UNIVERSITY of MARYLAND
UPPER CHESAPEAKE HEALTH

EFFECTS OF ENVIRONMENTAL FACTORS ON CANCER AND HEALTH

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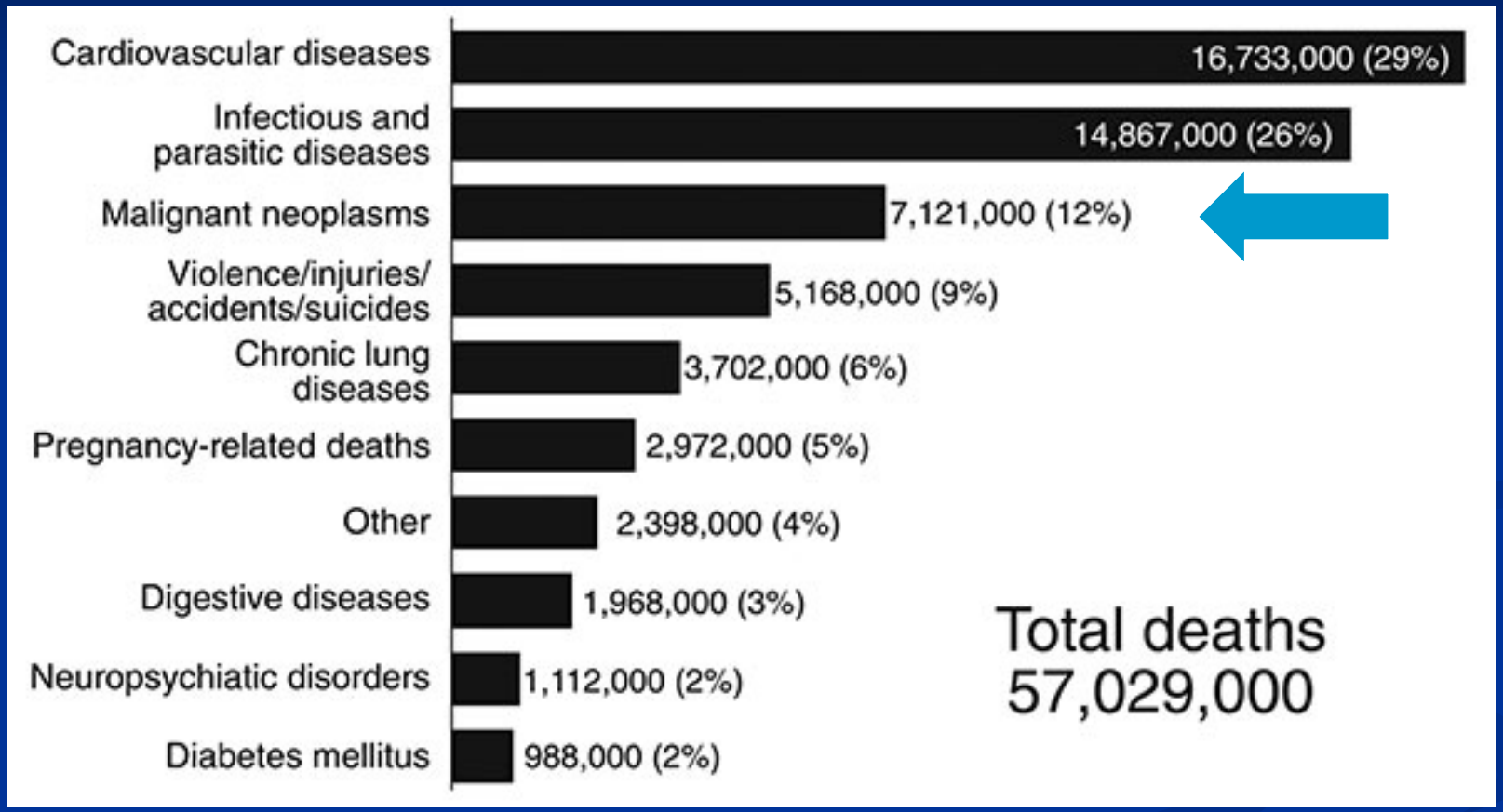
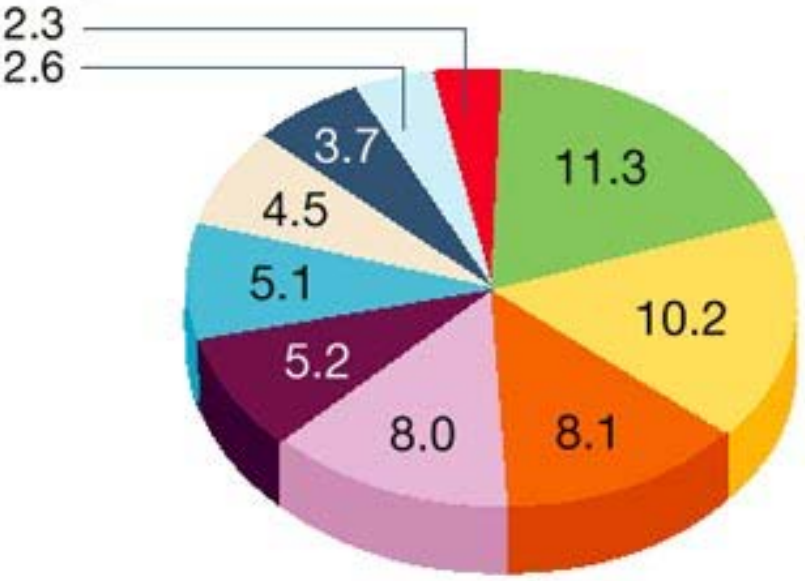
No Disclosures or Conflicts of Interest

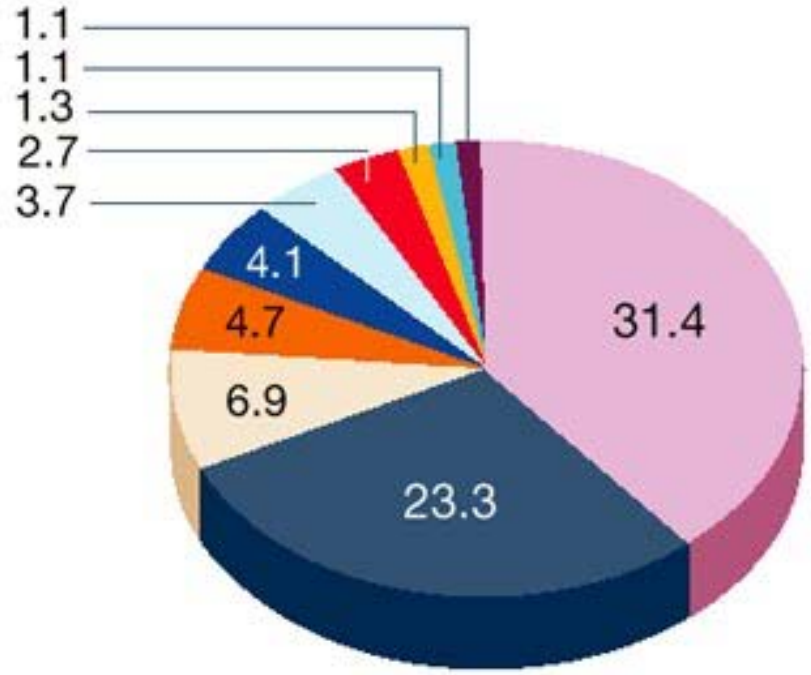

Cardiovascular diseases
16,733,000 (29%)
Infectious and parasitic diseases
14,867,000 (26%)
Malignant neoplasms
7,121,000 (12%)
Violence/injuries/ accidents/suicides
5,168,000 (9%)
Chronic lung diseases
3,702,000 (6%)
Pregnancy-related deaths
2,972,000 (5%)
Other
2,398,000 (4%)
Digestive diseases
1,968,000 (3%)
Neuropsychiatic disorders
1,112,000 (2%)
Diabetes mellitus
988,000 (2%)
Total deaths
57,029,000

1900

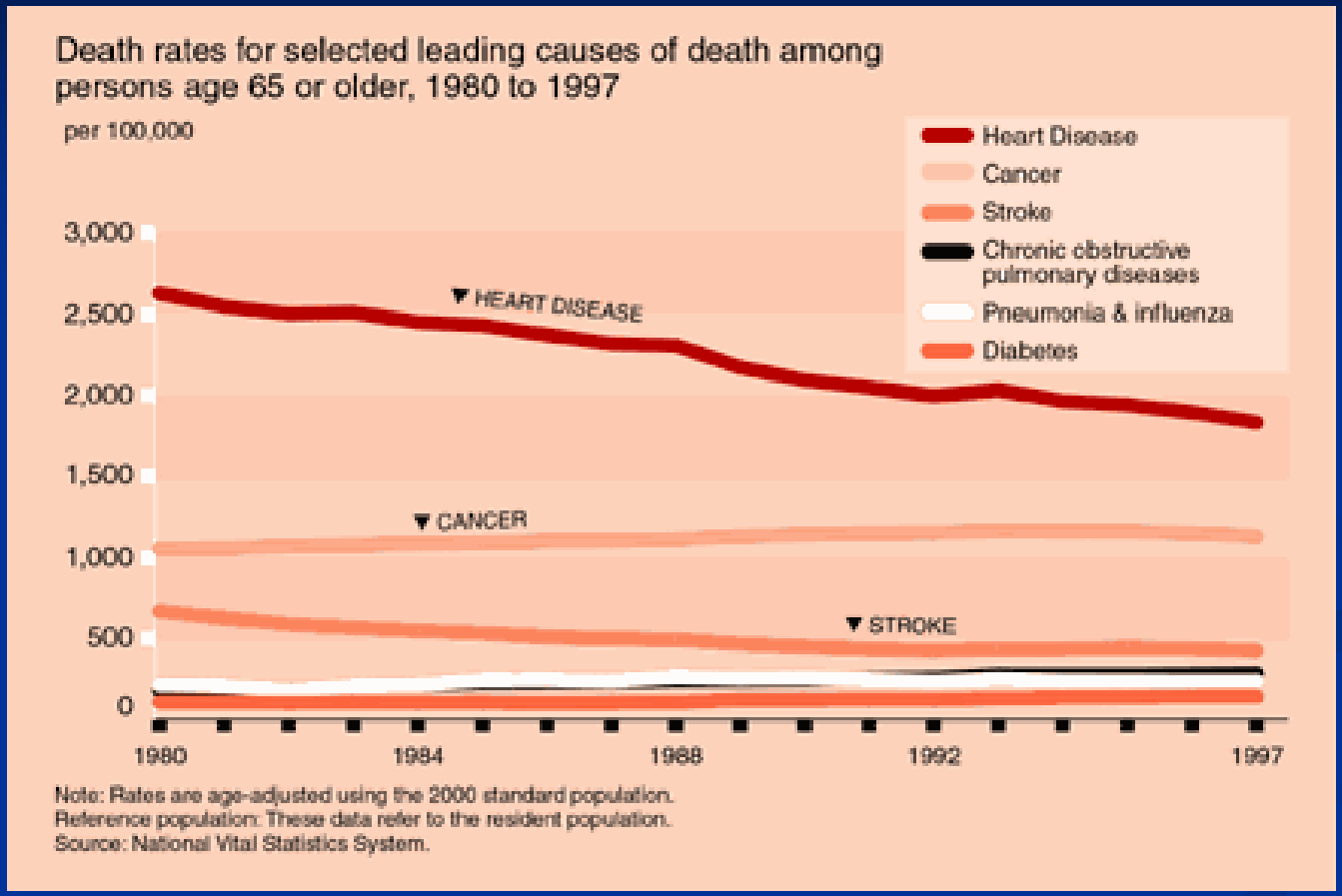


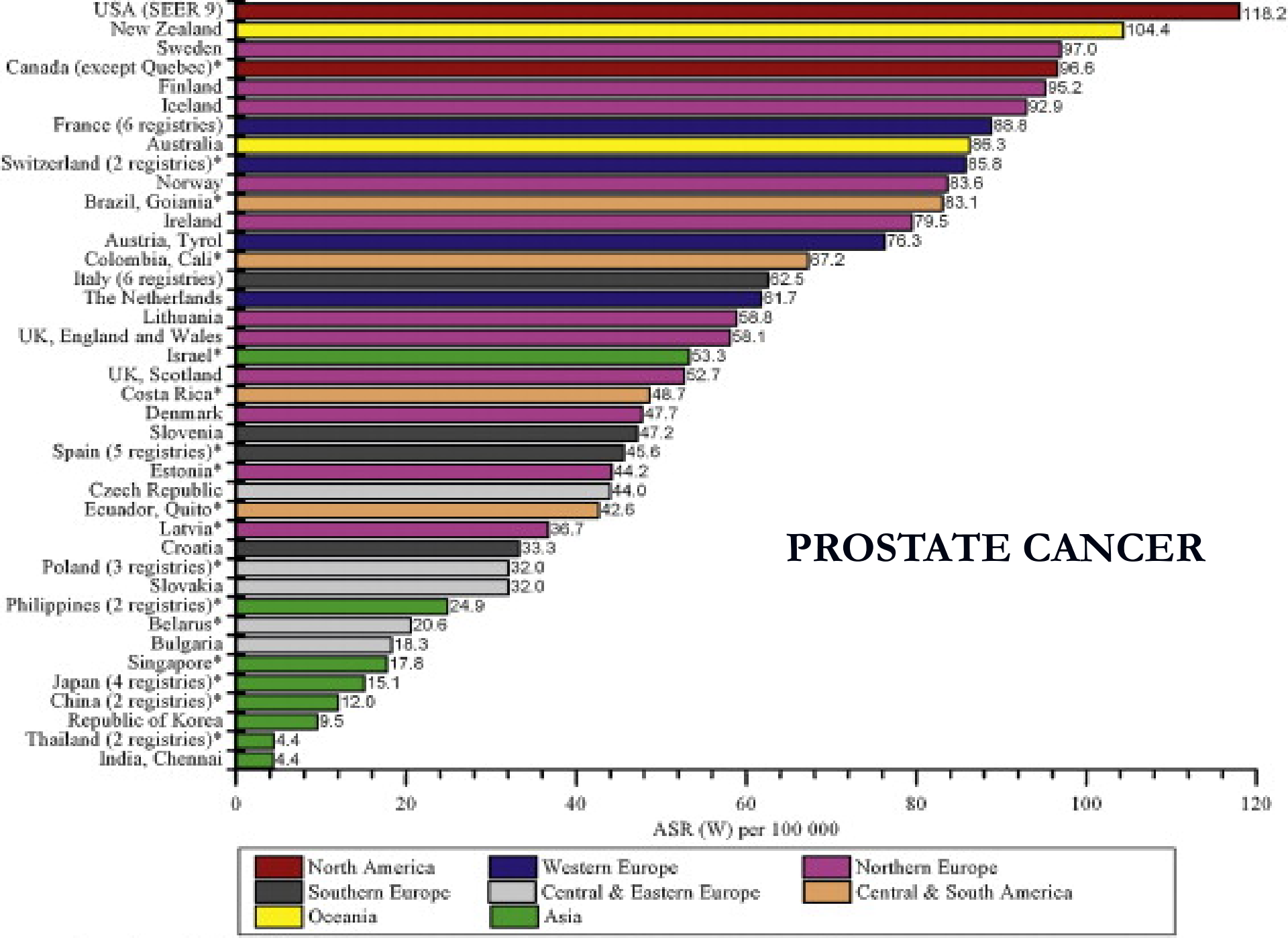
- Tuberculosis
- Pneumonia
- Diarrhoea
- Heart disease
- Liver disease
- Injuries
- Stroke
- Cancer
- Bronchitis
- Diphtheria

1997



- Heart disease
- Cancer
- Stroke
- Chronic lung disease
- Unintentional injuries
- Pneumonia / influenza
- Diabetes
- Suicide
- Chronic kidney disease
- Chronic liver disease

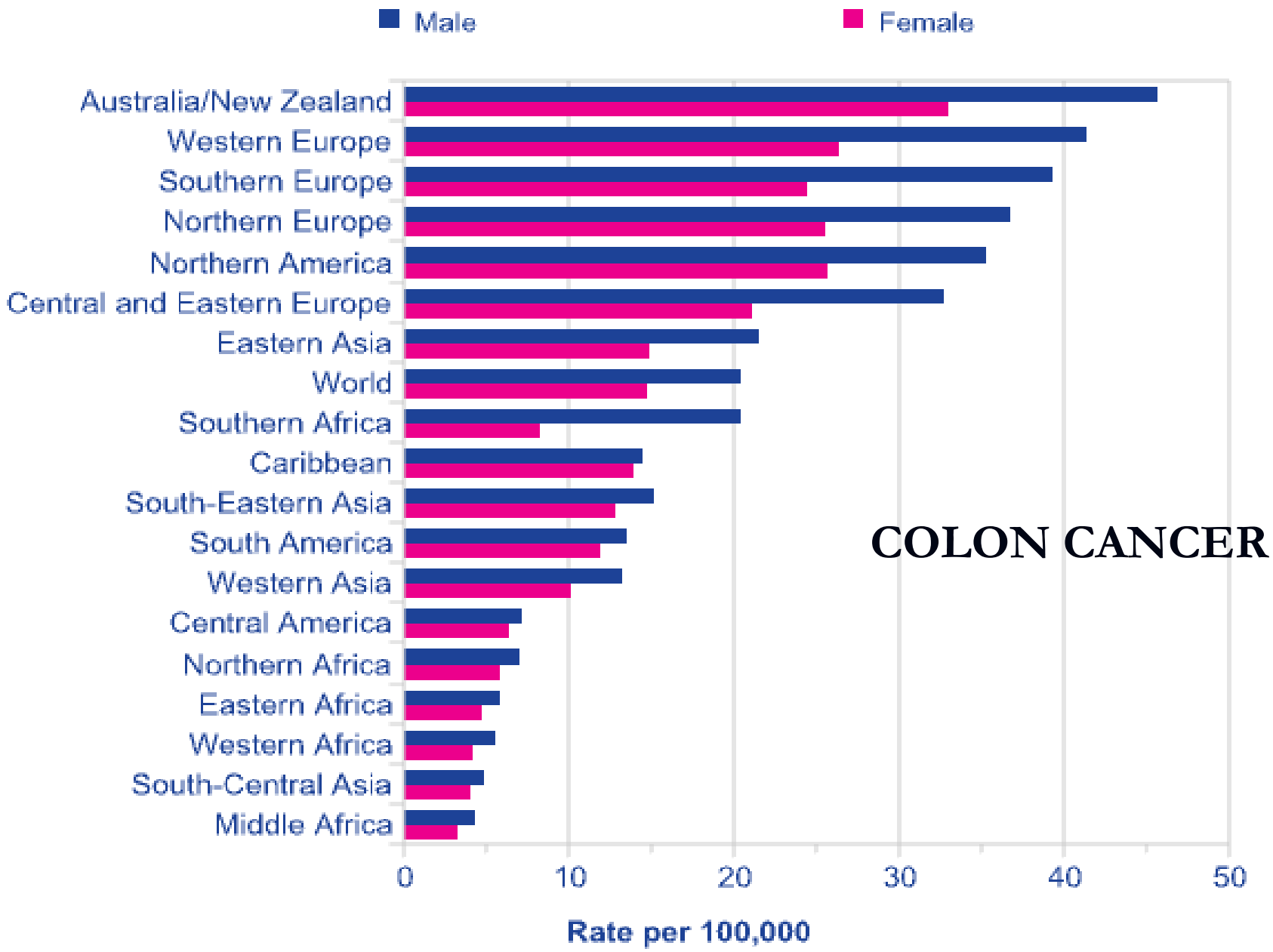

Death rates for selected leading causes of death among persons age 65 or older, 1980 to 1997
per 100,000
Heart Disease
Cancer
Stroke
Chronic obstructive pulmonary diseases
Pneumonia & influenza
Diabetes
3,000
2,500
2,000
1,500
1,000
500
0
HEART DISEASE
CANCER
STROKE
1980
1984
1988
1992
1997
Note: Rates are age-adjusted using the 2000 standard population.
Reference population: These data refer to the resident population.
Source: National Vital Statistics System.



