Food as Medicine

Nutrition to Prevent Chronic Disease

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Program Director, Internal Medicine Residency
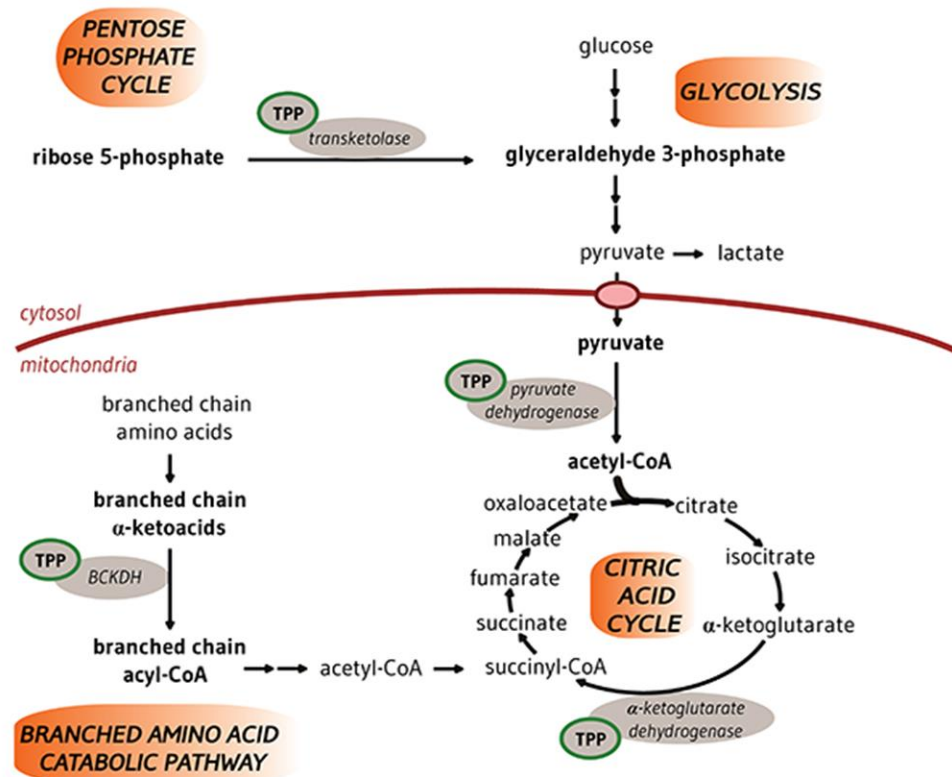
Kettering Medical Center

Kettering, OH

John 10:10

- "The thief does not come except to steal, and to kill and to destroy. I have come that they may have life, and that they may have it more abundantly."

Figure 1. Metabolic Pathways Requiring Thiamin Pyrophosphate

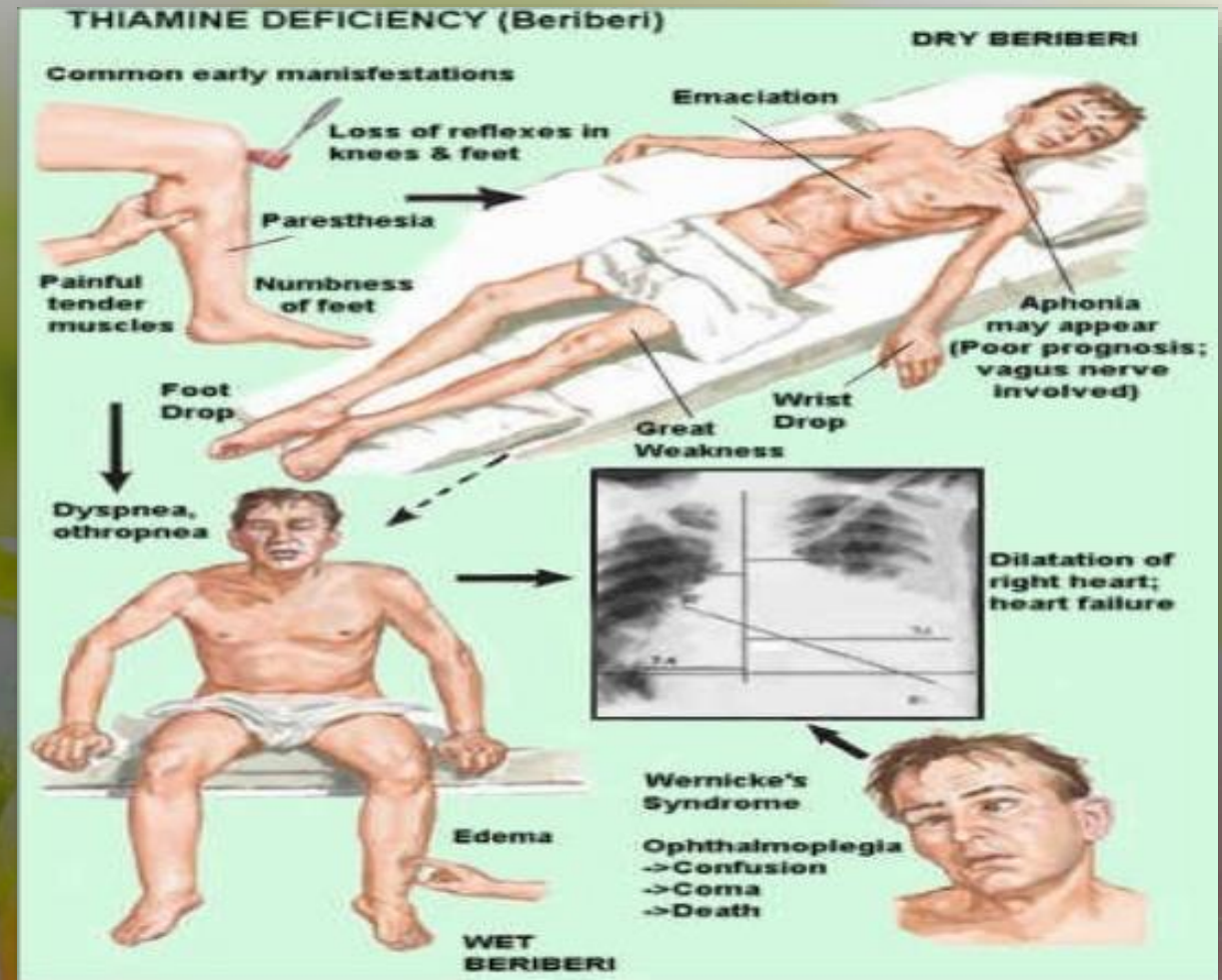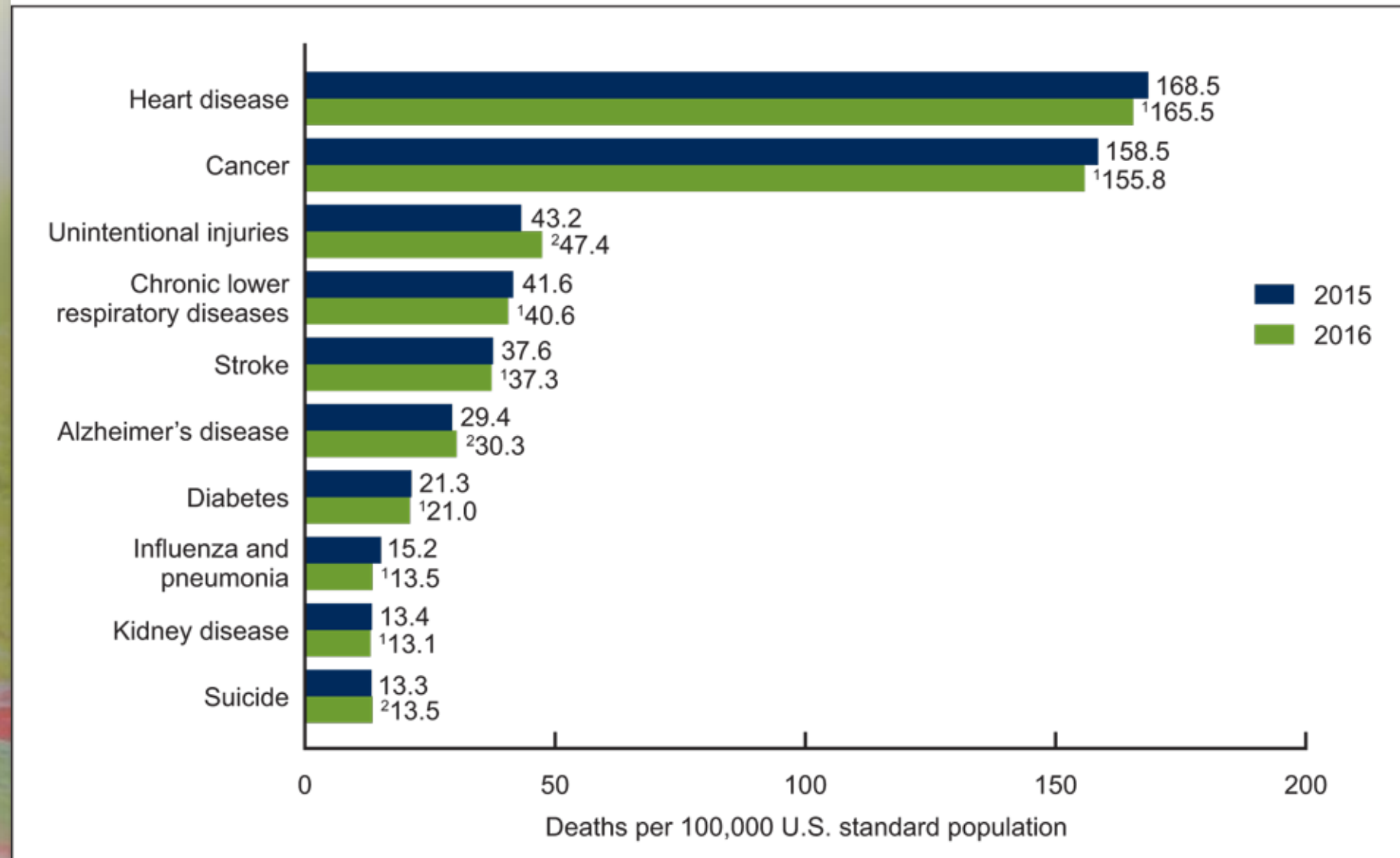BCKDH, branched chain α-ketoacid dehydrogenase complex; CoA, coenzyme A; TPP, thiamin pyrophosphate.

THIAMINE DEFICIENCY (Beriberi)

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

[Legend: 2015, 2016]

Cause of death	2015	2016
Heart disease	168.5	[1]165.5
Cancer	158.5	[1]155.8
Unintentional injuries	43.2	[2]47.4
Chronic lower respiratory diseases	41.6	[1]40.6
Stroke	37.6	[1]37.3
Alzheimer's disease	29.4	[2]30.3
Diabetes	21.3	[1]21.0
Influenza and pneumonia	15.2	[1]13.5
Kidney disease	13.4	[1]13.1
Suicide	13.3	[2]13.5

