Plant-based Nutrition:

Reversing Disease?

February 5, 2020

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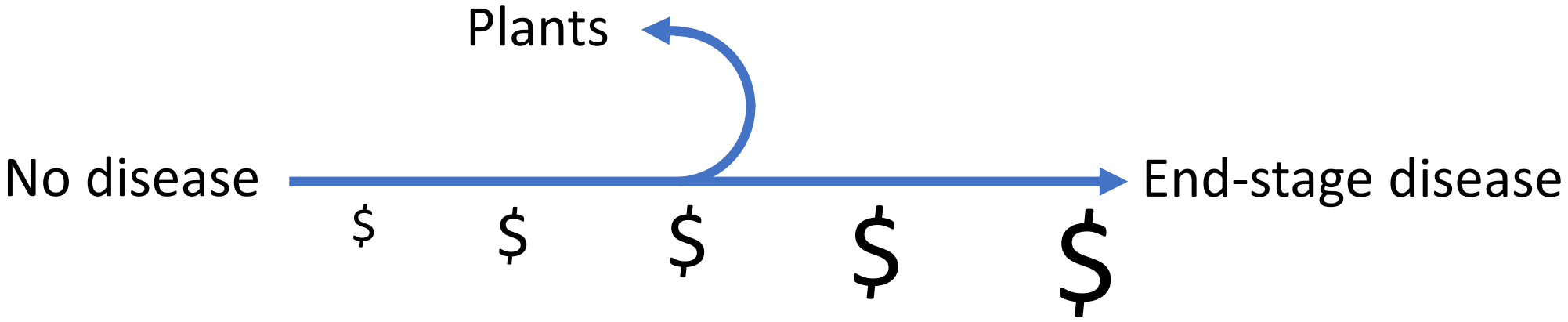
Disease Reversal?



Plant-based Nutrition Objectives

- Appreciate contribution to good health
- Describe what is a whole-food plant-based diet
- Describe scientific evidence
- Describe role in disease management and prevention
- Identify barriers and educational strategies

What does health optimization mean?

- Longevity
- Quality
  - Maintenance of personal ADL
  - Free of chronic disease
- Healthcare provider's objective

Healthiest Countries

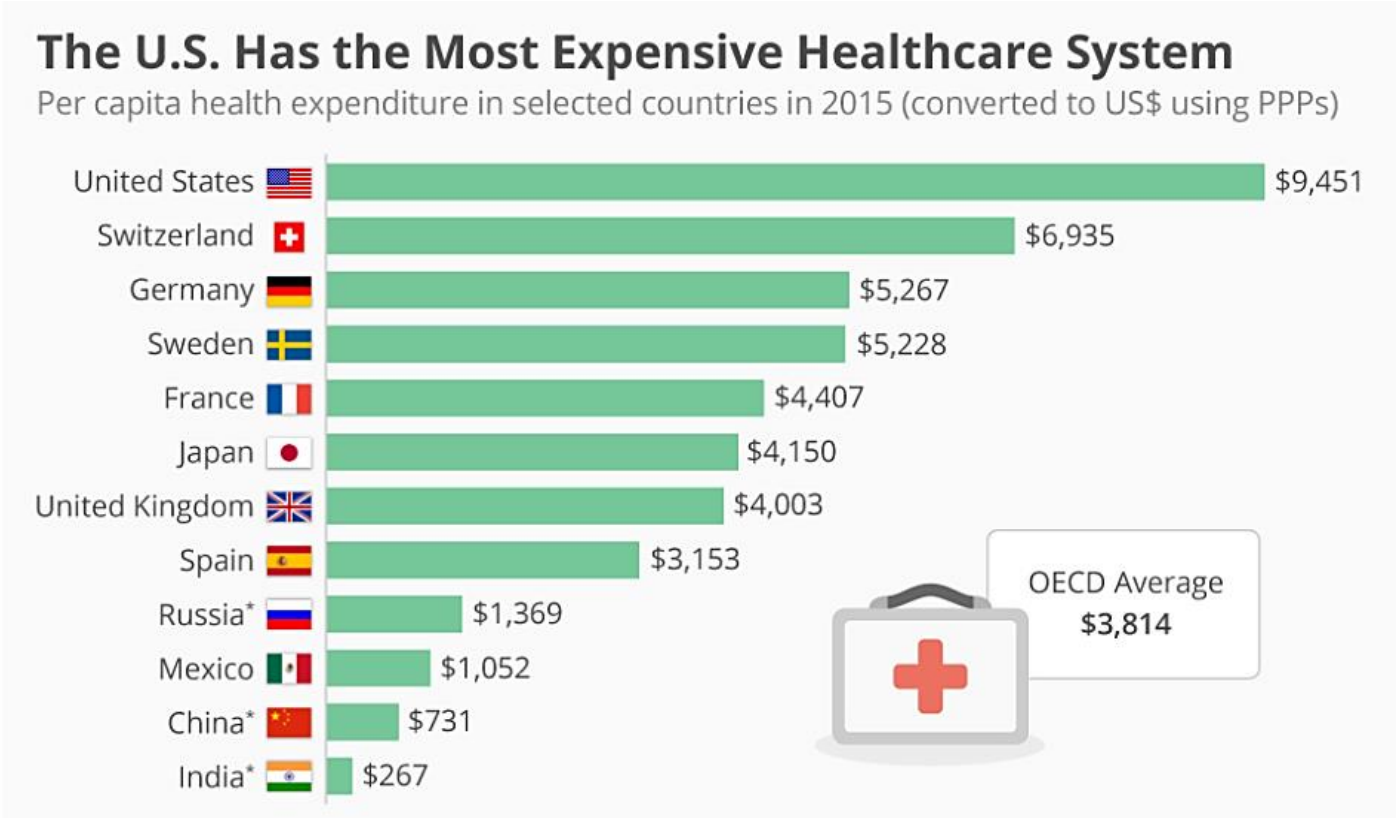
- Bloomberg analysis from UN, World Bank, and WHO, using range of factors from life expectancy to obesity, tobacco use, air quality and access to clean water
- **Spain #1**
  - notable decline in CV diseases and cancer deaths over past decade, partly due to policies based on screening and prevention
  - primary care particularly praised with specialized family doctors acting as health system gatekeepers
  - Plant-based Mediterranean diet
- **U.S. #35**

2019 Rank	2017 Rank	Change	Economy	Health Grade
1	6	+5	Spain	92.75
2	1	-1	Italy	91.59
3	2	-1	Iceland	91.44
4	7	+3	Japan	91.38
5	3	-2	Switzerland	90.93
6	8	+2	Sweden	90.24
7	5	-2	Australia	89.75
8	4	-4	Singapore	89.29
9	11	+2	Norway	89.09
10	9	-1	Israel	88.15
11	10	-1	Luxembourg	87.39
12	14	+2	France	86.94
13	12	-1	Austria	86.30
14	15	+1	Finland	85.89
15	13	-2	Netherlands	85.86
16	17	+1	Canada	85.70
17	24	+7	S. Korea	85.41
18	19	+1	New Zealand	85.06
19	23	+4	U.K.	84.28
20	22	+2	Ireland	84.06

https://www.weforum.org/agenda/2019/02/these-are-the-world-s-healthiest-nations/

Economics

- How, vs how much, money is spent
- Maybe solution lies beyond pharmaceutical and technological advances
  - Artificial pancreas
  - Next gen diabetic med
  - Next gen TAVR system
  - Robotic surgical systems
- More money doesn't always buy happiness … or health