PROSTATE CANCER

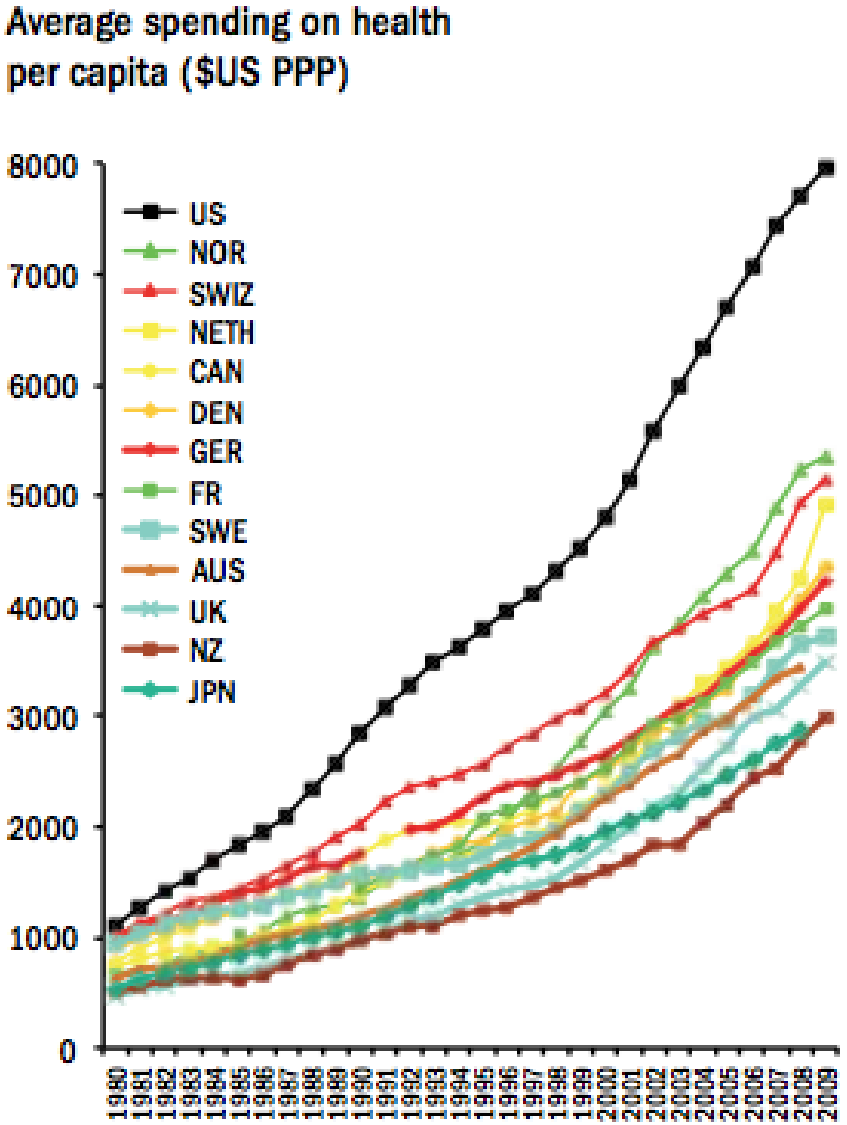
Source: Cancer Incidence in Five Continents

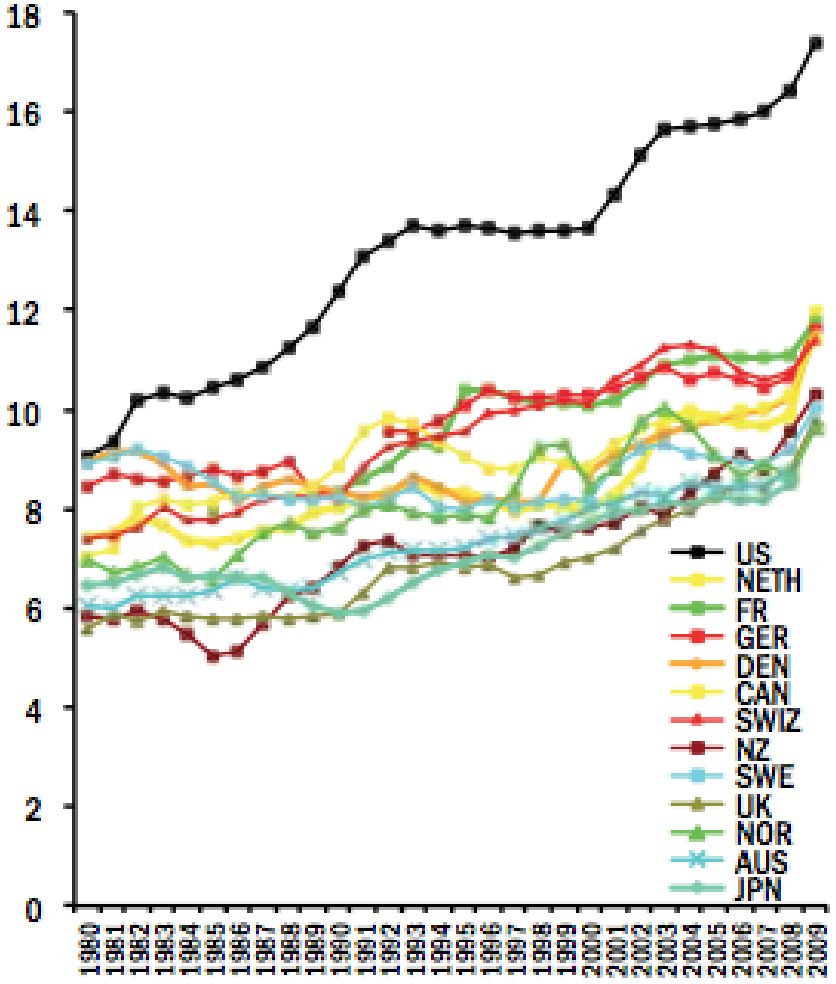
*Average of rates for four or fewer years in the time period 2000-2004



COLON CANCER

Exhibit 1. International Comparison of Spending on Health, 1980–2009





Note: PPP = Purchasing power parity—an estimate of the exchange rate required to equalize the purchasing power of different currencies, given the prices of goods and services in the countries concerned.
Source: OECD Health Data 2011 (Nov. 2011).

Economist.com rankings

Highest life expectancy

Years, 2005–10

1	Andorra*	83.5
2	Japan	82.6
3	Hong Kong	82.2
4	Iceland	81.8
5	Switzerland	81.7
6	Australia	81.2
7	Spain	80.9
	Sweden	80.9
9	Canada	80.7
	France	80.7
	Israel	80.7
	Macau	80.7
13	Italy	80.5
14	Cayman Islands*	80.2
	New Zealand	80.2
	Norway	80.2
17	Singapore	80.0
18	Austria	79.8
	Netherlands	79.8
20	Faroe Islands*	79.5
	Greece	79.5
	Martinique	79.5
23	Belgium	79.4
	Germany	79.4
	Malta	79.4
	Britain	79.4
	Virgin Islands (US)	79.4
28	Finland	79.3
29	Guadeloupe	79.2
30	Channel Islands	79.0
	Cyprus	79.0
32	Ireland	78.9
33	Costa Rica	78.8
34	Luxembourg	78.7
	Puerto Rico	78.7
	United Arab Emirates	78.7
37	Chile	78.6
	South Korea	78.6
39	Cuba	78.3
	Denmark	78.3
41	United States	78.2
42	Bermuda*	78.1
	Portugal	78.1
44	Slovenia	77.9
45	Kuwait	77.6
	Taiwan*	77.6
47	Barbados	77.3
48	Brunei	77.1

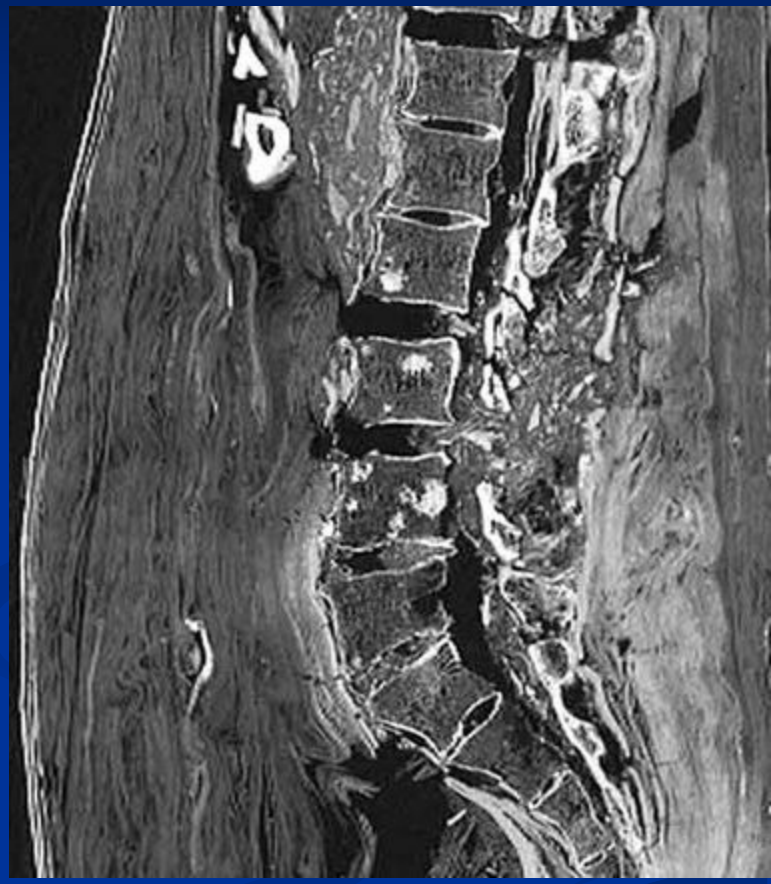
*2007 estimate

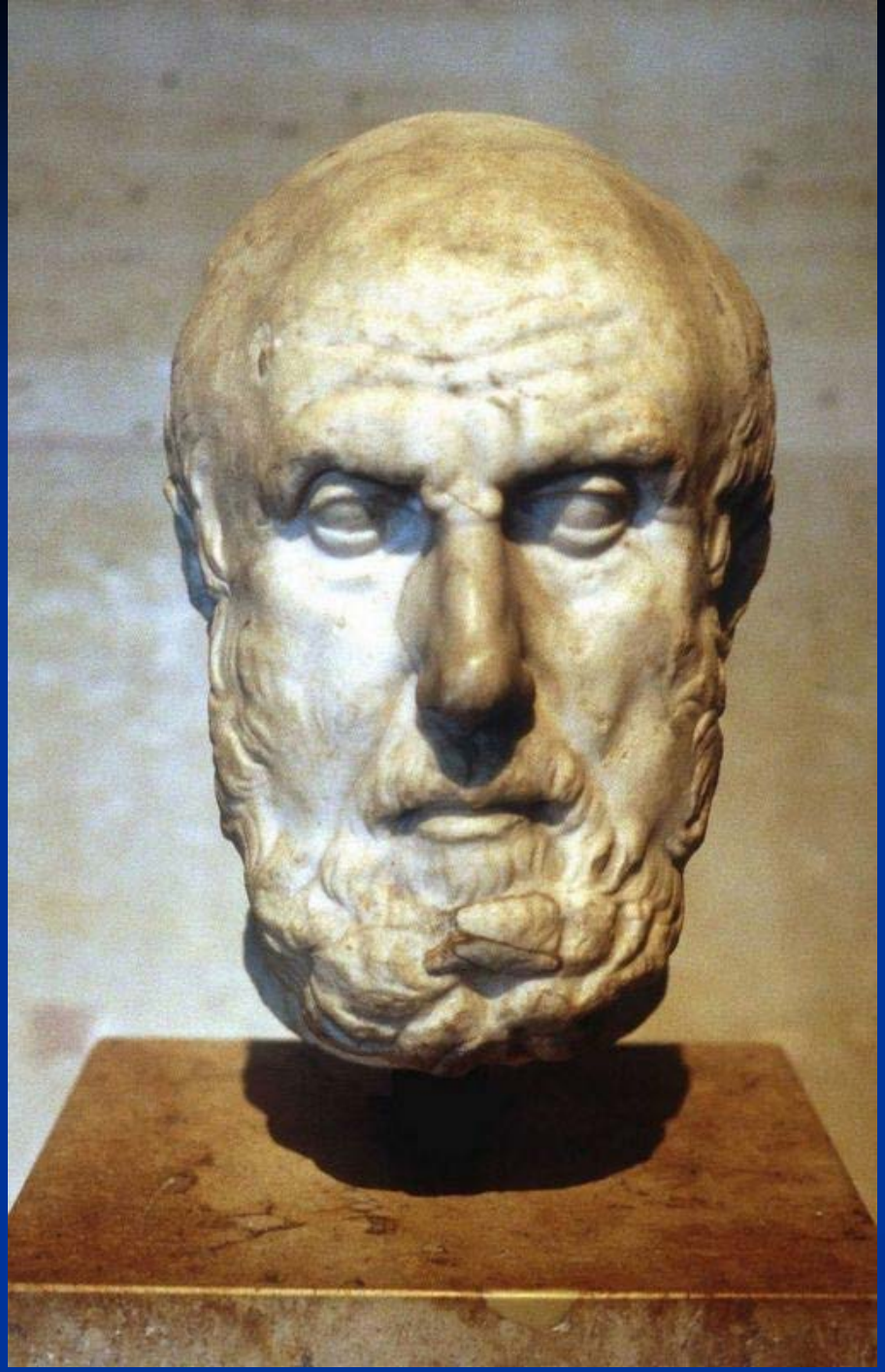
Source: "Pocket World in Figures", based on data from the United Nations Population Division and *CIA World Factbook*