Deaths per 100,000 U.S. standard population

[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
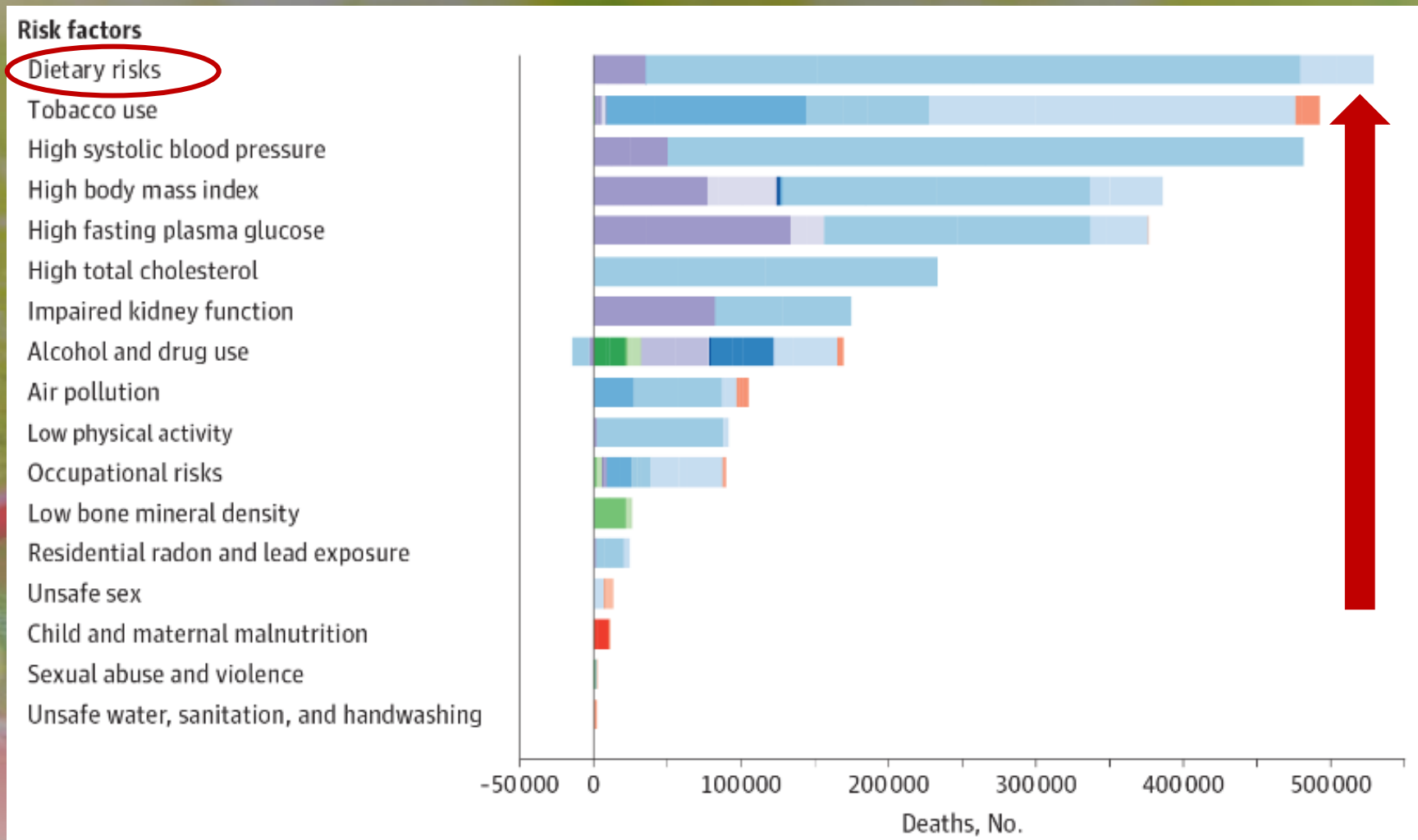
Proportional cardiometabolic mortality attributable to overall suboptimal diet in the United States in 2012
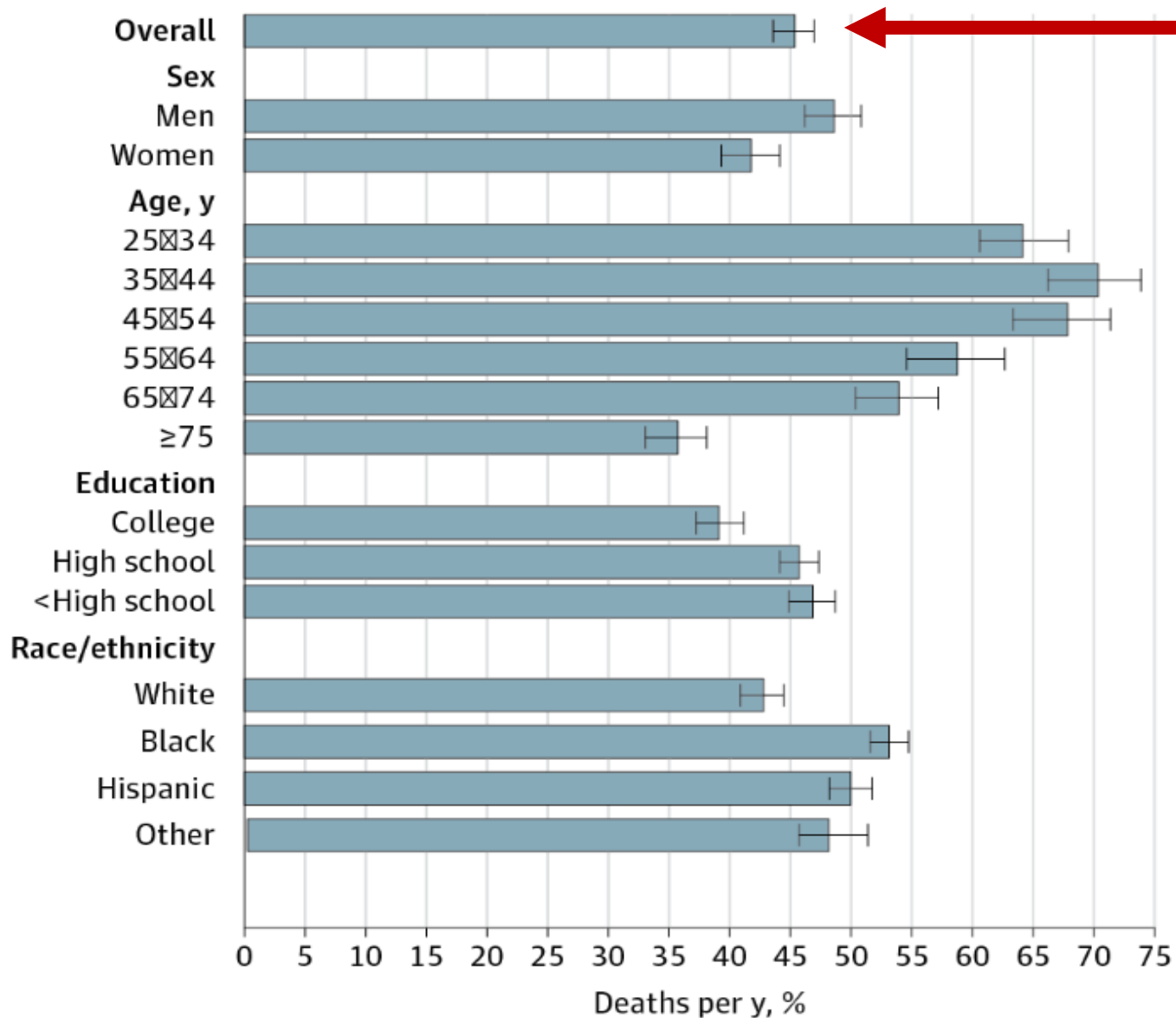
45% of deaths due to heart disease, stroke, & diabetes are directly caused by poor diet.

Micha et al
JAMA 2018

I Corinthians 6:19,20

- "Or do you not know that your body is the temple of the Holy Spirit who is in you, whom you have from God, and you are not your own? For you were bought with a price; therefore glorify God in your body and in your spirit which are God's."
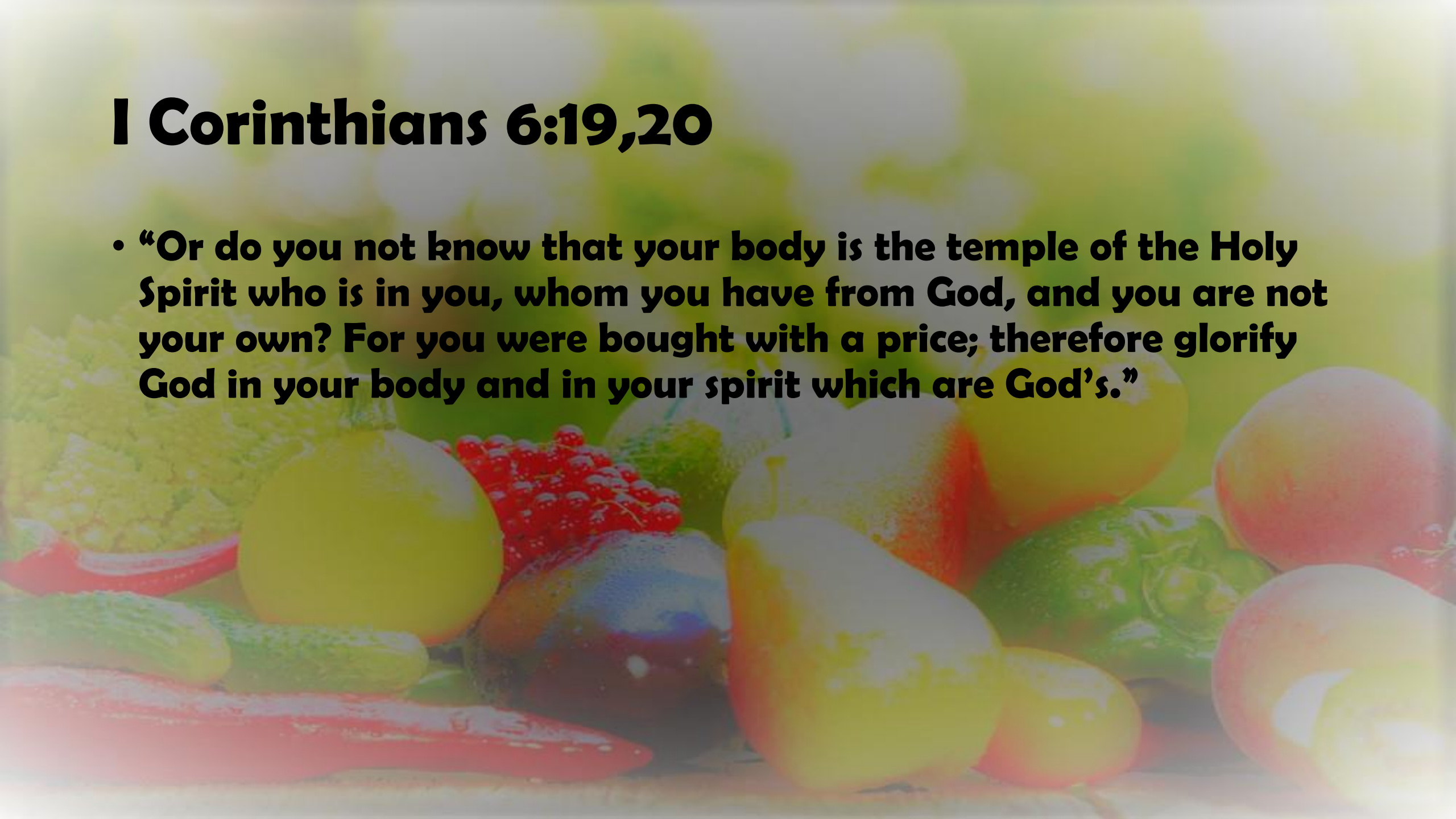
"We are too busy mopping the floor to turn off the faucet."

What I'll Cover

- Consensus views on nutrition

- What do Americans 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	Debatable	Unhealthful
Whole Grains	Poultry	Processed meat
Legumes	Eggs	Red meat
Fruits	Dairy	Added sugar
Vegetables	Fish	Refined grains
Nuts		Ultraprocessed foods
Seeds		

Healthful

Wh...
Leg...
Fru...
Veg...
Nut...
See...

Debatable

Unhealthful

Processed meat
Red meat
Added sugar
Refined grains
Ultraprocessed foods

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
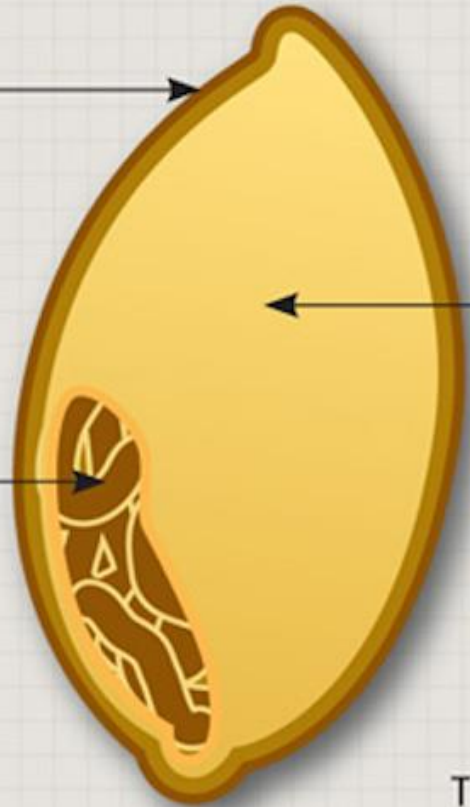
Anatomy of a grain

Bran: protects the seed
- Fibre
- B vitamins
- Minerals

Germ: nourishment for the seed
- B vitamins
- Vitamin E
- Minerals
- Phytochemicals

Endosperm: energy for the seed
- Carbohydrates
- Some protein
- Some B vitamins

The bran and germ are removed when wholegrains are refined.

Whole Grains:

Whole wheat

Oats

Rye

Corn

Brown rice

Barley

Kamut

Spelt

Millet

Teff

Wild rice

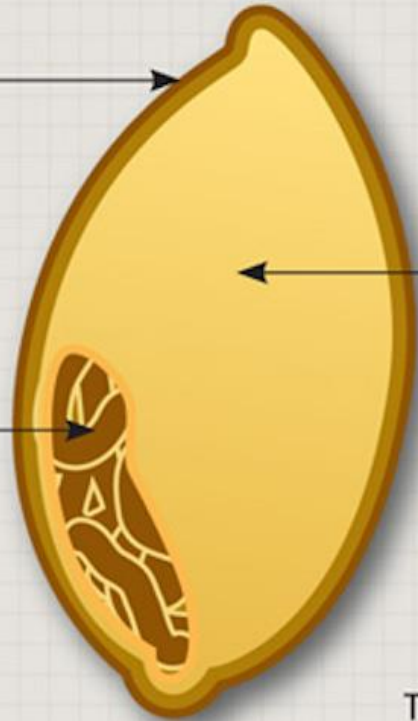## Pseudograins:

Quinoa

Amaranth

Buckwheat

Anatomy of a grain

Bran: protects
~~(crossed out)~~
- F...
- ...erals

Germ: nourishment
~~(crossed out)~~
- ...erals
- Phytochemicals

Endosperm: energy for the seed
- Carbohydrates
- Some protein
- Some B vitamins

The bran and germ are removed when wholegrains are refined.