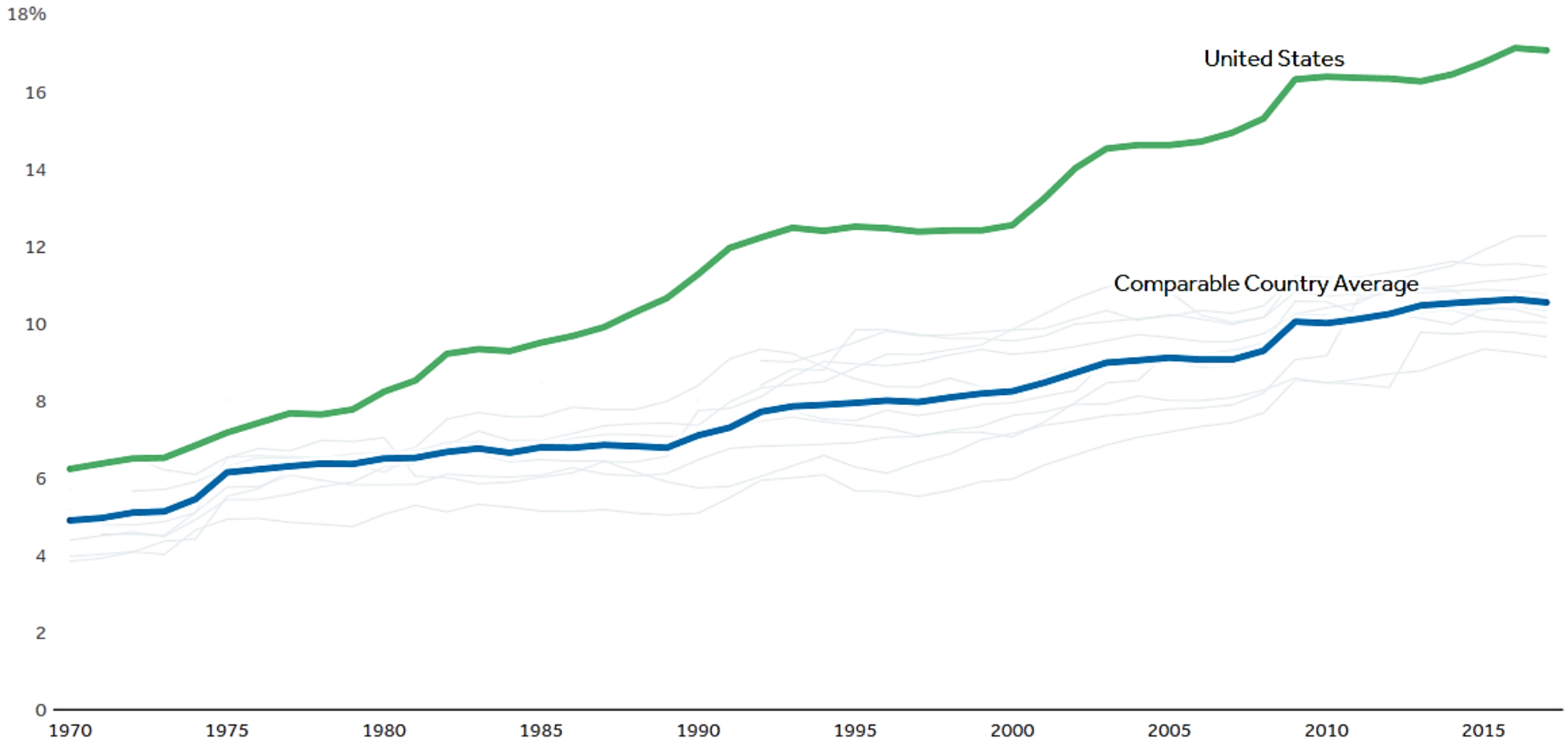
Organisation for Economic Cooperation and Development (OECD)

Life Expectancy

U.S. with lowest life expectancy

https://www.healthsystemtracker.org/chart-collection/u-s-life-expectancy-compare-countries/#item-le_life-expectancy-at-birth-in-years-2017_dec-2019-update

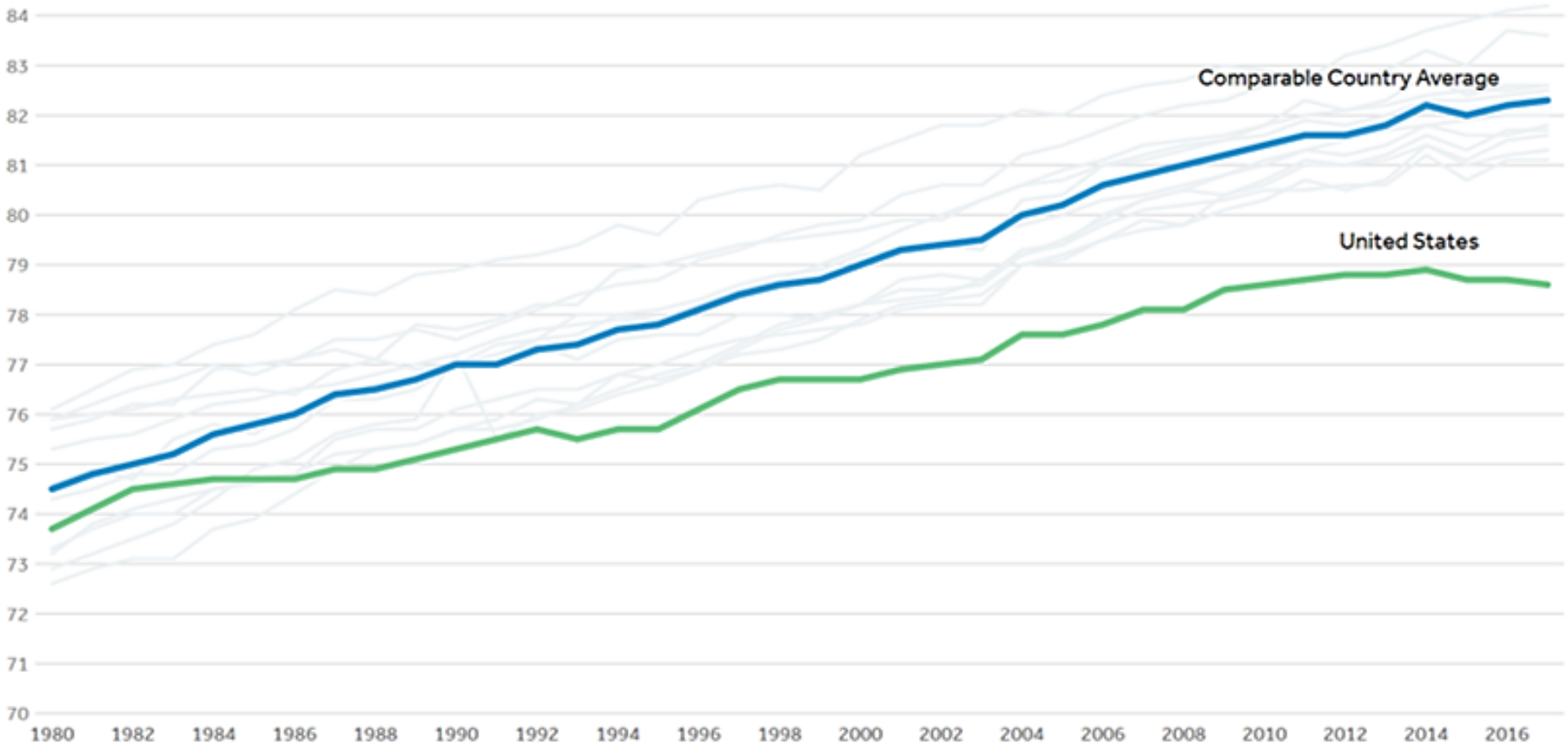
Healthcare expenditures %GDP, 1980-2017



- U.S. expenditure gap increasing

https://www.healthsystemtracker.org/chart-collection/u-s-life-expectancy-compare-countries/#item-le_life-expectancy-at-birth-in-years-2017_dec-2019-update

Total Life Expectancy, 1980-2017



- U.S. slower growth, and declining

https://www.healthsystemtracker.org/chart-collection/u-s-life-expectancy-compare-countries/#item-le_life-expectancy-at-birth-in-years-2017_dec-2019-update

