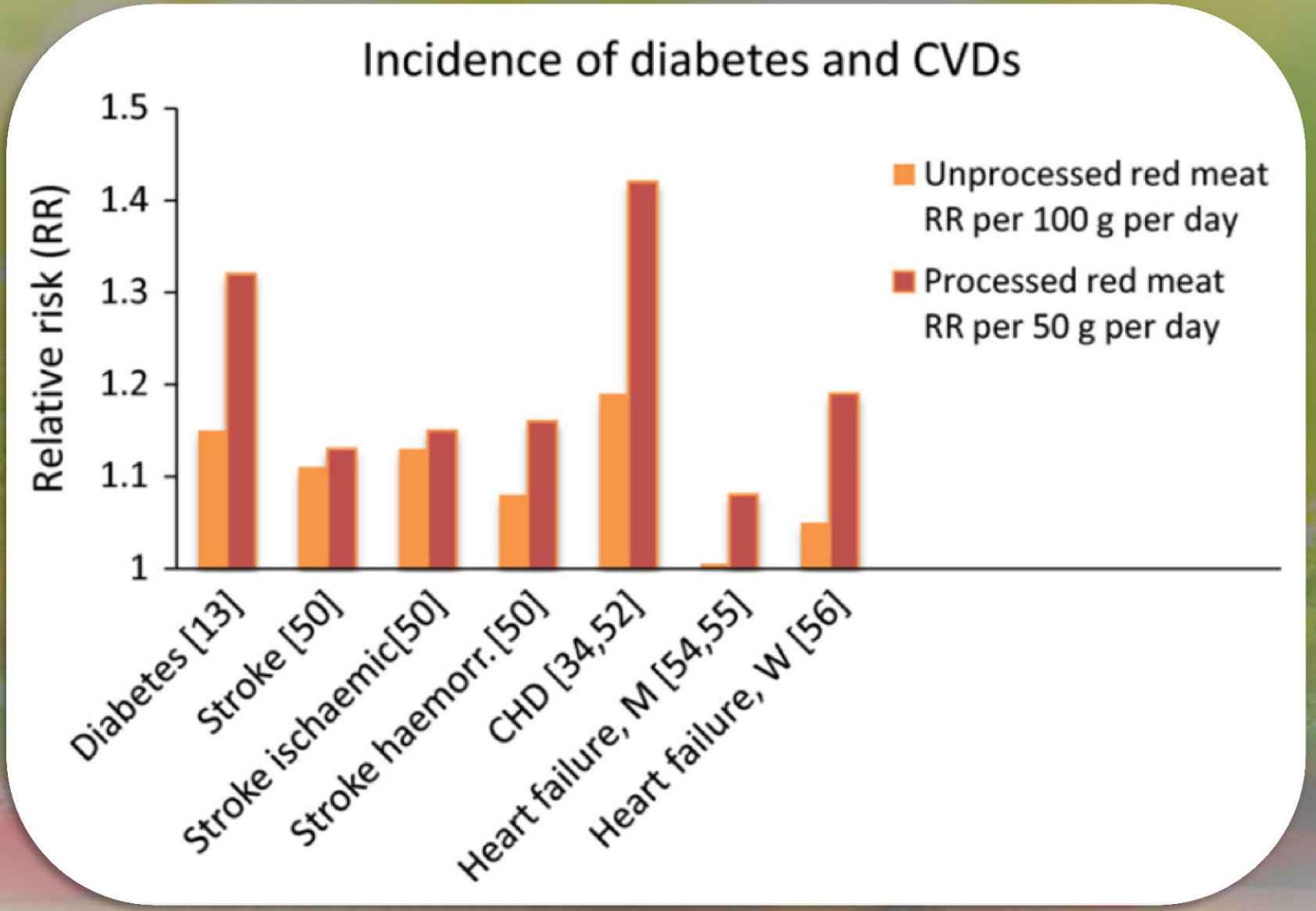
In the great majority of cases, the location of the lesions followed a constant pattern. If the lesion was found in the proximal third of the left coronary artery, it was usually thickest on the epicardial side of the lumen, whereas, if it was in the distal third of the artery just proximal to the bifurcation of the circumflex artery, it tended to as-

TABLE 2.—*Sites of Lesions Found in Coronary Arteries at Autopsy*

Site	No. of Cases
Left coronary	
Above bifurcation	10
At bifurcation	22
And circumflex	1
And right coronary	1
Circumflex, and right coronary	1
Anterior descending	
Branch	114
And circumflex	13
And right coronary	33
And left coronary	5
Left and right coronaries	4
Left coronary, and circumflex	1
Circumflex, and right coronary	8
Left and right coronary, and circumflex	11
Right coronary only	3
Circumflex only	4

- Grains
- Legumes
- Fruits
- Vegetables
- Nuts & Seeds
- Small amounts of meat/poultry/dairy/eggs
- Few highly processed foods

Red & Processed Meat – CV Risk



Wolk, Journal of Internal Medicine 2016

Meatless Diets & Ischemic Heart Disease

	Ischemic Heart Disease
Key et al (Am J Clin Nutr 1999, n>76,000)	↓ 24% (mortality)
Huang et al (Ann Nutr Metab 2012, n>124,000)	↓ 29% (mortality)
EPIC Oxford (Am J Clin Nutr 2013, n>44,000)	↓ 32% (incident cases)

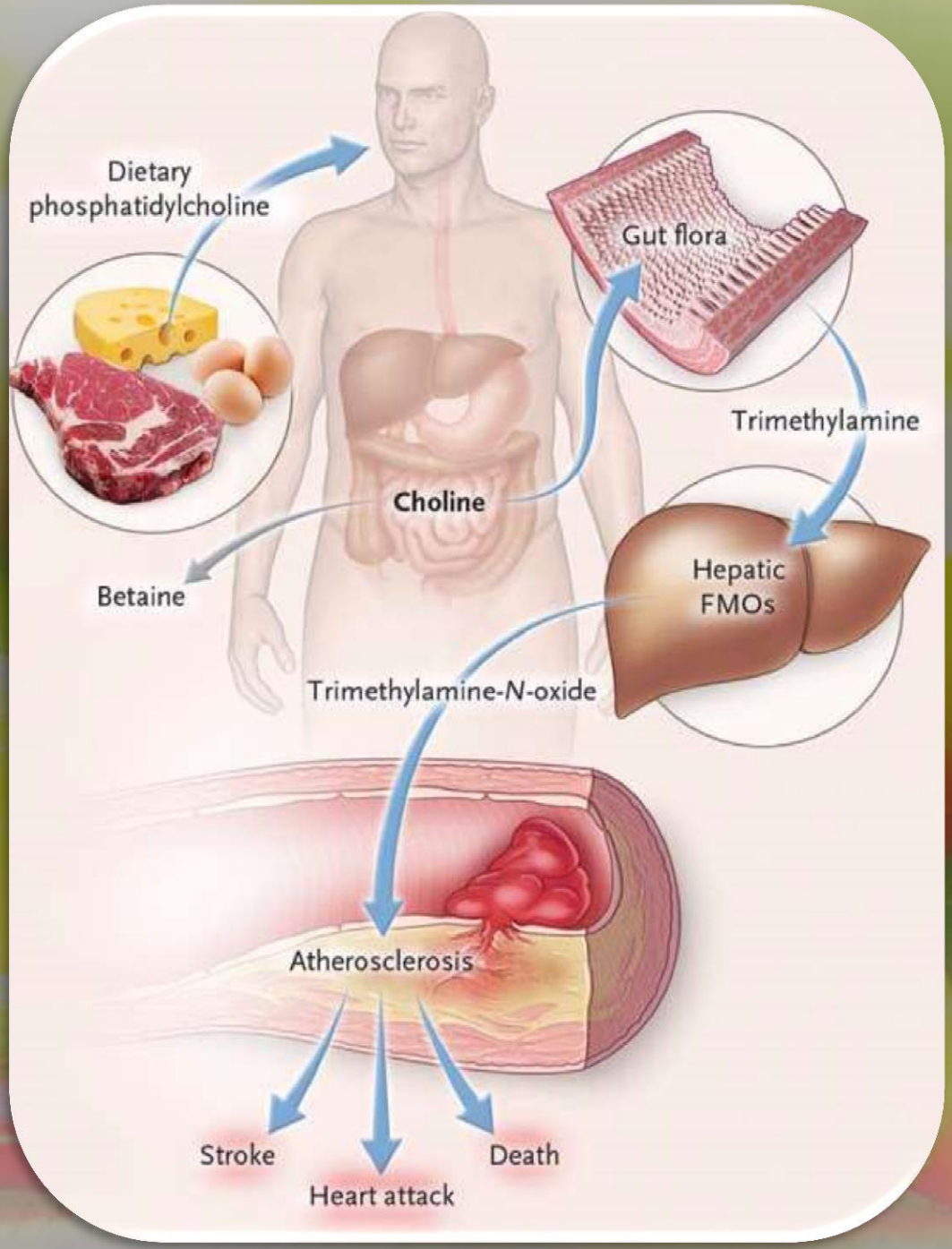
TMAO effects

↑ Uptake of cholesterol macrophages

↑ foam cell formation

↑platelet aggregation

↓ hepatic clearance of cholesterol



TMAO Increases

- All-cause mortality
- CV mortality
- Major adverse CV events
- CHF severity
- 30-day adverse CV events post ACS

Tang W et al
N Eng J Med 2013

Koeth R et al
Nat Med, 2013

JAMA Intern Med. 2014 Apr;174(4):516-24. doi: 10.1001/jamainternmed.2013.13563.

Added sugar intake and cardiovascular diseases mortality among US adults.

Yang Q[1], Zhang Z[1], Gregg EW[2], Flanders WD[3], Merritt R[1], Hu FB[4].

Hazard ratio, CV mortality: 2.75 for >25% of kcal from added sugar

Am J Clin Nutr. 2000 Jun;71(6):1455-61.

A prospective study of dietary glycemic load, carbohydrate intake, and risk of coronary heart disease in US women.

Liu S[1], Willett WC, Stampfer MJ, Hu FB, Franz M, Sampson L, Hennekens CH, M...

RR Coronary heart disease: 1.98 for highest quintile of refined carbohydrates

Limits on Added Sugar (AHA recommendations)

6 Teaspoons added sugars per day for women

9 Teaspoons added sugars per day for men

15 Teaspoons of sugars in a 20 oz. coke

23 Teaspoons ACTUAL sugars consumed by average American per day

Women: 6 tsp/100 Kcal/25g
Men: 9 tsp/ 150 Kcal/ 37.5g

Johnson et al, Circulation 2009

Words That Really Just Mean 'Added Sugar'

agave juice
agave nectar
agave sap
agave syrup
beet sugar
brown rice syrup
brown sugar
cane juice
cane sugar
cane syrup
clintose
confectioners
powdered sugar
confectioners
sugar
corn glucose syrup
corn sweet
corn sweetener
corn syrup
date sugar
dextrose
drimol
dri mol
dri-mol
drisweet
dri sweet
dri-sweet
dried raisin
sweetener
edible lactose
flo malt
flo-malt
flomalt
fructose
fructose sweetener
glaze and icing
sugar
glaze icing sugar
golden syrup
gomme
granular sweetener
granulated sugar
hi-fructose corn
syrup
high fructose corn
syrup
honey
honibake
honi bake
honi-bake
honi flake
honi-flake
invert sugar
inverted sugar
isoglucose
isomaltulose
kona ame
kona-ame
lactose
liquid sweetener
malt
malt sweetener
malt syrup
maltose
maple
maple sugar
maple syrup
mizu ame
mizu-ame
mizuame
molasses
nulomoline
powdered sugar
rice syrup
sorghum
sorghum syrup
starch sweetener
sucanat
sucrose
sucrovert
sugar beet
sugar invert
sweet n neat
table sugar
treacle
trehalose
tru sweet
turbinado sugar
versatose

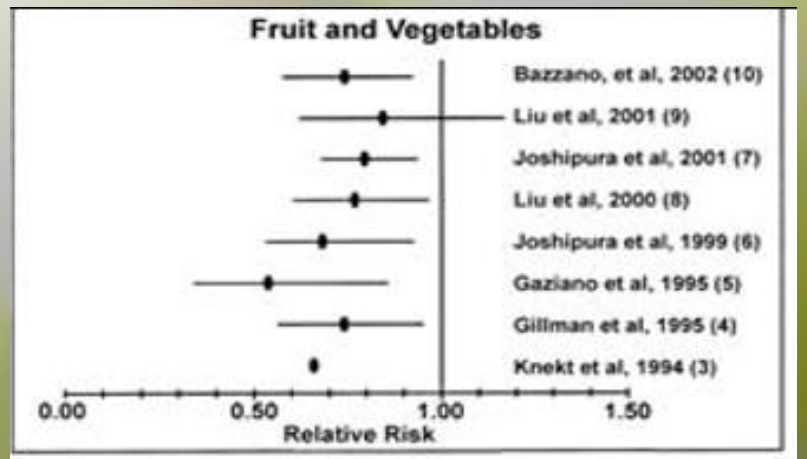
Source: "Sweetening of the Global Diet, Particularly Beverages: Patterns, Trends, and Policy Responses" by Barry M. Popkin and Corinna Hawkes

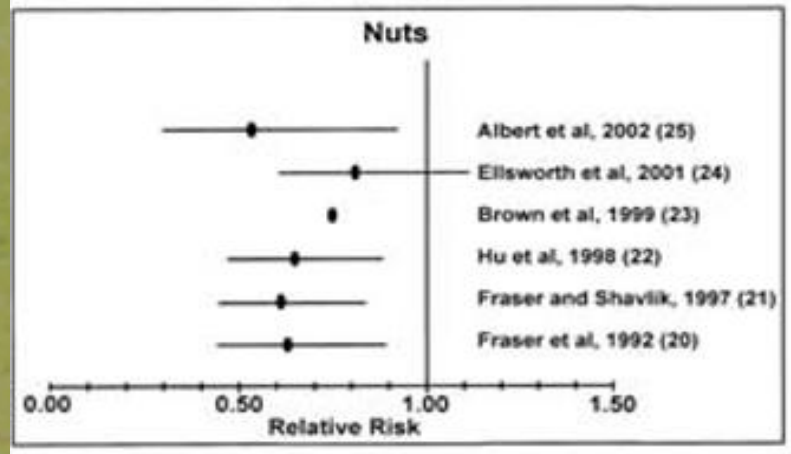
Int J Epidemiol. 2017 Jun 1;46(3):1029-1056. doi: 10.1093/ije/dyw319.