Objectives

- Brief history of cancer
- Relationship between environmental factors, nutrition and most of our modern diseases, including cancer
- Show that some of our "Western" medical problems are preventable
- Convince you it's NEVER TOO LATE to make better personal choices in food, water and lifestyle
- Empower individuals and communities to ACT

ca. 1500 BC





Hippocrates ca. 460 – ca. 370 BC

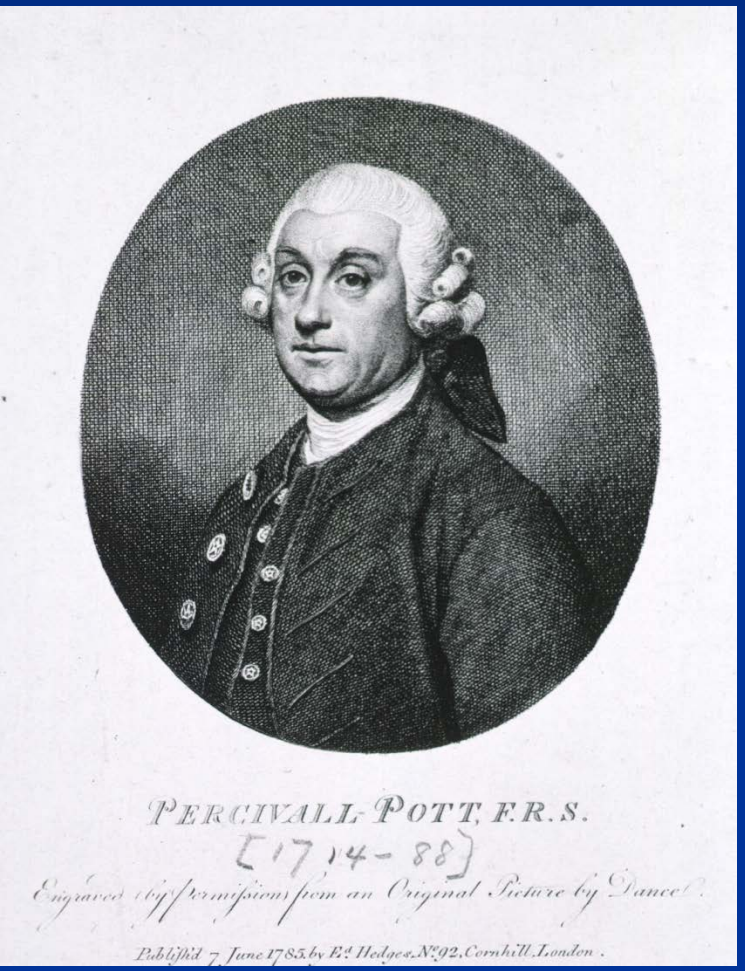
"Carcinos" = Crab or Crayfish

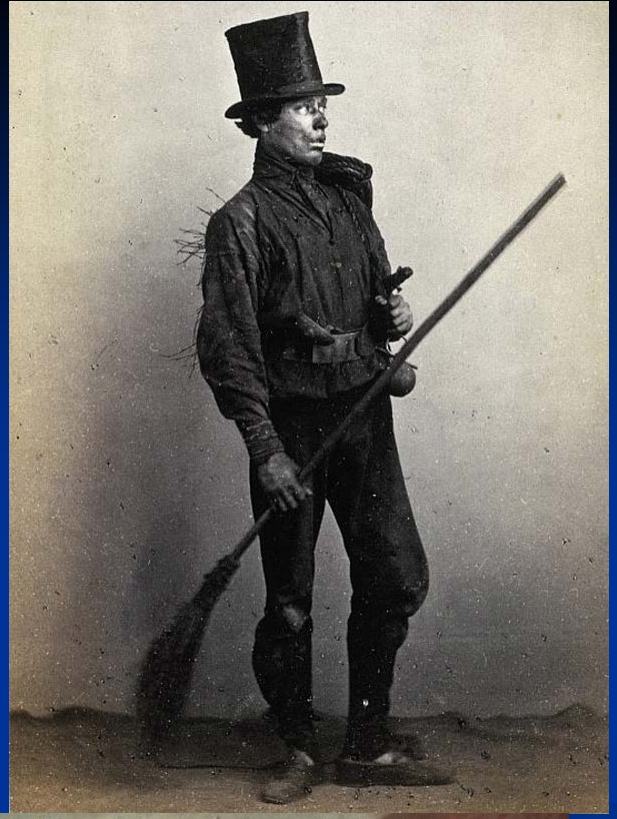
Bernardino Ramazzini (1633 – 1714)

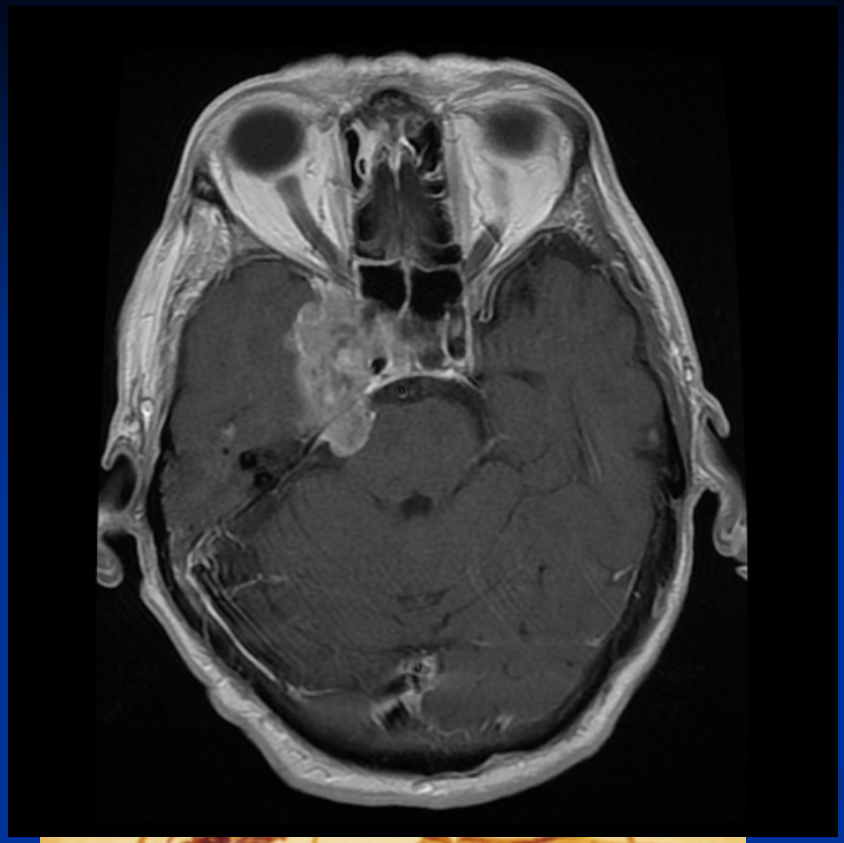
Breast Cancer… "Nun's Disease"

Virtually No Cervical Cancer

Percival Pott (1714 – 1788)







John Hill (1714 – 1775)

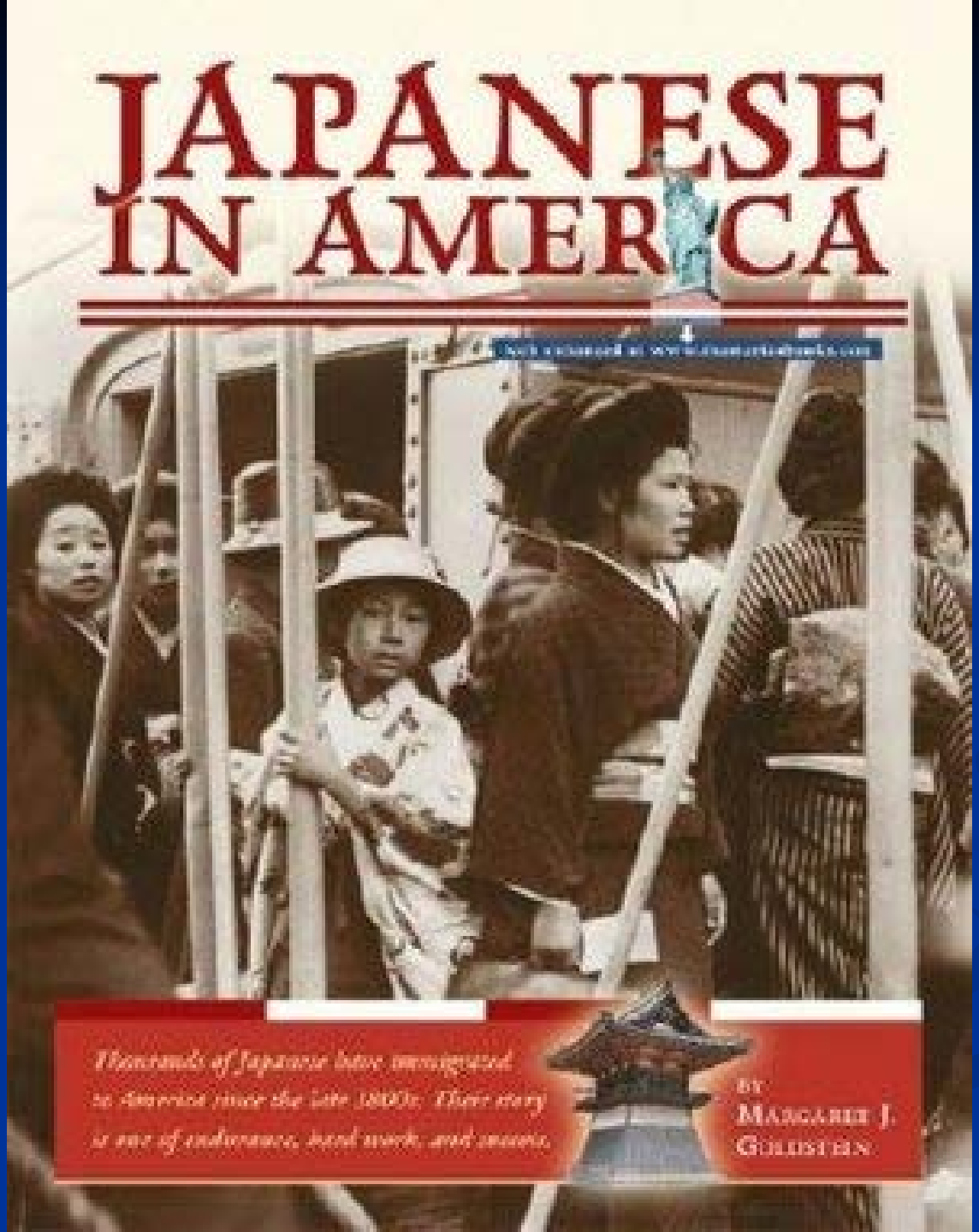
Seminal Discoveries

- 1863 – Rudolph Virchow identifies white blood cells in cancer tissue, making first connection between inflammation and cancer
- 1911 – Peyton Rous discovers that a virus causes cancer in chickens
- 1915 – K. Yamagiwa and K. Ichakawa induce cancer in rabbits by rubbing coal tar into their skin

Seminal Discoveries

- 1910s – Germany makes first association between tobacco and lung cancer
- 1930s – Nazi campaign against tobacco "passivrauchen"
- 1950s – British and American epidemiologists make more conclusive connection between tobacco and cancer
- 1964 – US Surgeon General Report on Smoking

JAPANESE IN AMERICA



Thousands of Japanese have immigrated to America since the late 1800s. Their story is one of endurance, hard work, and success.

BY MARGARET J. GOLDSTEIN

The Japanese in America

- Rates of Stomach Cancer are MUCH higher in Japan than in the US, about 6-7 times higher
- Rates of prostate, breast and colon cancer are very low in Japan
- Cardiovascular disease and diabetes are also lower in the Japanese and Asians
- Okinawa boasts the largest number of centenarians in the world

The Japanese in America

- Hawaiian descendants (Nisei) of the first wave of Japanese immigrants (Issei) have altered rates of all of these diseases
- Stomach cancer rates are only a 1/3 of their parents
- Prostate, breast and colon cancer are higher
- Heart disease and diabetes are also higher
- Third generation (Sansei): rates of these cancers approach that of native born Caucasian-Americans

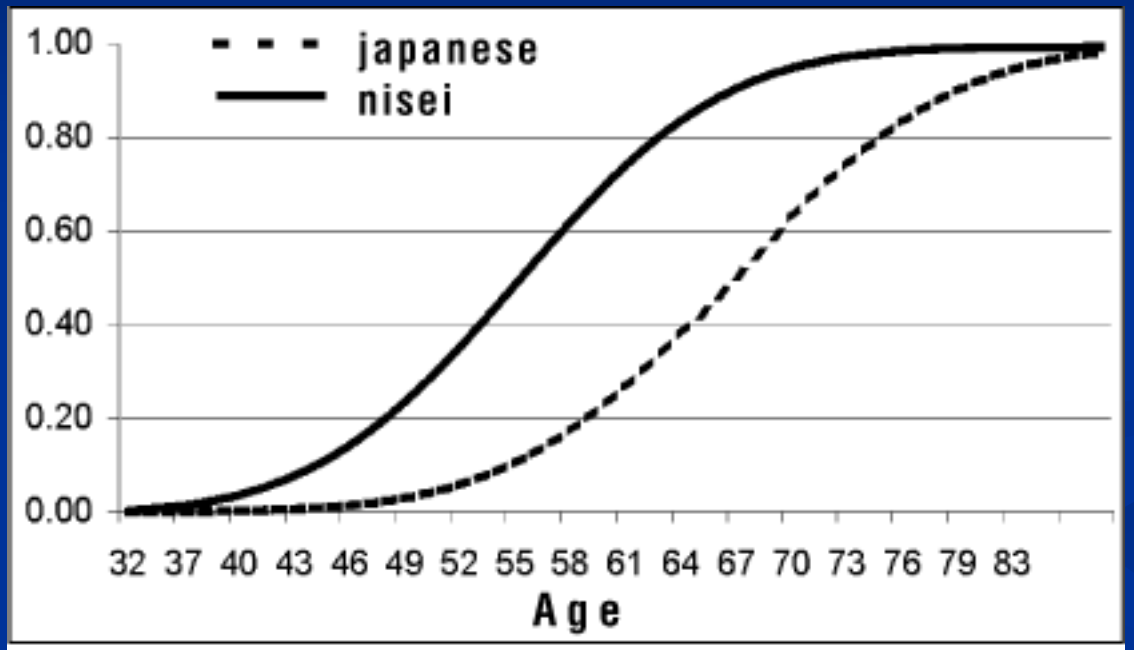
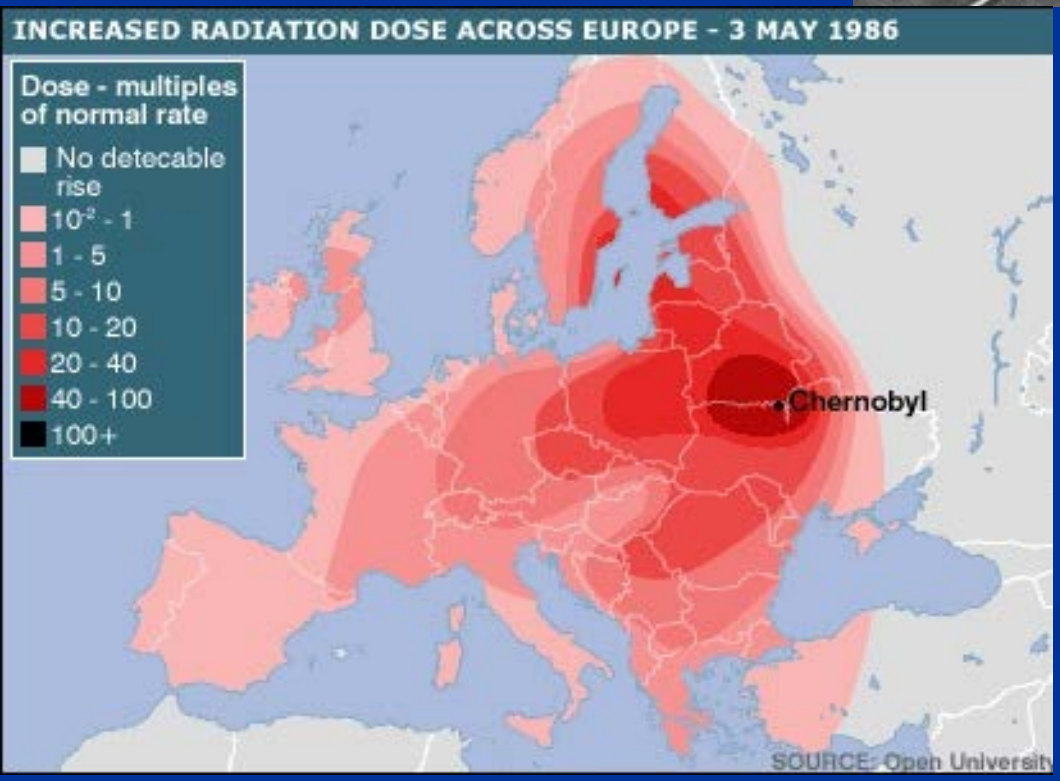
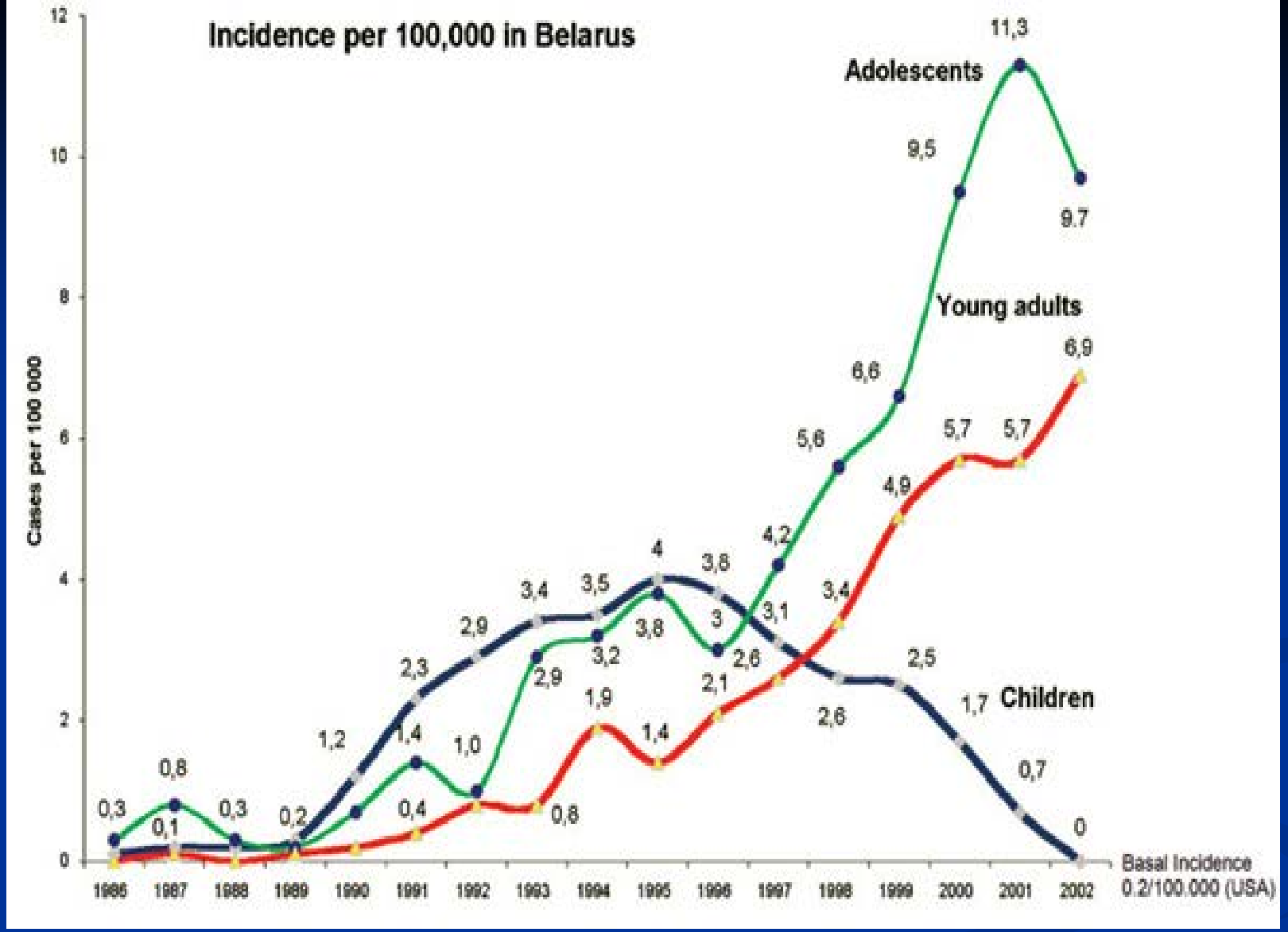


Fig. 2 – Accumulated distribution of the age of coronary heart disease onset in the Japanese and Nisei groups.