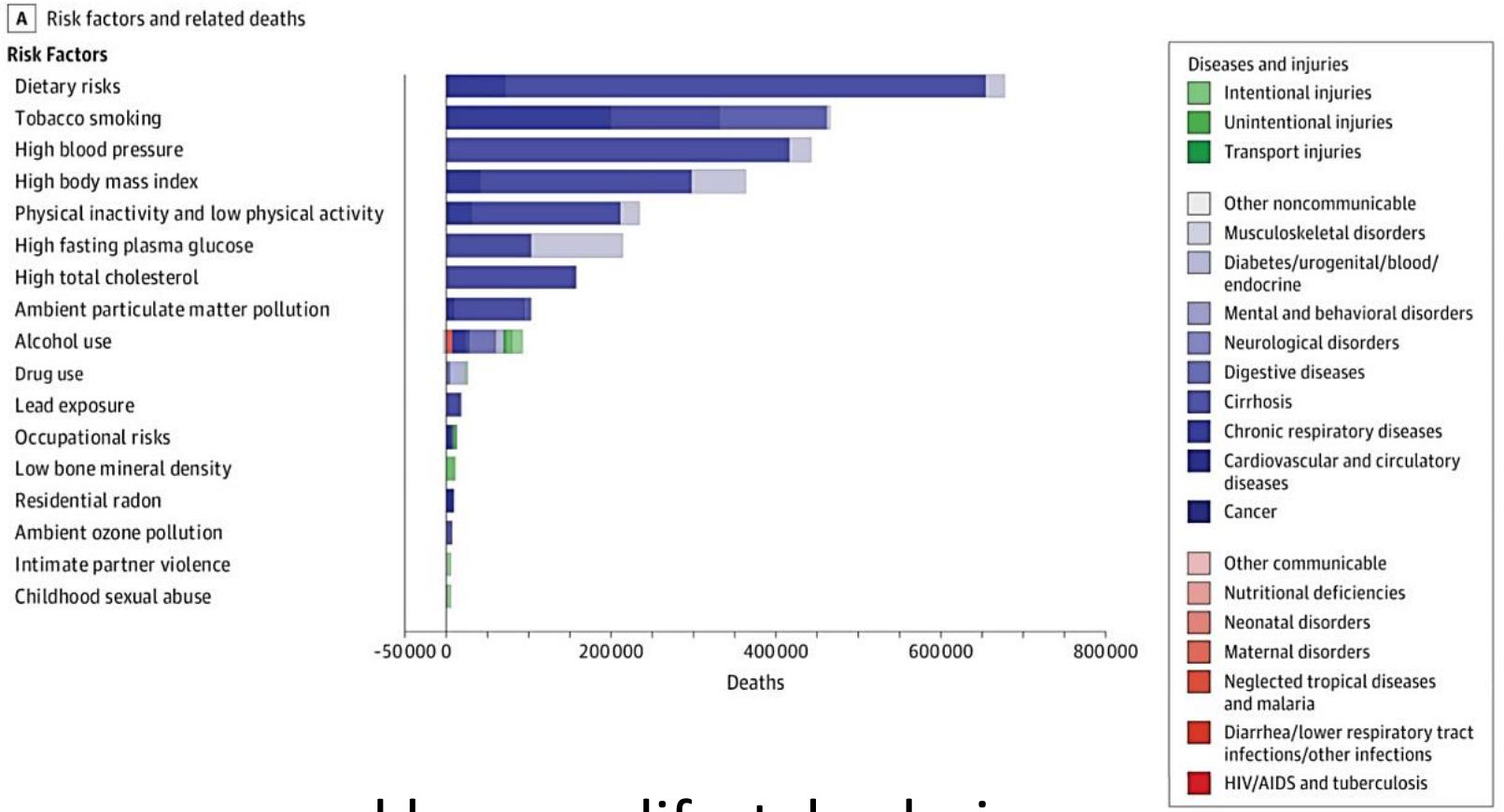
U.S. Causes of Death (CDC 2017)

1. Heart disease (647K, $199B)
2. Cancer (599K, $174B)
3. Accidents (170K)
4. Chronic lower respiratory disease (160K)
5. Stroke (146K)
6. Alzheimer's (121K)
7. Diabetes (84K, $237B)

- 90% of $3.5 trillion spent on chronic diseases

Chronic Disease Etiology

1. Poor diet
2. Tobacco use
3. Physical Inactivity



- 80-90% of chronic diseases caused by poor lifestyle choices

https://www.healthypeople.gov/

Blue Zones

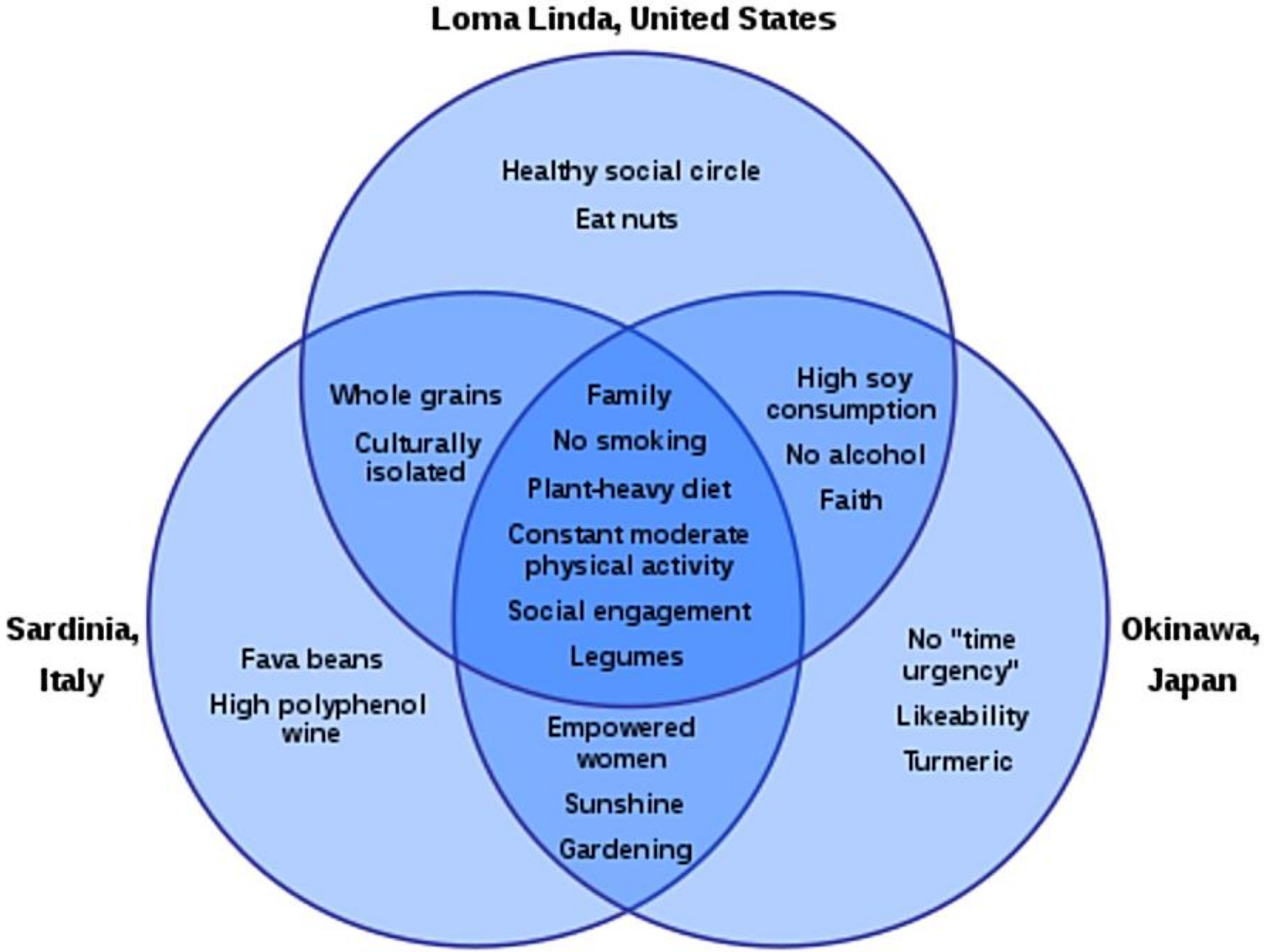
- Areas with highest life expectancy or proportions of centenarians (10-20X vs U.S.)
- Loma Lindans live 8-9 years longer than U.S. counterparts