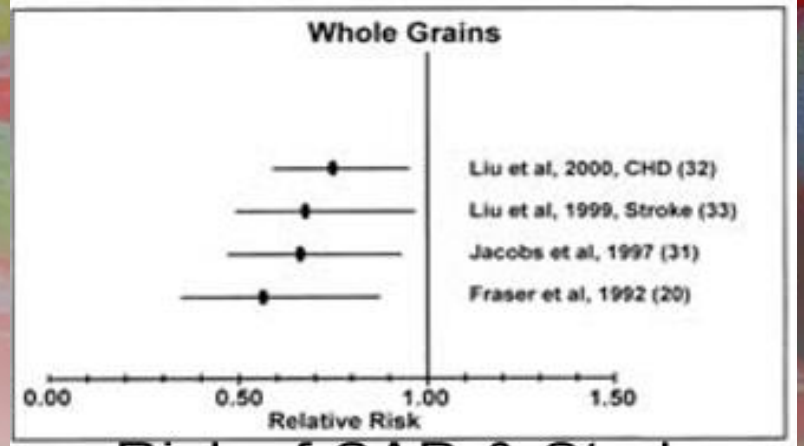
Fruit and vegetable intake and the risk of cardiovascular disease, total cancer and all-cause mortality-a systematic review and dose-response meta-analysis of prospective studies.

Aune D[1,2,3], Giovannucci E[4,5,6], Boffetta P[7], Fadnes LT[8], Keum N[5,6], Norat T[2], Greenwood DC[9], Riboli E[2], Vatten LJ[1], Tonstad S[10].

- Systemic review and meta-analysis, 95 studies worldwide
- Each 2.5 servings/day of fruits & vegetables decreases risk by
  - 8% for CHD
  - 16% for stroke
  - 10% for all cause mortality
- Benefits continued up to 10 servings/day







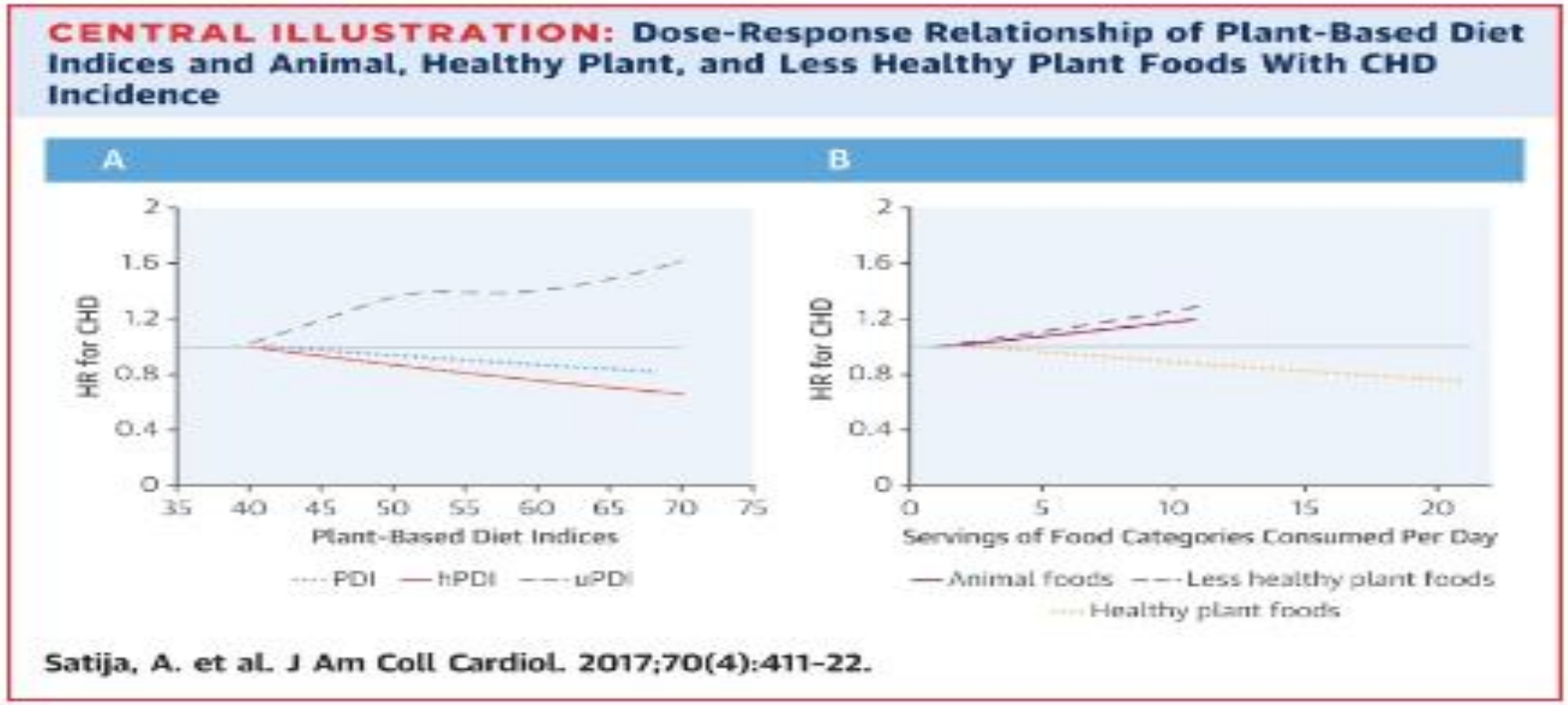
Risk of CAD & Stroke

J Am Coll Cardiol. 2017 Jul 25;70(4):411-422. doi: 10.1016/j.jacc.2017.05.047.

Healthful and Unhealthful Plant-Based Diets and the Risk of Coronary Heart Disease in U.S. Adults.

Satija A[1], Bhupathiraju SN[2], Spiegelman D[3], Chiuve SE[4], Manson JE[5], Willett W[6], Rexrode KM[7], Rimm EB[8], Hu FB[8].

- **Nurses' Health Study 1 & 2, Health Professionals Follow-Up Study; 4.8 million person-years of follow-up**
- **Plant-based diet index (PDI): high in all plant foods, low in animal foods**
  - **Healthy PDI: High in whole grains, fruits, vegetables, nuts, legumes, vegetable oils**
  - **Unhealthy PDI: high in fruit juice, refined grains, fried potatoes & chips, sugar-sweetened beverages, sweets/desserts**



Hazard ratio, CHD incidence

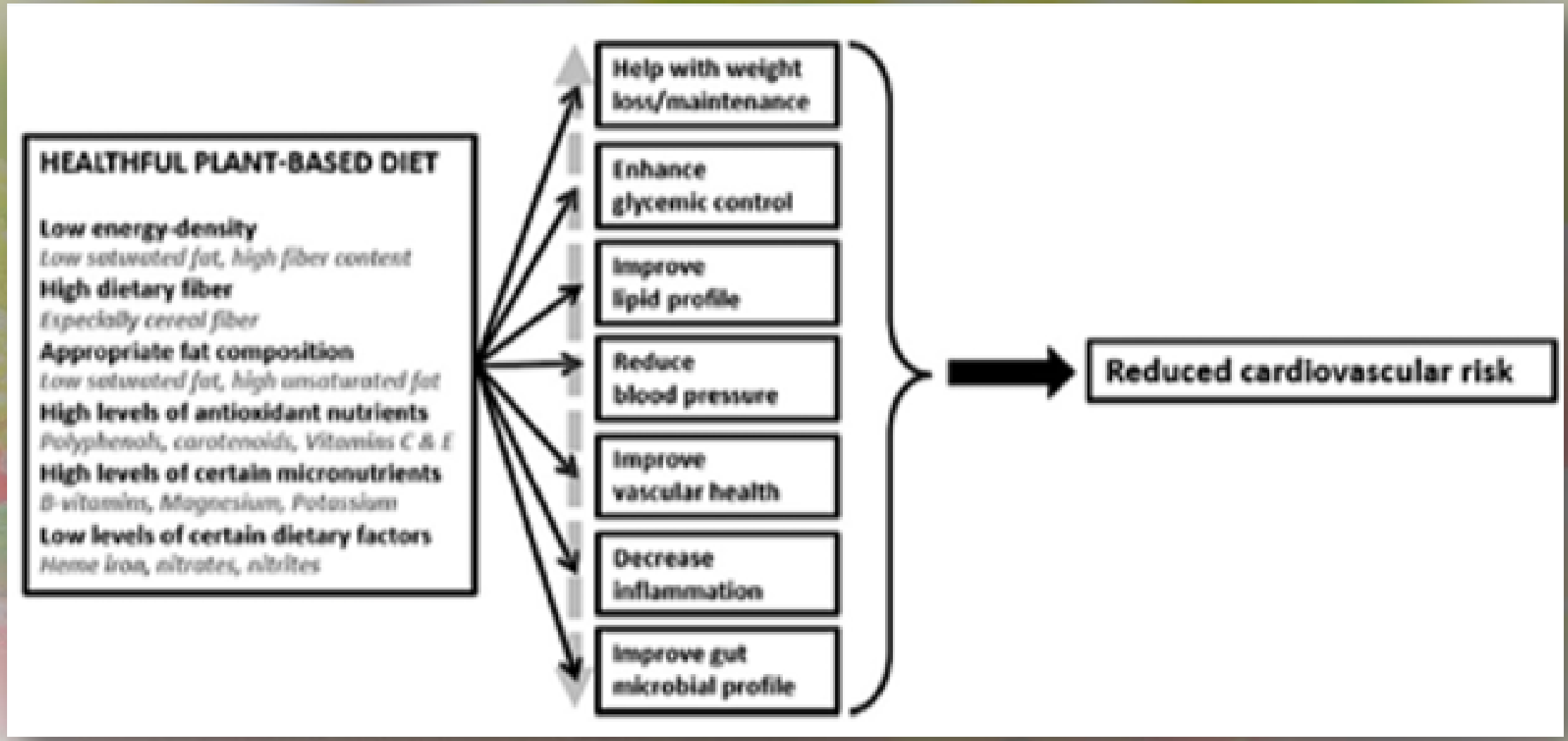
- Overall plant-based diet: 0.92 (0.83-1.01)
- Healthy plant-based: 0.75 (0.68-0.83)
- Unhealthy plant-based: 1.32 (1.20-1.46)

Plant Foods & Cardiovascular Health: Mechanisms?

- Replace disease-promoting foods
- Reduce LDL oxidation via polyphenols/antioxidants
- Improve endothelial function
- Reduce inflammation
- Beneficially alter gut microbiota
- Lower blood pressure via high potassium low sodium
- Decrease lipids

Randomized Controlled Trials	Decrease in Total & LDL Cholesterol
Semi-veg diet, Lacto-ovo veg diet	10-15%
Vegan diet	15-20%
Veg w added fiber/soy/nuts	20-35%

The Pleiotropic Benefits of Plant Foods



Intensive Lifestyle Changes for Reversal of Coronary Heart Disease

Dean Ornish, MD; Larry W. Scherwitz, PhD; James H. Billings, PhD, MPH; K. Lance Gould, MD; Terri A. Merritt, MS; Stephen Sparler, MA; William T. Armstrong, MD; Thomas A. Ports, MD; Richard L. Kirkeeide, PhD; Charissa Hogeboom, PhD; Richard J. Brand, PhD

JAMA 1998

- RCT, pts with CAD, 5 yrs
- Plant-based lifestyle vs physician's diet advise
- CV events: RR 2.47 in control group, despite statins
- Angina: +186% in control, -91% in intervention

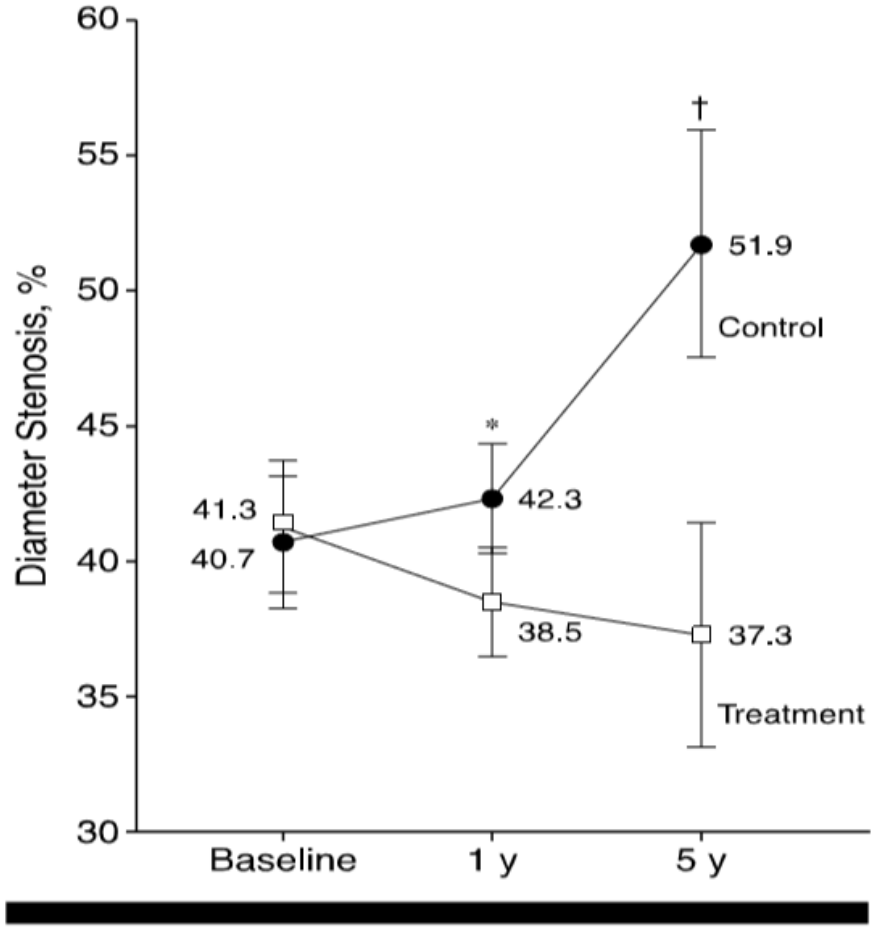


Figure 1.—Mean percentage diameter stenosis in treatment and control groups at baseline, 1 year, and 5 years. Error bars represent SEM; asterisk, $P = .02$ by between-group 2-tailed test; dagger, $P = .001$ by between-group 2-tailed test.