CHERNOBYL April 1986



~ 1,000,000 cases of cancer

FUKUSHIMA

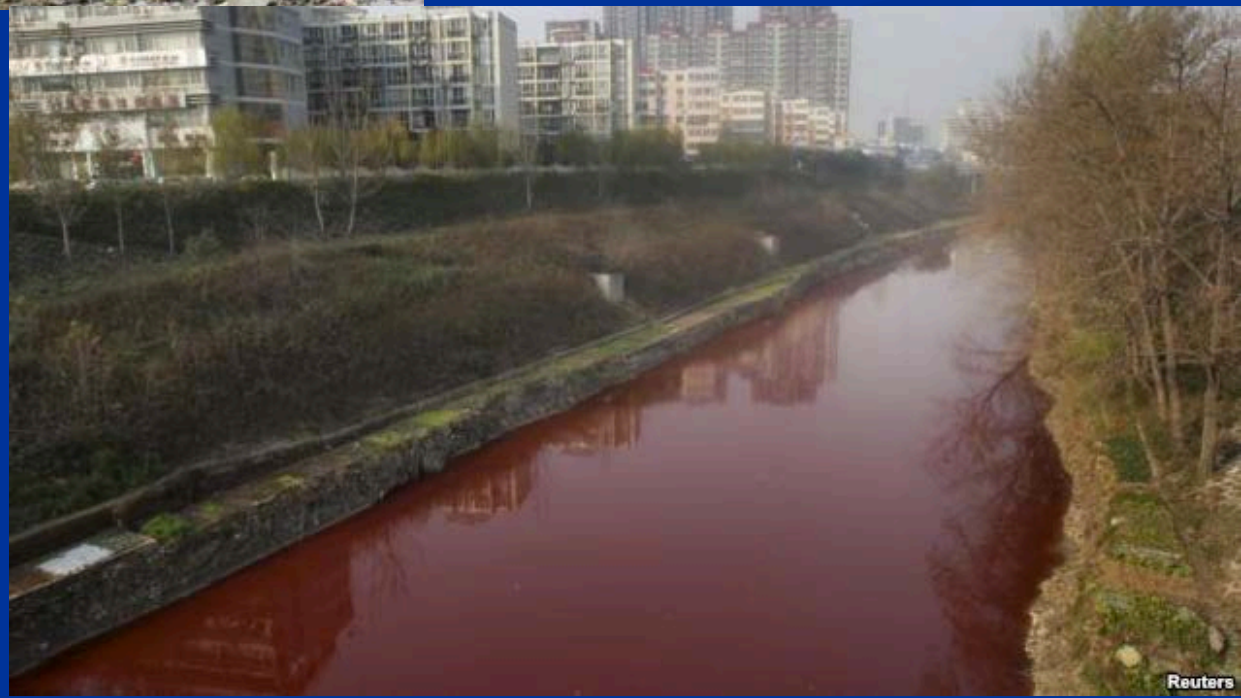
60% of groundwater polluted

20% of soil with heavy metals

“cancer villages”

8 year old girl with lung cancer

CHINA 2014

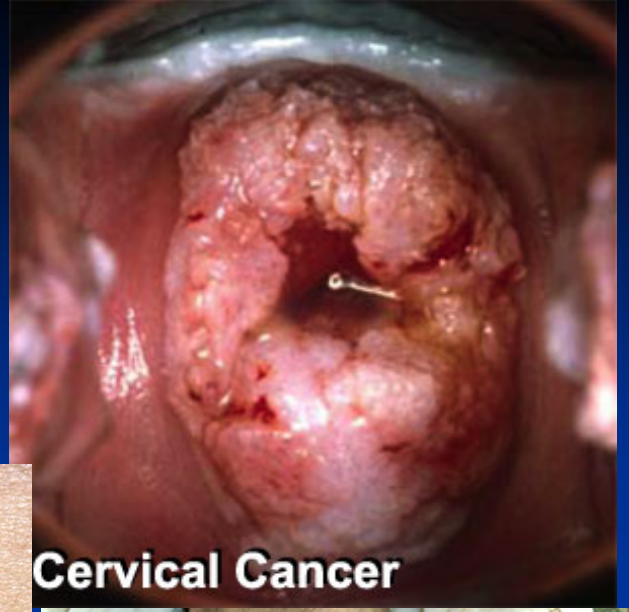


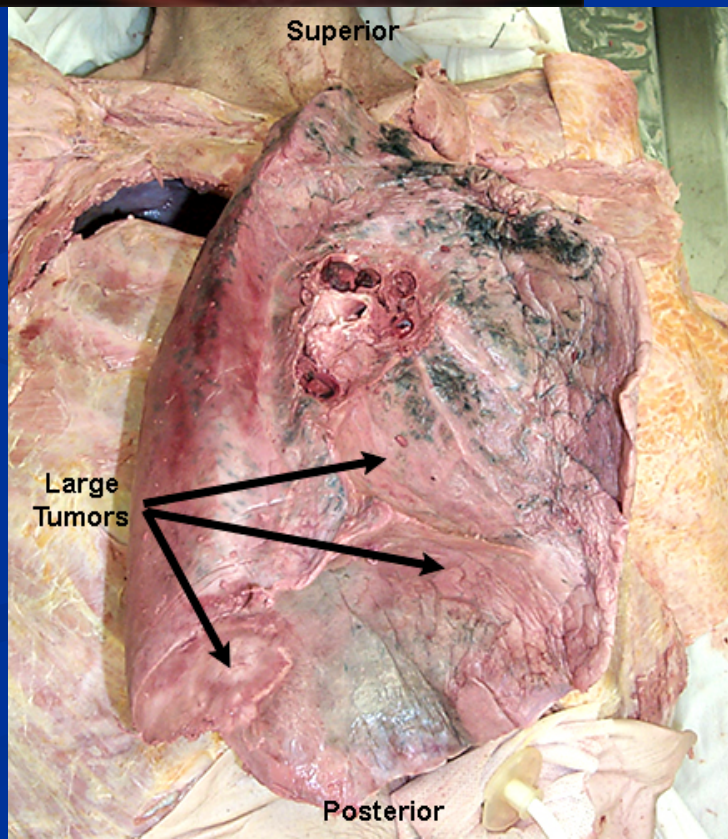
Facts

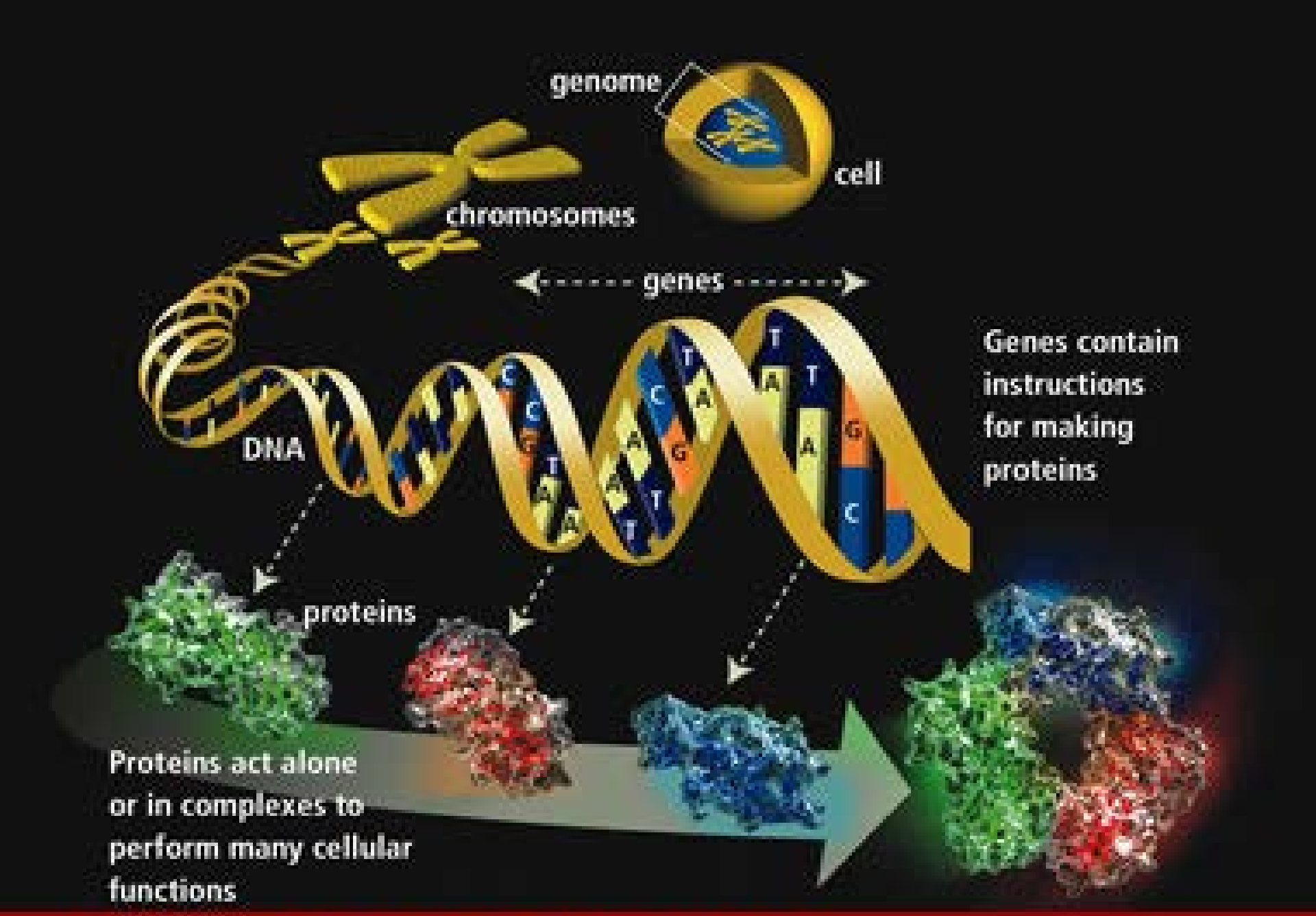
- 41% of Americans will be diagnosed with cancer
- 21% of Americans will die from cancer
- 35% of Americans are obese, including 17% of children
- 40% of Americans over age 65 have diabetes or prediabetes
- Nutritional studies are mixed and confusing
- These studies take many years to play out

… studies have shown that we could prevent about 82 percent of heart attacks, about 70 percent of strokes, over 90 percent of type 2 diabetes, and over 70 percent of colon cancer, with the right dietary choices as part of a health lifestyle. The best drugs can reduce heart attacks by about 20 or 30 percent, yet we put almost all of our resources into promoting drugs rather than healthy lifestyle and nutrition.