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

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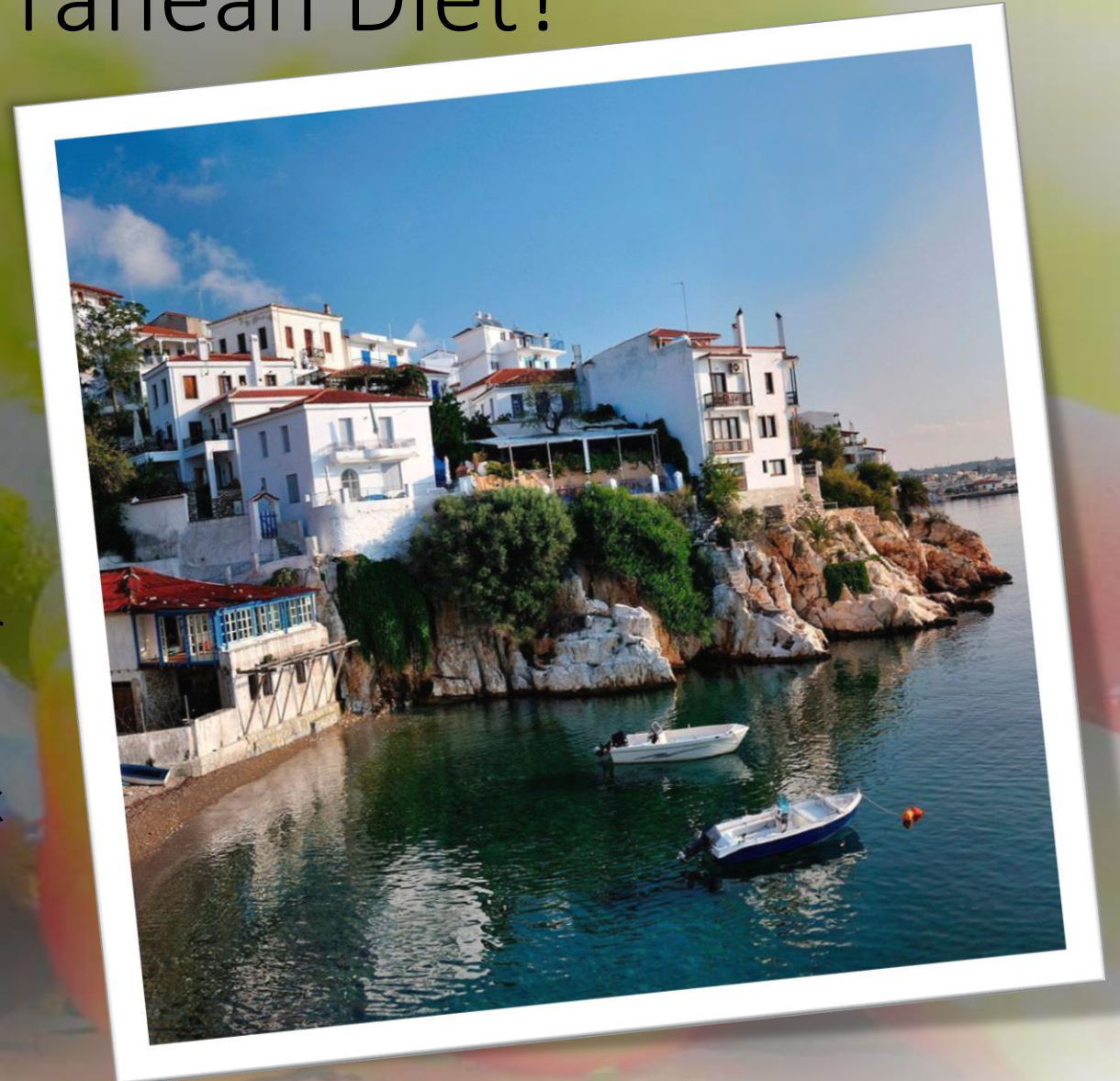
- **More plants → better outcomes**
- **More meats → worse outcomes**
- **Fish, olive oil, alcohol - not the primary benefit**

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

33 References   3 Citing Articles

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

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

Research

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

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

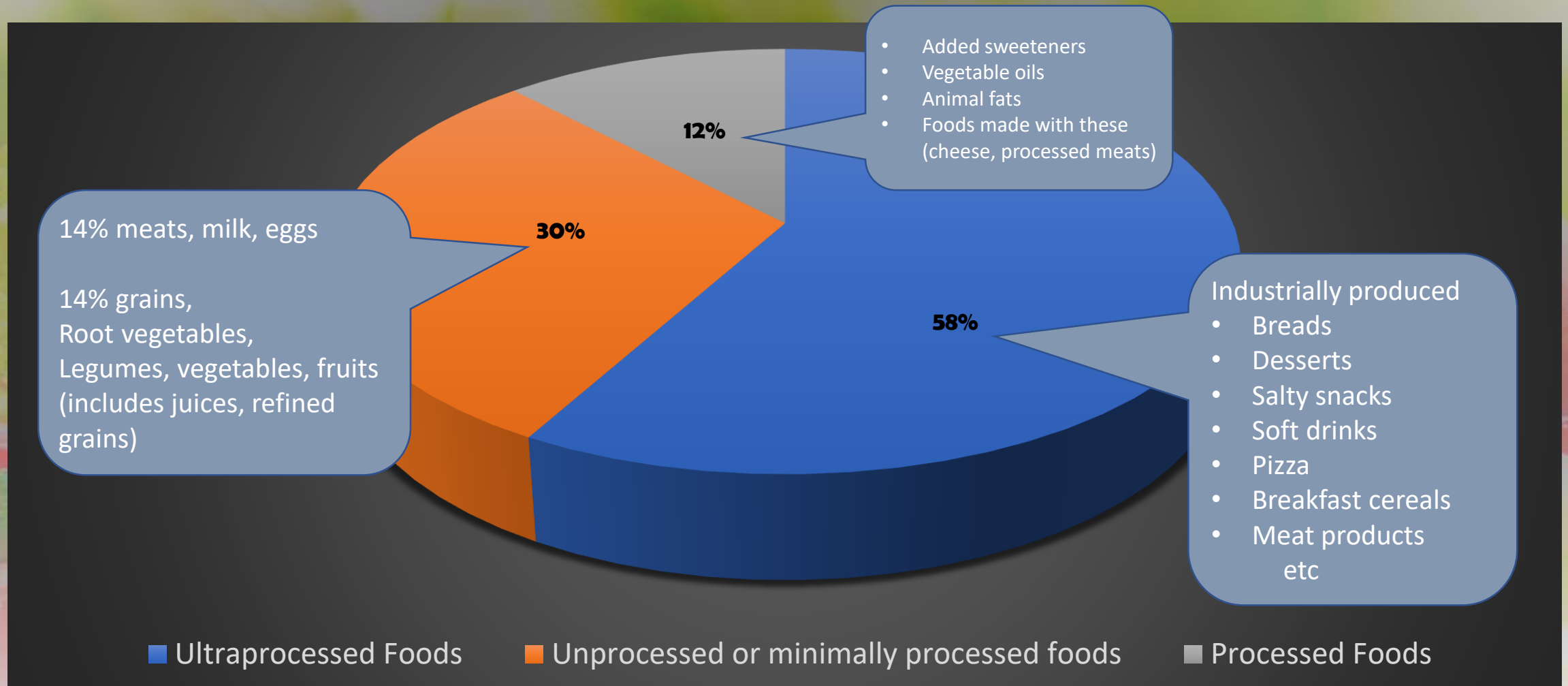**#3 Chicken and chicken mixed dishes**

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

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

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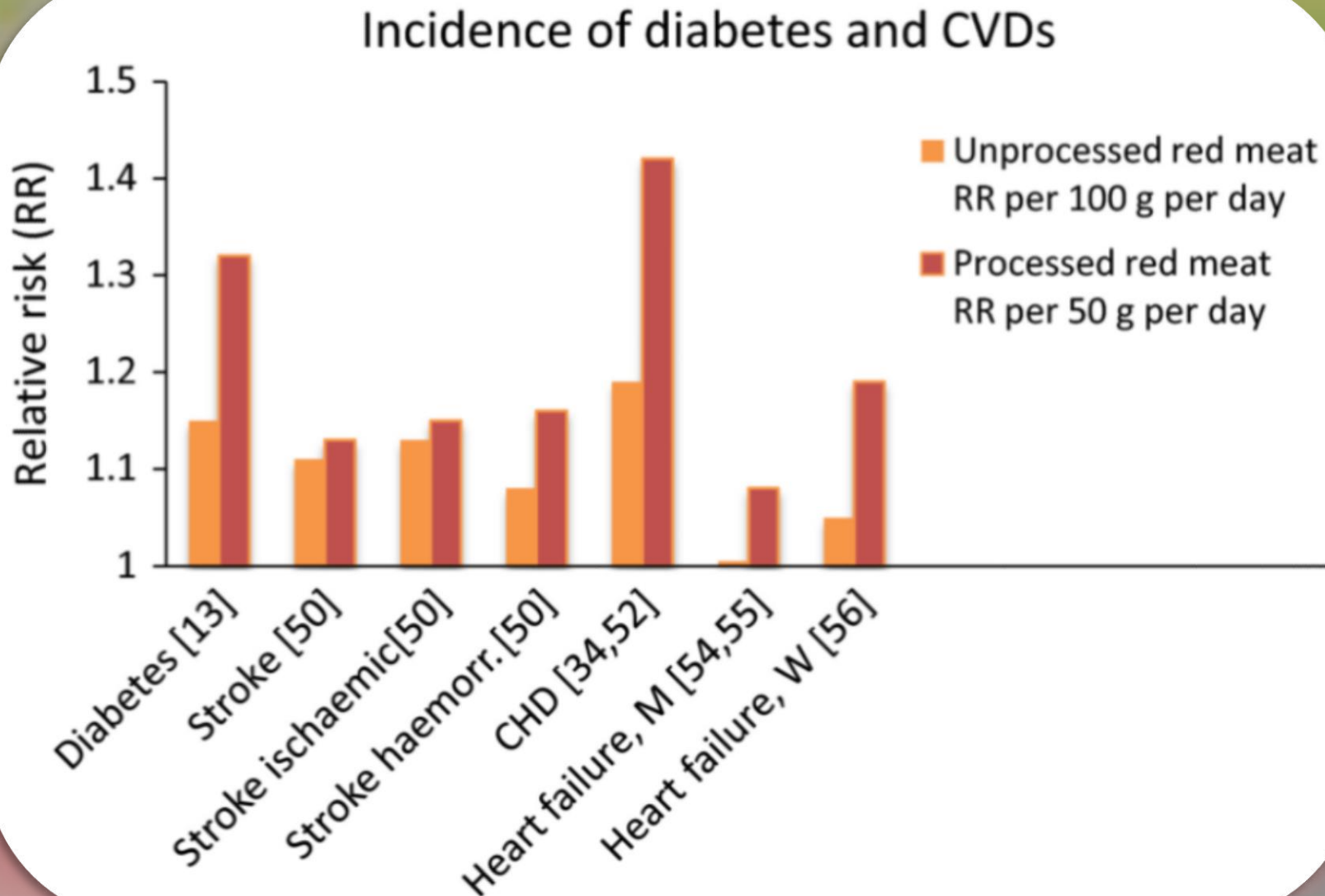
TABLE 2.—*Sites of Lesions Found in Coronary Arteries at Autopsy*

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

Blue Zones
Areas with high concentrations of active centenarians.