Cardiovascular Disease

Insulin Resistance

Cancer Prevention

Obesity

Pharma & Healthcare

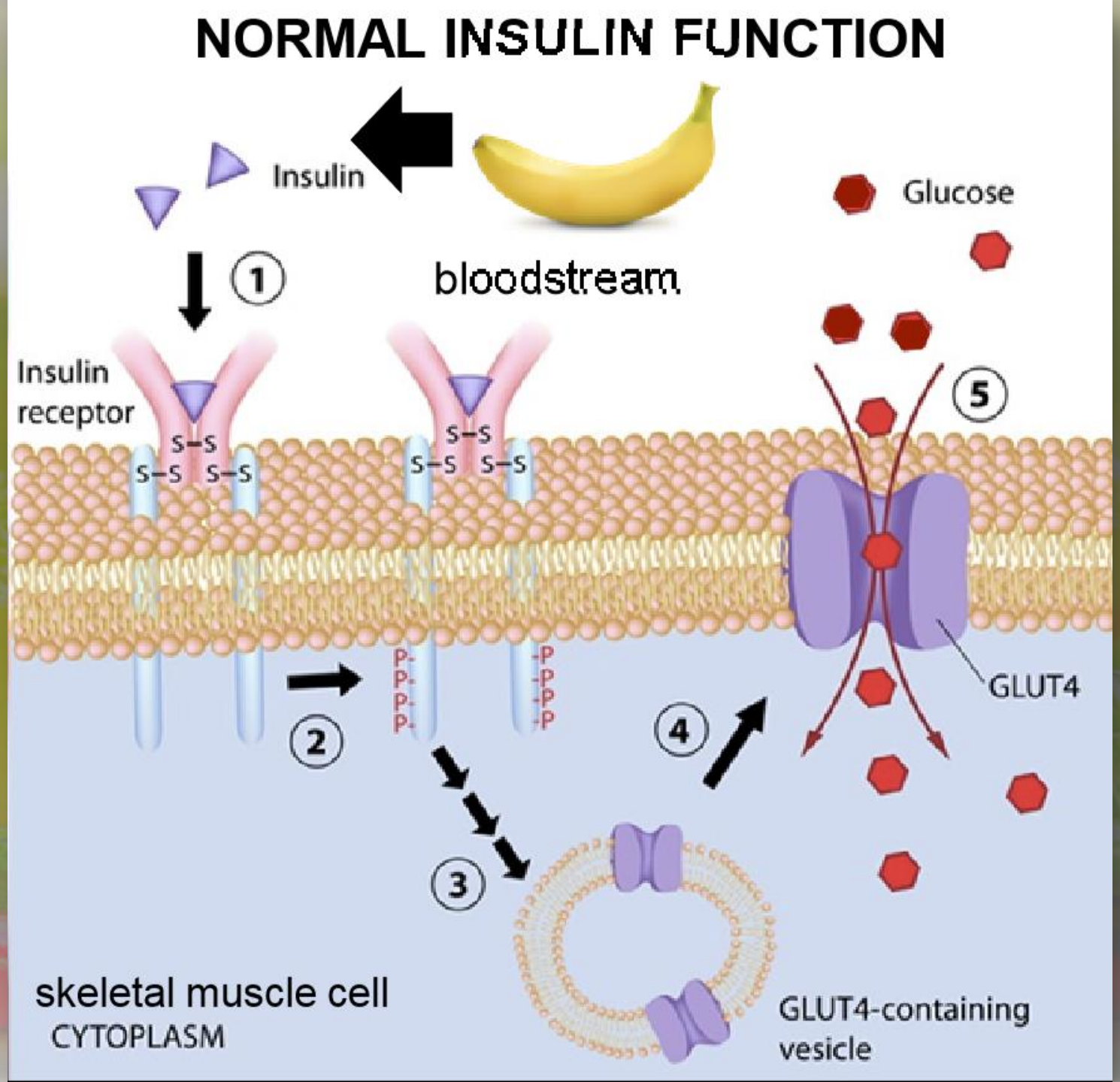
SEP 8, 2015 @ 09:29 PM

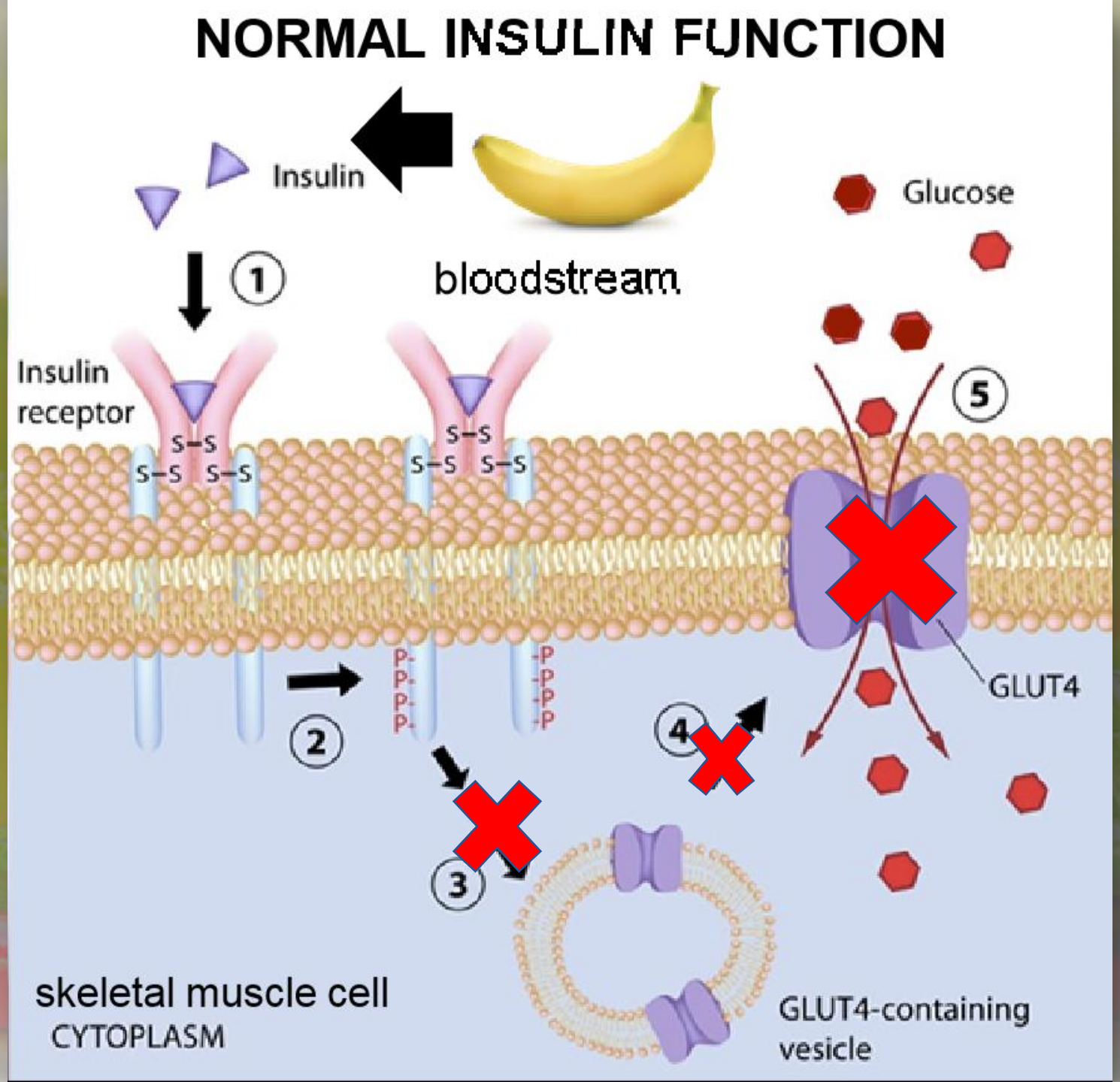
Half Of Adults In The U.S. Have Diabetes Or Pre-Diabetes, Study Finds

Robert Glatter, MD, CONTRIBUTOR

I cover breaking news in medicine, med tech and public health FULL BIO

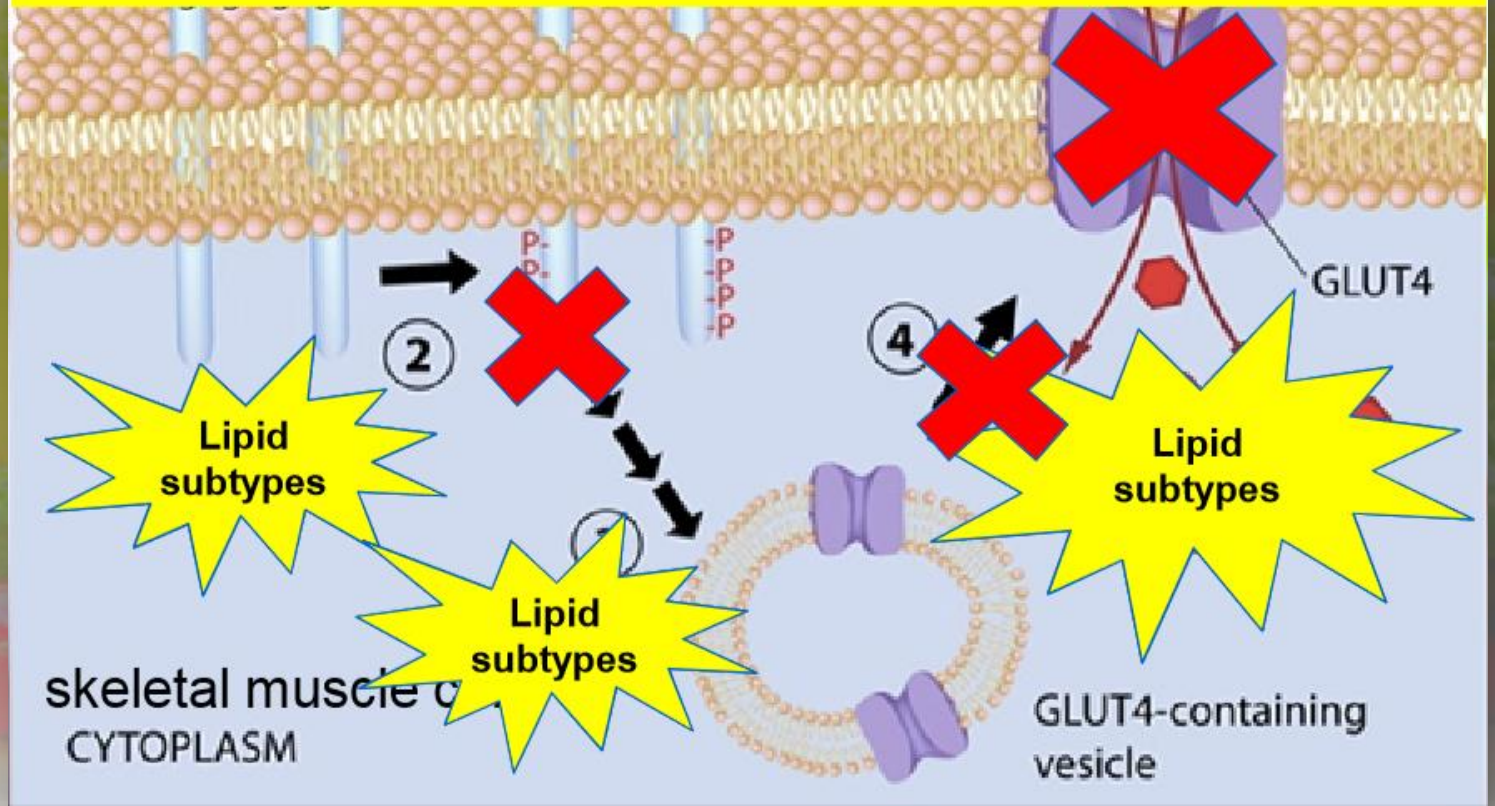
Opinions expressed by Forbes Contributors are their own.


NORMAL INSULIN FUNCTION
Insulin
Glucose
1
bloodstream
Insulin receptor
S–S
S–S
S–S
S–S
S–S
5
2
P
4
GLUT4
3
skeletal muscle cell
CYTOPLASM
GLUT4-containing vesicle


NORMAL INSULIN FUNCTION
Insulin
Glucose
1
bloodstream
Insulin receptor
S–S
S–S
S–S
S–S
S–S
5
GLUT4
2
P
4
3
skeletal muscle cell
CYTOPLASM
GLUT4-containing vesicle

INSULIN RESISTANCE

LIPOTOXICITY



REVIEW ARTICLE

Ectopic Fat in Insulin Resistance, Dyslipidemia, and Cardiometabolic Disease

Gerald I. Shulman, M.D., Ph.D.