Blue Zones

- Lessons: move naturally, right outlook, right tribe, **eat wisely**
- 95 percent of 100 year-olds ate plant-based diet
- Consume small meat portions about 5 times monthly (Sundays, holidays)
- **Low risk of chronic diseases: cancer, diabetes, heart disease**

https://www.bluezones.com/2018/08/future-of-health-care-is-creating-environmental-change/

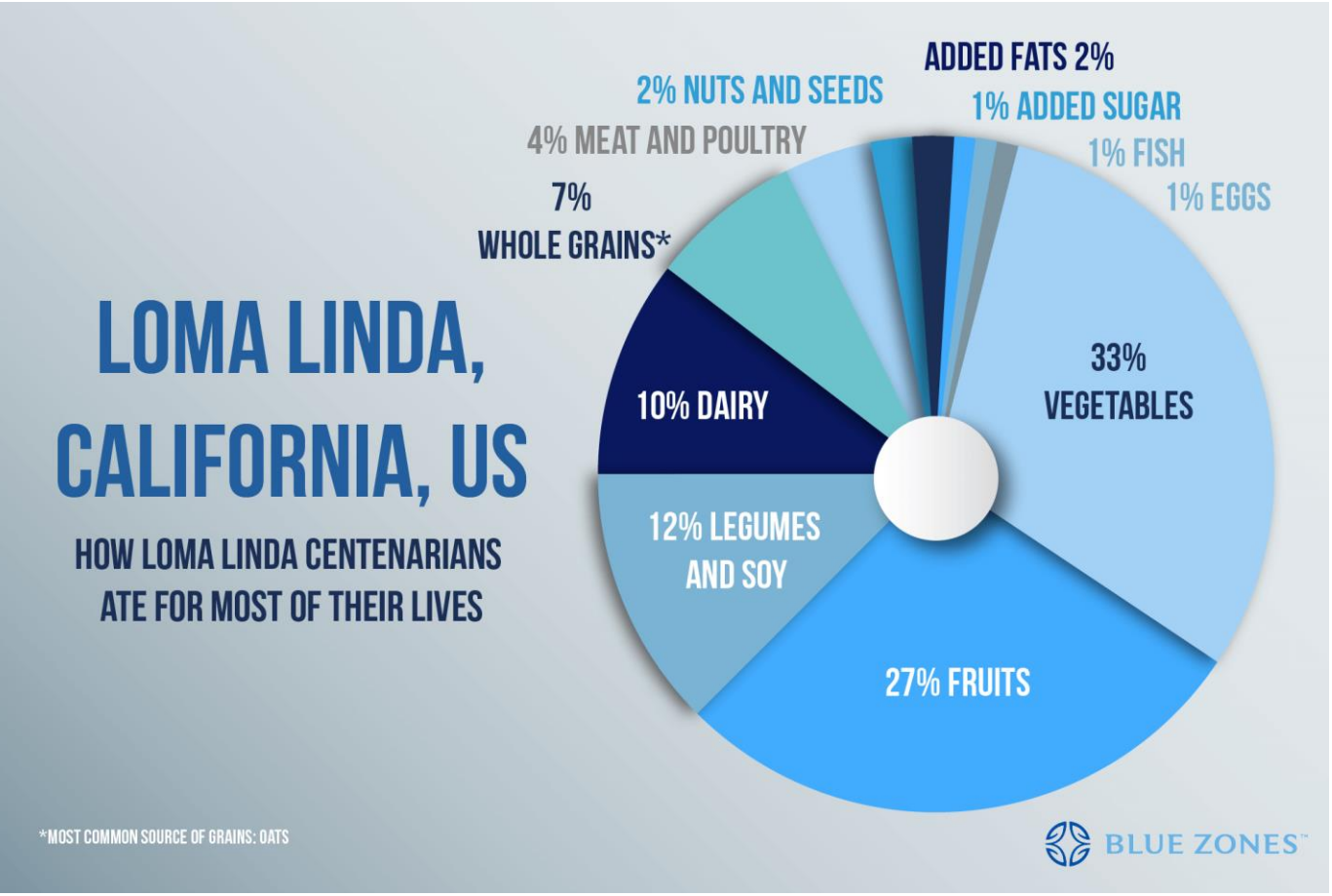
Blue Zones

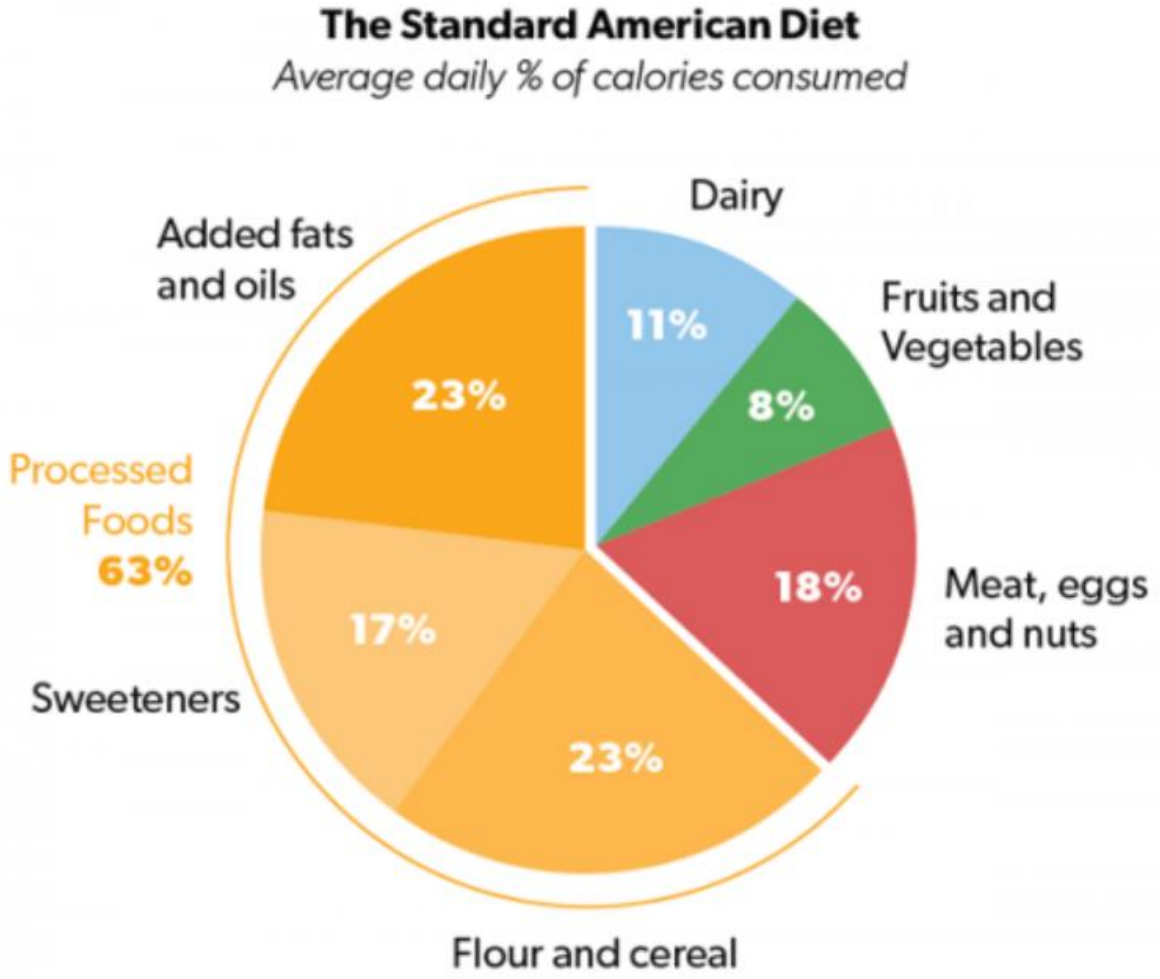

Loma Linda, United States
Healthy social circle
Eat nuts
Whole grains
Culturally isolated
Family
No smoking
Plant-heavy diet
Constant moderate physical activity
Social engagement
Legumes
High soy consumption
No alcohol
Faith
Sardinia, Italy
Fava beans
High polyphenol wine
Empowered women
Sunshine
Gardening
Okinawa, Japan
No "time urgency"
Likeability
Turmeric