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

Red & Processed Meat – CV Risk

Incidence of diabetes and CVDs

Legend:
- Unprocessed red meat RR per 100 g per day
- Processed red meat RR per 50 g per day

Meatless Diets & Ischemic Heart Disease

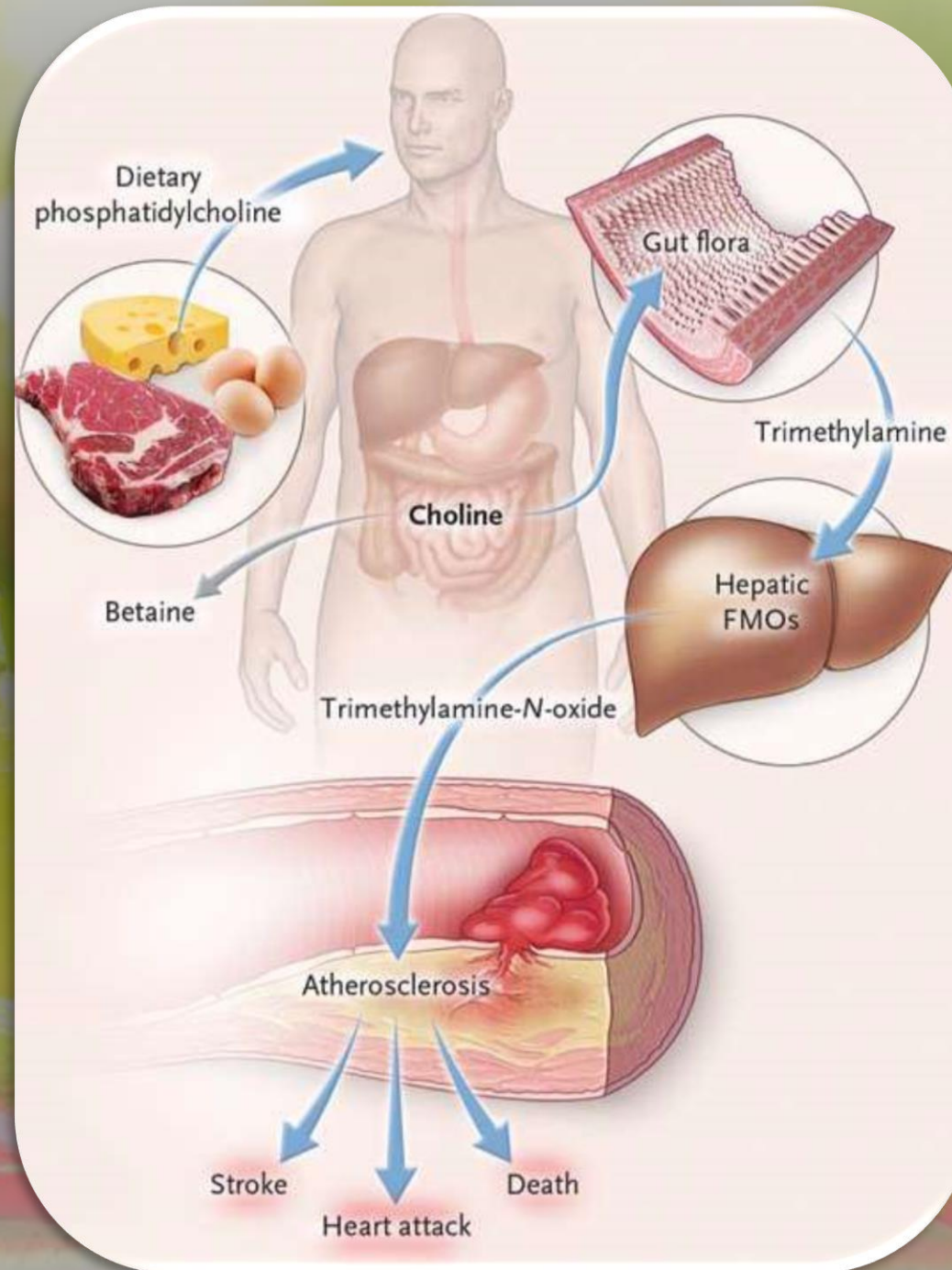|	Ischemic Heart Disease
Key et al (Am J Clin Nutr 1999, n>76,000)	↓ 24% (mortality)
Huang et al (Ann Nutr Metab 2012, n>124,000)	↓ 29% (mortality)
EPIC Oxford (Am J Clin Nutr 2013, n>44,000)	↓ 32% (incident cases)

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

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

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, Ma...

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

Limits on Added Sugar
(AHA recommendations)

15 Teaspoons of sugars in a
20 oz. coke

6 Teaspoons added sugars per day for women

9 Teaspoons added sugars per day for men

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

SUGAR
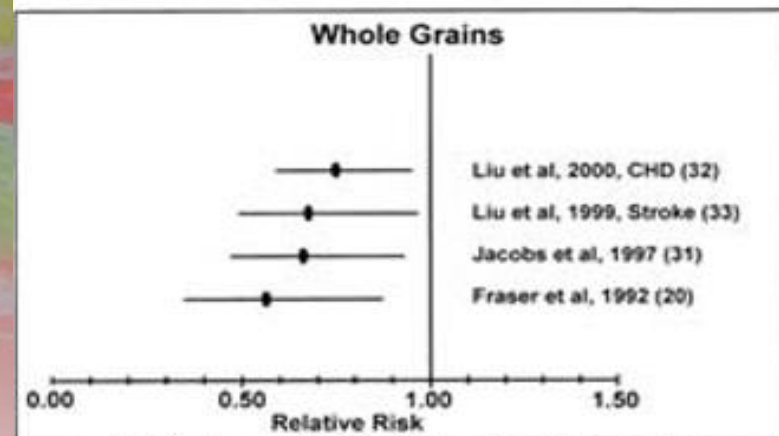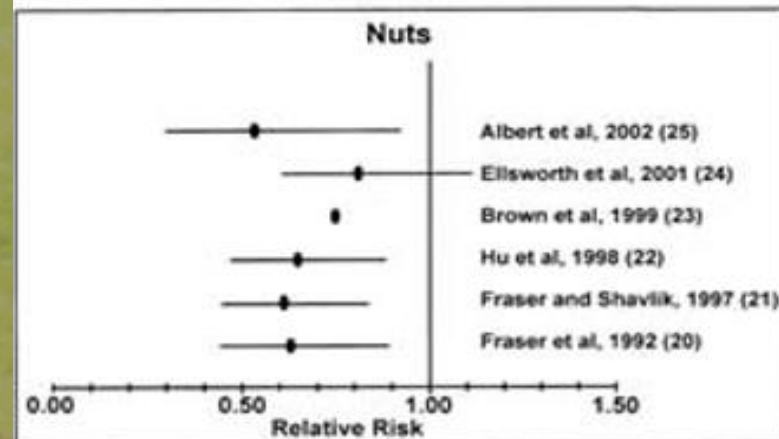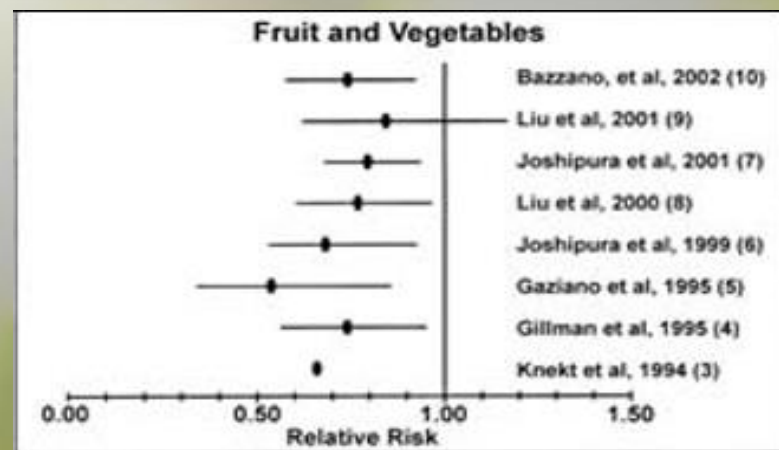
Words That Really Just Mean 'Added Sugar'

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

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

Fruit and Vegetables

Bazzano, et al, 2002 (10)
Liu et al, 2001 (9)
Joshipura et al, 2001 (7)
Liu et al, 2000 (8)
Joshipura et al, 1999 (6)
Gaziano et al, 1995 (5)
Gillman et al, 1995 (4)
Knekt et al, 1994 (3)

0.00   0.50   1.00   1.50
Relative Risk

Nuts

Albert et al, 2002 (25)
Ellsworth et al, 2001 (24)
Brown et al, 1999 (23)
Hu et al, 1998 (22)
Fraser and Shavlik, 1997 (21)
Fraser et al, 1992 (20)

0.00   0.50   1.00   1.50
Relative Risk

Whole Grains

Liu et al, 2000, CHD (32)
Liu et al, 1999, Stroke (33)
Jacobs et al, 1997 (31)
Fraser et al, 1992 (20)

0.00   0.50   1.00   1.50
Relative Risk

Risk of CAD & Stroke

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[9].

- **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**

CENTRAL ILLUSTRATION: Dose-Response Relationship of Plant-Based Diet Indices and Animal, Healthy Plant, and Less Healthy Plant Foods With CHD Incidence
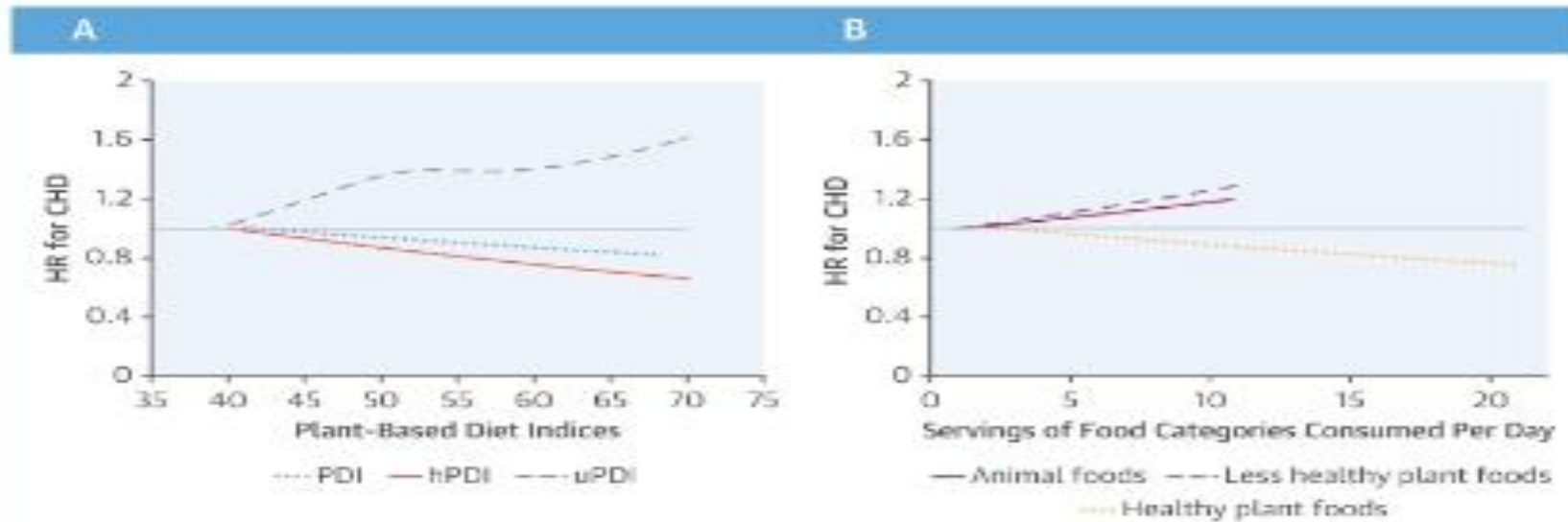
Satija, A. et al. J Am Coll Cardiol. 2017;70(4):411–22.

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%

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

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 ∨

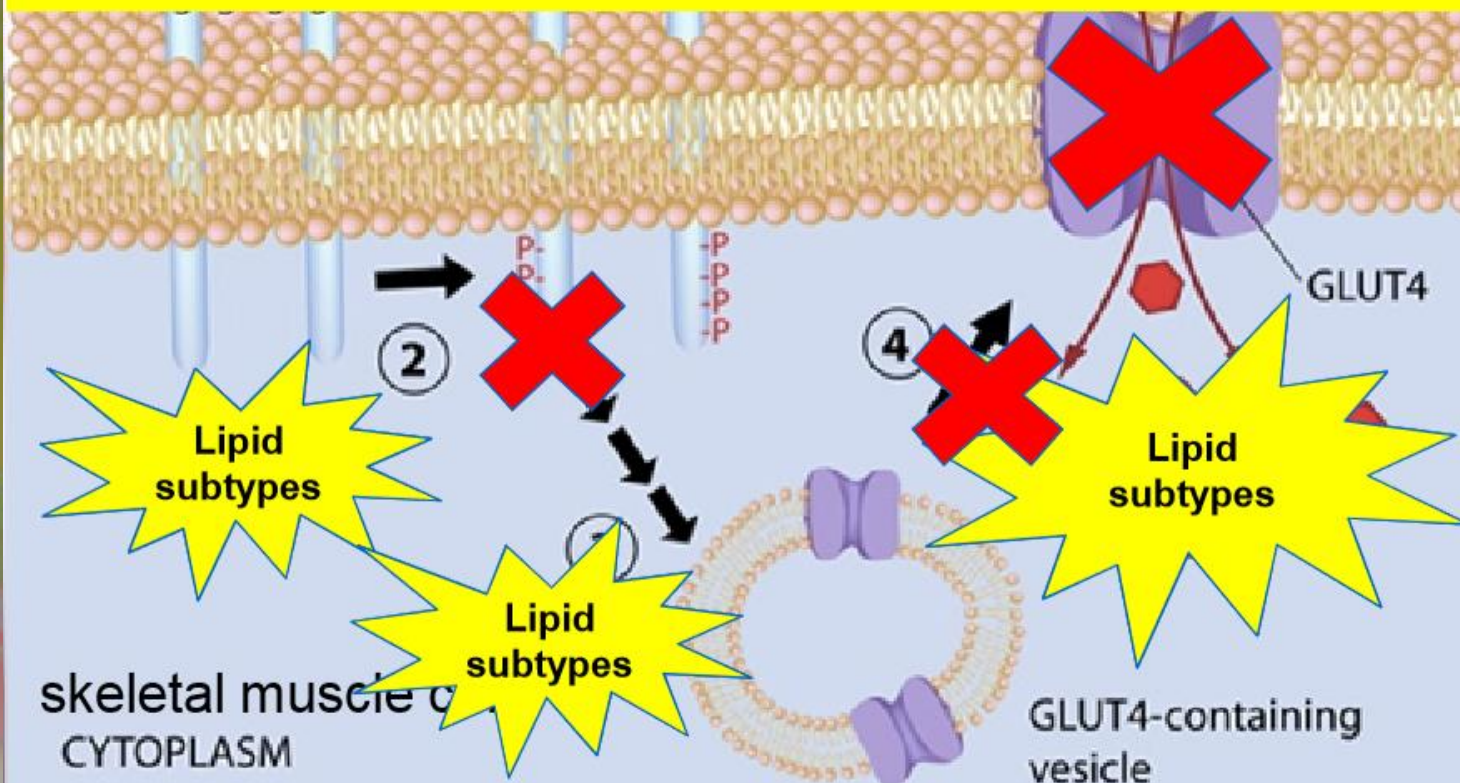Opinions expressed by Forbes Contributors are their own.