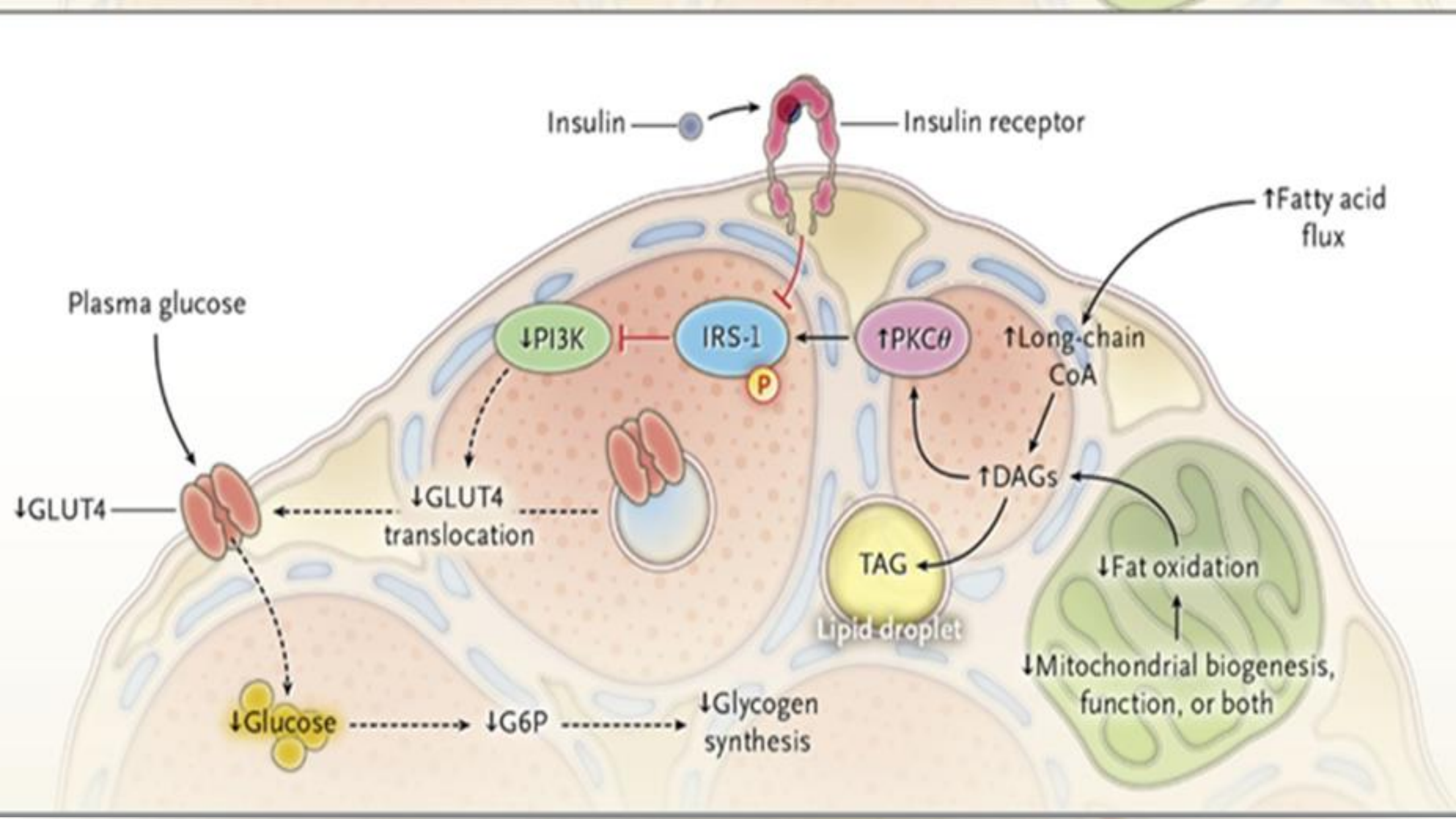
Article Figures/Media Metrics

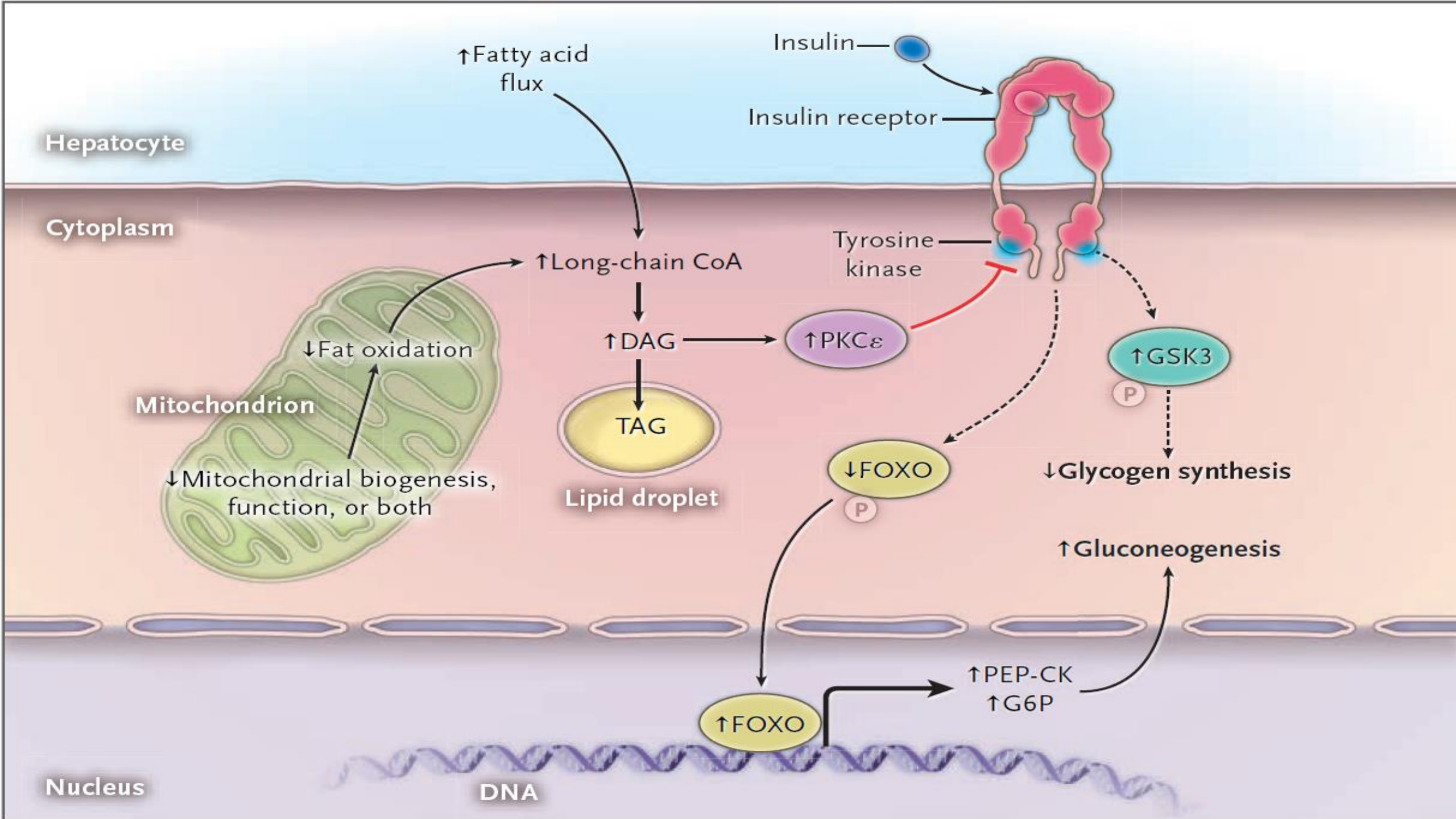
References 225 Citing Articles Letters

September 18, 2014
N Engl J Med 2014; 371:1131-1141
DOI: 10.1056/NEJMra1011035

Fat accumulation in skeletal muscle & liver cells (ectopic fat) is a primary cause of insulin resistance

- **Skeletal Muscle: decreased glucose uptake**
- **Liver: decreased glycogen synthesis, increased gluconeogenesis**


Insulin
Insulin receptor
↑Fatty acid flux
Plasma glucose
↓PI3K
IRS-1
P
↑PKCθ
↑Long-chain CoA
↓GLUT4
↓GLUT4 translocation
↑DAGs
TAG
Lipid droplet
↓Fat oxidation
↓Mitochondrial biogenesis, function, or both
↓Glucose
↓G6P
↓Glycogen synthesis

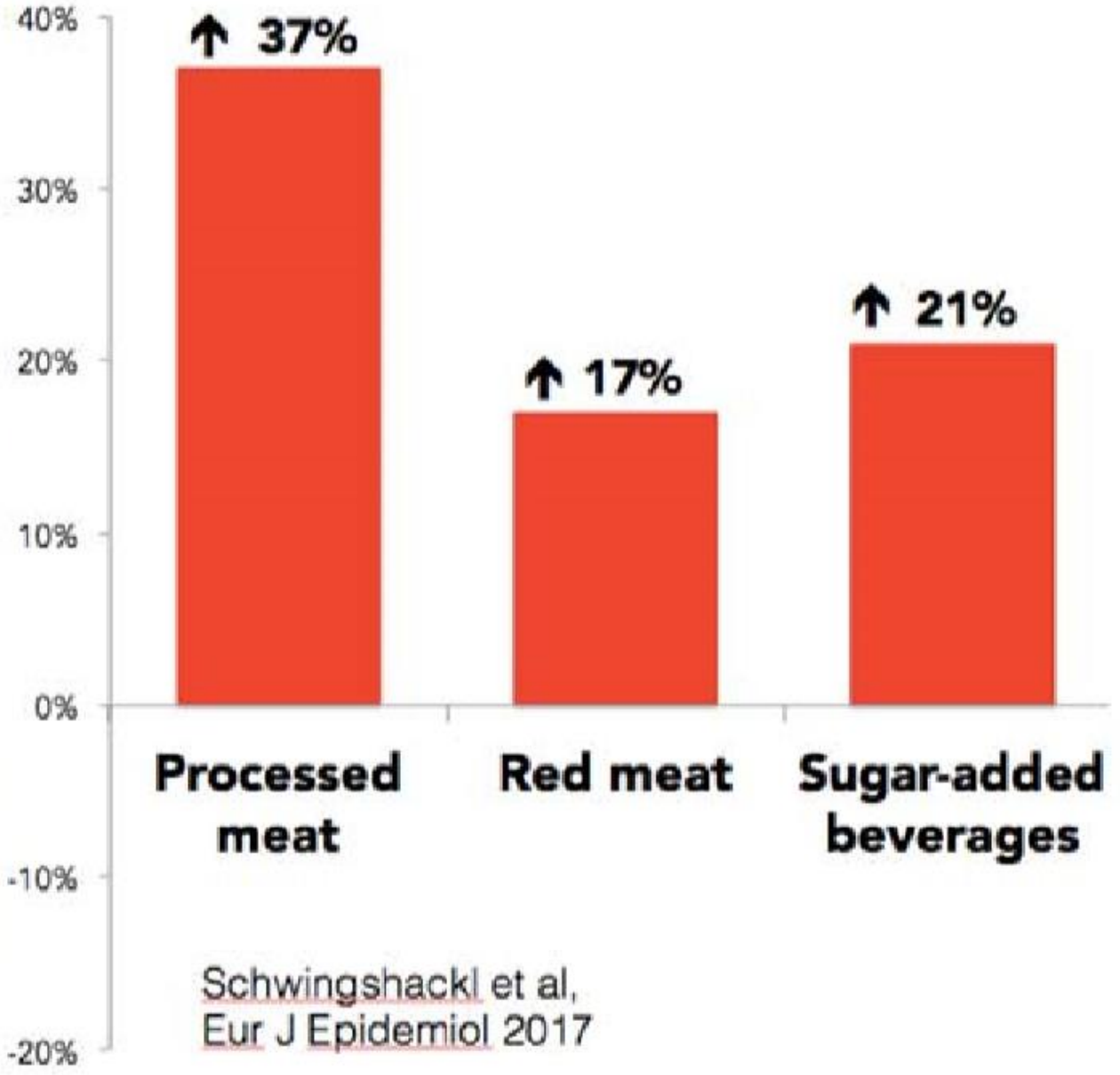

↑Fatty acid flux
Insulin
Insulin receptor
Hepatocyte
Cytoplasm
Tyrosine kinase
↑Long-chain CoA
↑DAG
↑PKCε
↑GSK3
P
↓Fat oxidation
Mitochondrion
TAG
Lipid droplet
↓Mitochondrial biogenesis, function, or both
↓FOXO
P
↓Glycogen synthesis
↑Gluconeogenesis
↑FOXO
↑PEP-CK
↑G6P
Nucleus
DNA

- Adiposity
- Excess calories
- Excess dietary fat
- Inflammation
- Oxidative stress
- Mitochondrial dysfunction

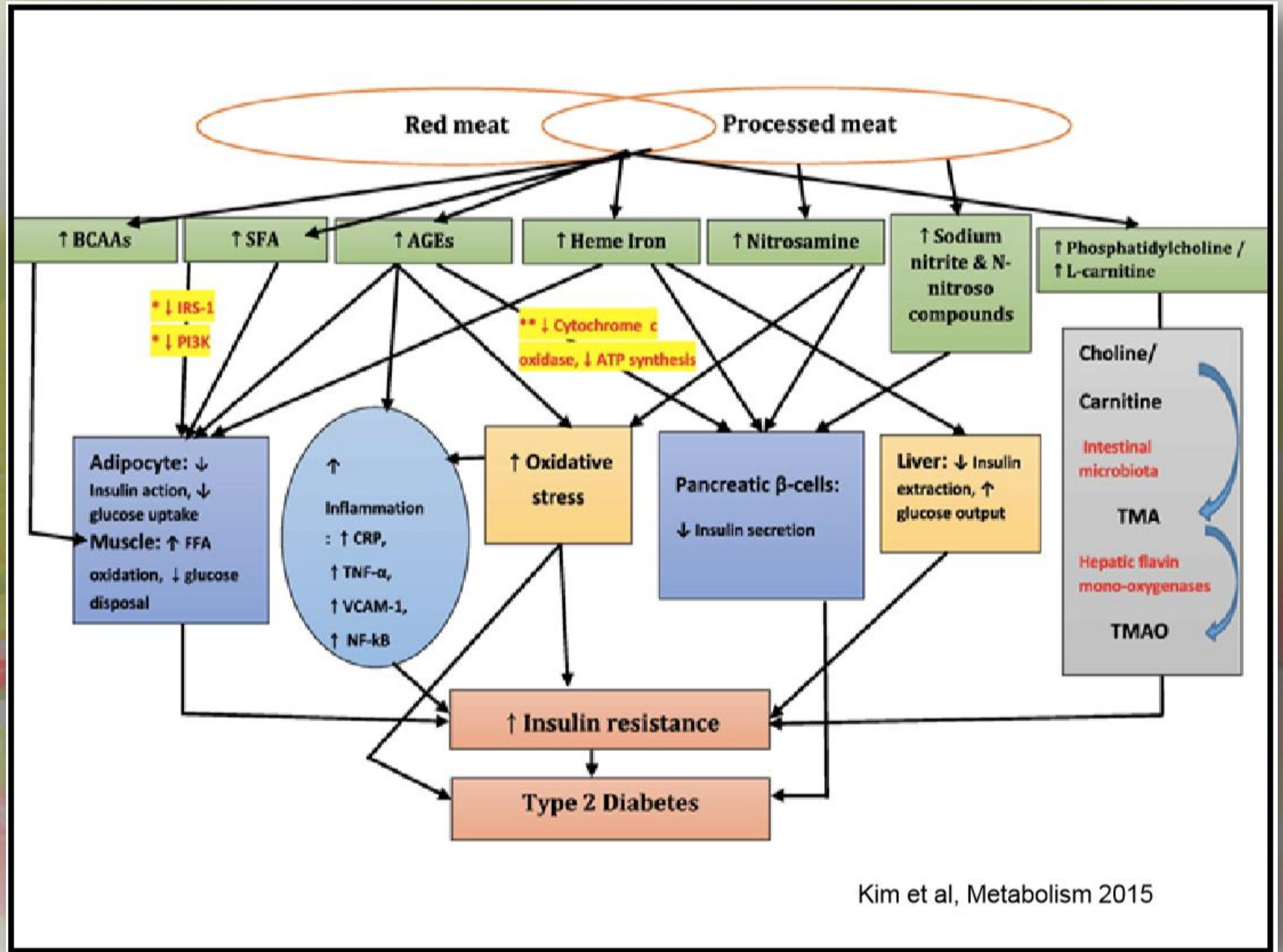
Fat accumulation in [illegible] cells (ectopic fat) is a primary c[illegible] resistance

- **Skeletal Muscle: decreased**
- **Liver: decreased glycogen synthesis, increased gluconeogenesis**