Diets

- Standard American Diet (SAD)
  - 2/3 from processed foods (added sweeteners, oils, processed flours)
  - 1/3 from animal foods (95% factory farmed)
  - 10% of calories from unprocessed (whole) plant foods
- Vegetarian – no animals but eat products coming from animals
- Ovo-lacto vegetarian – no meats but eggs and dairy products
- Pesco vegetarian – vegetarian + seafood
- Vegan – no animal based products

Plant-based vs SAD nutrition





- Focus on unprocessed foods and plants

https://www.bluezones.com/exploration/loma-linda-california/

SAD statistics

- 150 lbs of each added sugar and processed flour per person per year
- 4,000X more vegetable oils now vs. 1950
- 800 calories more per day vs. 1950
- 97% exceed recommended protein intake
- 97% fail to consume minimum recommended daily fiber (women 25 gm, men 30 gm)
- 1.5% consume minimum daily 5 servings of produce

Whole food plant-based diet: Sample Menu

- **Breakfast**
  - Oatmeal with berries, walnuts, cinnamon and soy milk. Fruit.
  - Hash brown skillet with peppers, onions, and mushrooms
- **Lunch**
  - Vegetable-bean minestrone soup, 100% whole grain roll, raw vegetables.
  - Large garden salad topped with garbanzo beans, wild rice, sunflower seeds, and balsamic vinegar
- **Dinner**
  - Whole grain pasta with marinara sauce, steamed vegetables.
  - Bean burrito with salsa and avocado, side salad.

Whole food plant-based diet: Benefits

- Complex carbohydrates/starches for fuel, but also contain fiber, vitamins and minerals
- High in fiber (animal foods contain no fiber)
- Naturally lower in fat but contain healthy fats: Mono and PUFA omega-3 and 6's
- Minimizes/eliminates trans fats, saturated fats, and cholesterol
- Ideal levels and type of protein
- Micronutrient rich: vitamins and minerals, antioxidants
- Phytonutrients: Discovered and yet undiscovered nutrients found only in plants, critical for optimal health
- Low calorie density, helping prevent overeating and obesity

Caloric density

- Satiety – foods with water and fiber activate stretch receptors
- Consume 3-5 lbs of food daily

Calories/lb. of food			
Low density		High density	
Salad	<100	Meat	700-1500
Non-starchy vegetables	100-200	Sugar	1500
Fruit	200-400	Flour	1500
Cooked grains/pasta	350-500	Cheese	2000
Potatoes/yams/squash	400-500	Dried fruit	2400
Legumes	600	Nuts/seeds	2800
		Butter	3200
		Oil	4000

Nutrition Facts

Serving Size 12 fl oz

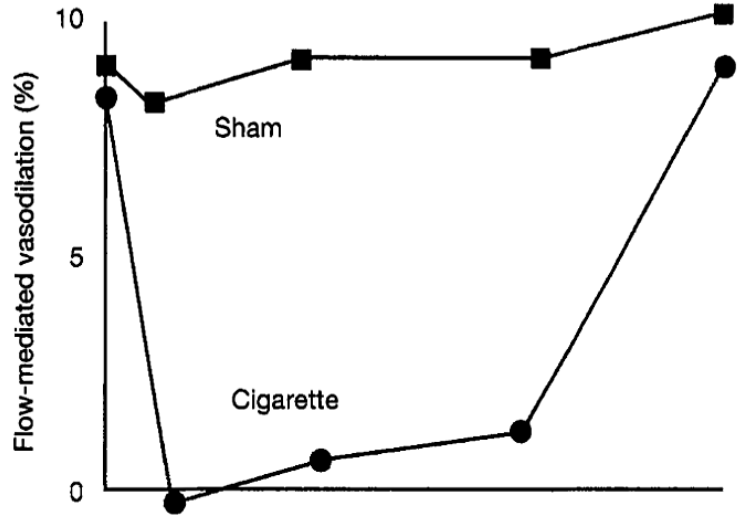
Amount Per Serving	
Calories	**170**
	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 60mg	**3%**
Total Carbohydrate 46g	**15%**
Dietary Fiber 0g	0%
Sugars 46g	
Protein 0g	
Calcium 0mg	0%
Iron 0mg	0%
Vitamin A 0mcg	0%
Vitamin C 0mg	**2%**

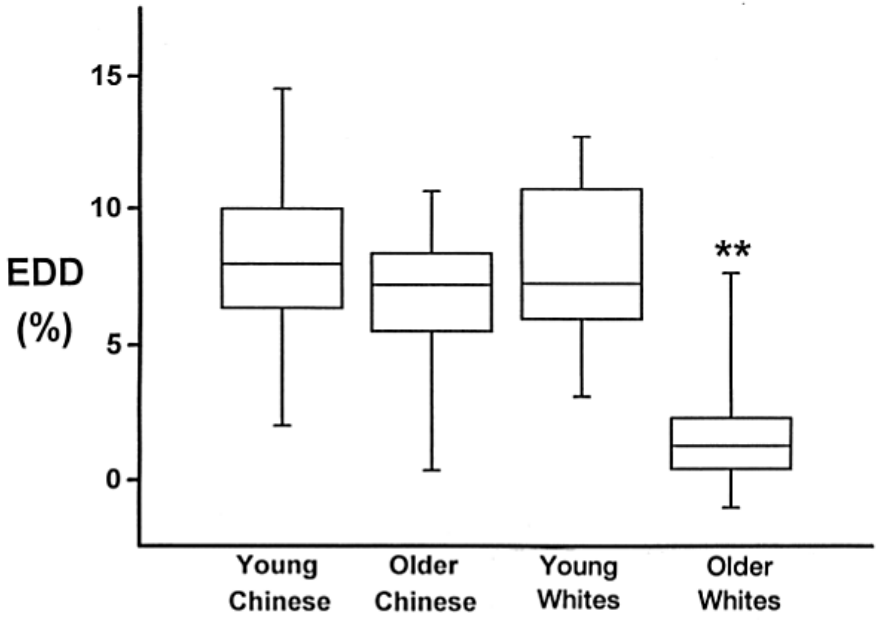
* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

44 Net Carbs Per Serving

CV Disease - Arterial Function

- Endothelial dysfunction initial step in pathogenesis of cardiovascular disease, cancer, infectious diseases
- Data suggests progressive endothelial dysfunction is not inevitable consequence of aging
- Older Chinese low prevalence of CAD despite high prevalence of smoking



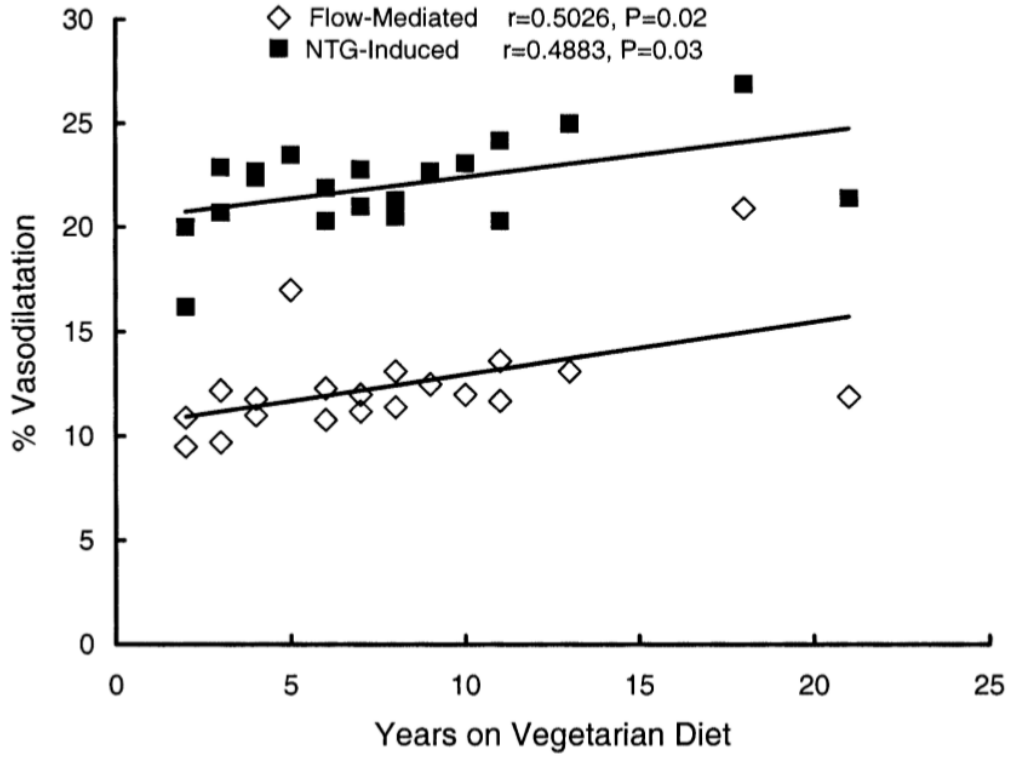


CV Disease - Arterial function

- Vegetarians have increased vascular dilatory response versus omnivores
- Correlates with duration
- Cross-sectional study