NORMAL INSULIN FUNCTION

Insulin

bloodstream

Glucose

Insulin receptor

S—S
S—S S—S

S—S
S—S S—S

① ② ③ ④ ⑤

P-
P-
P-
P-

P-
P-
P-
P-

GLUT4

skeletal muscle cell
CYTOPLASM

GLUT4-containing vesicle

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**
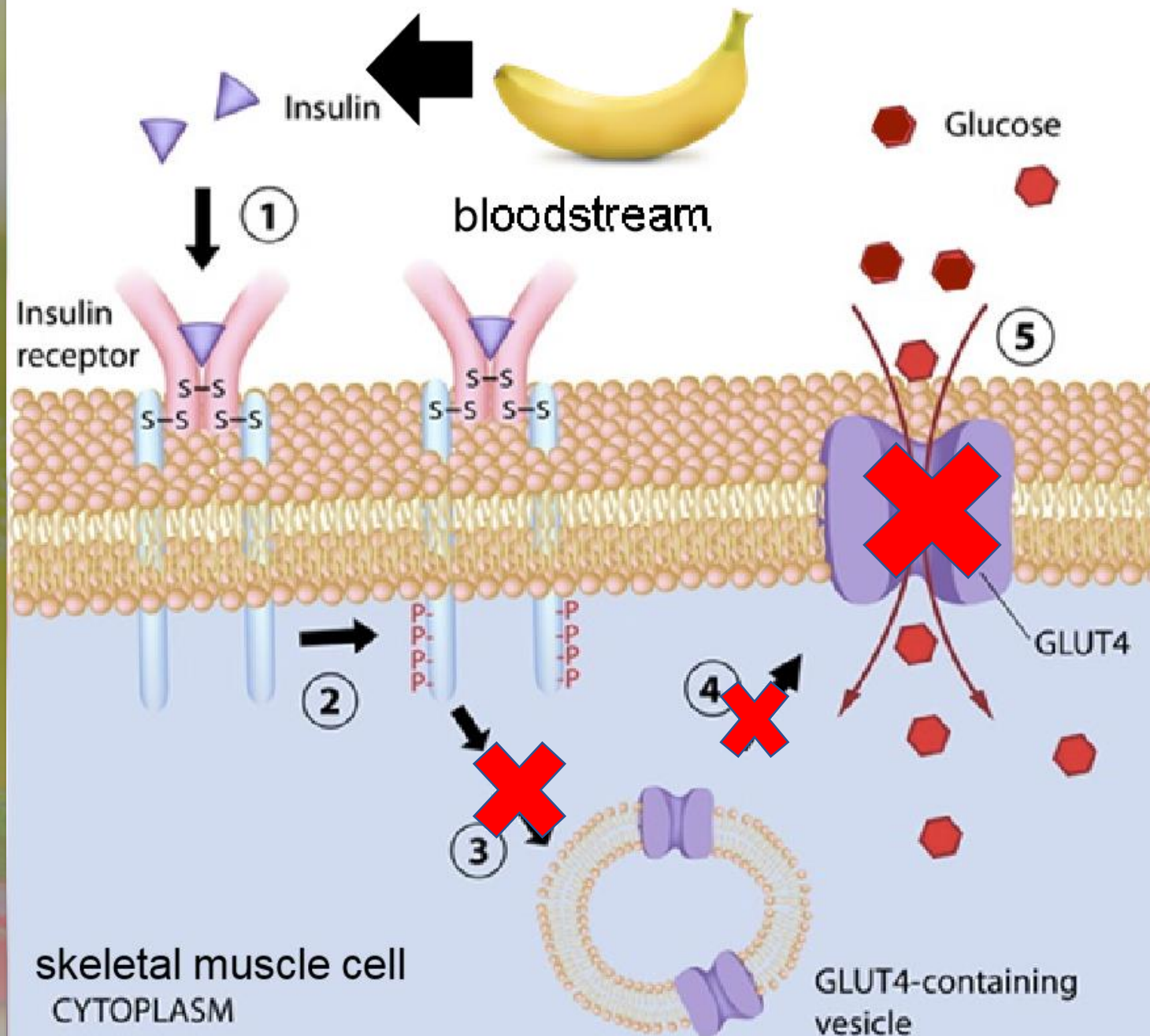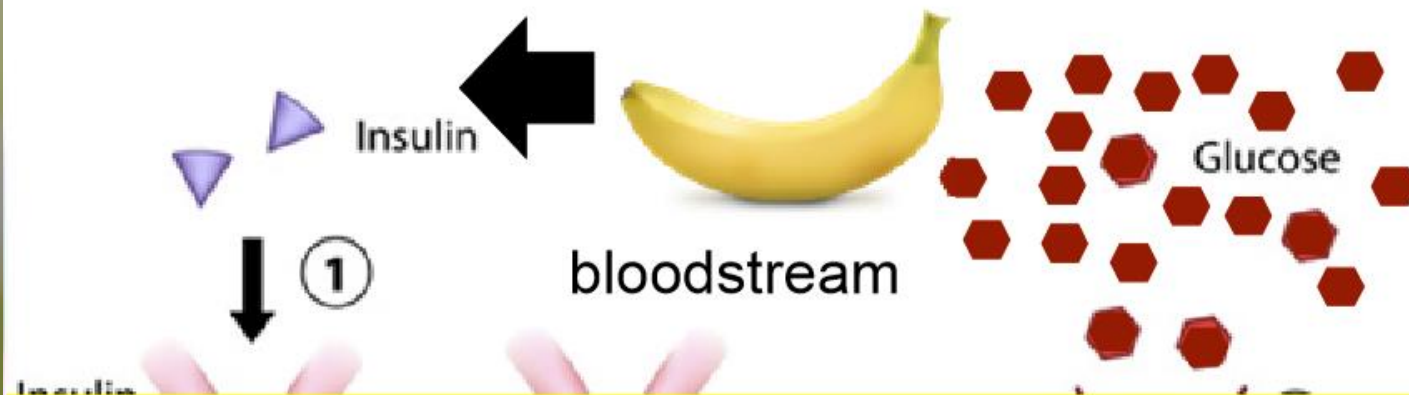
Ectopic Fat in Insulin Resistance, Dyslipidemia, and Cardiometabolic Disease

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

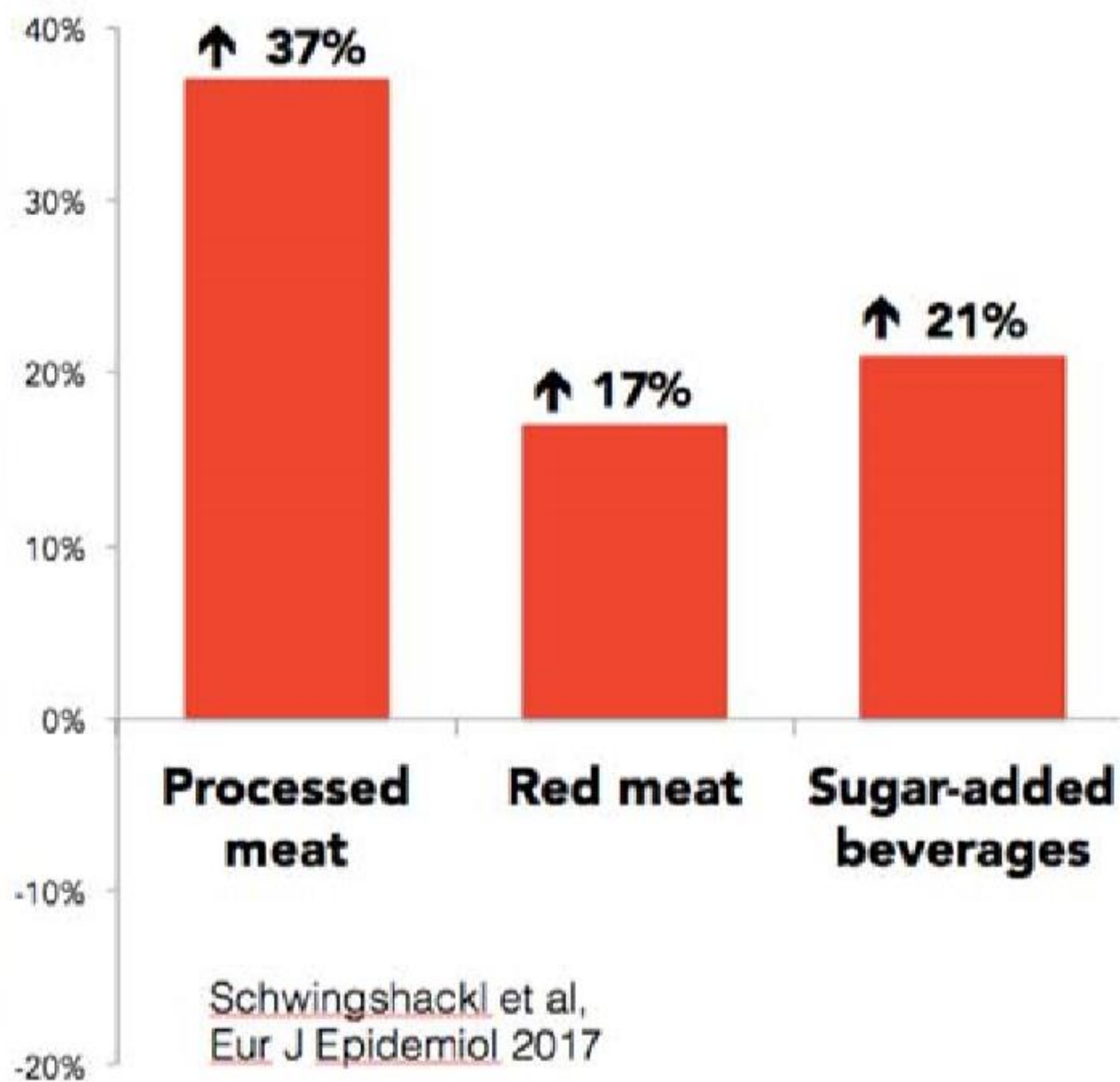Article   Figures/Media   Metrics   September 18, 2014
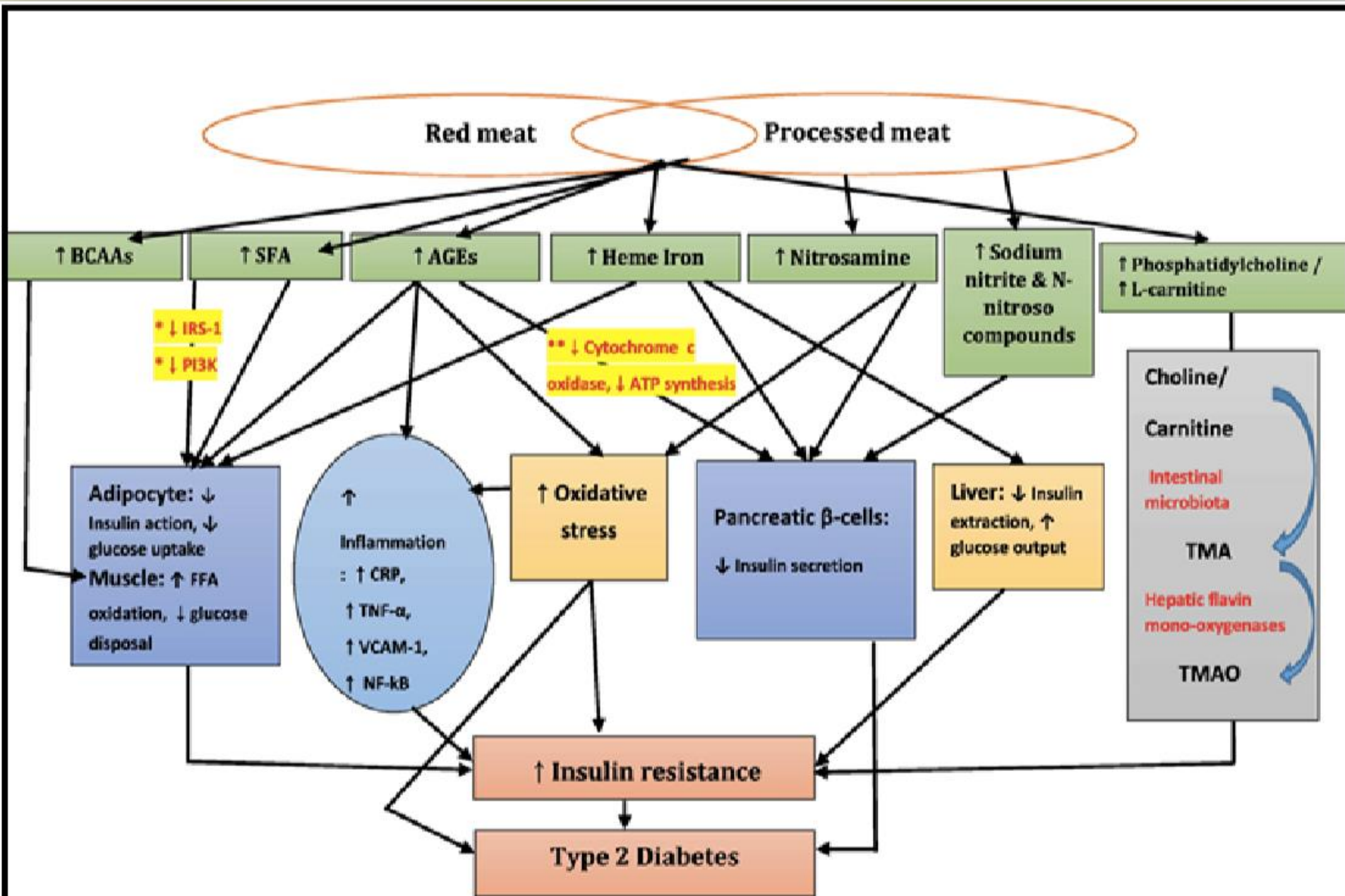
References   225 Citing Articles   Letters