Risk of Diabetes Per Each Daily Serving



Schwingshackl et al,
Eur J Epidemiol 2017



Kim et al, Metabolism 2015

Epidemiology/Health Services Research

Dietary Protein Intake and Incidence of Type 2 Diabetes in Europe: The EPIC-InterAct Case-Cohort Study

Monique van Nielen[1] ⇑, Edith J.M. Feskens[1], Marco Mensink[1], Ivonne Sluijs[2], Esther Molina[3], Pilar Amiano[4,5], Eva Ardanaz[5,6], Beverly Balkau[7], Joline W.J. Beulens[2], Heiner Boeing[8], Françoise Clavel-Chapelon[7,9], Guy Fagherazzi[7,9], Paul W. Franks[10], Jytte Halkjaer[11], José Maria Huerta[5,12], Verena Katzke[13], Timothy J. Key[14], Kay Tee Khaw[15], Vittorio Krogh[16], Tilman Kühn[13], Virginia V.M. Menéndez[17], Peter Nilsson[10], Kim Overvad[18], Domenico Palli[19], Salvatore Panico[20], Olov Rolandsson[21], Isabelle Romieu[22], Carlotta Sacerdote[23,24], Maria-José Sánchez[3,5], Matthias B. Schulze[8], Annemieke M.W. Spijkerman[25], Anne Tjonneland[11], Rosario Tumino[26], Daphne L. van der A[25], Anne M.L. Würtz[18], Raul Zamora-Ros[27,28], Claudia Langenberg[15], Stephen J. Sharp[15], Nita G. Forouhi[15], Elio Riboli[29] **and** Nicholas J. Wareham[15] **for the InterAct Consortium**

Author Affiliations

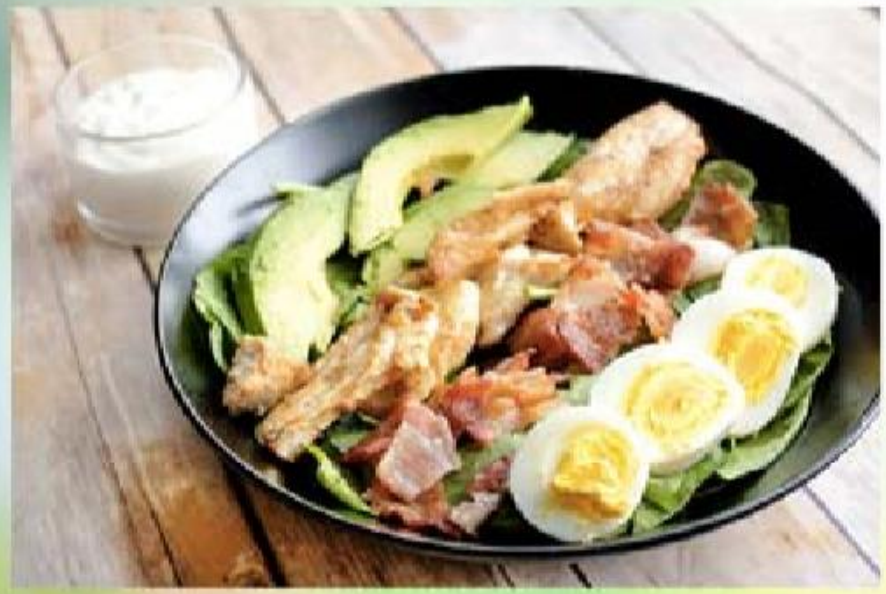
Corresponding author: Monique van Nielen, monique.vannielen@wur.nl.

Diabetes Care 2014 Jul; 37(7): 1854-1862. https://doi.org/10.2337/dc13-2627

- Replace carbs with protein → increased risk of DM2
- 22% increased risk for highest quintile of protein (109g/day)
- Association attributed to animal protein

Low-carb diets can *increase* the risk of diabetes…

- Bao et al, Diabetes Care 2016
- de Koning et al, Am J Clin Nutr 2011
- Schulze et al, Br J Nutr 2008



…and do not improve glycemic control over the long-term

- Snorgaard et al, BMJ Open Diabetes Res Care 2017
- van Wyk et al, Diabet Med 2016

Fructose from Sugar-Sweetened Foods/Drinks

"Empty Calories" → Weight gain

De novo lipogenesis in liver

Obesity

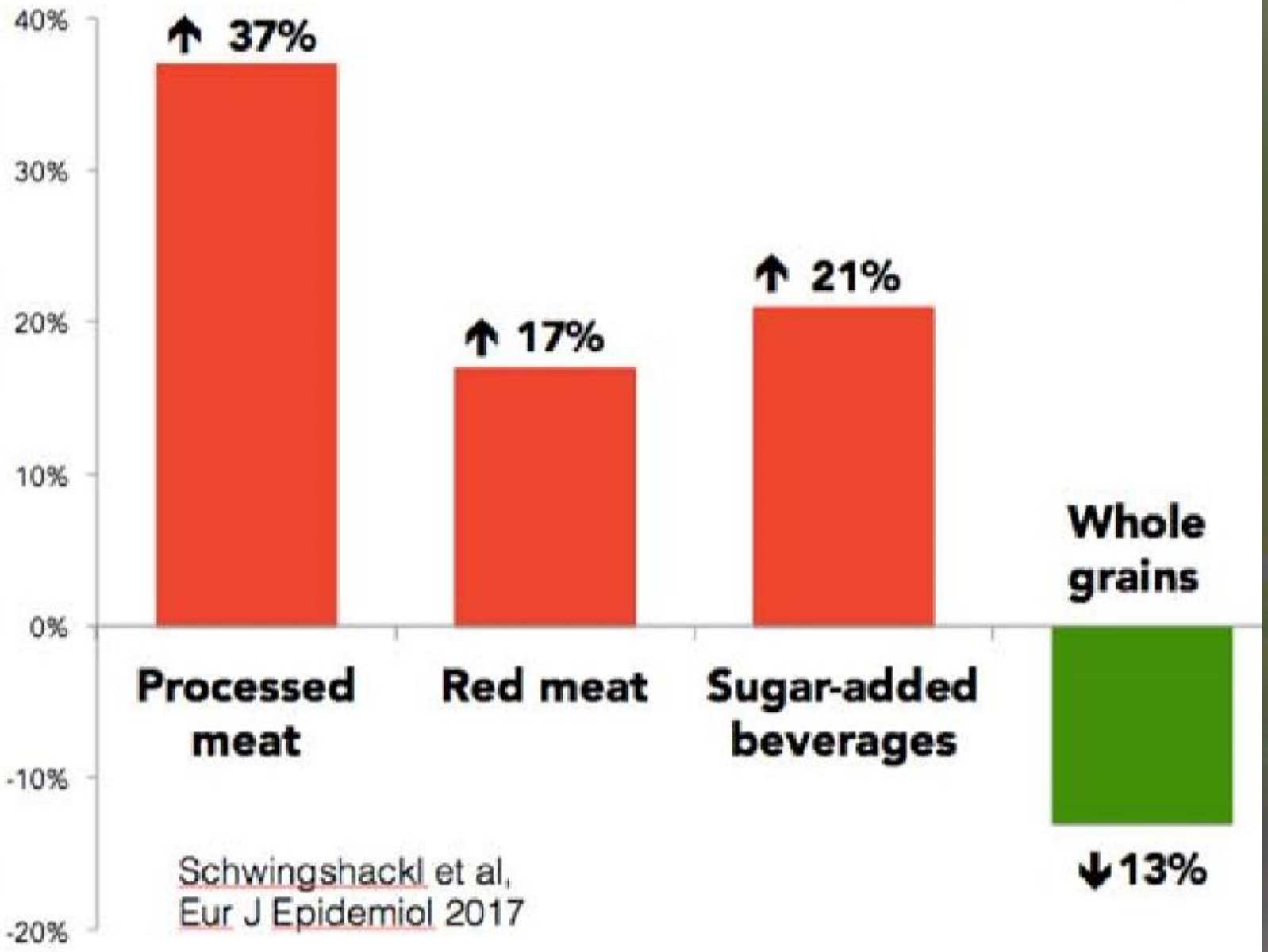
Fatty liver & increased fat in skeletal muscle

Lipotoxicity → Insulin Resistance

Which type of foods most protective against type 2 diabetes?

A.Cruciferous vegetables
B.Berries
C.Whole Grains
D.Fish

Risk of Diabetes Per Each Daily Serving



Whole Grains lower diabetes risk: effect of cereal fiber

- Improves postprandial glucose response
- Lowers calorie density
- Increases satiety
- Metabolized by gut bacteria to form *short-chain fatty acids*
  - Increase GLP1
  - Increase insulin sensitivity
  - Regulate cytokines to decrease inflammation
  - Improve mitochondrial function


NOT GUILTY

PLoS Med. 2017 Apr; 14(4): e1002279.
Published online 2017 Apr 11. doi: 10.1371/journal.pmed.1002279

PMCID: PMC5388466
PMID: 28399126

Fresh fruit consumption in relation to incident diabetes and diabetic vascular complications: A 7-y prospective study of 0.5 million Chinese adults

Huaidong Du,[1,2,*] Liming Li,[3,4,*] Derrick Bennett,[2] Yu Guo,[4] Iain Turnbull,[2] Ling Yang,[1,2] Fiona Bragg,[2] Zheng Bian,[4] Yiping Chen,[1,2] Junshi Chen,[5] Iona Y. Millwood,[1,2] Sam Sansome,[2] Liangcai Ma,[6] Ying Huang,[7] Ningmei Zhang,[8] Xiangyang Zheng,[9] Qiang Sun,[10] Timothy J. Key,[11] Rory Collins,[2] Richard Peto,[2] Zhengming Chen,[2] and China Kadoorie Biobank study[¶]

Sanjay Basu, Academic Editor

- >500,000 adults followed for 7 yrs
- Daily fruit consumption: 12% lower risk of diabetes
- In those who had diabetes at baseline, 3x/wk fruit lowered
  - All-cause mortality by 17%
  - Microvascular complications by 28%
  - Macrovascular complications by 13%

RESEARCH ARTICLE

Plant-Based Dietary Patterns and Incidence of Type 2 Diabetes in US Men and Women: Results from Three Prospective Cohort Studies

Ambika Satija ✉, Shilpa N. Bhupathiraju, Eric B. Rimm, Donna Spiegelman, Stephanie E. Chiuve, Lea Borgi, Walter C. Willett, JoAnn E. Manson, Qi Sun, Frank B. Hu

Published: June 14, 2016 - https://doi.org/10.1371/journal.pmed.1002039

- Nurses' Health Study 1 & 2, Health Professionals Follow-Up Study; 4.8 million person-years of follow-up
- Risk of type 2 diabetes
  - Plant-based dietary pattern: **20% ↓ risk**
  - Healthy plant-based pattern: **34% ↓ risk**
  - Unhealthy plant-based pattern: **16% ↑ risk**
- Independent of body weight & other risk factors

Plant-Based Diet for Type 2 Diabetes

- RCT, 99 pts with DM2 x 74wks
- Low-fat plant-based diet (no calorie restrictions) vs conventional, reduced-calorie diet
- Better glycemic control with plant-based diet (a1c -0.40 vs -0.01, p+0.03) when med adjustments excluded
- Better lipid reduction & weight loss with plant-based diet