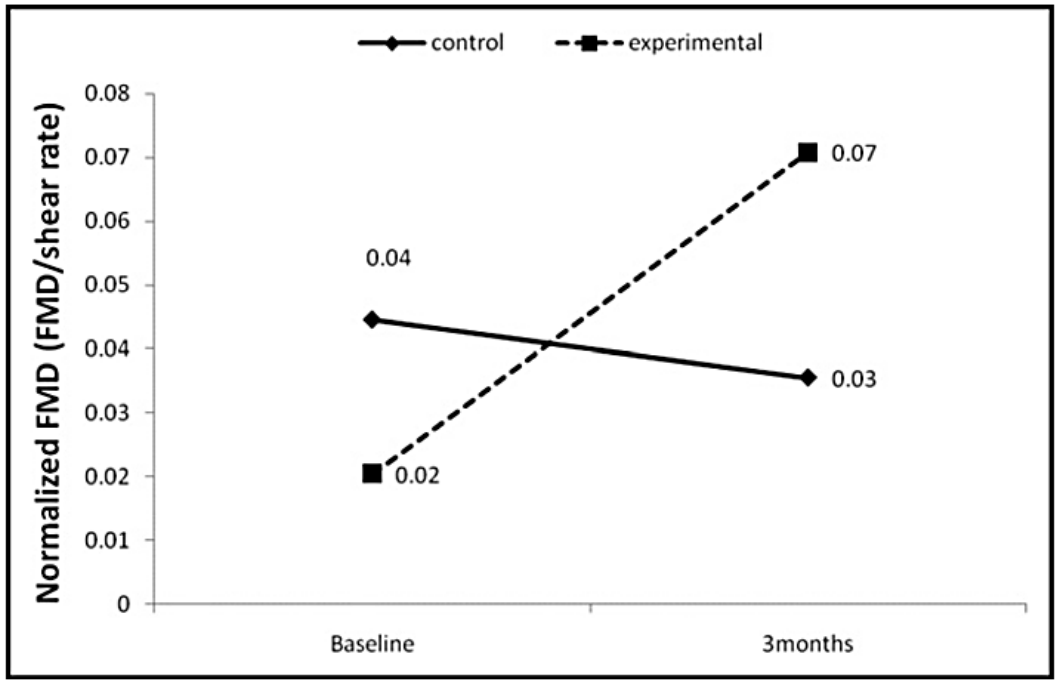
Vasodilatory functions of brachial artery evaluated by ultrasonography in omnivores and vegetarians[a]

	Omnivore ($n = 20$)	Vegetarian ($n = 20$)	P-value
Baseline vessel size (mm)	4.42 ± 0.53	4.21 ± 0.55	0.2071
Flow-mediated dilatation (%)	3.13 ± 1.36	13.78 ± 2.54	<0.001
NTG-induced dilatation (%)	13.78 ± 2.06	21.99 ± 2.21	<0.001



CV Disease - Arterial function

- Interventional trial demonstrates increased arterial function on plant-based diet
- CRP with statistical significant decrease as well



CV Disease - Angina

- RCT of coronary heart disease patients randomized to intensive lifestyle changes (plant-based diet, smoking cessation, exercise) and followed for 5 years including quantitative arteriography
- Experimental group - 91% reduction in reported frequency of angina after 1 year
- Control group - 185% increase in reported frequency of angina
    - Control group patients asked to follow the advice of their personal physicians regarding lifestyle changes
- At 5 years experimental group's angina symptoms sustained at similar levels
- Long-term reduction in angina comparable to that achieved following CAB surgery or angioplasty
- Angina reduction helped maintain long-term adherence
- Stenosis diameter
    - Experimental group - progressively improved at 1 and 5 years (8% improvement)
    - Control group – progressively worsened at 1 and 5 years (28% worsening)
- More cardiac events in control group with RR 2.47 (1.48-4.20)

Intensive lifestyle changes for Reversal of Coronary Heart Disease. JAMA, December 16, 1996-Vol 280; No 23. Ornish

CV Disease - Angina

- 22 sites, >1000 patients with CAD asked to make changes in diet (10% calories from fat, plant based), engage in moderate exercise (3 hours/week), and practice stress management (1 hour/day)
- Baseline
  - 108 patients reported mild angina
  - 174 patients reported limiting angina.
- By 12 weeks
  - 74% were angina free
  - Additional 9% moved from limiting to mild angina
- Angina improvements similar to those observed in smaller randomized controlled clinical trials evaluating same lifestyle change program
- Observed decreases were similar to those reported in studies of CAB or PCI

Intensive lifestyle changes for Reversal of Coronary Heart Disease. JAMA, December 16, 1996-Vol 280; No 23. Ornish

Diabetes

- Insulin resistance etiology: intramyocellular lipid (fat buildup in muscle cells)

1. Saturated (animal fats) and trans fats in diet
2. Saturated fat production in the cell from added sugar in diet
3. Processed carbohydrates
4. Excess body/belly fat spilling back into the bloodstream

Diabetes

- 12 week RCT comparing vegan versus conventional diabetes diet
- Experimental unrestricted vegan diet group
- Control conventional diabetes diet per diabetes association - restricted intake based on body weight, activity, need for weight control, and compliance. Total carbohydrate intake 50-60%.
- High compliance vegan participants had greater A1c reduction (-0.9% vs. -0.3%)
- RCTs of metformin with 0.9% reduction

Effect of a Brown Rice Based Vegan Diet and Conventional Diabetic Diet on Glycemic Control of Patients with Type 2 Diabetes: A 12-Week RCT. Yu-Mi Lee, et al.