Walter Willett, MD, Chairman, Department of Nutrition, Harvard University

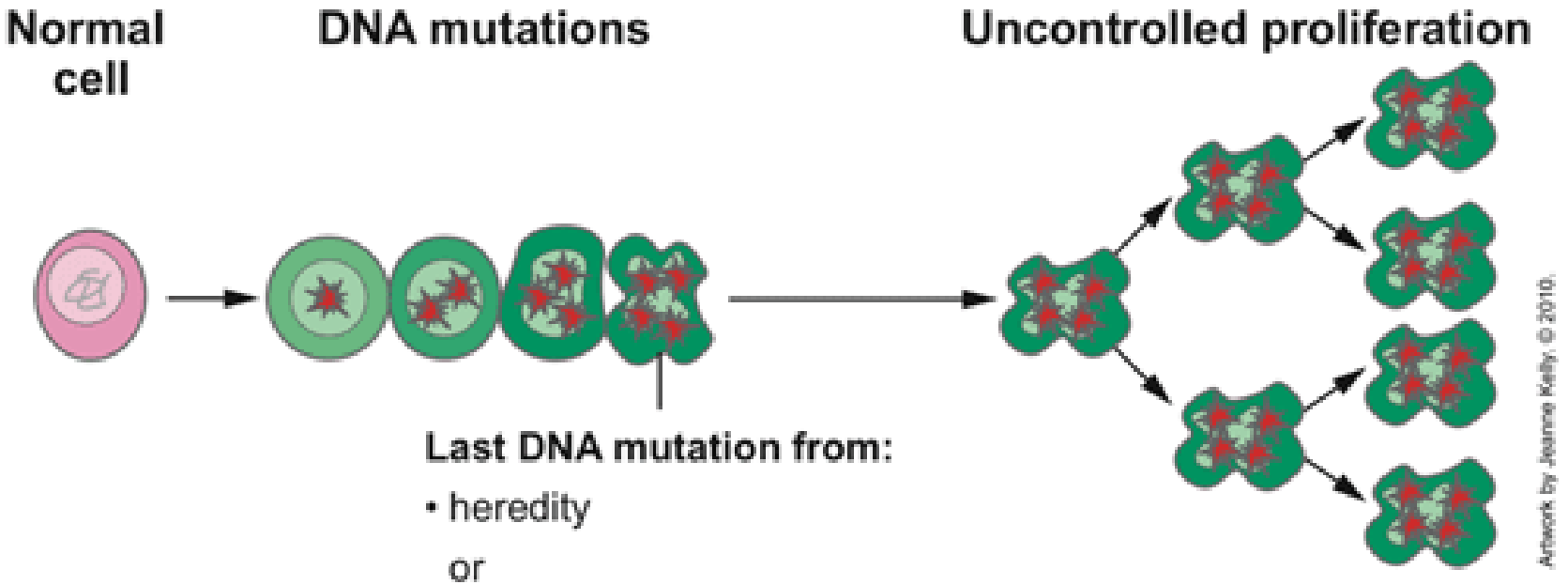

Cervical Cancer


Superior
Large
Tumors
Posterior



From Genes to Proteins

Cancer Arises From DNA Mutations in Cells

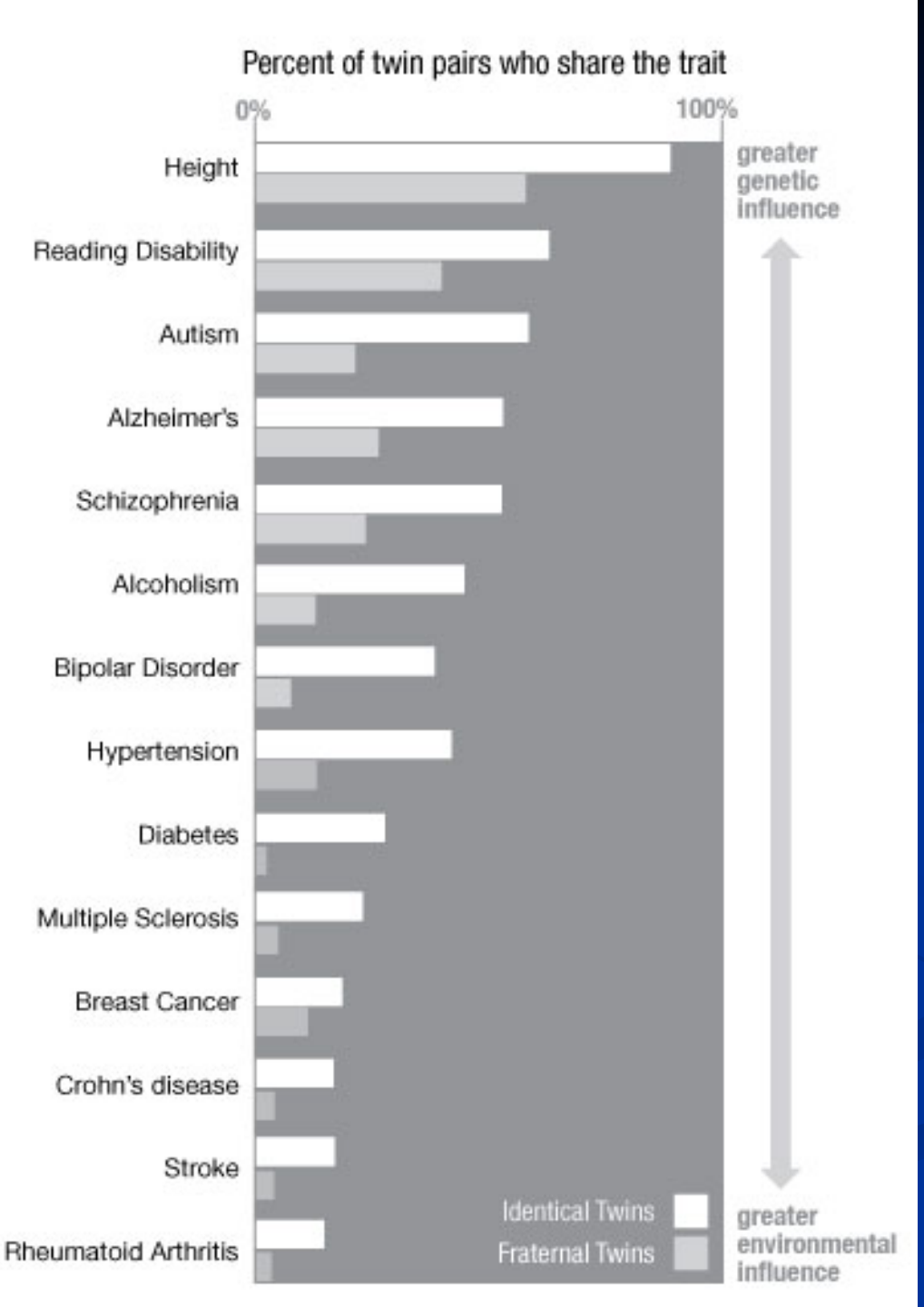


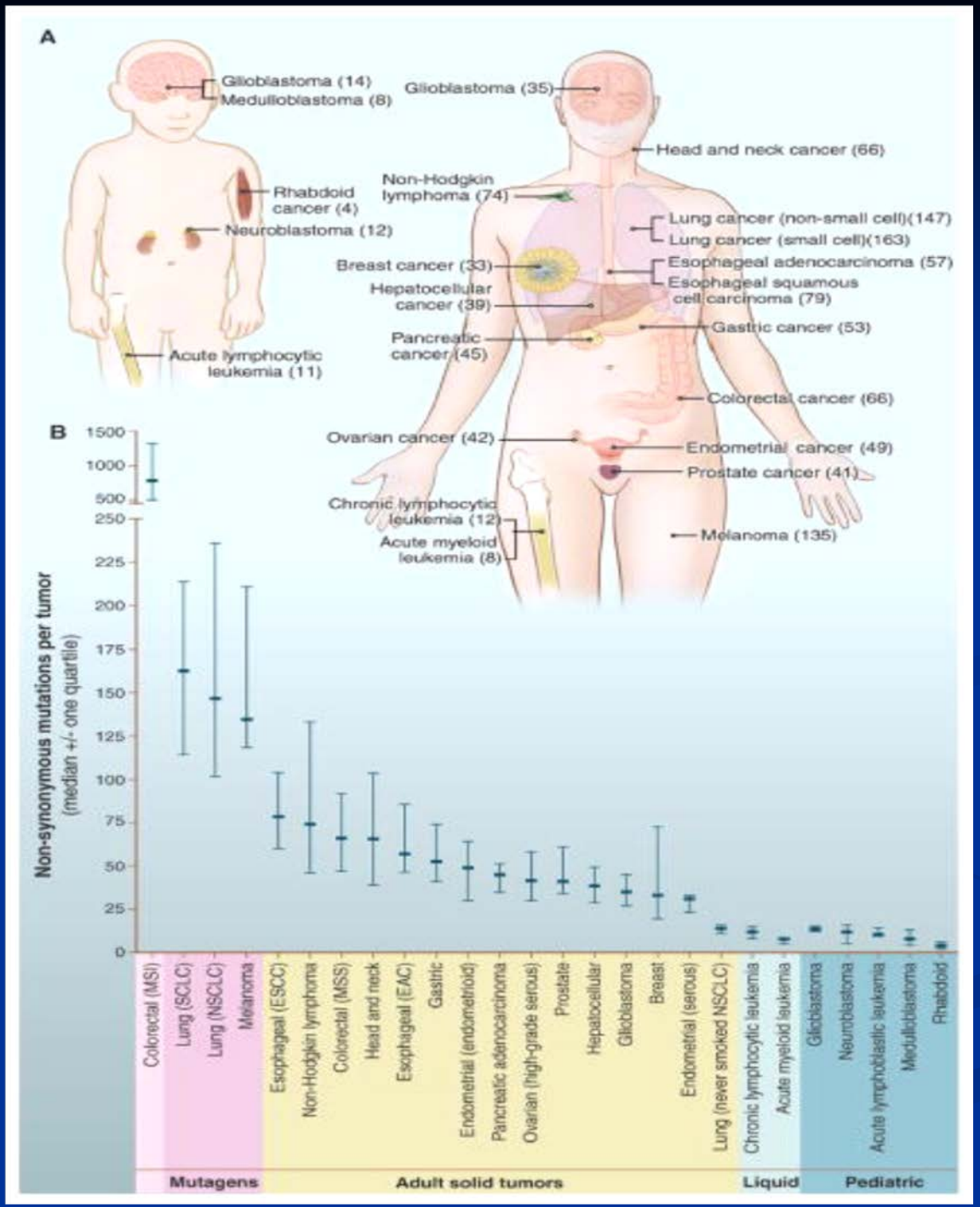
INHERITED
VS.
ENVIRONMENTAL

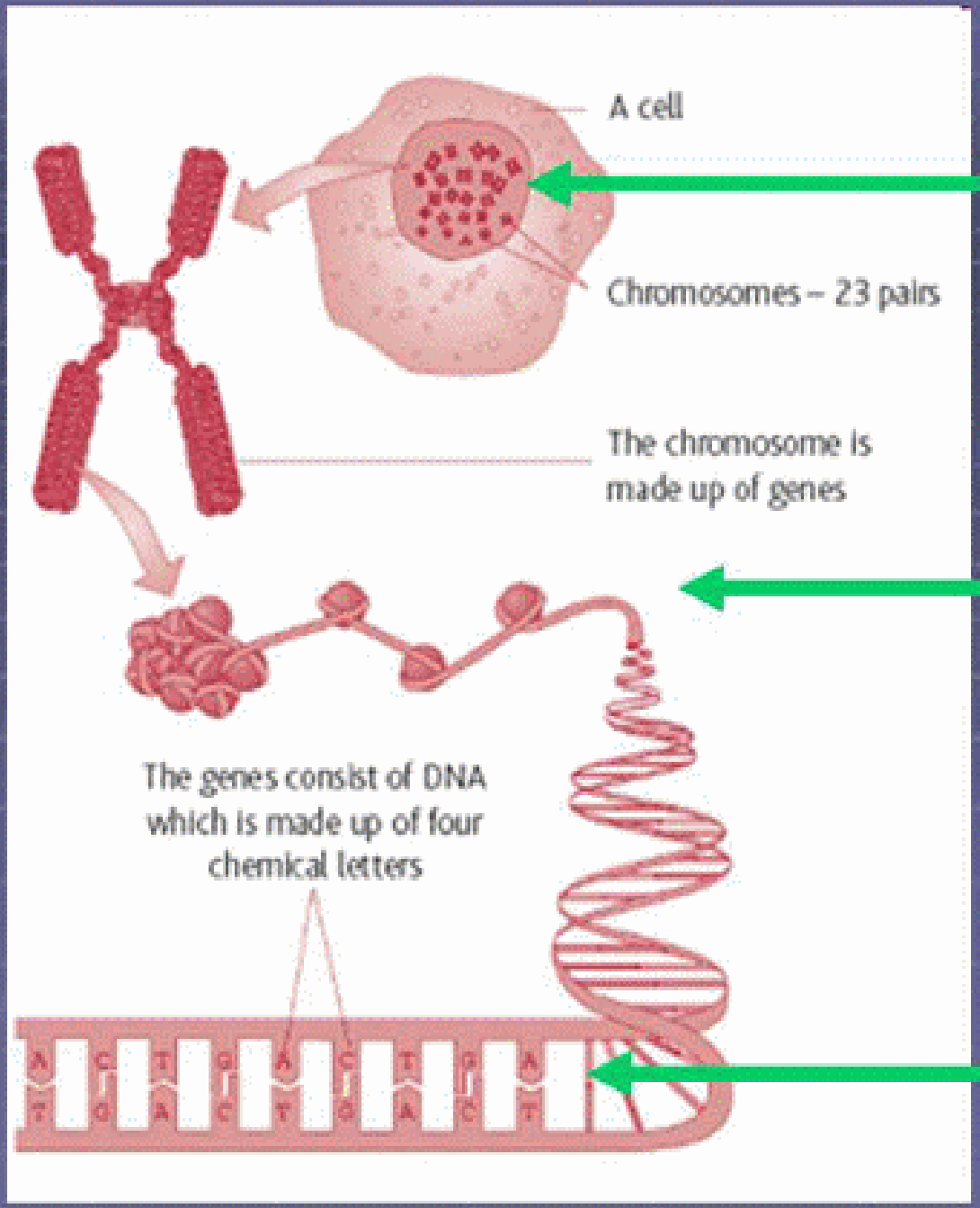
Twin Studies

Monozygote – share environment and genes

Dizygote – share environment


Percent of twin pairs who share the trait
0%
100%
Height
Reading Disability
Autism
Alzheimer's
Schizophrenia
Alcoholism
Bipolar Disorder
Hypertension
Diabetes
Multiple Sclerosis
Breast Cancer
Crohn's disease
Stroke
Rheumatoid Arthritis
greater genetic influence
Identical Twins
Fraternal Twins
greater environmental influence


A
Glioblastoma (14)
Medulloblastoma (8)
Rhabdoid cancer (4)
Neuroblastoma (12)
Acute lymphocytic leukemia (11)
Glioblastoma (35)
Head and neck cancer (66)
Non-Hodgkin lymphoma (74)
Lung cancer (non-small cell)(147)
Lung cancer (small cell)(163)
Breast cancer (33)
Esophageal adenocarcinoma (57)
Esophageal squamous cell carcinoma (79)
Hepatocellular cancer (39)
Gastric cancer (53)
Pancreatic cancer (45)
Colorectal cancer (66)
Ovarian cancer (42)
Endometrial cancer (49)
Prostate cancer (41)
Chronic lymphocytic leukemia (12)
Acute myeloid leukemia (8)
Melanoma (135)
B
Non-synonymous mutations per tumor
(median +/- one quartile)
1500
1000
500
250
225
200
175
150
125
100
75
50
25
0
Colorectal (MSI)
Lung (SCLC)
Lung (NSCLC)
Melanoma
Esophageal (ESCC)
Non-Hodgkin lymphoma
Colorectal (MSS)
Head and neck
Esophageal (EAC)
Gastric
Endometrial (endometrioid)
Pancreatic adenocarcinoma
Ovarian (high-grade serous)
Prostate
Hepatocellular
Glioblastoma
Breast
Endometrial (serous)
Lung (never smoked NSCLC)
Chronic lymphocytic leukemia
Acute myeloid leukemia
Glioblastoma
Neuroblastoma
Acute lymphoblastic leukemia
Medulloblastoma
Rhabdoid
Mutagens
Adult solid tumors
Liquid
Pediatric



HUMAN GENOME
~25,000 genes packaged in every human cell

EPIGENETICS:

Environment (temperature, radiation, food, drugs, nutrients produce immediate effects that can be imprinted long-term

MUTATION HERE CAN PRODUCE GENOTYPES OR RARE GENETIC DISORDERS

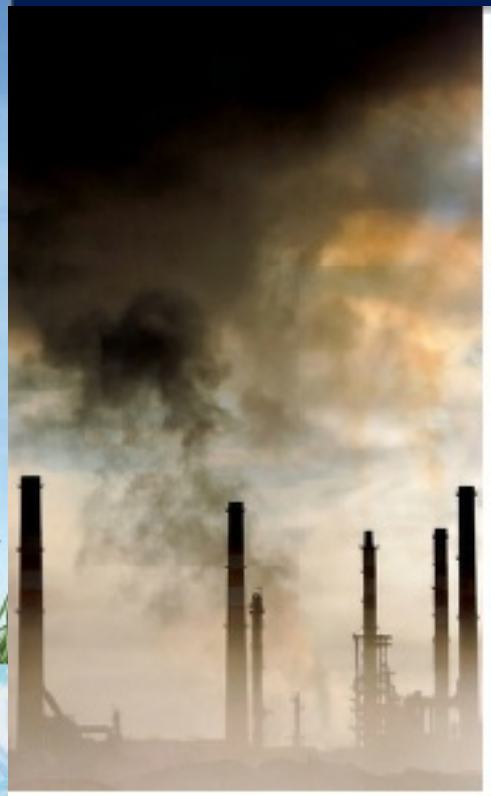

JANUARY 18, 2010
Joe Klein: The CIA's Afghan Disaster
Yemen: The New Center Of Terror
Why the Recession Hasn't Been Cool To Teens
TIME
WHY YOUR DNA ISN'T YOUR DESTINY
The new science of epigenetics reveals how the choices you make can change your genes —and those of your kids
BY JOHN CLOUD
www.time.com

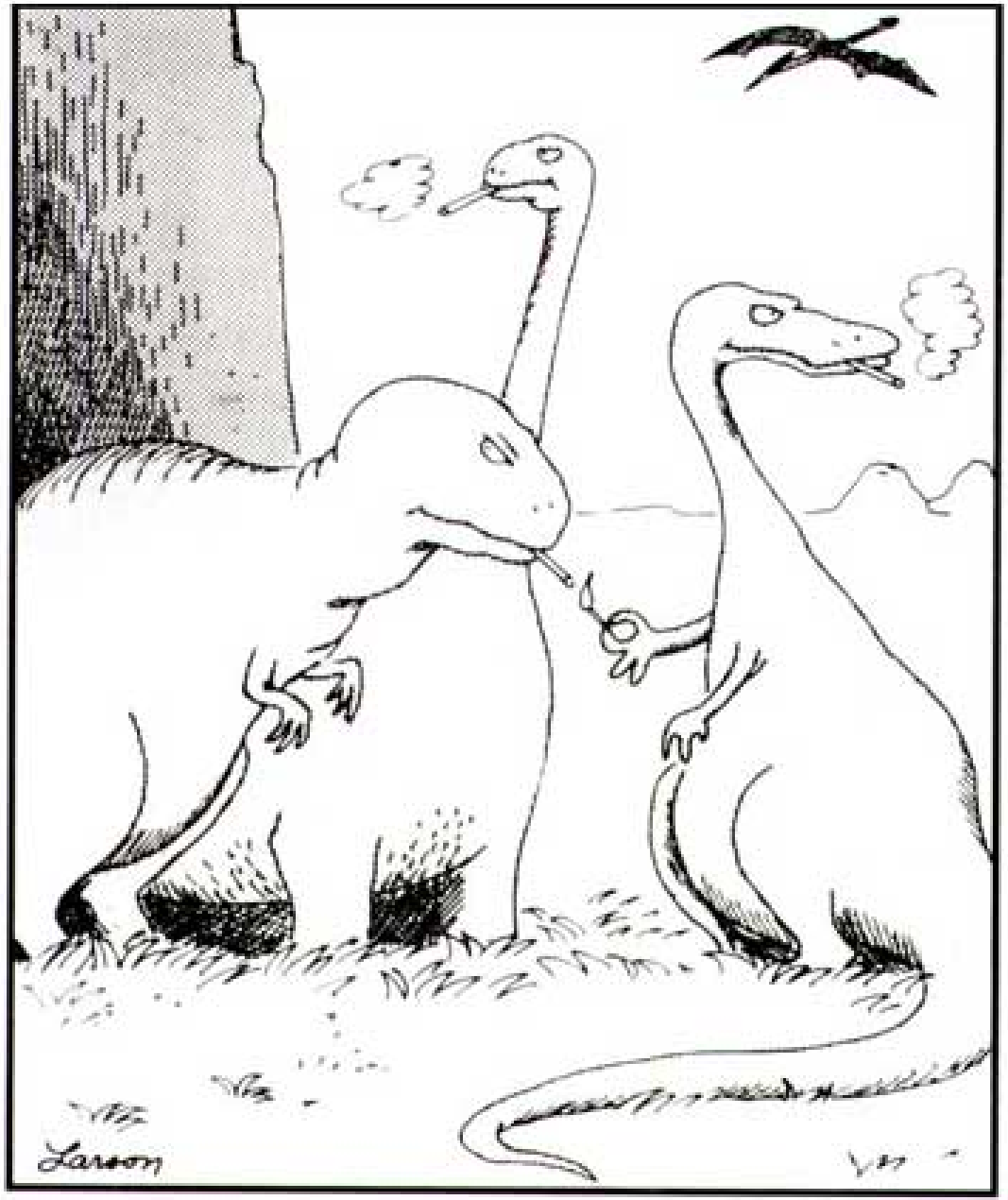
2008–2009 Annual Report | President's Cancer Panel

REDUCING ENVIRONMENTAL CANCER RISK

What We Can Do Now

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES National Institutes of Health National Cancer Institute