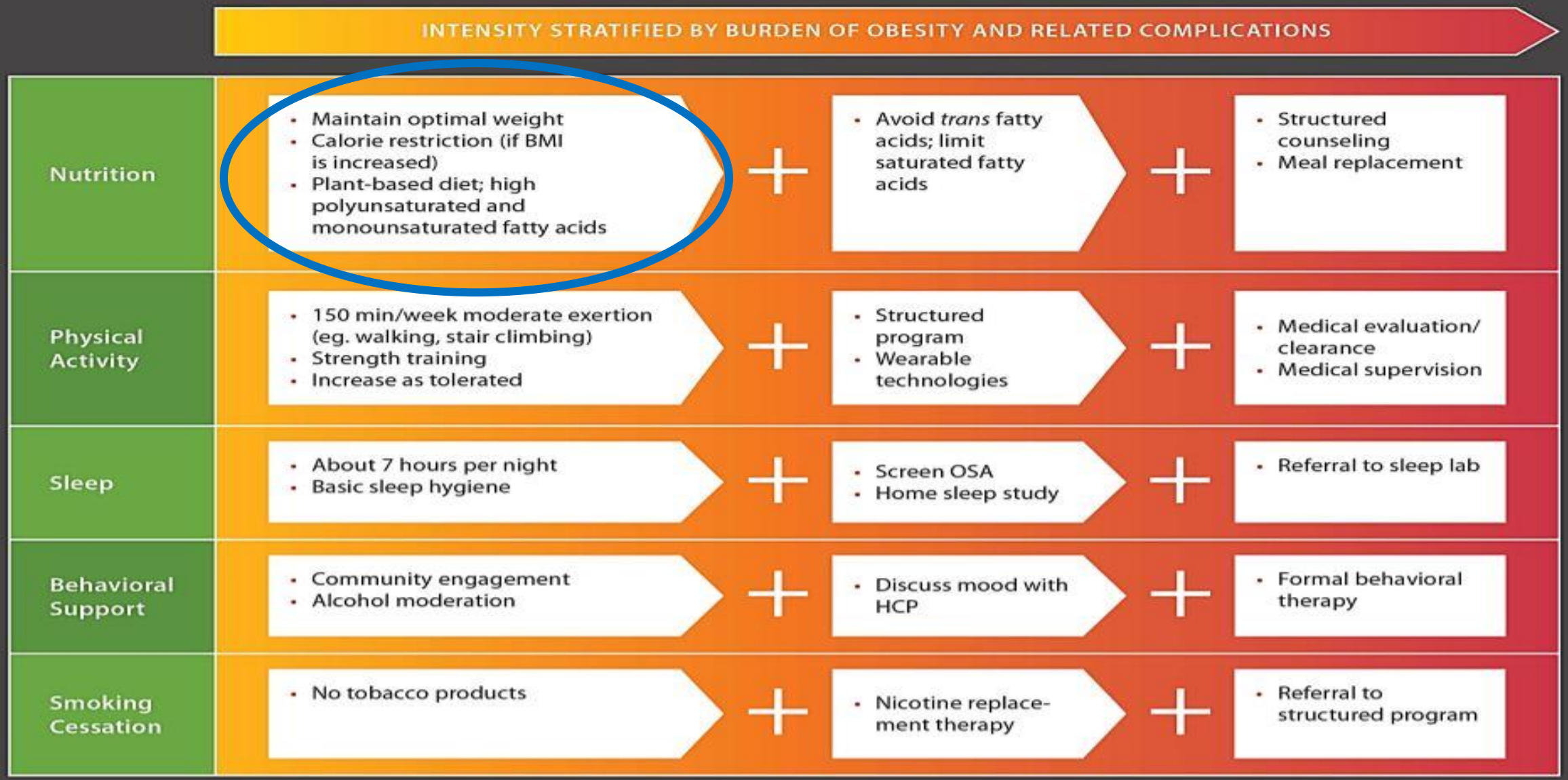
Barnard et al, AM J Clin Nutr 2009






LIFESTYLE THERAPY

RISK STRATIFICATION FOR DIABETES COMPLICATIONS



 DOI 10.4158/EP161682.CS


Cardiovascular Disease
Insulin Resistance
Cancer Prevention
Obesity

Healthful

Whole Grains
Legumes
Fruits
Vegetables
Nuts
Seeds

Debatable

Poultry
Eggs
Dairy
Fish

Unhealthful

Processed meat
Red meat
Added sugar
Refined grains
Ultraprocessed foods

CNN Money Business Markets Tech Media Personal Finance Small Biz Luxury

The Feed

Processed meat causes cancer, says WHO

NBCNEWS HOME TOP VIDEOS ONGOING: CONFEDERATE FLAG FUROR ARTIFICIAL TURF DEBATE

U.S. WORLD LOCAL POLITICS HEALTH TECH SCIENCE POP CULTURE BUSINESS INVESTIGATIONS SPORTS MORE

NIGHTLY NEWS TODAY MEET THE PRESS DATELINE

HEALTH › CANCER

HEALTH CARE DIET & FITNESS MENTAL HEALTH MEN'S HEALTH WOMEN'S HEALTH

HEALTH

OCT 26 2015, 8:46 AM ET

Ham, Sausages Cause Cancer; Red Meat Probably Does, Too, WHO Group Says

by MAGGIE FOX

The Washington Post

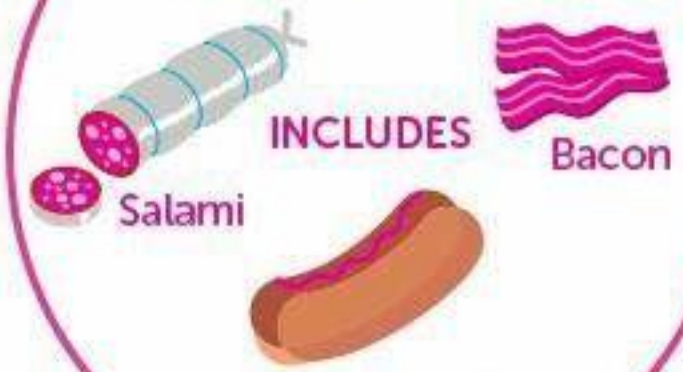
Wonkblog

Hot dogs, bacon and other processed meats cause cancer, World Health Organization declares

MEAT AND CANCER HOW STRONG IS THE EVIDENCE?

IARC CARCINOGENIC CLASSIFICATION GROUPS

Processed meats have been given Group 1 classification



INCLUDES

Salami

Bacon

Sausages and hot dogs

GROUP 1 — Causes cancer

Probably causes cancer

GROUP 2A

GROUP 2B — Possibly causes cancer

GROUP 3 — Not classifiable as a cause of cancer

GROUP 4 — Probably not a cause of cancer

These categories represent how likely something is to cause cancer in humans, not how many cancers it causes

Red meats have been given Group 2A classification

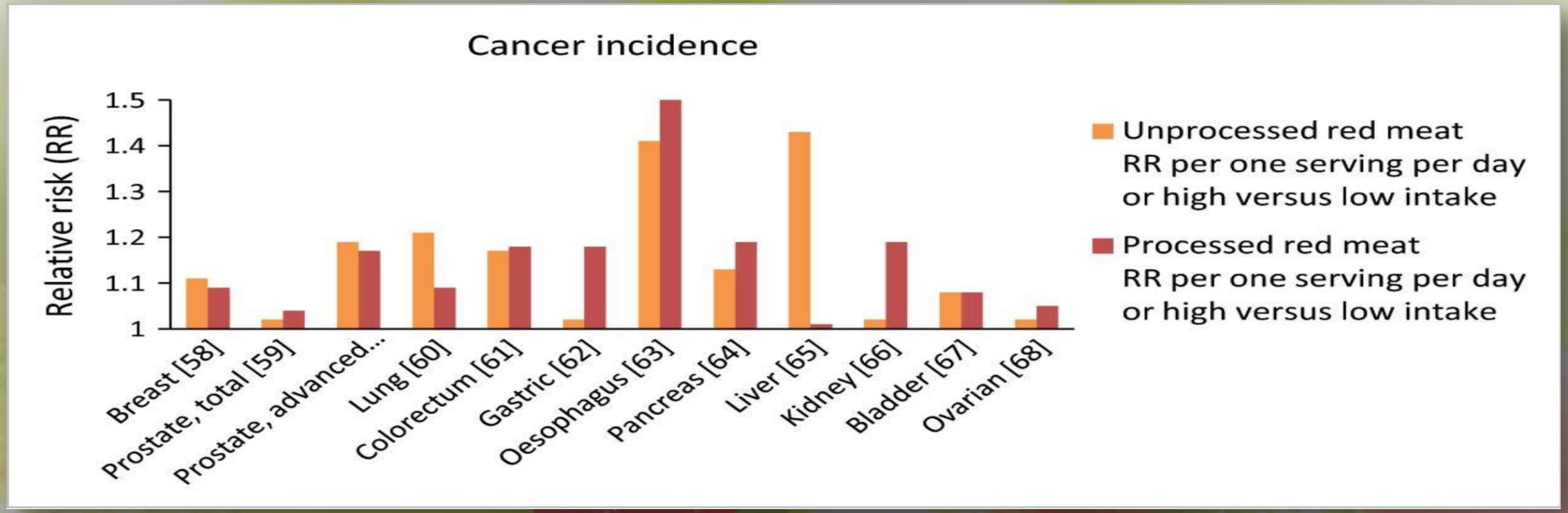
Pork Beef Lamb

(Does not include chicken or fish)

WE WILL BEAT CANCER SOONER
cruk.org

CANCER RESEARCH UK

Red & Processed Meat – Cancer Risk



Risk of colorectal cancer:

- 17% increase per 100g/day red meat
- 18% increase per 50g/day of processed meat

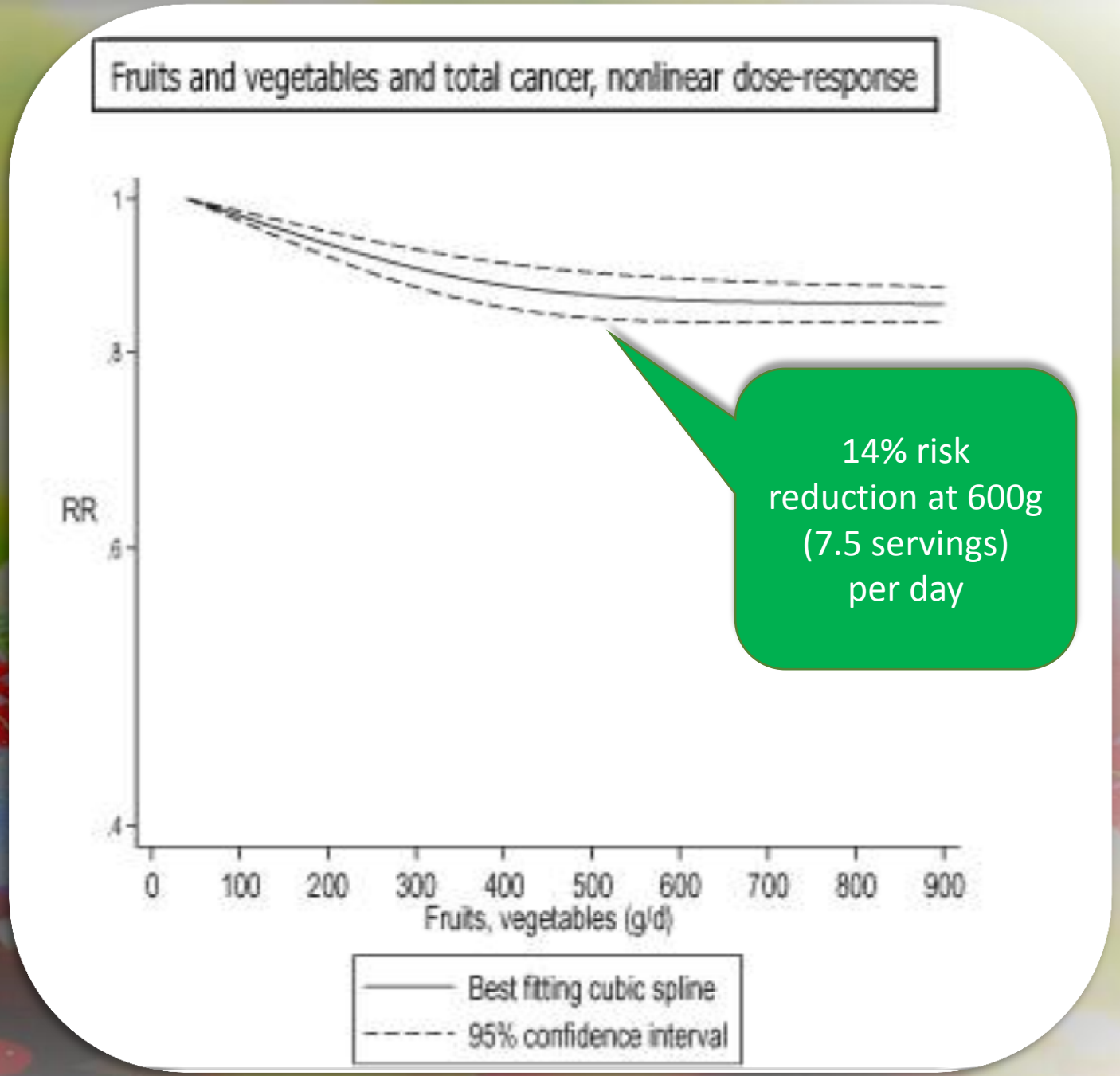
(Chan et al, Plos One 2011)

What are the mechanisms?

- Nitrate Salts
- Heme iron
- Heterocyclic amines
- Polyaromatic hydrocarbons
- Advanced glycation end products
- N-Glycolylneuraminic acid (Neu5Gc)

Fruits & Vegetables

- 7.5 servings/day confers significant, 14% reduction in total cancer risk
- Significant benefit for cruciferous vegetables & green-yellow vegetables



Aune et al, Int J Epidemiol 2017

Whole Grains

- Every 3 servings/day
  - Decreases colorectal cancer risk by 17%
  - Decreases total cancer mortality by 17%
- In stages I-III colon cancer, every 5 g daily increase in whole-grain fiber associated with 33% decrease in colorectal cancer mortality

Blood cell gene expression associated with cellular stress defense is modulated by antioxidant-rich food in a randomised controlled clinical trial of male smokers

Siv K Bøhn, Mari C Myhrstad, Magne Thoresen, Marit Holden, Anette Karlsen, Siv Haugen Tunheim, Iris Erlund, Mette Svendsen, Ingebjørg Seljeflot, Jan Ø Moskaug, Asim K Duttaroy, Petter Laake, Harald Arnesen, Serena Tonstad, Andrew Collins, Christan A Drevon and Rune Blomhoff

BMC Medicine 2010 8:54

https://doi.org/10.1186/1741-7015-8-54

Received: 5 August 2010 | Accepted: 16 September 2010 | Published: 16 September 2010

Fruits & vegetables: ↑ expression of genes used in cell defense & DNA repair

Changes in prostate gene expression in men undergoing an intensive nutrition and lifestyle intervention

Dean Ornish,[*†‡] Mark Jesus M. Magbanua,[§] Gerdi Weidner,[*] Vivian Weinberg,[¶] Colleen Kemp,[*] Christopher Green,[§] Michael D. Mattie,[§] Ruth Marlin,[*] Jeff Simko,[∥] Katsuto Shinohara,[§] Christopher M. Hagg,[§] and Peter R. Carroll[§]

Plant-based diet: ↓ expression of tumor-promoting genes

Recommendations

Body Fatness
Be as lean as possible within the normal range of body weight

Physical Activity
Be physically active as part of everyday life

Foods and Drinks that Promote Weight Gain
Limit consumption of energy-dense foods
Avoid sugary drinks

Plant Foods
Eat mostly foods of plant origin

Animal Foods
Limit intake of red meat and avoid processed meat

Alcoholic Drinks
Limit alcoholic drinks

Preservation, Processing, Preparation
Limit consumption of salt
Avoid moldy cereals (grains) or pulses (legumes)

Dietary Supplements
Aim to meet nutritional needs through diet alone

American Institute for Cancer Research, AICR.org

Cardiovascular Disease

Insulin Resistance

Cancer Prevention

Obesity


Choose Your Diet
THE G FREE DIET
Cooking for Isaiah
GLUTEN-FREE & DAIRY-FREE
Flat Belly Diet!
GLUTEN-FREE COOKBOOK
150
SOUTH BEACH DIET GLUTEN SOLUTION
The Sugar Smart Diet
What's the best diet for healthy weight loss?
CHIA VITALITY
THE JUICE LADY
CHERIE CALBOM
JUICING, FASTING, AND DETOXING FOR LIFE
REVISED AND UPDATED
BRAD'S RAW MADE EASY
The Fast, Delicious Way to Lose Weight, Optimize Health, and Live Mostly in the Raw
BRAD GRUNO
Natalia Rose
FOREVER BEAUTIFUL
The Age-Defying Detox Plan
Candice Kumai
CLEAN GREEN DRINKS
100+
Cleansing Recipes to Renew & Restore Your Body and Mind
SIDE EFFECT: SKINNY
DENISE AUSTIN
The Perfect 10 Diet
THE CALORIE MYTH
How to Eat More, Exercise Less, Lose Weight, and Live Better
JONATHAN BAILOR
Bestselling Diet Books
THE NO-SALT, LOWEST-SODIUM
500
CLEAN
Betty Crocker
Healthy
DANGEROUS GRAINS

What's the best diet for healthy weight loss?

- Sustainable – not a temporary 'diet'

What's the best diet for healthy weight loss?