Diabetes

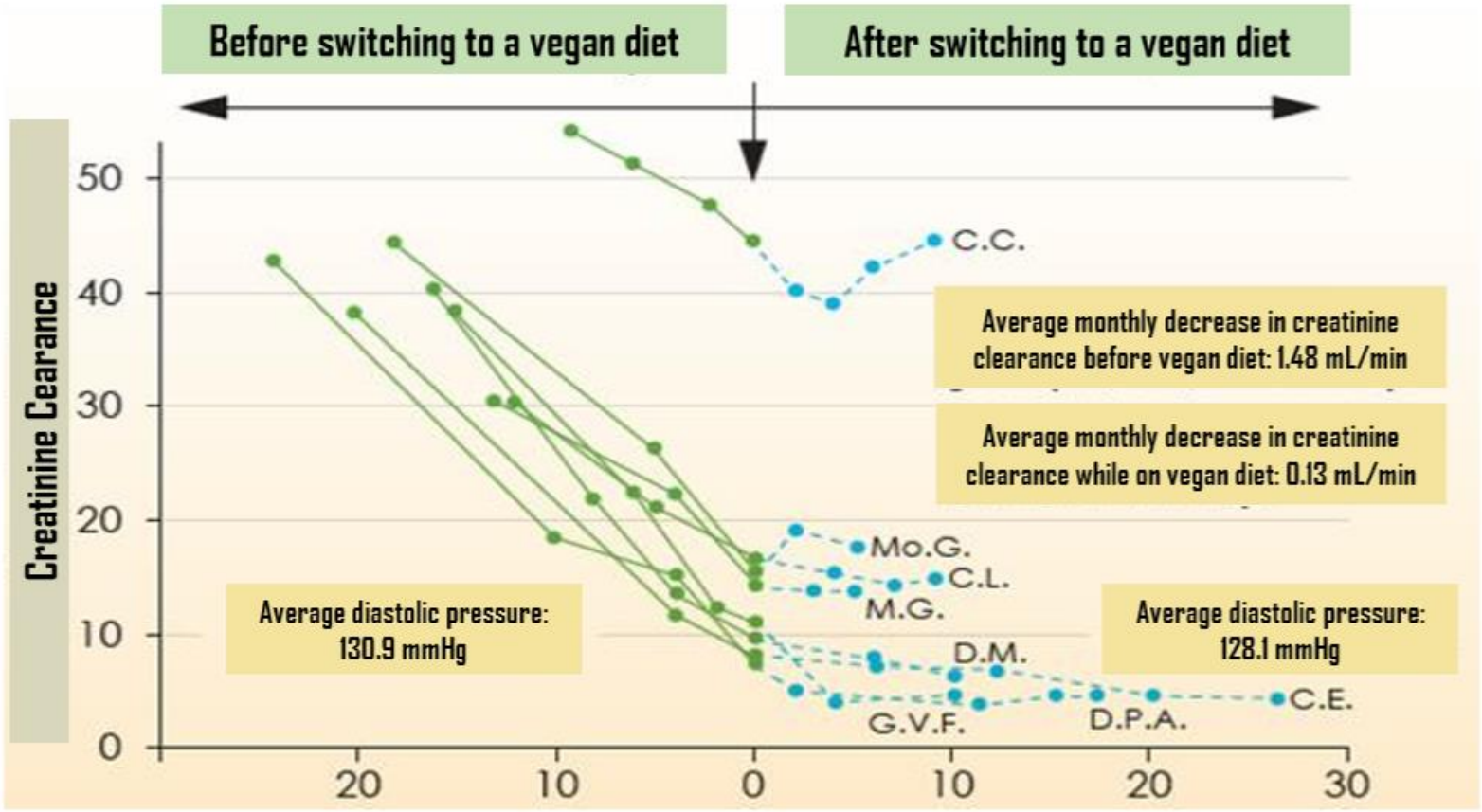
- 22 week RCT comparing low-fat vegan vs ADA diet

- Experimental group with great reductions
  - Weight loss 6.5 kg (vs 3.1 kg)
  - A1c 1.2 (vs 0.4)
  - LDL (21.2% vs 10.7%)
  - 43% (vs 26%) reduced their diabetes medications

Provided by and thanks for Buffington

Diabetes – renal disease

- Slowed rate of renal decline on vegan diet



www.scottbrown.us/switching-to-a-vegan-diet.html

Cancer - prostate

- 93 prostate cancer pts electing to forego conventional treatment
- Experimental (vegan) diet (95% compliant) vs control
- PSA at 1 year; blood dripped onto human prostate cancer cells
- Vegan group had drop in PSA, greater decrease in cancer cell growth

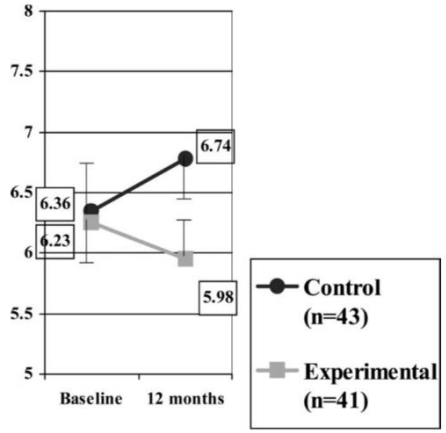


FIG. 1. Mean changes ± SEM in PSA in ng/ml between experimental and control groups after 1 year.

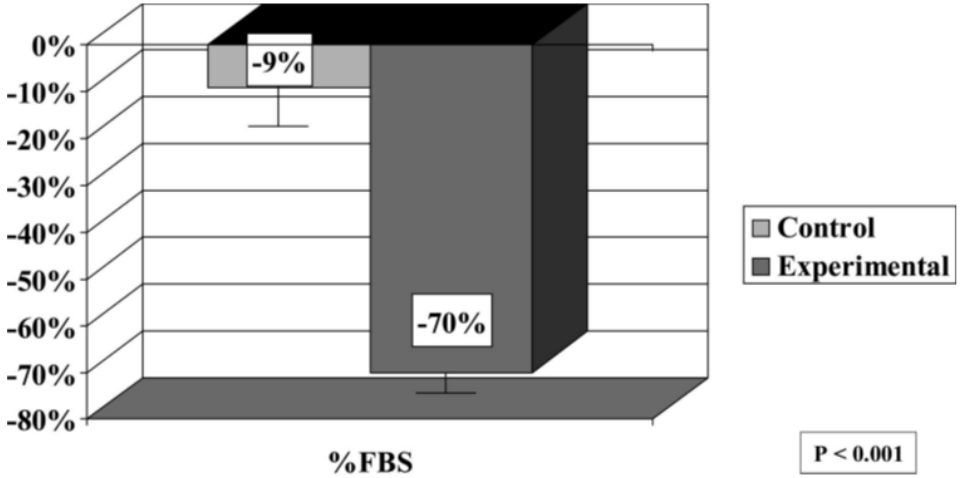
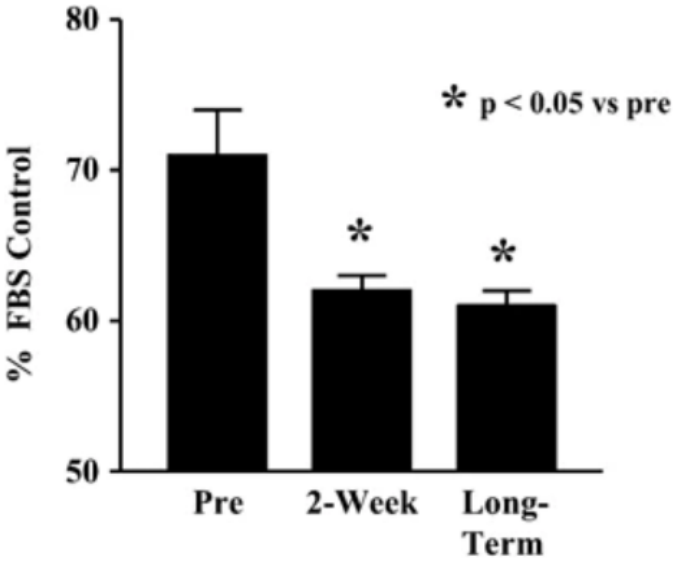


FIG. 2. Mean changes ± SEM in percent serum stimulated LNCaP cell growth from baseline to 1 year in experimental and control groups.