The real reason dinosaurs became extinct

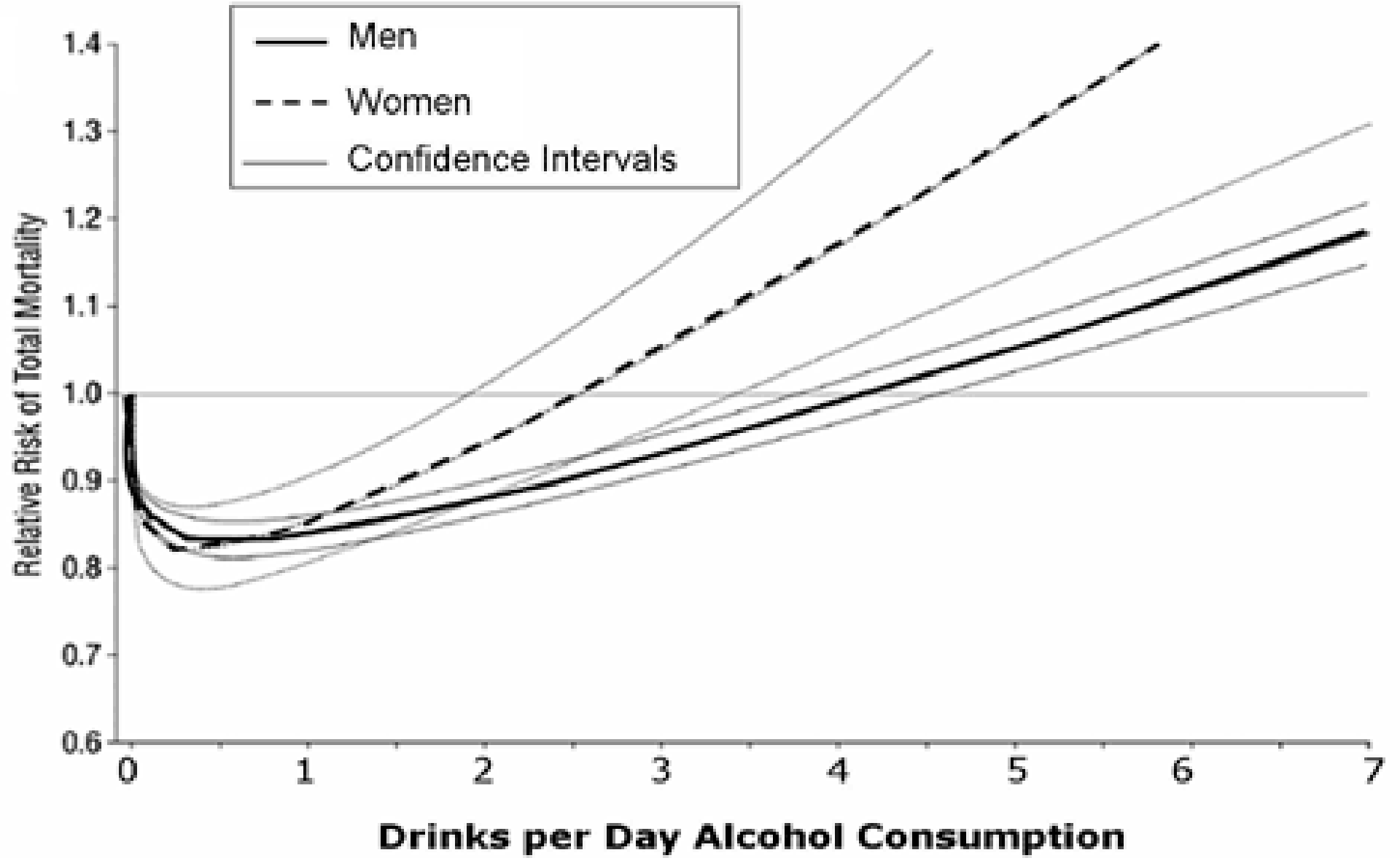
Tobacco

- Associated with 1 in 5 deaths in US (about 500,000/year) per CDC
- Smokers lose 13 years of life compared to nonsmokers
- About $300 billion dollars per year in health costs (direct and indirect) per US Surgeon General


A
B


Come to where the flavor is.
SURGEON GENERAL'S WARNING: Cigarette Smoke Contains Carbon Monoxide.


OCN


Men
Women
Confidence Intervals
Relative Risk of Total Mortality
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0
1
2
3
4
5
6
7
Drinks per Day Alcohol Consumption

12 fl oz of regular beer = **8–9 fl oz of malt liquor** (shown in a 12 oz glass) = **5 fl oz of table wine** = **1.5 fl oz shot of 80-proof spirits** ("hard liquor"—whiskey, gin, rum, vodka, tequila, etc.)

about 5% alcohol

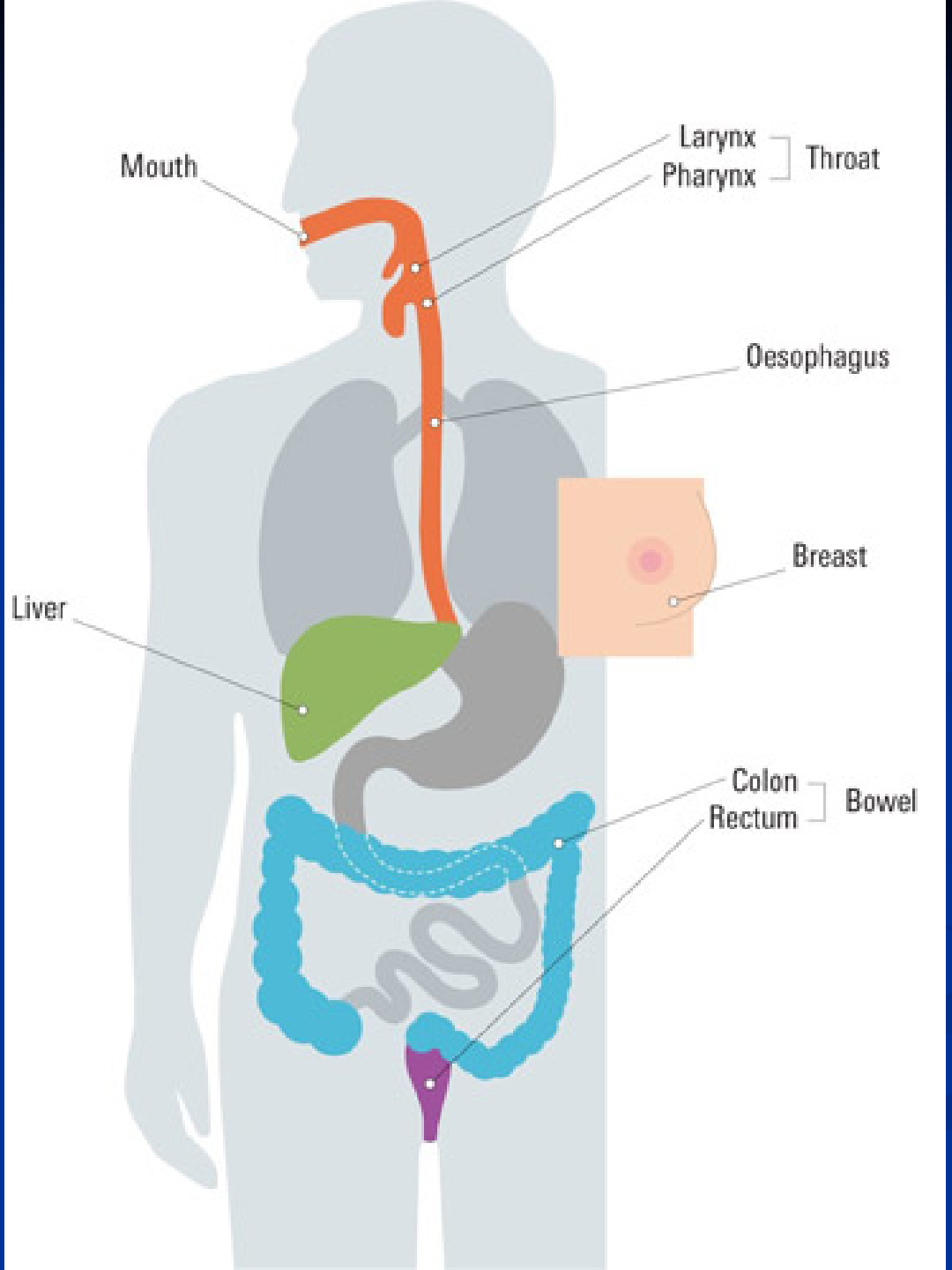
about 7% alcohol

about 12% alcohol

about 40% alcohol

The percent of "pure" alcohol, expressed here as alcohol by volume (alc/vol), varies by beverage.

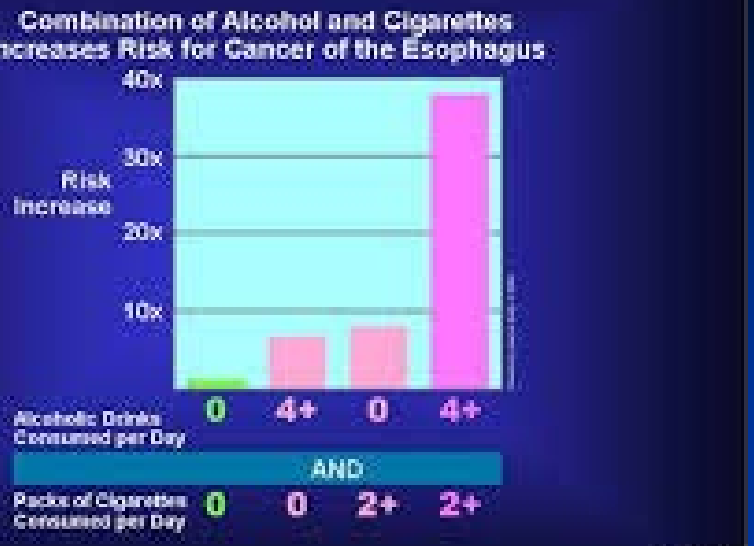
National Institute on Alcohol Abuse and Alcoholism. www.niaaa.nih.gov

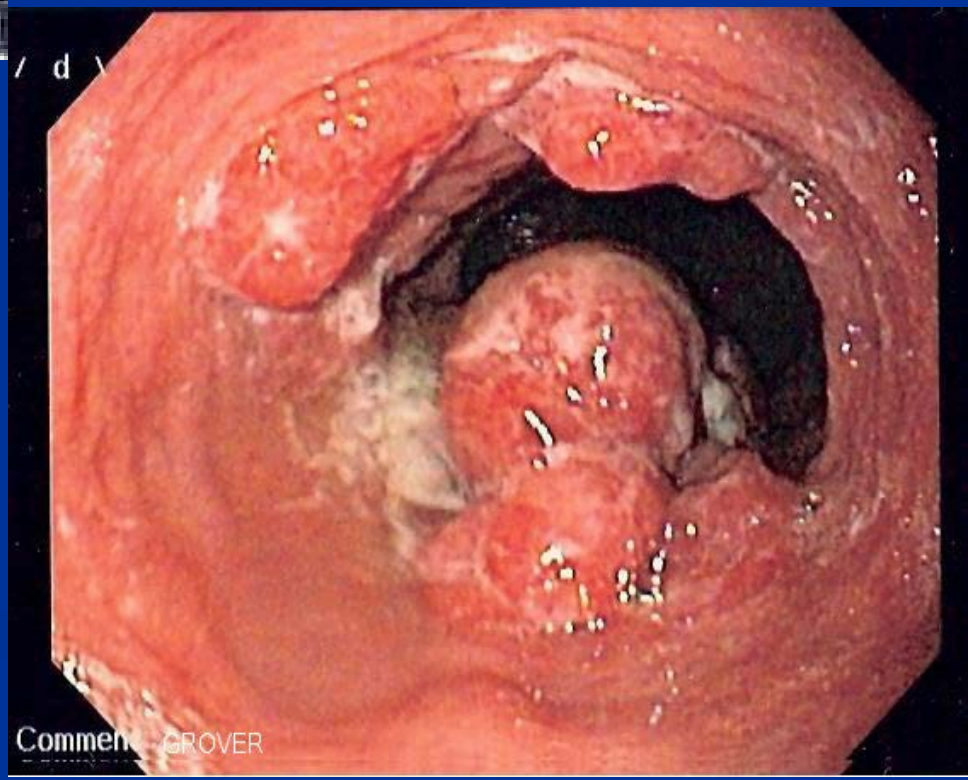

Mouth
Larynx
Pharynx
Throat
Oesophagus
Breast
Liver
Colon
Rectum
Bowel

Breast Cancer and Alcohol

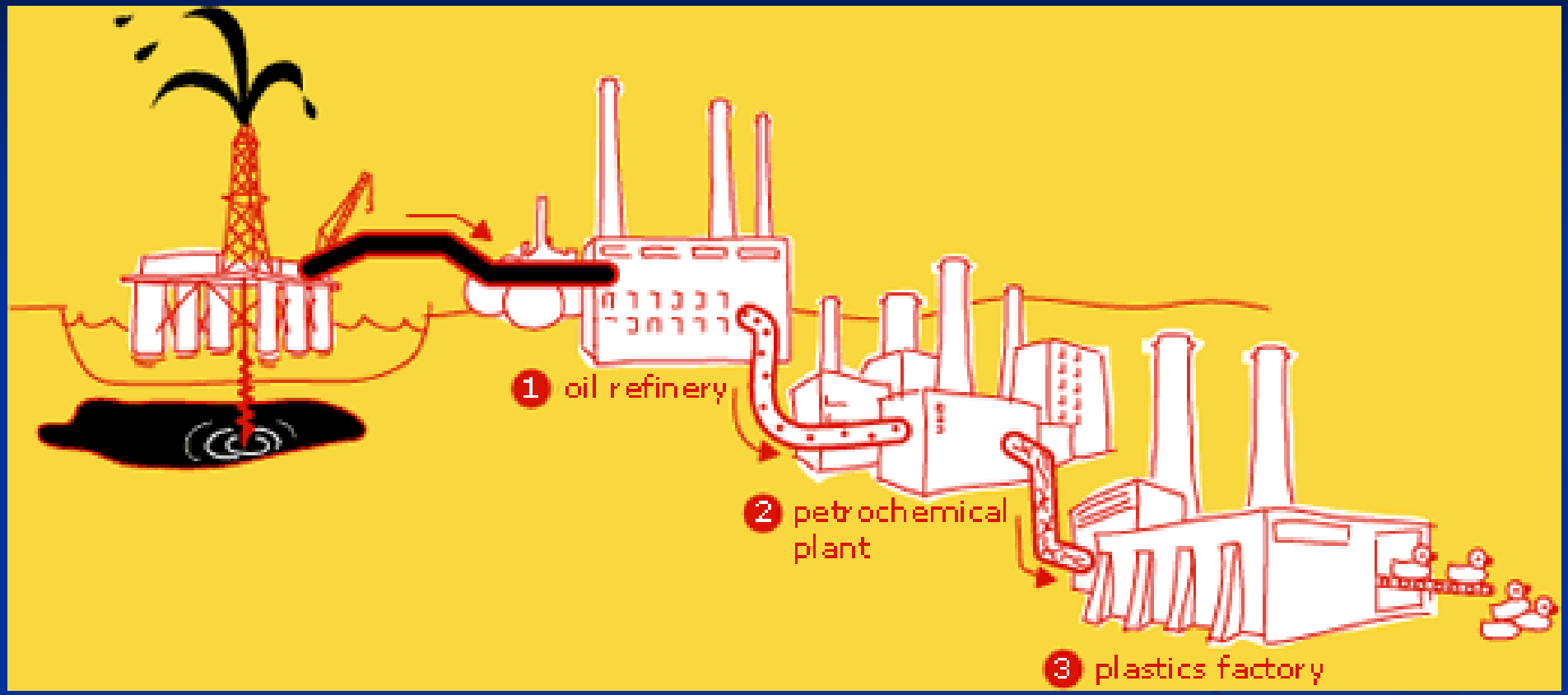
- A woman who drinks 3 drinks per week has a 15% higher risk of breast cancer than a nondrinker
- 2009 AACR study showed a 30% increased risk of recurrence of breast cancer in women who drank 3-4 drinks/week
- Million Women Study in UK showed for every 10 g/day of alcohol a 12% increase in breast cancer (JNCI 2009)

Limit Alcohol and Tobacco





ECOVER
FABRIC SOFTENER
Glencairn
Spring
Safeway
Coca-Cola
LEMON
Washing-up Liquid
500ml
fresh
SKIMMED
MILK
PINEAPPLE
& GRAPEFRUIT
tropical
JUST CHILL
WASH LIQUID
ED FORMULA
5L


1 oil refinery
2 petrochemical plant
3 plastics factory

Global Plastics Additives Market Size and Forecast, 2012 - 2020 ($Million)

Global Plastics Additives Market

Market by 2020 - $57.8 Billion

Growing at a CAGR of **4.4%** (2013 - 2020)

Global Plastics Additives Market By Functions

- Property Modifiers
- Property Stabilizers
- Property Extenders
- Processing Aids

Global Plastics Additives Market By Product types

- Plasticizers
- Flame Retardants
- Impact Modifiers
- Antioxidants
- Antimicrobials
- UV Stabilizers

Global Plastics Additives Market Dynamics

Drivers

- Higher consumption of plastic
- Commercialization in automotive, consumer appliances & construction industry
- Availability of versatile properties
- Environment friendly
- Reusable Applications

Restraints

- Increased healthcare threats
- Stringent government regulation is hampering the plastic additives market.