- Sustainable – not a temporary 'diet'
- Optimizes overall health independent of weight loss

Annals of Internal Medicine®

LATEST ISSUES CHANNELS CME/MOC IN THE CLINIC JOURNAL CLUB WEB EXCLUSIVES AUTHOR INFO

< PREV ARTICLE | THIS ISSUE | NEXT ARTICLE >

ORIGINAL RESEARCH | 7 SEPTEMBER 2010

Low-Carbohydrate Diets and All-Cause and Cause-Specific Mortality: Two Cohort Studies

Teresa T. Fung, ScD; Rob M. van Dam, PhD; Susan E. Hankinson, ScD; Meir Stampfer, MD, DrPH; Walter C. Willett, MD, DrPH; Frank B. Hu, MD, PhD

Article, Author, and Disclosure Information

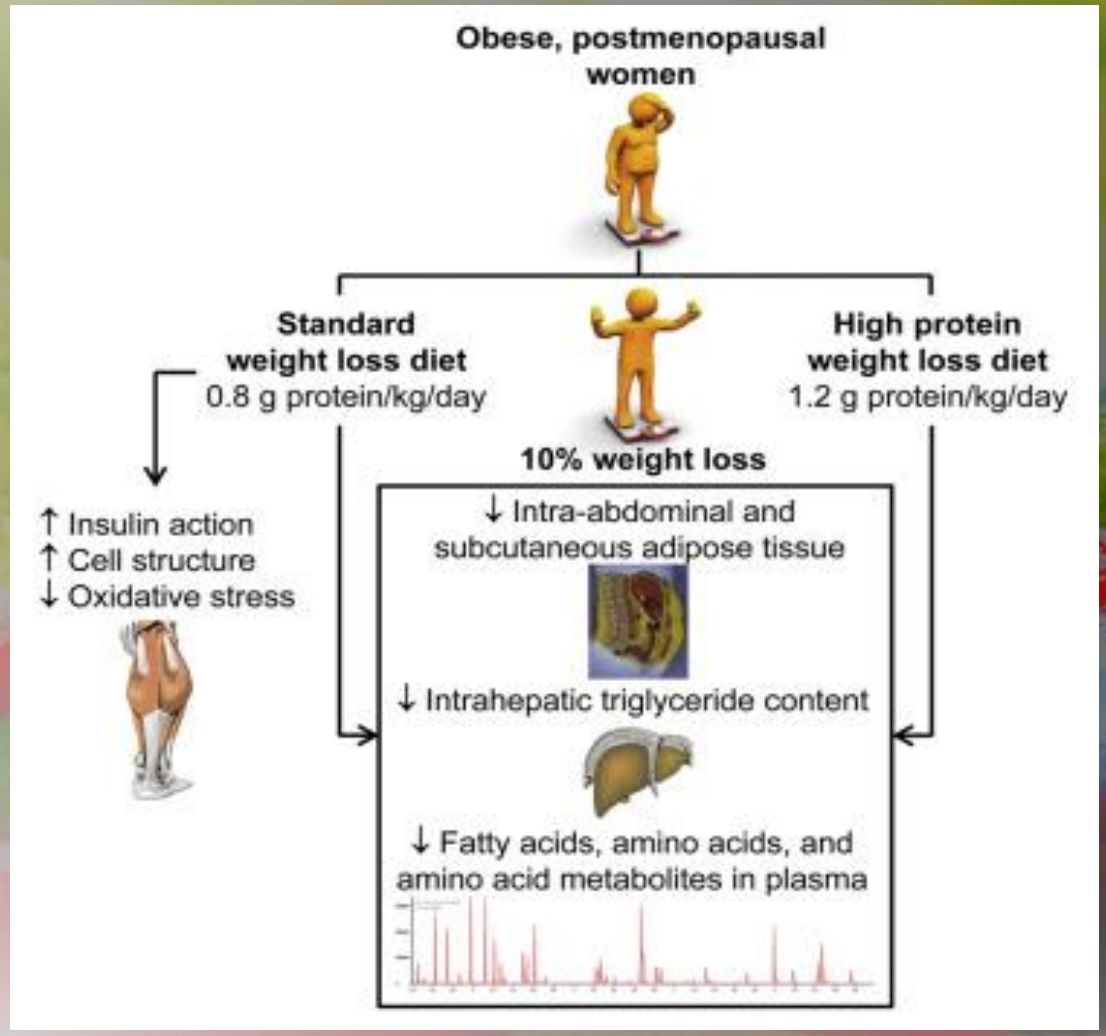
- Prospective cohort study: 130,000 pts, 20 yrs
- Low-carb diets – animal vs plant
- Increased mortality with animal-based diet
  - All-cause, HR 1.23
  - Cardiovascular, HR 1.14
  - Cancer, HR 1.28
- Lower mortality with plant-based diet (HR 0.80)

Fung et al, Ann Intern Med 2010

Endocrinology > General Endocrinology

High-Protein Diet Fails to Improve Insulin Sensitivity

— Leads to weight loss but with costly trade-off



"...the metabolic benefits of weight loss were completely abolished in women who consumed high-protein diets" despite the same, substantial degree of weight loss as women consuming a lower-protein diet.

Smith et al., 2016, Cell Reports 17, 849-861

Low-Carb High-Fat Diets

Possible Benefits

- Avoids added sugar & refined grains
- Short-term weight loss
- Short-term glycemic improvements in DM pts

Major Concerns

- Limited evidence; most studies short-term, w intermediate markers
- High saturated fat; LDL can increase or at best stay stable
- May increase risk of CV disease, cancer, premature death like other low-carb diets
- Can be low in fiber & restricts very healthful foods: whole grains, beans, most fruits
- Unclear if sustainable in long-term


“Eat food. Not too much.
Mostly plants.”
Michael Pollan

More Plants...Healthier Weight

Prevalence Studies:

People eating diets high in plant foods have healthier BMIs

Tonstad, Diabetes Care 2009
Spencer, Int J Obesity 2003
Wang, Int J Obesity 2009

Prospective Studies:

Diets low in fiber & high in meat are strongly tied to weight gain

Vergnaud et al, AM J Clin Nutr 2010
Halkjaer et al, Int J Obesity 2011
Rosell M et al, Int J Obesity 2006

Journal of General Internal Medicine

January 2016, Volume 31, Issue 1, pp 109–116 | Cite as

Vegetarian Diets and Weight Reduction: a Meta-Analysis of Randomized Controlled Trials

- 12 RCTs of vegetarian vs nonvegetarian diets; 1151 subjects, median 18 wks
- Weight loss significantly greater with vegetarian diet
- Mean difference, -2.02 kg (95% CI: -2.80 to -1.23)
  - Vegan diet: -2.52 kg (95% CI: -3.02 to -1.98)
  - Lacto-ovo-vegetarian diet: -1.48 kg (95% CI: -3.43 to 0.47)
- Greater weight loss when energy restricted

Huang RY et al, J Gen Intern Med 2016

Fiber: Not just for constipation anymore!

- Increases satiety without extra calories
- Add 14g fiber/day → 10-18% lower calorie intake
- Whole grain fiber increases metabolic rate & promotes loss of calories in stool
- Promotes beneficial gut bacterial patterns & production of SCFAs
- Improves blood sugar response to food
- Reduces heart disease, diabetes, & cancer risk

110 calories: orange juice (8 oz.)

400 calories: mocha (medium)

280 calories: regular cola (20 oz.)

230 calories: fruit drink (16 oz.)

200 calories: sweet tea (16 oz.)

150 calories: beer (12 oz.)

A Day of Beverages

1370 Calories

Carbs, Protein, & Fat: The Bottom Line

WHOLE VS REFINED CARBS

Whole Carbohydrates (Containing Natural Sugars)


FRUITS


LEAFY GREENS & VEGGIES


STARCHY VEGGIES (POTATOES, SWEET POTATOES)


BEANS, LENTILS, PEAS


WHOLE GRAINS (BROWN RICE, QUINOA, OATS)


CORN


PASTA MADE FROM 100% WHOLE WHEAT, BROWN RICE, LENTILS, QUINOA, BEANS & CHICKPEAS

High in Fiber
High in Water
High in Antioxidants

High in Minerals
High in Vitamins
Minimally Processed

Refined Carbohydrates (Often With Refined Sugars)


CANDY

SODA


PASTRIES (DONUTS, SCONES, CROISSANTS)


SUGARY CEREALS


WHITE RICE


WHITE FLOUR PASTA

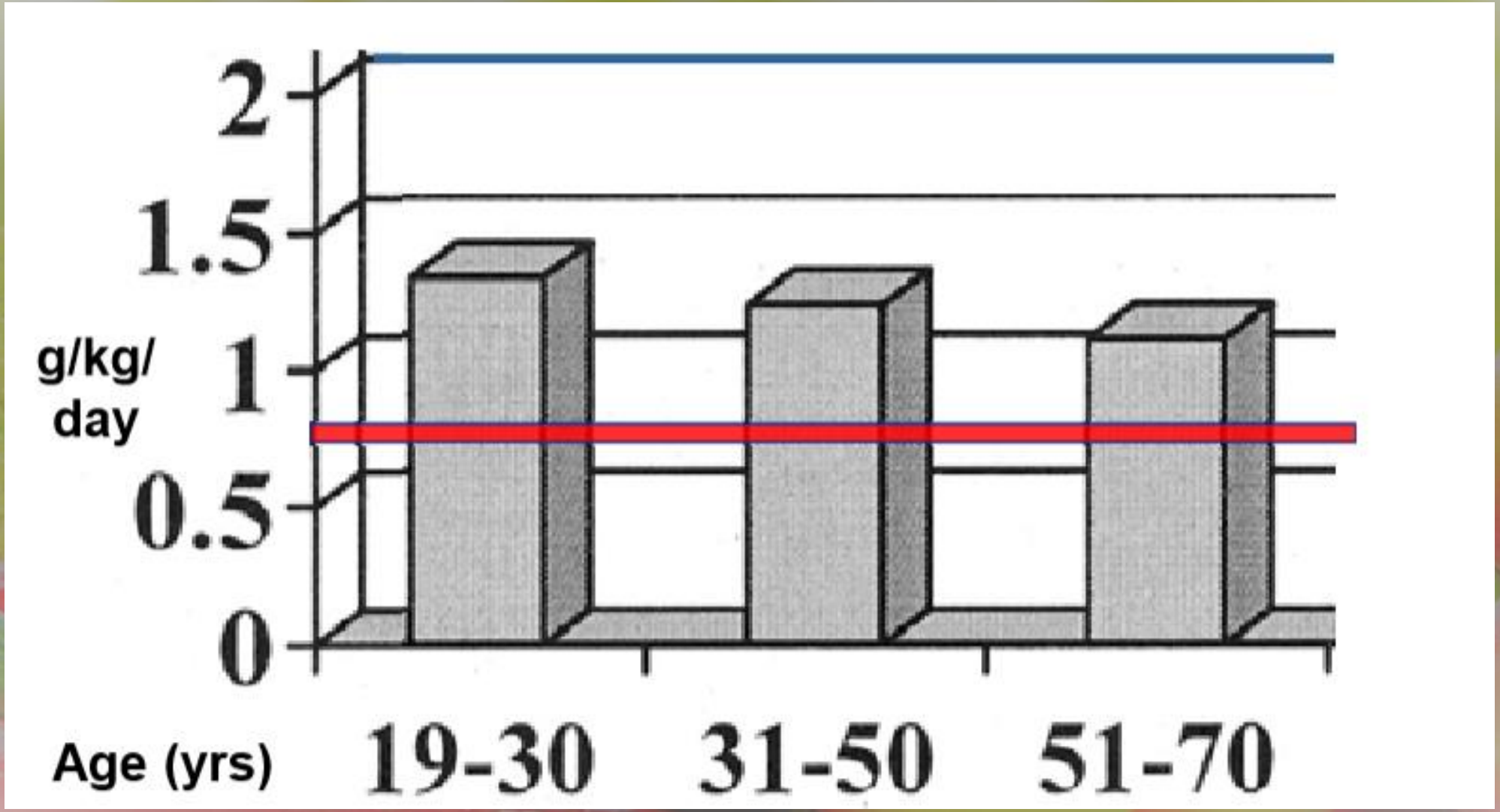

WHITE BREADS

Low in Fiber
Low in Macronutrients
Highly Processed

FORKSOVERKNIVES.COM


Protein

Protein Needs vs Actual Intake



Fulgoni et al, Am J Clin Nutr 2008

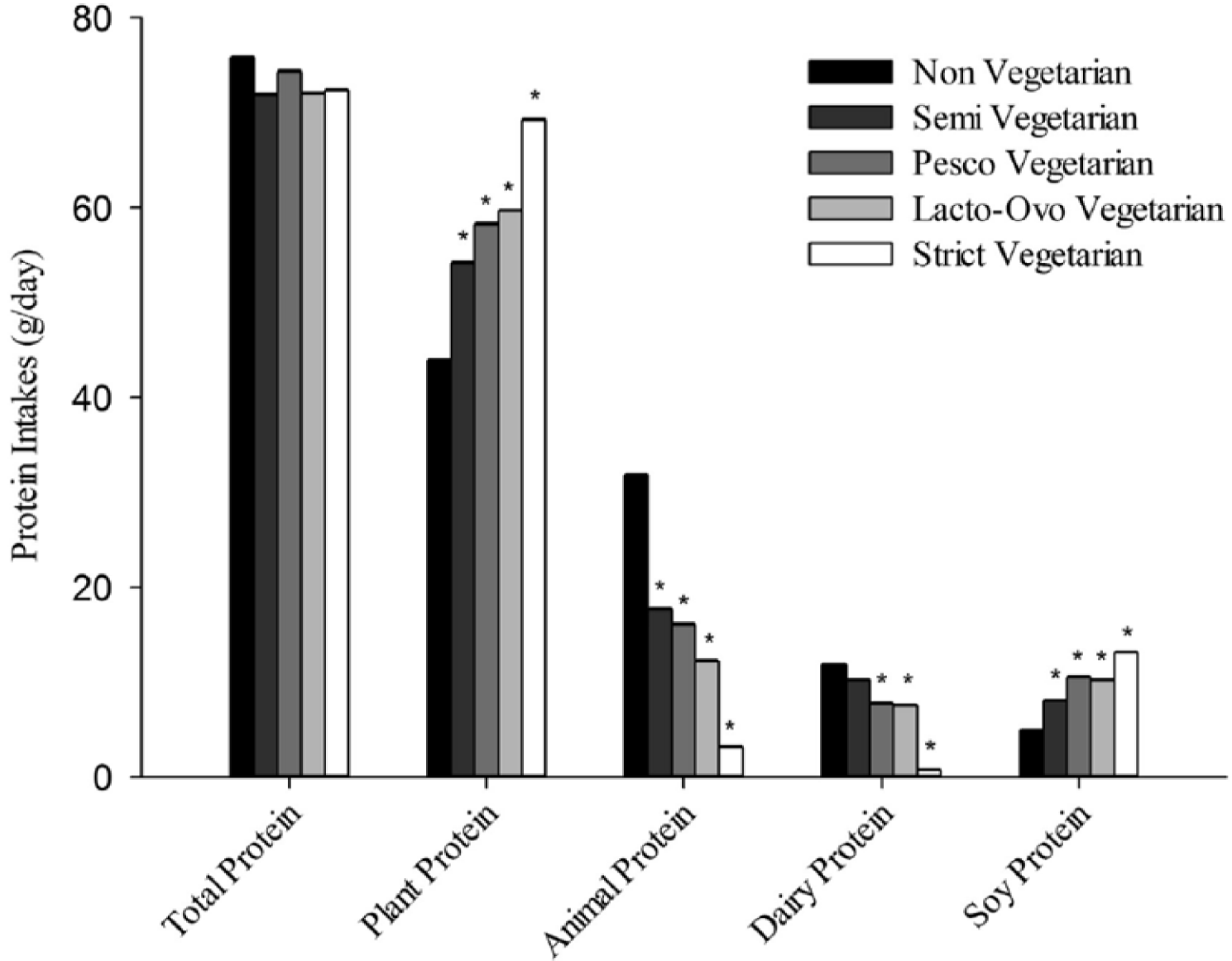


Figure. Dietary mean protein intakes standardized to 2,000 kcal/day by dietary pattern in the Adventist Health Study 2. Adjustments were made for age, sex, and race. *Significant contrast ($P<0.05$) and a mean difference ≥20% when compared to nonvegetarian dietary pattern as the group of reference.