Cancer - prostate

- Gene down-regulation

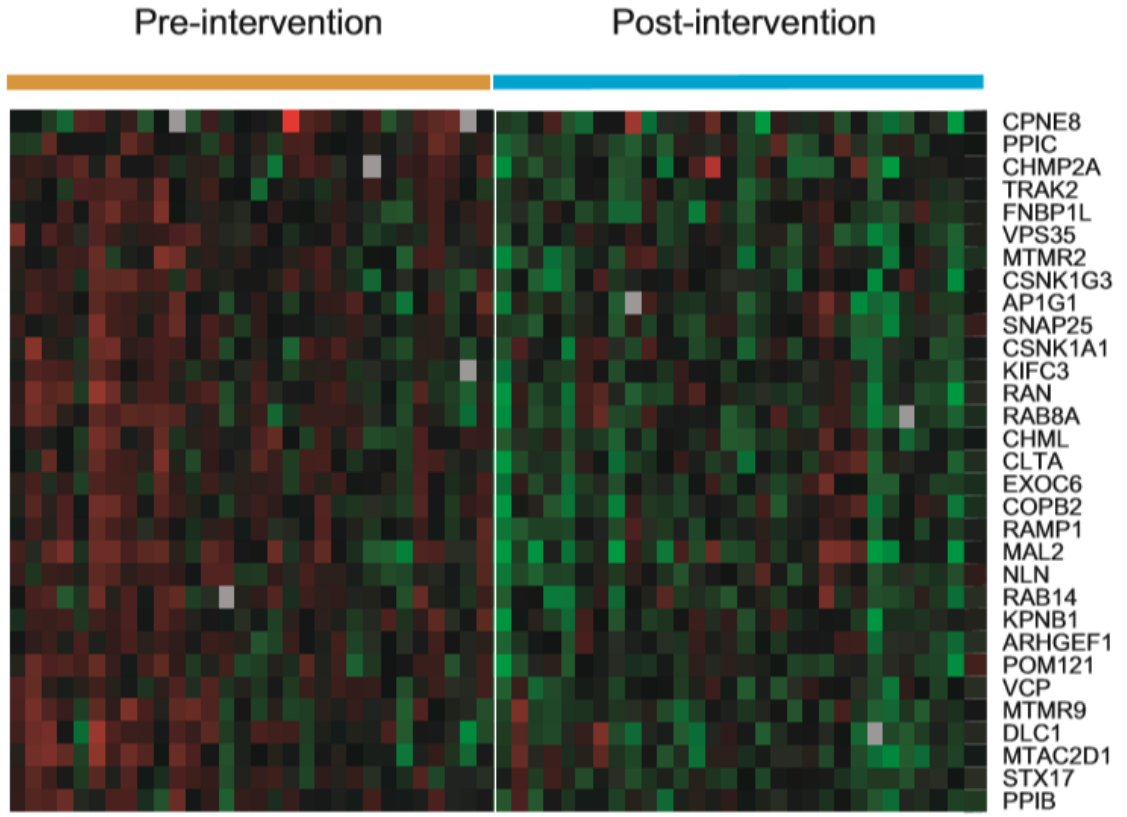


Fig. 4. Heat map of the gene ontology group "Intracellular Protein Traffic" illustrating the down-regulation of these 31 transcripts. Pre- and postcomprehensive diet and lifestyle intervention samples are indicated.

Marksdailyapple.com

Cancer - colon

- Adventist Health Study 2 (AHS-2) is a large, prospective, North American cohort trial including 96,354 Seventh-Day Adventist men and women recruited between January 1, 2002, and December 31, 2007 with 77,659 remaining after exclusions
- Diets included vegan, lacto-ovo vegetarian, pescovegetarian, semivegetarian and nonvegetarian
- Follow-up of 7.3 years, 380 cases of colon cancer and 110 cases of rectal cancer documented
- Hazard ratio – risk of CRC was 78% (0.64-0.95) for vegetarian group. (22 of 100 won’t get CRC)

Population Health

- Seventh Day Adventists – Loma Linda, CA
  - >90,000 participants studied for many years
  - Health Habits: exercise, healthy diet (increased plant-based diets vs average American)
  - 30% reduced cancer risk, 50% reduced CV disease and death vs Non-Adventists
- EPIC Studies (European Prospective Investigation of Cancer and Nutrition)
  - >50,000 participants from 10 different countries
  - Plant-based diets with lower risk of most chronic diseases: BMI, diabetes, heart disease, cancer

Adventist Health Study-2

- Increased plant consumption → Decreased prevalence of diabetes

Unadjusted prevalence of type 2 diabetes and distribution of nondietary variables according to diet

	Vegan	**Lacto-ovo vegetarian**	**Pesco-vegetarian**	**Semi-vegetarian**	**Nonvegetarian**	***P***
N	2,731	20,408	5,617	3,386	28,761	
Type 2 diabetes	2.9	3.2	4.8	6.1	7.6	<0.0001

Education – provider training

- Medical school nutrition course prereqs: 0

- Medical school nutrition education
  - <20 hours of coursework
  - 27% of schools have nutrition course (vs 37% 30 years ago)

- Residency
  - Cardiology 30+ pages of requirements with 0 nutrition requirements
  - Internal Medicine 30+ pages of requirements with 0 nutrition requirements

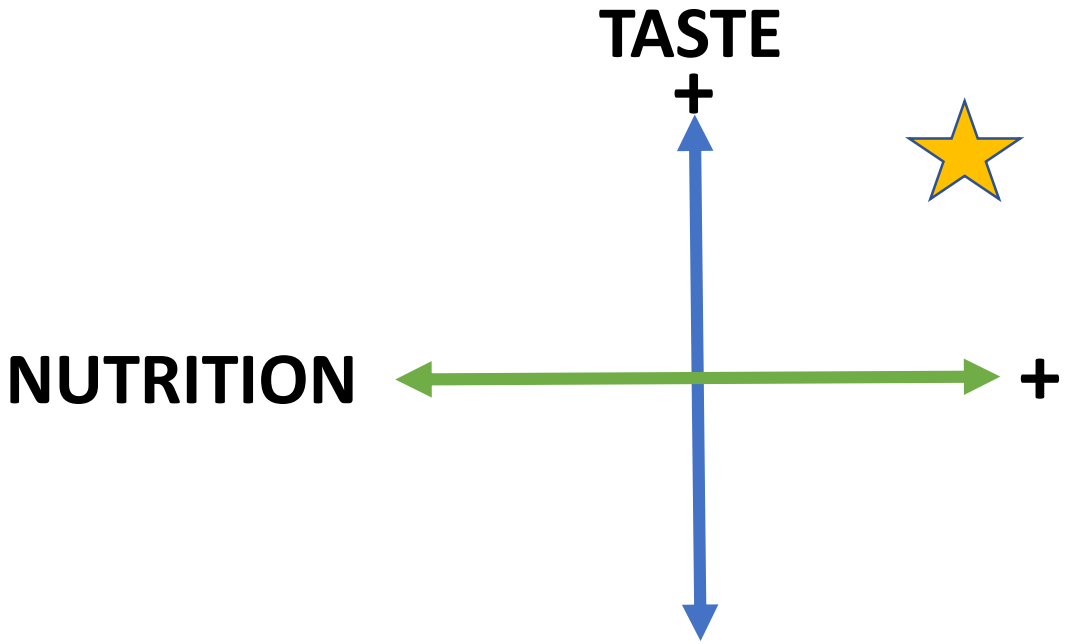
Education – provider focus

- Percent of time physicians spend discussing nutrition during chronic care visits: 2.7% (e.g. 32 seconds of 20-minute encounter)

- In another study of 8,513 chronic disease visits, nutrition was discussed at 23.5% of encounters
  - When discussed it was <1 minute

Plant nutrition adoption – barriers

- Quality metrics – myopic focus?
- Quantitative assessment – lacking validated questionnaires
- Nutritional knowledge (provider and patient)
- Nutritional label awareness
- Misconceptions
- Patient preferences/readiness



Education - patient

- Randomized controlled community pilot study
- 3 community clinics in medically underserved areas in California
- Control and experimental group
  - 5-week educational program, five 150-minute sessions per week
  - Topics: diabetes pathophysiology, healthy eating, monitoring glucose and diabetic complications, sampling plant based foods
- Experimental group had follow-up support focus groups at 1, 3, and 6 months
- Control group had 6-month assessment
- Experimental group greater A1c reduction (9.49 > 7.31) vs. control group (9.57 > 8.53)
- Parallels literature supporting better outcomes when coupling education with follow-up support for implementing lifestyle change, including support groups and holding patients accountable

Education – plant-based diet basics

- 100% whole grains: quinoa, brown rice, bulgar (cracked wheat), oatmeal
- Nuts: **handful** per day
- Beans: **1 cup** per day
- Fruits and vegetables: **5-10** serving/day

- Sugar-sweetened beverages
- Salty snacks (non-sweet processed foods)
- Packaged sweets
- Processed meats

*** Nutritional differential goal: green - red = positive, ideally 4**

Summary

- Despite increasing expenditure, U.S. healthcare outcomes lag other countries with greater focus on lifestyle medicine including nutrition
- Cause of **80-90% chronic disease is lifestyle related,** with major nutritional component
- **Targeting 80-90%** whole food plant-based diet can extend lifespan and concurrently manage most chronic diseases including symptoms
- Spending adequate time developing nutritional knowledge including regular follow up is important for effective sustainable change
- Develop nutritional **conscience**, read nutritional **labels**, **track intake**
- **Nutritionfacts.org**

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Questions?