Global Plastics Additives Market By Applications

- Plasticizers applications
- Flame Retardants applications
- Impact Modifiers applications
- Antioxidants applications
- Antimicrobials applications
- UV Stabilizers applications

Global Plastics Additives Market By Geography

North America, Europe
Asia-Pacific, LAMEA

Asia-Pacific to be the fastest growing market at a CAGR of 4.8%

For More Details See Table of Contents

Symbol	Acronym	Full name and uses
	PET	Polyethylene terephthalate - Fizzy drink bottles and frozen ready meal packages.
	HDPE	High-density polyethylene - Milk and washing-up liquid bottles
	PVC	Polyvinyl chloride - Food trays, cling film, bottles for squash, mineral water and shampoo.
	LDPE	Low density polyethylene - Carrier bags and bin liners.
	PP	Polypropylene - Margarine tubs, microwave-able meal trays.
	PS	Polystyrene - Yoghurt pots, foam meat or fish trays, hamburger boxes and egg cartons, vending cups, plastic cutlery, protective packaging for electronic goods and toys.
	Other	Any other plastics that do not fall into any of the above categories. For example melamine, often used in plastic plates and cups.

Plastics

- Some of the “additives” are carcinogenic
- Can leach into liquids on contact
- Can “offgas” when heated
- Think of the “new car” smell or your vinyl shower curtain

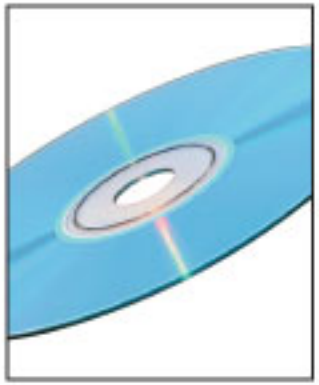
Bisphenol A

- Commonly used in #7 plastics, such as polycarbonate
- Provides flexibility, compressibility and visibility
- Known to leach out into container liquids
- Developed in 1891 as a synthetic estrogen

Common uses for bisphenol A

Dental sealants

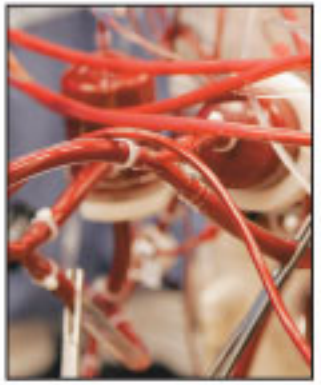
Eyeglasses



Compact discs

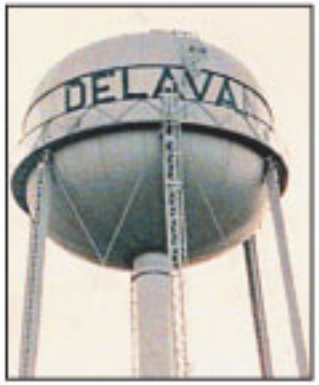
Photographic film

Food containers, infant bottles and reusable water bottles



Medical devices

Polycarbonate for water pipes



Epoxy-phenolic resins in surface coatings of drinking water storage tanks

Bisphenol A manufacturers

- Bayer MaterialScience
- Dow Chemical Co.
- General Electric Co.*
- Hexion Specialty Chemicals Inc.
- Sunoco Chemicals

Sold its plastics division in 2007

Sources: Center for the Evaluation of Risks to Human Reproduction; American Chemistry Council

ALFRED ELICIERTO/aelicierto@journalsentinel.com
Photos: Journal Sentinel files

BPA (Bisphenol A) - Effects

- Endocrine disruptor, strongest effects during early development
- Estrogen mimic
- Obesity
- Neurological disorders
- Thyroid function
- Cancer risk: breast, prostate, neuroblastome
- Reproductive anomalies – ovarian development, ...
- DNA alterations related to estrogen
- Heart disease, diabetes
- Growth, reproduction, developtment of aquatic organisms, including fish, invertebrates, amphibians,

10 Canned Foods to Avoid to Reduce BPA Exposure

1. Coconut milk
2. Soup
3. Meat
4. Vegetables
5. Meals (e.g., ravioli in sauce)
6. Juice
7. Fish
8. Beans
9. Meal-replacement drinks
10. Fruit

*based on testing of more than 300 products

www.breastcancerfund.org

How to avoid BPA

Bisphenol A (BPA), a chemical found in plastics used to package food, may be linked to birth defects, reproductive problems, heart disease.

What to look for

7
OTHER

• Container bottoms marked with 7* or 3 may contain PBA

*New bio-based or combination plastics also marked with numeral 7

Potentially harmful

• Mimics the hormone estrogen

• Found in the urine of 93 percent of the population over age 6; suggests constant exposure to BPA

• BPA can leach into food or beverage if plastic container is heated

Products, purpose of BPA

Safer alternatives

Baby bottles
Makes bottle transparent

• Use glass bottles or plastic bag inserts
• BPA-free bottles available

Nondisposable water bottles
Makes bottle shatterproof

• Do not wash in dishwasher
• Use stainless steel or BPA-free plastic bottles

Canned food lining
Prevents corrosion, food contamination

• Choose food packaged in cardboard cartons
• Eat fresh produce

Dental sealant, composite
Resin contains BPA-based materials

• Amalgam filling; contains 50 percent mercury
• Consult dentist to limit risk

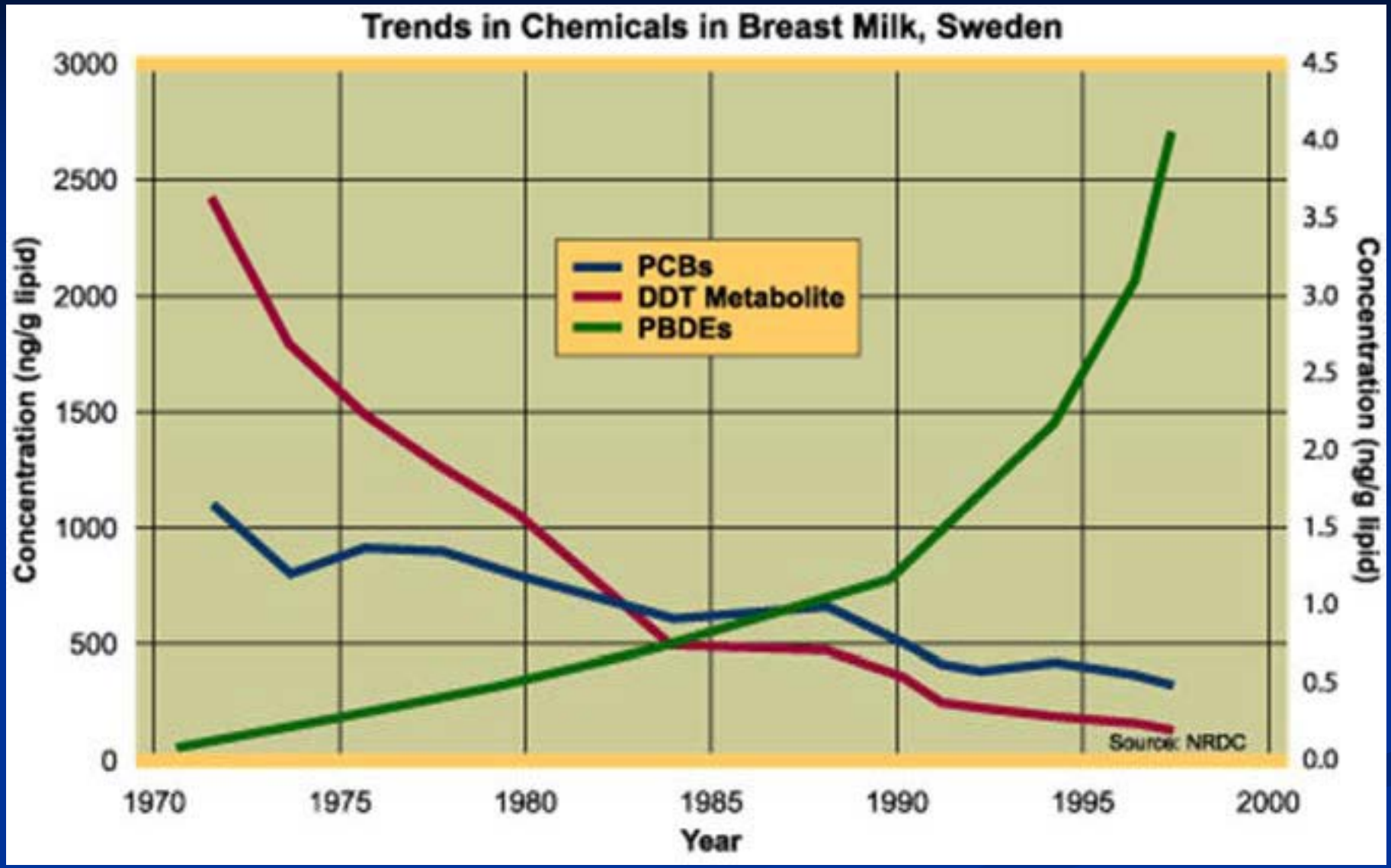
• **BPA also found in** plastic eyeglass lenses, coatings on cash register receipts, CDs, paints, medical equipment, toys

Source: AP, Green Guide, BPA Global Group, U.S. Centers for Disease Control and Prevention, American Dental Association

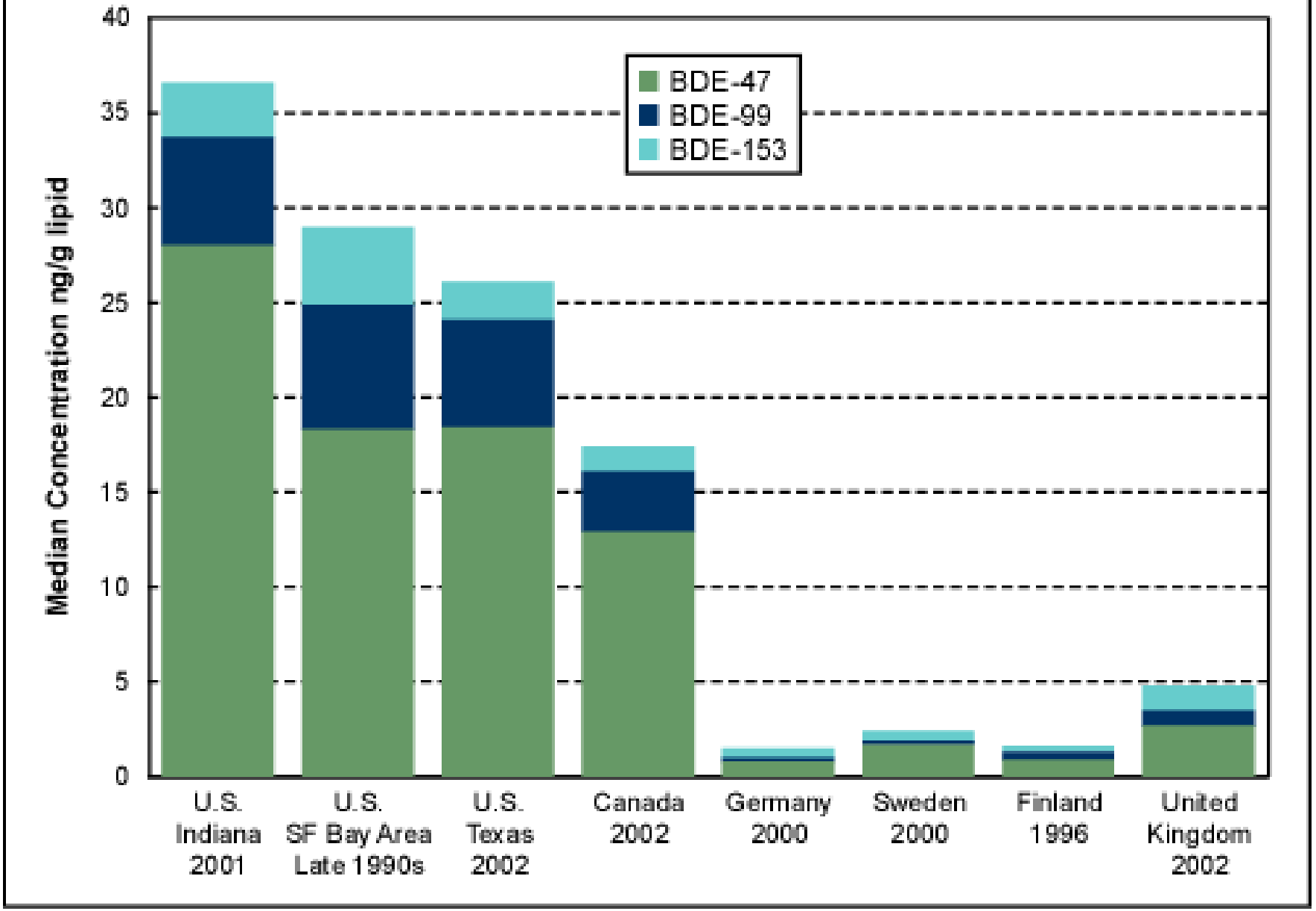
Graphic: Melina Yingling

Tip of the Iceberg

- 1/3 of plastic products found to leach substances
- Over 300 million tons of plastic produced yearly
- Europe has “precautionary principle”… we don’t


Trends in Chemicals in Breast Milk, Sweden
Concentration (ng/g lipid)
3000
2500
2000
1500
1000
500
0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Concentration (ng/g lipid)
PCBs
DDT Metabolite
PBDEs
Source: NRDC
1970
1975
1980
1985
1990
1995
2000
Year

PBDEs Breast Milk and Fat Samples Around the World



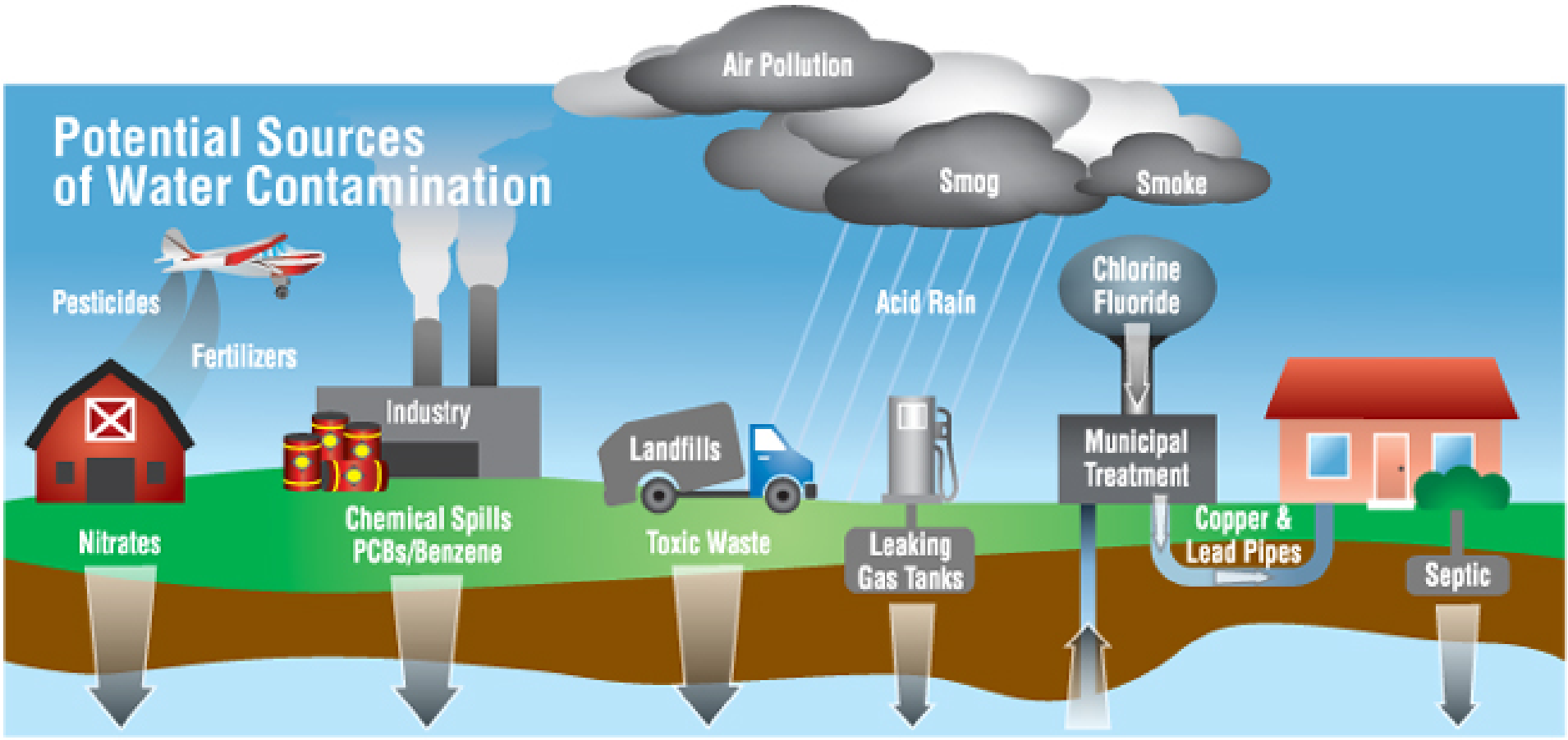
Source: Figure 3 in Schecter et al (EHP, August 2003), Table 1 in Mazdai et al (EHP, July 2003), and Table 1 in Kalantzi et al (EHP, July 2004)

What Can You Do?