Problems With Excess Protein

- Obesity
- Diabetes
- Heart Disease
- High Blood Pressure
- High Cholesterol
- Kidney Stones
- Worsened Kidney Function
- Gout
- Cancers

Original Investigation

October 2016

Association of Animal and Plant Protein Intake With All-Cause and Cause-Specific Mortality

Mingyang Song, MD, ScD[1,2]; Teresa T. Fung, ScD[2,3]; Frank B. Hu, MD, PhD[2,4,5]; et al

Conclusions and Relevance High animal protein intake was positively associated with cardiovascular mortality and high plant protein intake was inversely associated with all-cause and cardiovascular mortality, especially among individuals with at least 1 lifestyle risk factor. Substitution of plant protein for animal protein, especially that from processed red meat, was associated with lower mortality, suggesting the importance of protein source.

Among those 1 with ≥ risk factor, replacing just 3% of animal protein lowered mortality by

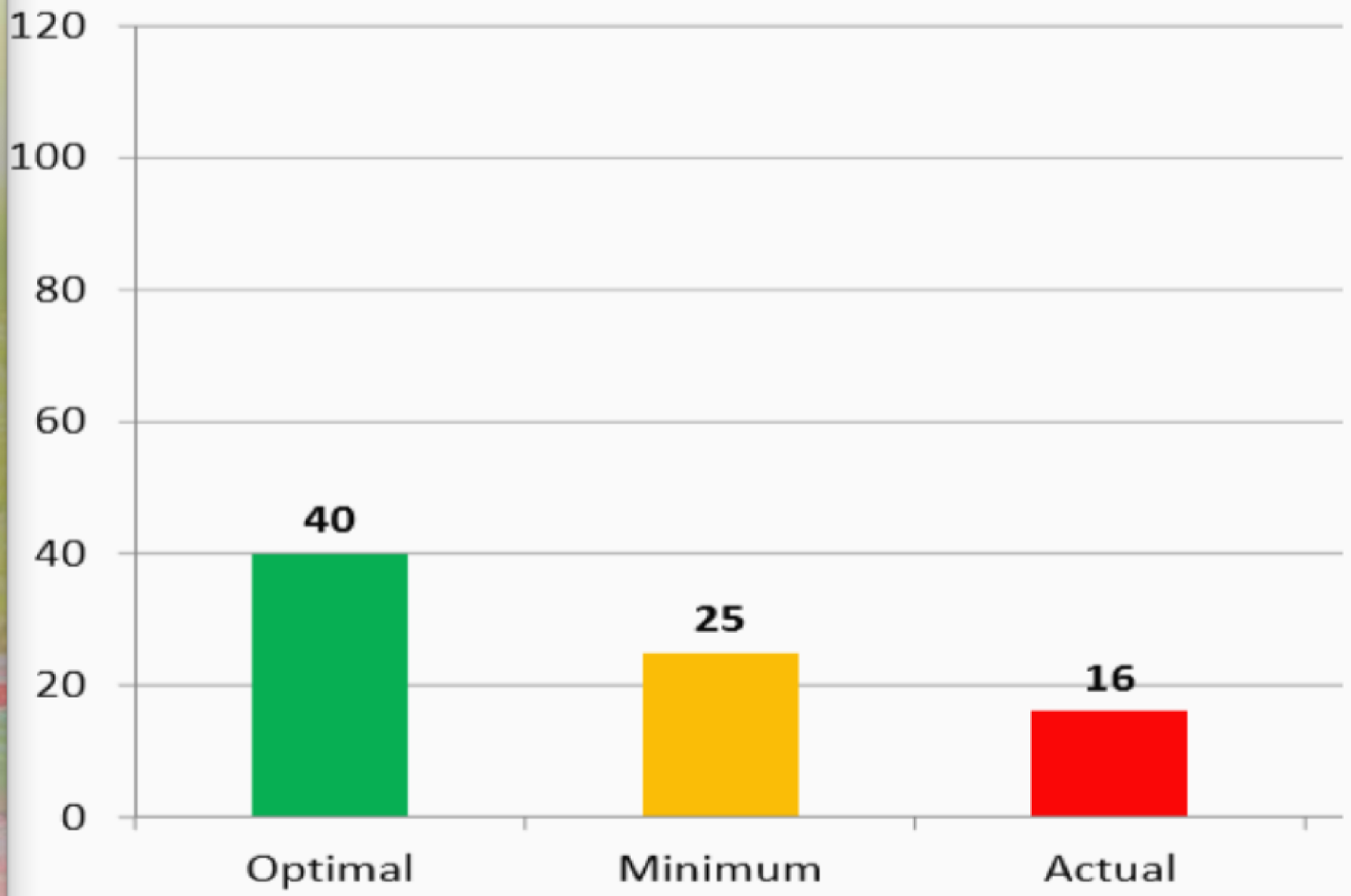
- 34% for processed red meat
- 19% for eggs (including 17% decrease in cancer death)
- 12% for unprocessed red meat
- 8% for dairy
- 6% for poultry & fish

The package matters....

What nutrient are 97% of Americans deficient in?

A.Iron
B.Omega 3 fatty acids
C.Calcium
D.Fiber

Fiber Intake Among US Adults (g/day)



cdc.gov/nchs/data/factsheets/factsheet_nutrition.pdf

Konner et al, Nutr Clin Prac 2010


Fats

The Skinny on Fats

Saturated

- Highest in animal foods, tropical oils
- Increase LDL, atherosclerosis, insulin resistance

Monounsaturated

- Olives, avocados, nuts
- Decrease insulin resistance

Trans-Fats

- “Partially hydrogenated” oils
- Mostly manmade
- Ultra processed foods
- Highly atherogenic

Polyunsaturated

- Vegetable oils, nuts, seeds, fish (omega 3)
- Decrease insulin resistance, lower LDL

A word about saturated fats...

The New York Times

Opinion

Butter Is Back

By Mark Bittman

March 25, 2014

639

Research

Intake of individual saturated fatty acids and risk of coronary heart disease in US men and women: two prospective longitudinal cohort studies

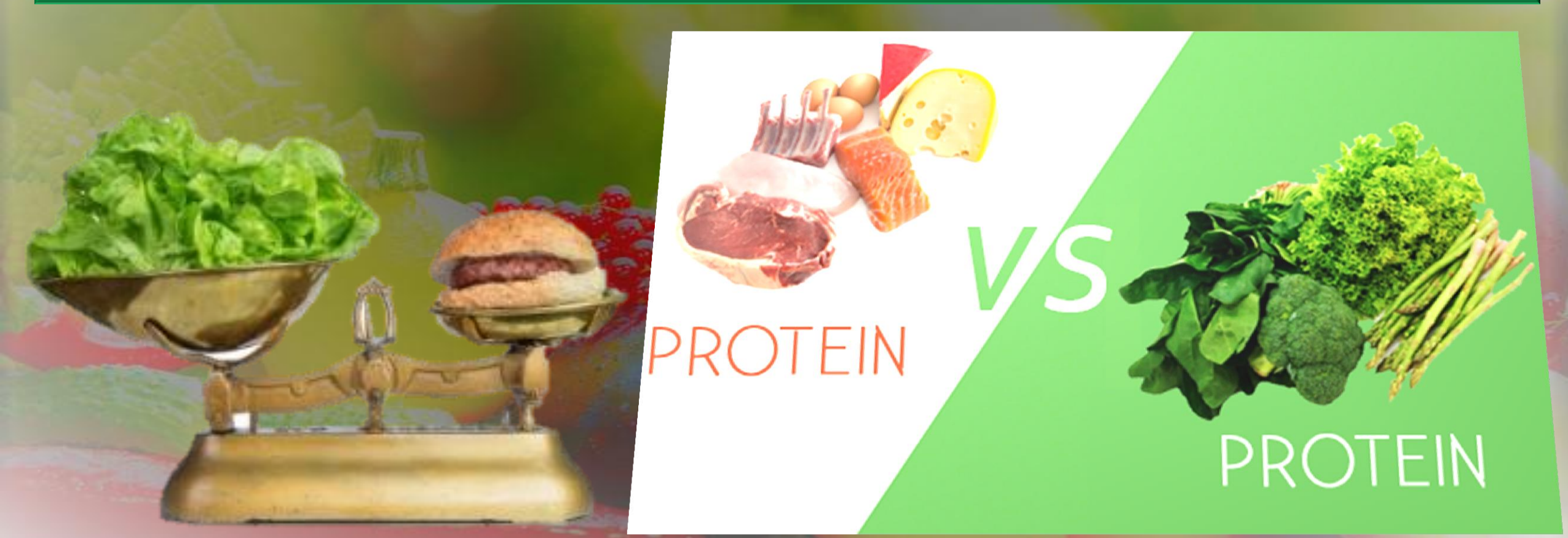
BMJ 2016 ; 355 doi: https://doi.org/10.1136/bmj.i5796 (Published 23 November 2016)
Cite this as: *BMJ* 2016;355:i5796

- Lower risk of CHD when saturated fat replaced with
  - Polyunsaturated fat
  - Monounsaturated fat
  - Whole grains
  - Plant proteins
- "Current dietary recommendations should focus on replacing saturated fat with unsaturated fats or whole grains as an effective approach towards preventing CHD."

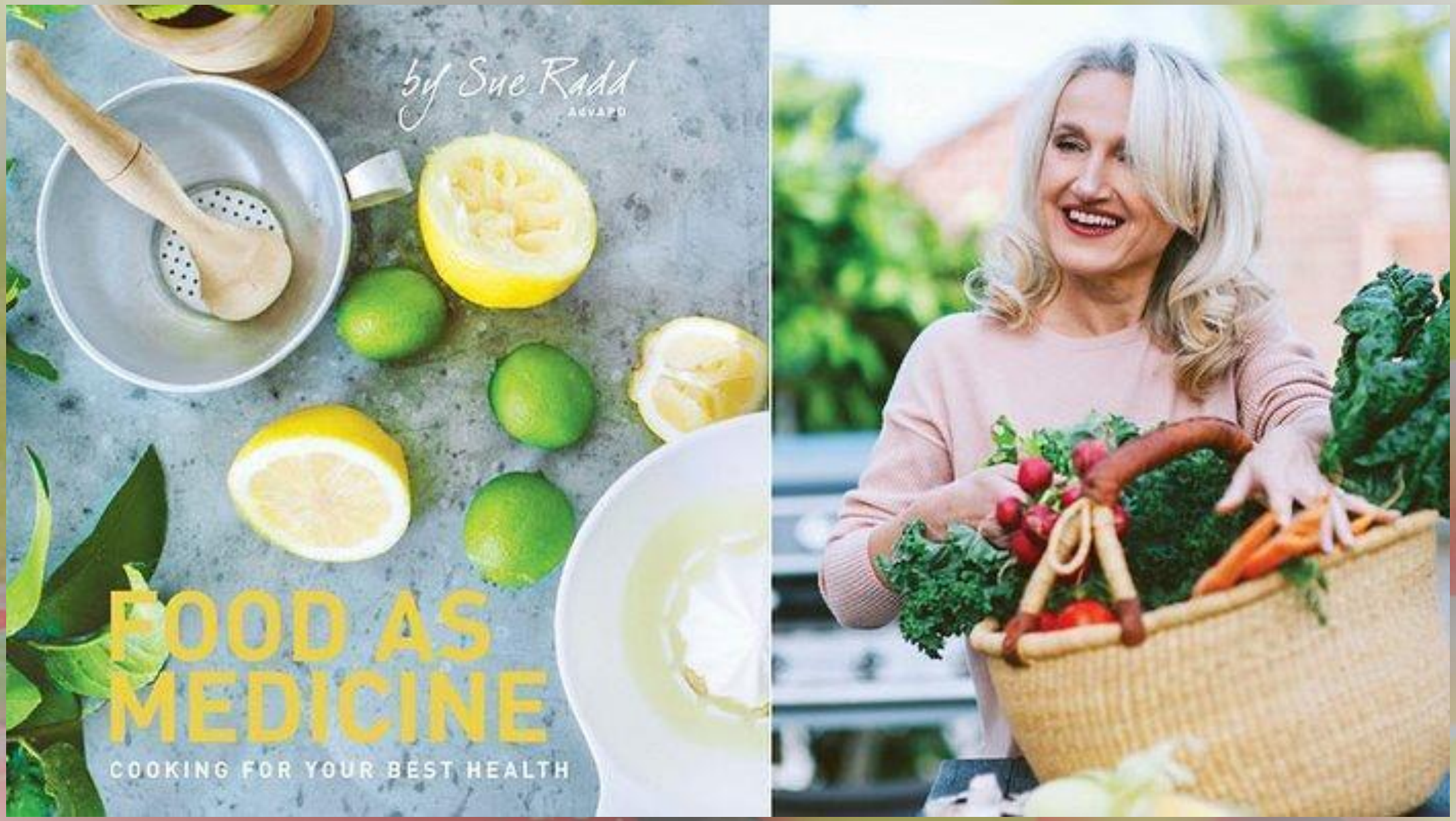
The package matters!

Protein & fat: animal vs plant sources

Carbs: refined vs whole-food sources



Then God said, “I give you every seed-bearing plant on the face of the whole earth and every tree that has fruit with seed in it. They will be yours for food.”
-Genesis 1:29


by Sue Radd
FOOD AS MEDICINE
COOKING FOR YOUR BEST HEALTH