Fat accumulation in ~~the~~ **cells (ectopic fat) is a primary** ~~cause of~~ **resistance**

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

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

Risk of Diabetes Per Each Daily Serving

Processed meat ↑ 37%
Red meat ↑ 17%
Sugar-added beverages ↑ 21%

Schwingshackl et al, Eur J Epidemiol 2017

Kim et al, Metabolism 2015

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

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- **Replace carbs with protein → <u>increased</u> 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

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

Bar chart showing risk of diabetes per each daily serving:
- Processed meat: ↑ 37%
- Red meat: ↑ 17%
- Sugar-added beverages: ↑ 21%
- Whole grains: ↓ 13%

Y-axis ranges from -20% to 40%.

Schwingshackl et al, Eur J Epidemiol 2017
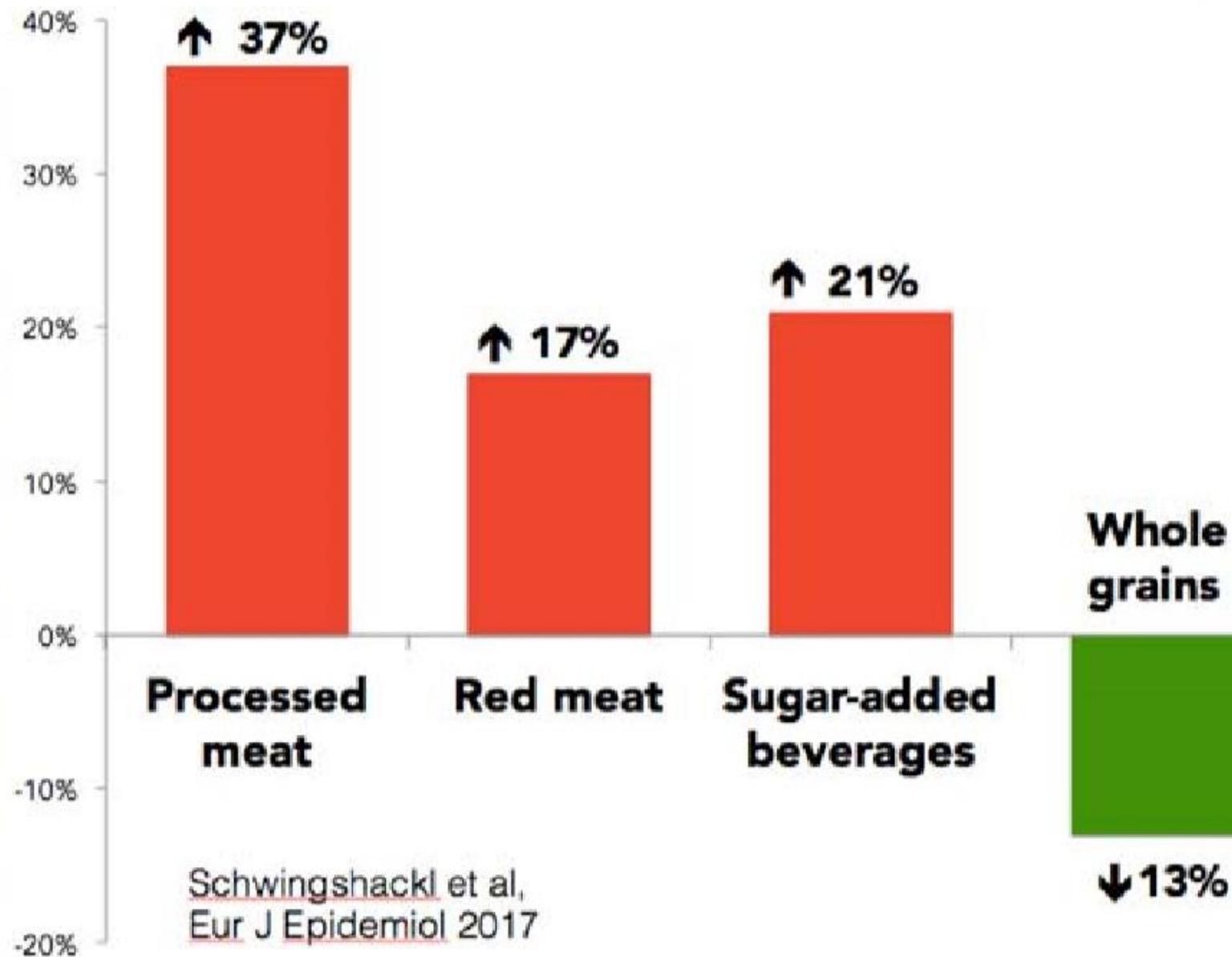
Whole Grains lower diabetes risk: effect of <u>cereal fiber</u>

- **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**

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%

- 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

INTENSITY STRATIFIED BY BURDEN OF OBESITY AND RELATED COMPLICATIONS

Nutrition	• Maintain optimal weight • Calorie restriction (if BMI is increased) • Plant-based diet; high polyunsaturated and monounsaturated fatty acids	**+** • Avoid *trans* fatty acids; limit saturated fatty acids	**+** • Structured counseling • Meal replacement
Physical Activity	• 150 min/week moderate exertion (eg. walking, stair climbing) • Strength training • Increase as tolerated	**+** • Structured program • Wearable technologies	**+** • Medical evaluation/clearance • Medical supervision
Sleep	• About 7 hours per night • Basic sleep hygiene	**+** • Screen OSA • Home sleep study	**+** • Referral to sleep lab
Behavioral Support	• Community engagement • Alcohol moderation	**+** • Discuss mood with HCP	**+** • Formal behavioral therapy
Smoking Cessation	• No tobacco products	**+** • Nicotine replacement therapy	**+** • Referral to structured program

Cardiovascular Disease

Insulin Resistance

Cancer Prevention

Obesity

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

MEAT + CANCER

TIME

THE WAR ON DELICIOUS

CNN Money

The Feed
Processed meat causes cancer, says WHO

NBCNEWS

HEALTH › CANCER

HEALTH
OCT 26 2015, 8:46 AM ET

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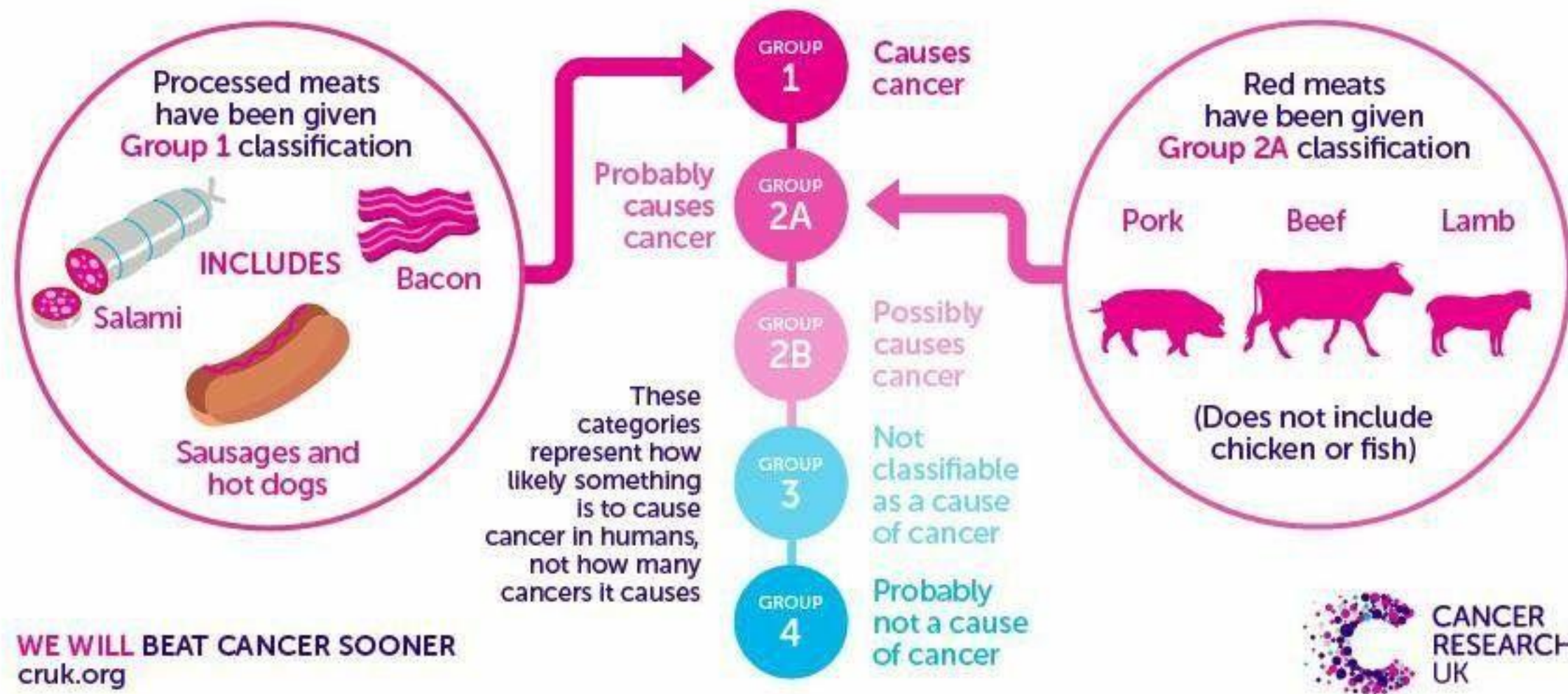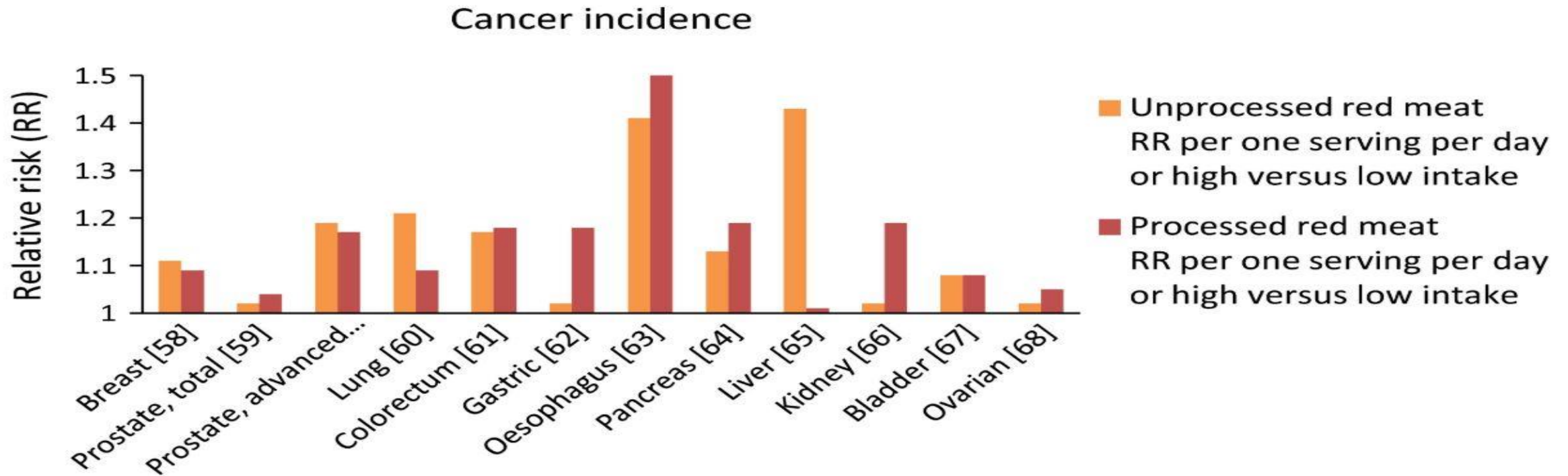by MAGGIE FOX

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

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

GROUP 1 — Causes cancer

GROUP 2A — Probably causes cancer

GROUP 2B — Possibly causes cancer

GROUP 3 — Not classifiable as a cause of cancer

GROUP 4 — Probably not a cause of cancer

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

Fruits and vegetables and total cancer, nonlinear dose-response
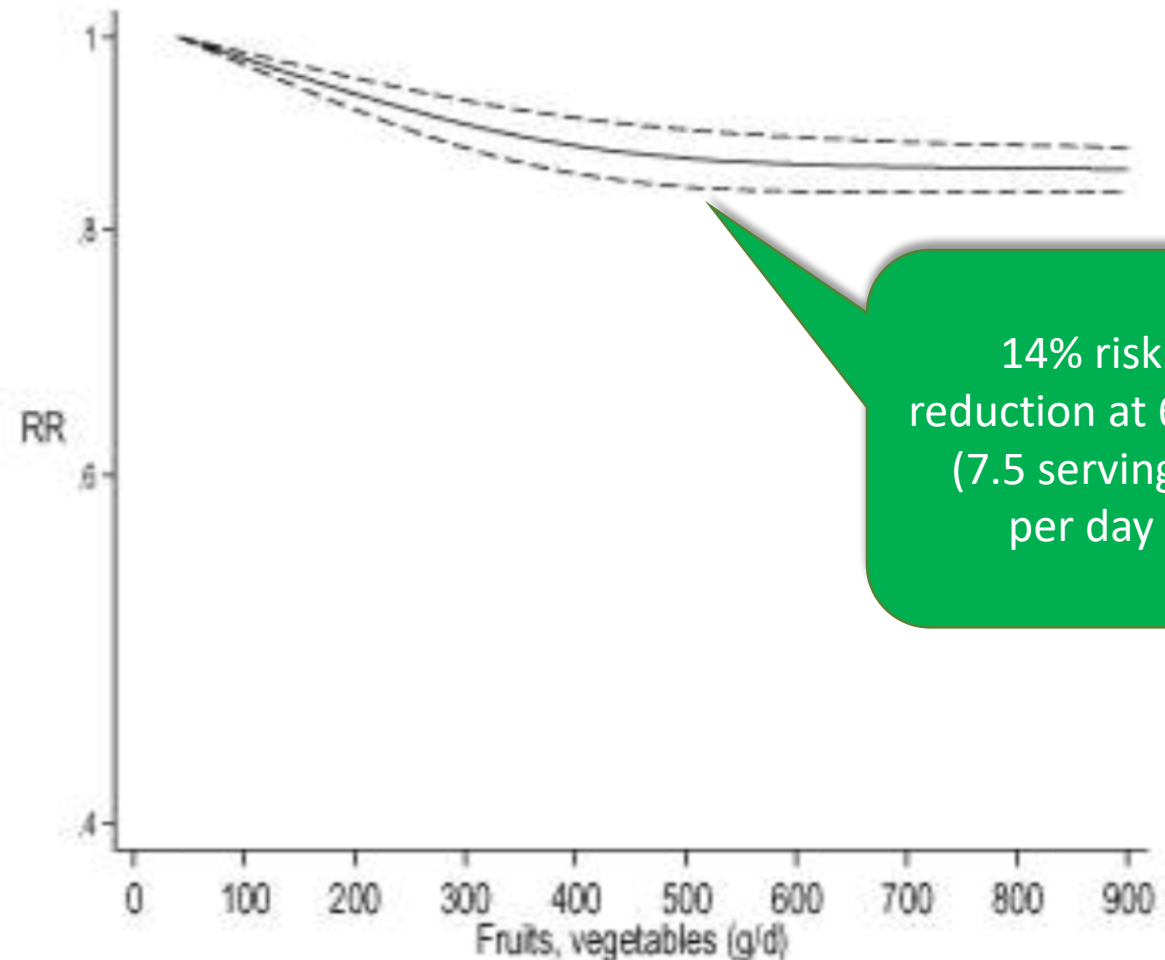
14% risk reduction at 600g (7.5 servings) per day

Best fitting cubic spline

95% confidence interval

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 ✉

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,[ǁ] Katsuto Shinohara,[§] Christopher M. Haqq,[§] 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

Genesis 1:29

- "And God said, 'See, I have given you every herb that yields seed which is on the face of all the earth, and every tree whose fruit yields seed; and to you it shall be for food."
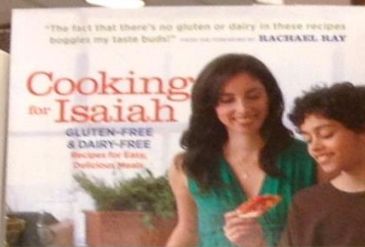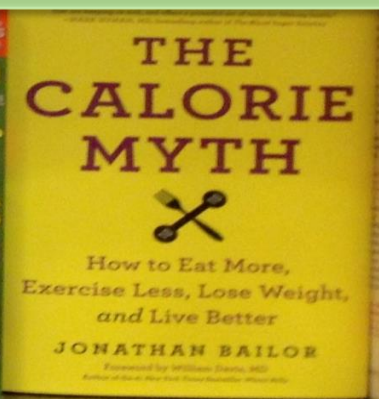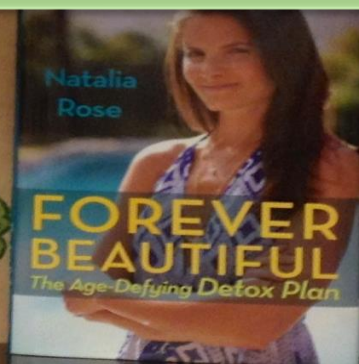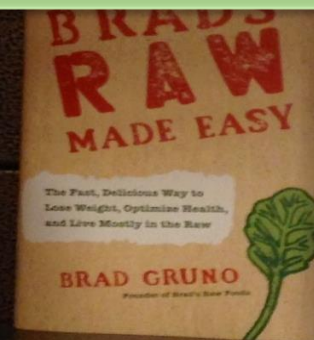
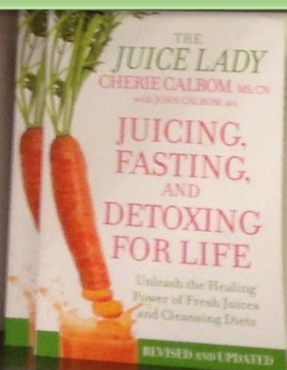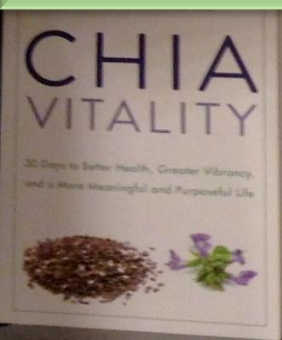Cardiovascular Disease

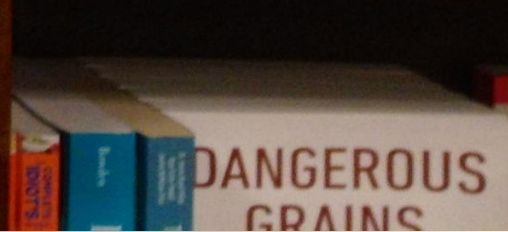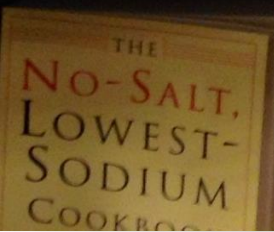Insulin Resistance

Cancer Prevention

Obesity

Choose Your Diet
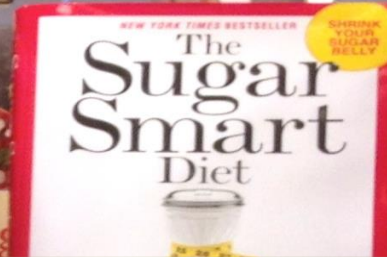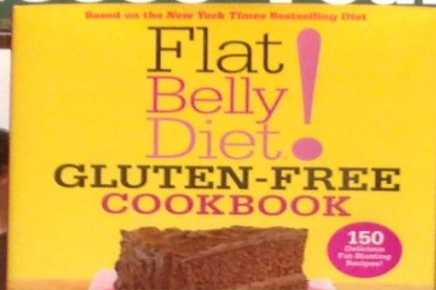
What's the best diet for healthy weight loss?
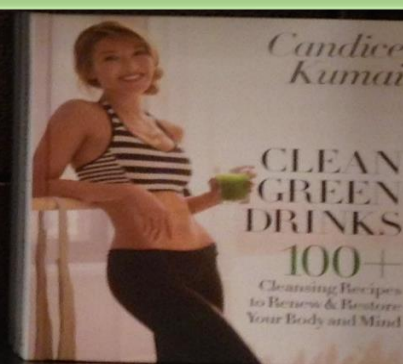
Bestselling Diet Books

Choose Your Diet

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

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

<u>Prevalence Studies:</u>

People eating diets high in plant foods have healthier BMIs

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

<u>Prospective Studies:</u>

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

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)	Refined Carbohydrates (Often With Refined Sugars)

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

Refined Carbohydrates (Often With Refined Sugars)

- CANDY
- SODA
- PASTRIES (DONUTS, SCONES, CROISSANTS)
- SUGARY CEREALS
- WHITE RICE
- WHITE FLOUR PASTA
- WHITE BREADS

↑ High in Fiber / High in Water / High in Antioxidants — High in Minerals / High in Vitamins / Minimally Processed
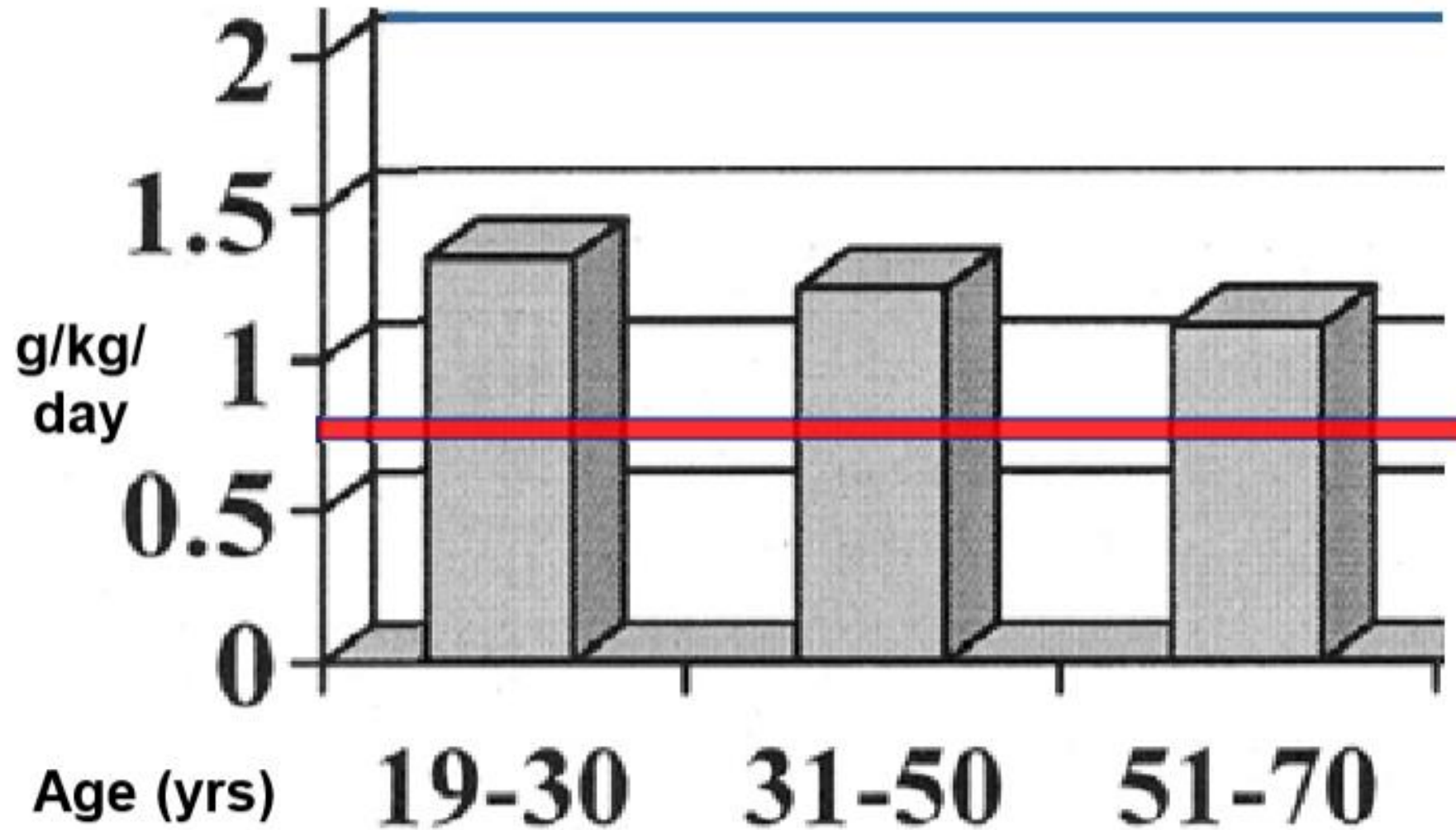
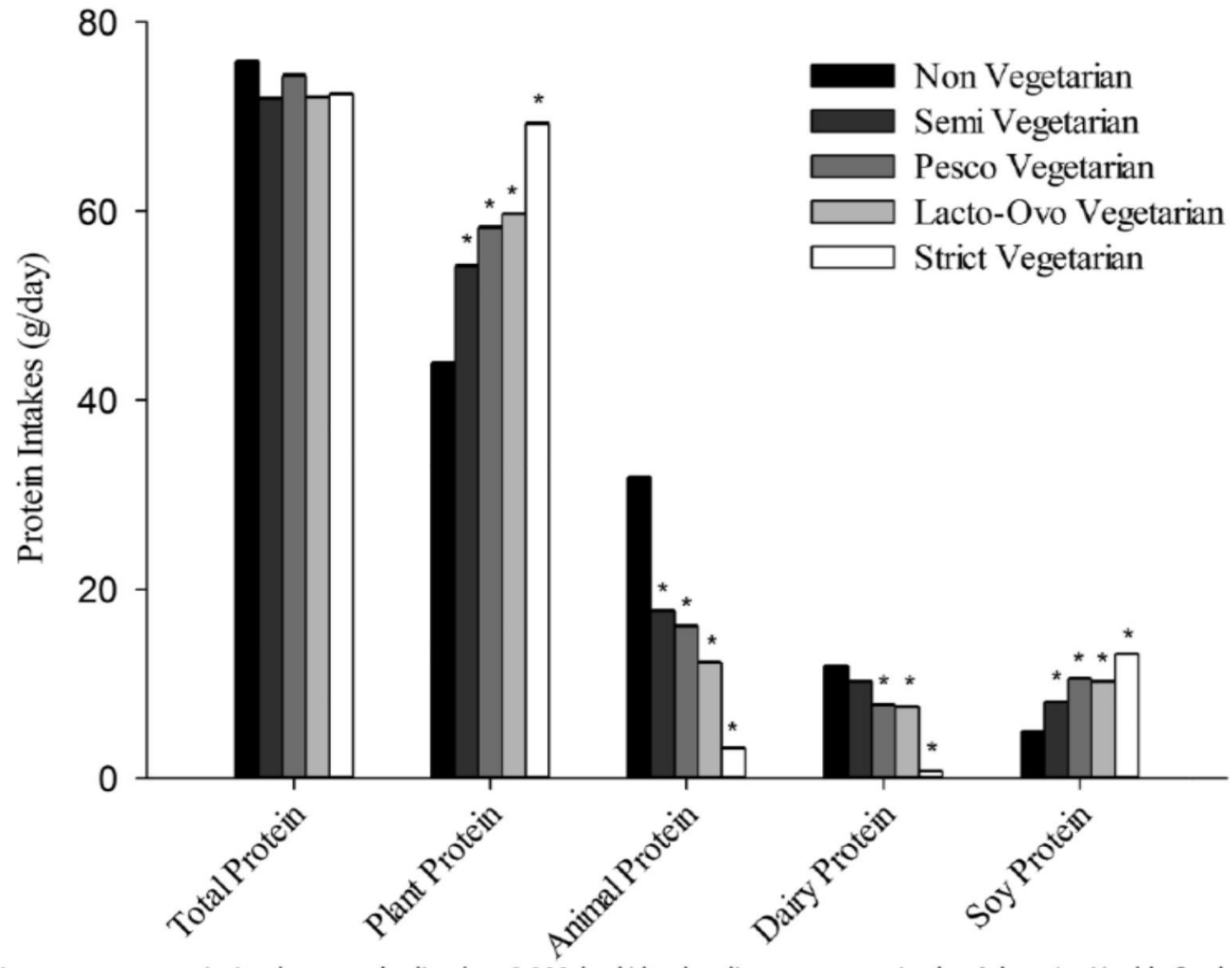↓ Low in Fiber / Low in Macronutrients / Highly Processed

Protein

Protein Needs vs Actual Intake

Fulgoni et al, Am J Clin Nutr 2008

Problems With Excess Protein

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

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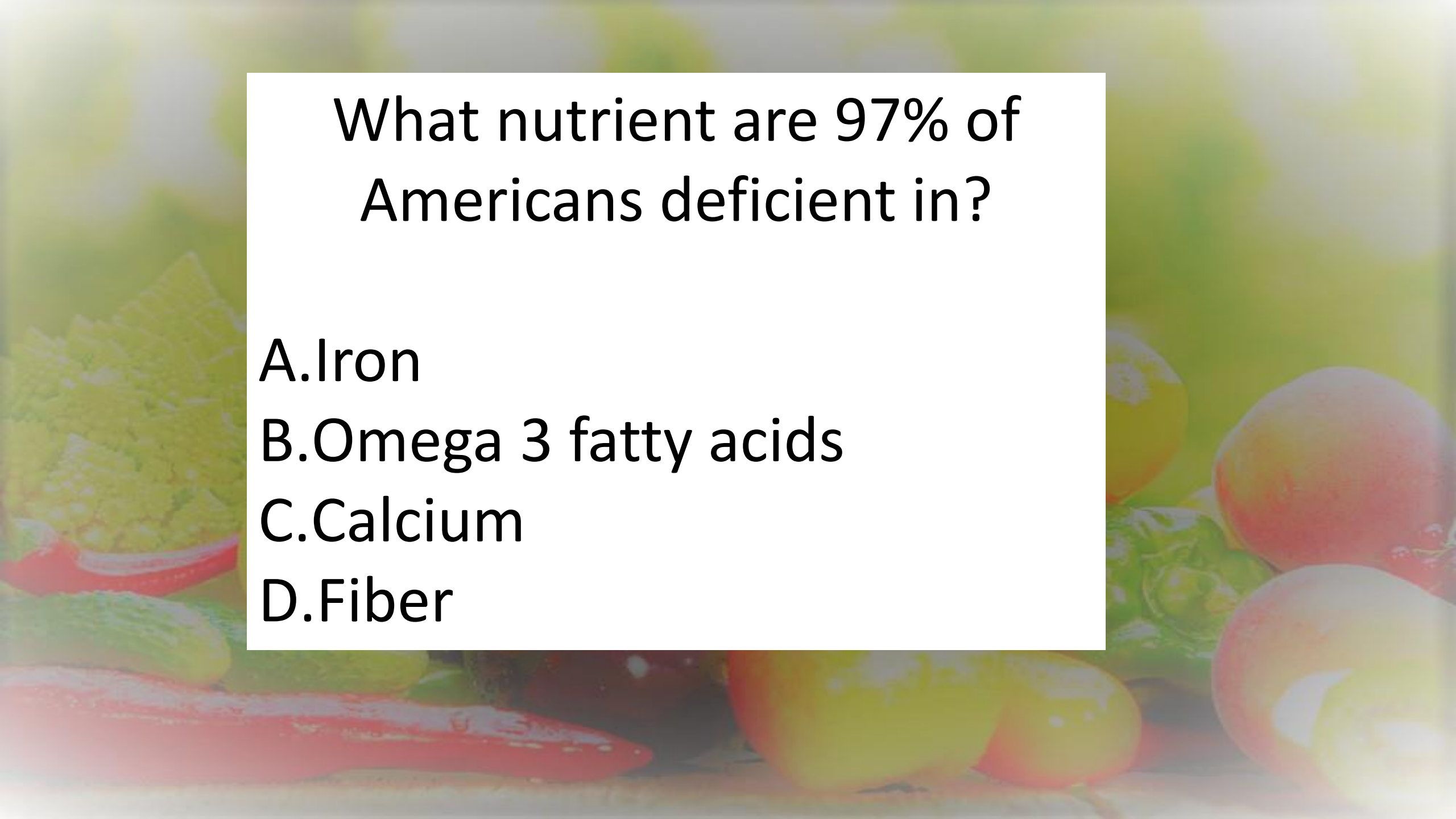
Conclusions and Relevance High animal protein intake was positively associated with cardiovascular mortality and high plant protein intake was inversely associated with all-cause and cardiovascular mortality, especially among individuals with at least 1 lifestyle risk factor. Substitution of plant protein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

Among those 1 with $\geq$ 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....

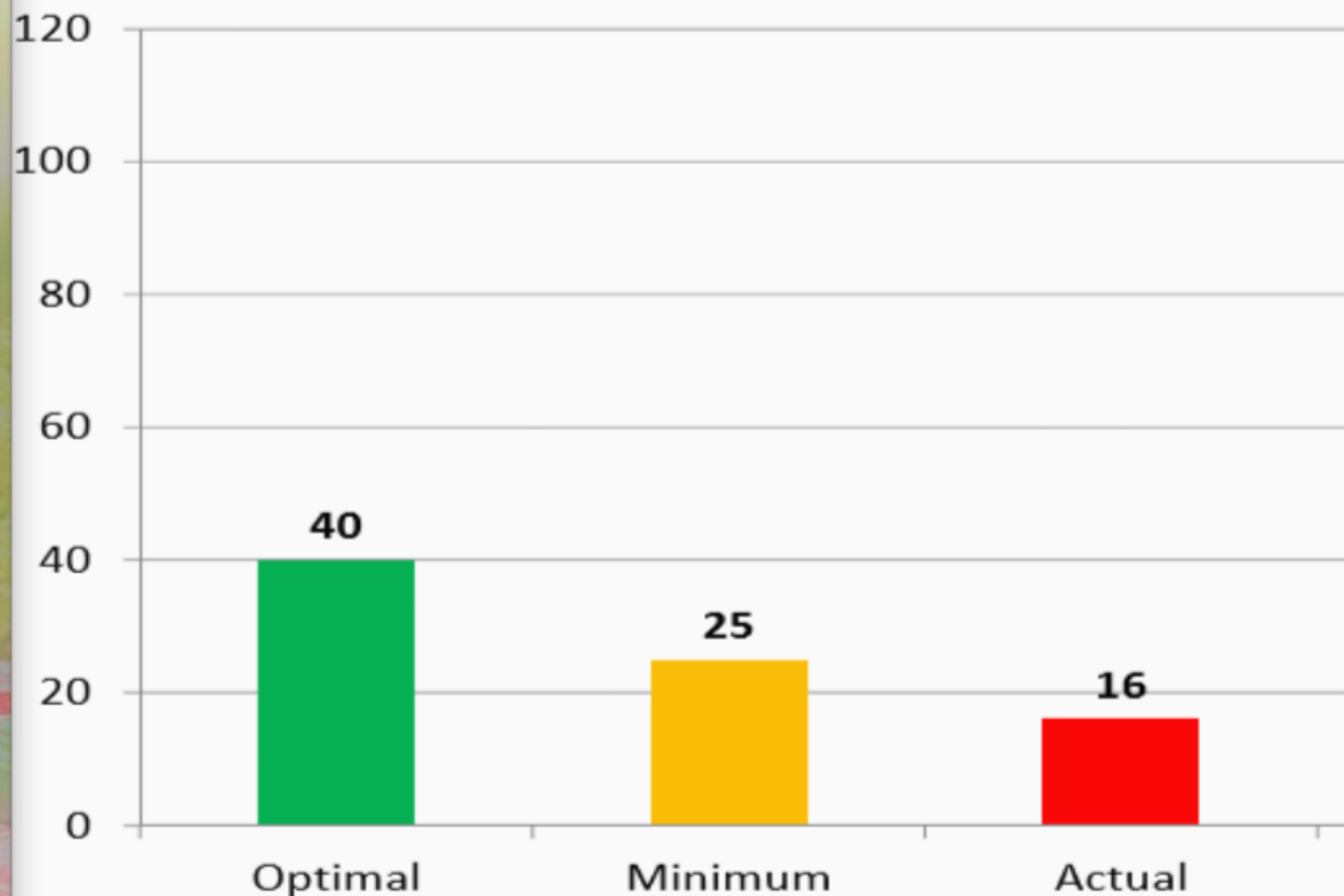# What nutrient are 97% of Americans deficient in?

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

The package matters!
Protein & fat: animal vs plant sources
Carbs: refined vs whole-food sources

PROTEIN VS PROTEIN

ANY QUESTIONS?

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
ACVAPD

FOOD AS
MEDICINE

COOKING FOR YOUR BEST HEALTH