RK8008
RK8005BL
RK802SS
RK8005RD
RK8005SS


North Pacific Gyre
Kuroshio Current
North Pacific Current
California Current
North Equatorial Current

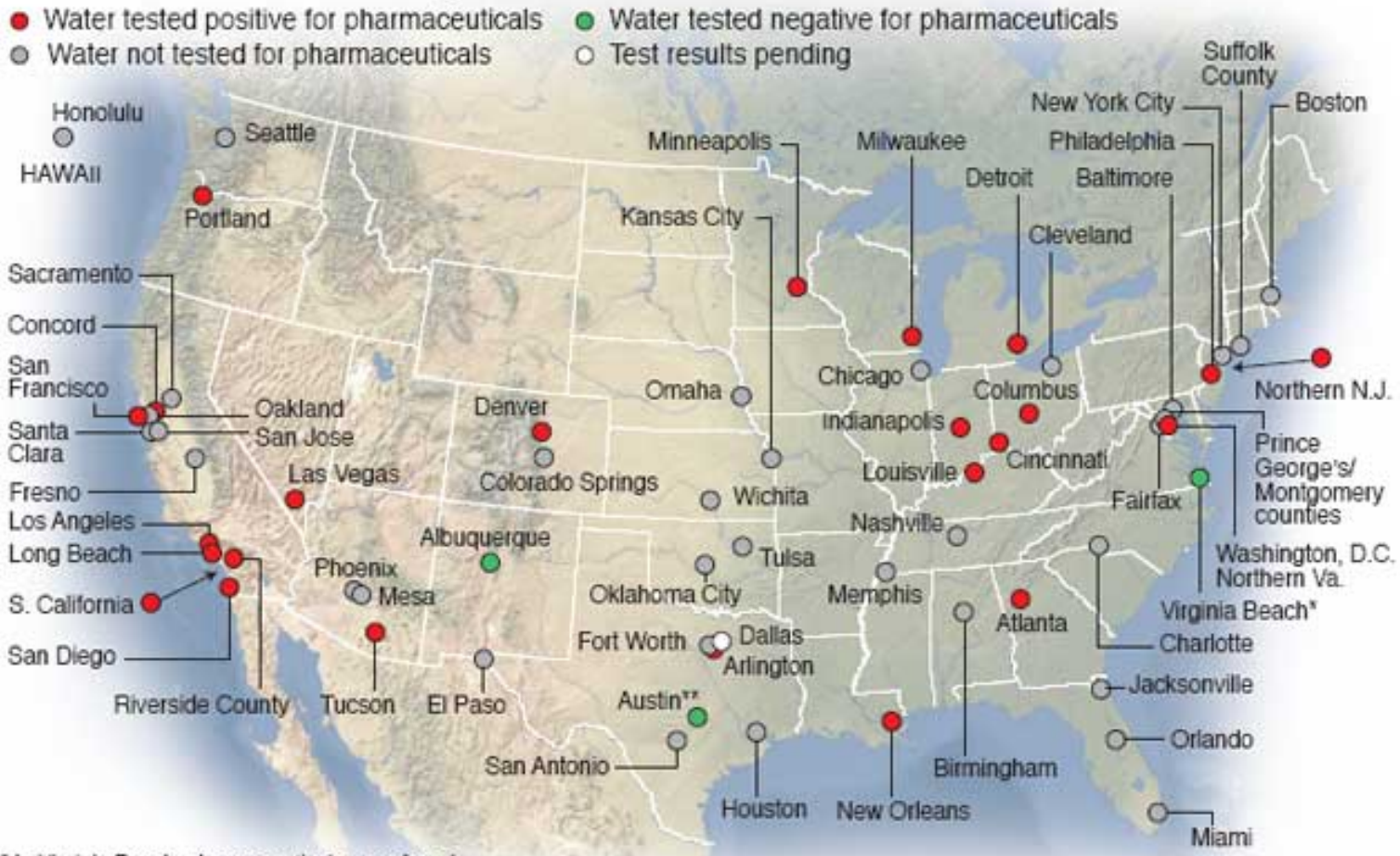

Our Oceans
Are Turning
Into Plastic…Are We?


Potential Sources of Water Contamination
Air Pollution
Smog
Smoke
Acid Rain
Chlorine Fluoride
Pesticides
Fertilizers
Industry
Landfills
Municipal Treatment
Nitrates
Chemical Spills PCBs/Benzene
Toxic Waste
Leaking Gas Tanks
Copper & Lead Pipes
Septic

Major water sources positive for pharmaceuticals

At least one pharmaceutical was detected in tests of finished drinking water supplies for 24 metropolitan areas, according to an Associated Press survey of 62 major water providers. Only 28 tested finished drinking water. Test results vary widely. Some water systems said tests had been negative, but the AP found independent research showing otherwise.

Pharmaceuticals in drinking water



* In Virginia Beach, pharmaceuticals were found in source water but not in treated drinking water.
** Drinking water in Austin, Texas, was tested for only one prescription drug, a synthetic birth control chemical.

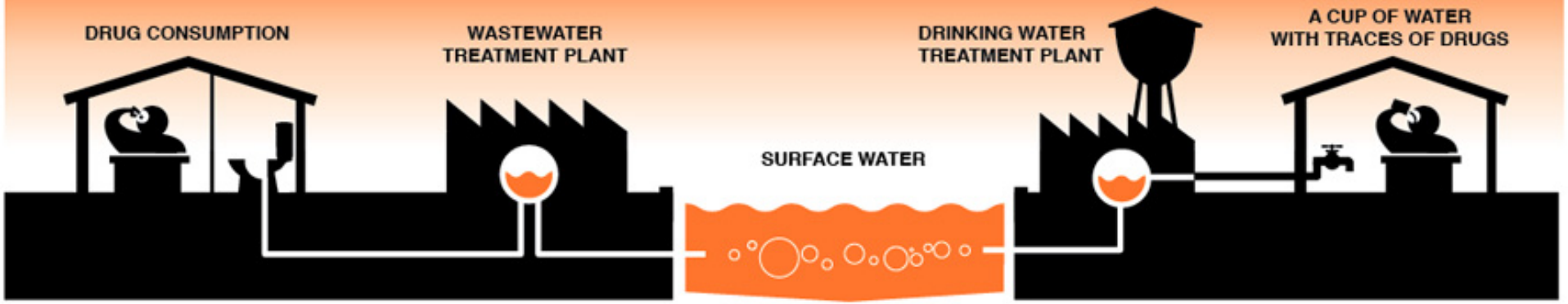
NOTE: All places include some surrounding areas except: Albuquerque, N.M.; Arlington, Texas; Fresno, Calif.; Long Beach, Calif.; Los Angeles; Memphis, Tenn.; New Orleans; New York City; and Orlando, Fla.

SOURCES: Drinking water providers' responses to Associated Press questions; AP review of scientific literature.

AP

Pharmaceuticals in drinking water

An investigation by The Associated Press found that drinking water supplied to at least 41 million Americans carried residues of antibiotics, anti-convulsants, mood stabilizers, sex hormones and other pharmaceuticals.



An estimated 90 percent of pharmaceuticals in the environment come from consumers. Many drugs end up in toilets, unmetabolized by the body or thrown away.

Sewage treatment plants were designed to remove disease-causing microbes and pathogens from water – not pharmaceuticals.

Testing has confirmed more than 100 different pharmaceuticals in surface waters. Fish, mollusks and algae are adversely affected by contamination.

Standard treatments used to clean drinking water are not good at removing pharmaceuticals.

Humans may be affected by the consumption of water that contains pharmaceuticals.

AP

Table 2. Concentrations and detection frequencies of volatile organic compounds detected in two or more samples, Glassboro area, NJ.

[µg/L, micrograms per liter; --, not established; <, less than; NDV, nondetect value; E, estimated concentration; MCL, maximum contaminant level; LHA, lifetime health advisory]

Compound	Common name	% wells detected	Concentration in µg/L			
			NDV	Median	Maximum	MCL LHA
Trichloromethane	Chloroform	80.5	<0.05	0.06	5.6	[5]80-100
Methyl tert-butyl ether	MTBE	44.4	<.1	.20	43.8	[5]20-200
Carbon disulfide	Carbon disulfide	38.9	<.05	E.01	E.04	--
Methylchloroform	TCA, 1,1,1-Trichloroethane	27.7	<.05	E.025	.64	[2]26
Perchloroethene	PCE, Tetrachloroethene	23.6	<.05	E.01	.17	[2]1
Trichlorofluoromethane	CFC 11, Freon 11	11.1	<.1	.11	.48	[3]2,000
Iodomethane	Methyl iodide	8.3	<.05	E.015	.17	--
1,1-Dichloroethene	Vinylidene chloride	6.9	<.1	E.01	E.04	[2]2
Methylbenzene	Toluene	6.9	<.05	E.02	.12	[1]1,000
Bromodichloromethane	Dichlorobromomethane	5.5	<.1	E.02	E.05	[4]80-100
Trichloroethene	TCE	5.5	<.05	E.005	E.007	[2]1
Tert-amyl methyl ether	TAME	4.2	<.1	E.01	E.02	--
1,2-Dichlorobenzene	o-Dichlorobenzene, 1,2-DCB	4.2	<.05	E.006	E.01	[1]600
Dibromochloromethane	Dibromochloromethane	4.2	<.1	E.03	E.04	[1]100
Ethylbenzene	Phenylethane	4.2	<.05	E.009	E.01	[1]700
Dichlorodifluoromethane	CFC 12, Freon 12	4.2	<.2	.42	4.3	[3]1,000
1,3-Dimethylbenzene 1,4-Dimethylbenzene	m- and p-Xylene	4.2	<.05	E.01	E.02	--

[1]MCL (U.S. Environmental Protection Agency, 1996)
[2]NJDEP MCL (Shelton, 1994)
[3]LHA (U.S. Environmental Protection Agency, 1996)
[4]Proposed MCL (U.S. Environmental Protection Agency, 1996)
[5]Proposed LHA (U.S. Environmental Protection Agency, 1996)

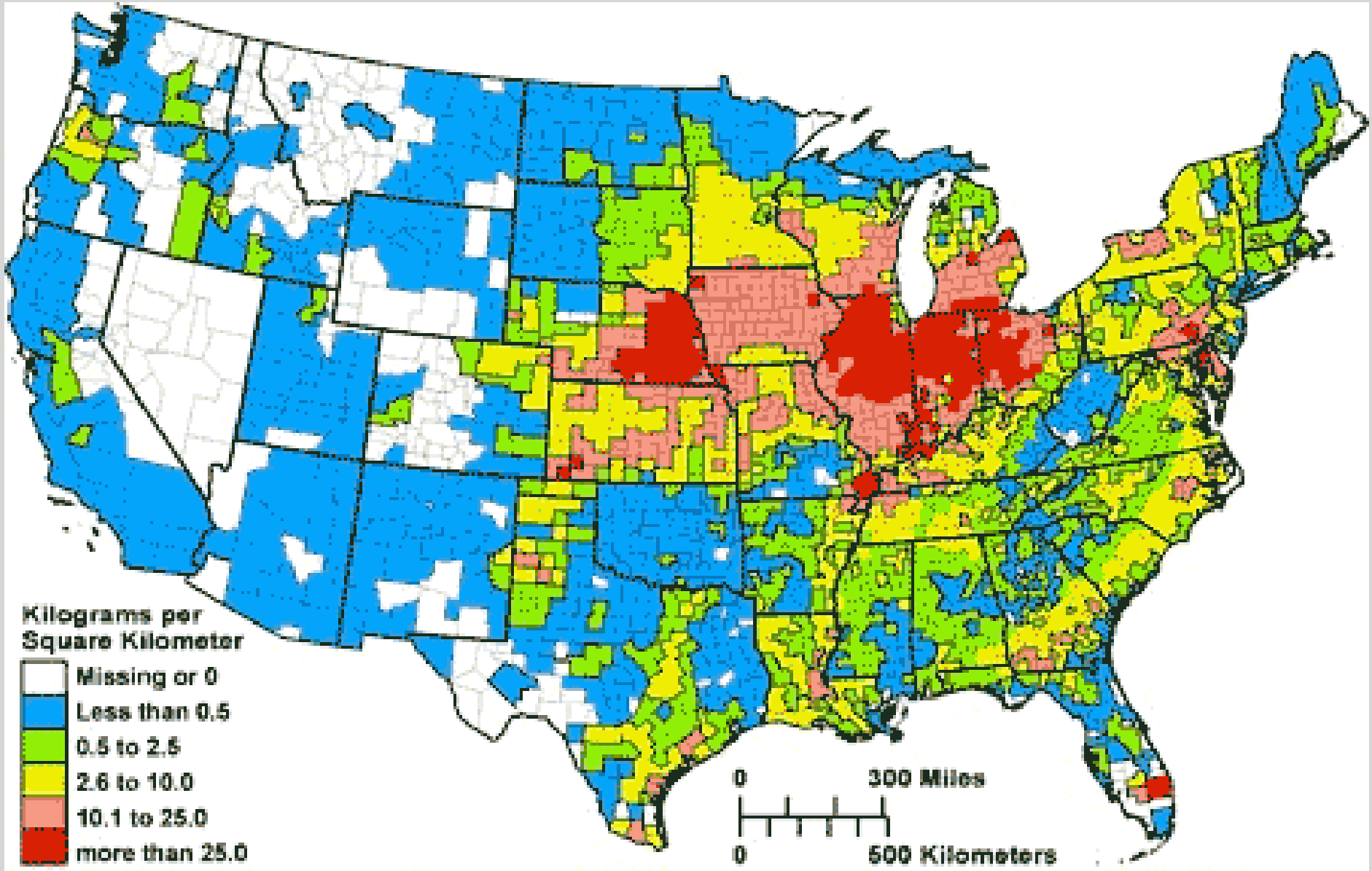


Figure 7. Atrazine use - kilograms per square kilometer (U.S. Geological Survey, 1991) range from less than 0.5 to more than 25.0. Relatively heavy application in 1991 is shown in the corn growing regions of Illinois, Indiana, and Ohio. Application and prevailing wind patterns around Lake Michigan may contribute to atrazine loads.

Atrazine and other Herbicide/Pesticides

- Widespread contamination of drinking supplies
- Banned in Europe
- Associated with birth defects, low birth weights
- Endocrine disruptor
- Possibly carcinogenic, 2011 panel of independent experts commissioned by EPA found "strong" evidence linking to thyroid cancer and "suggestive" link to ovarian


Atrazine

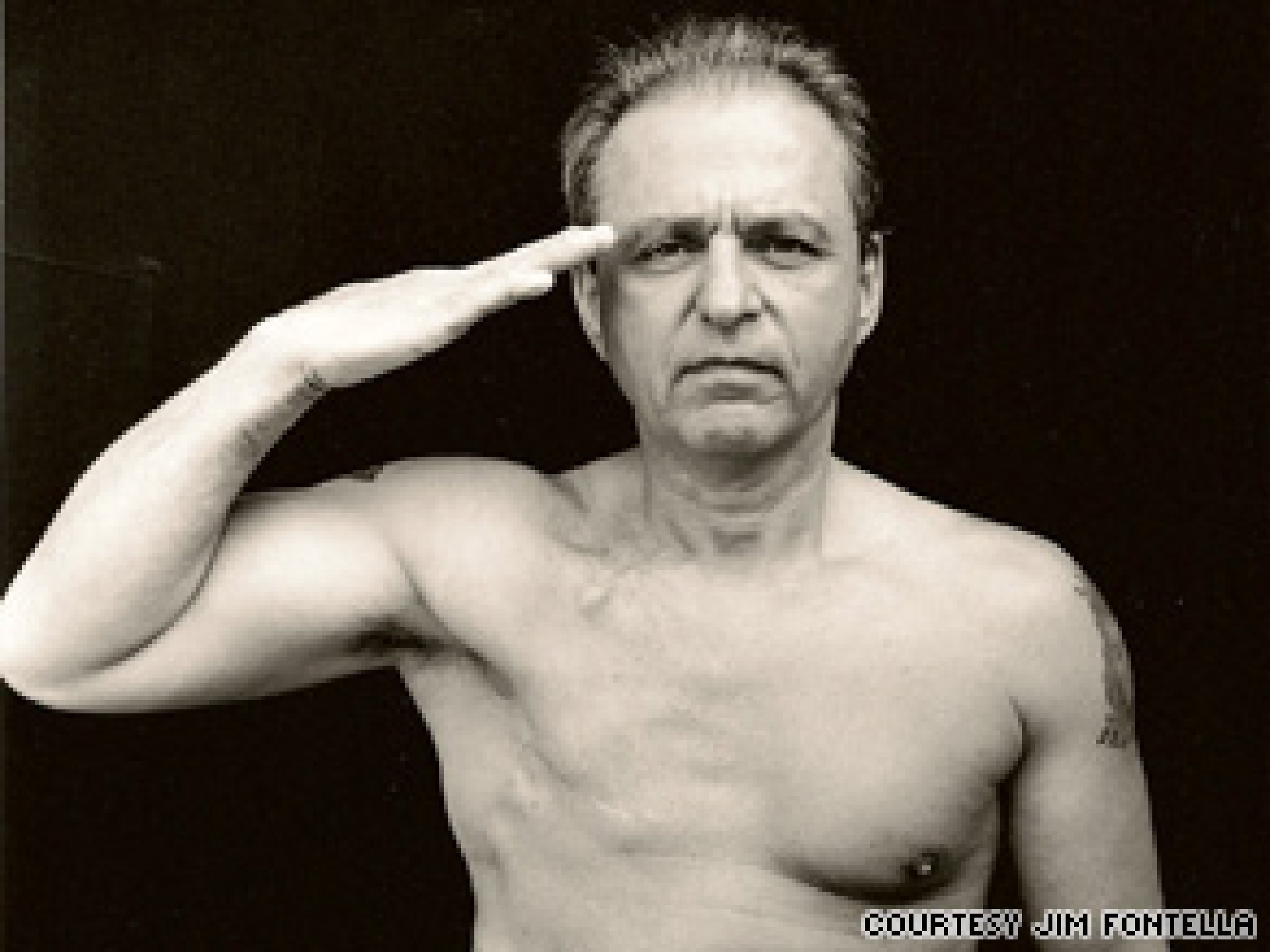
2003 Survey of Potomac Watershed

- 80% of MALE smallmouth bass produce eggs and exhibit female characteristics
- Numbers of hermaphroditic amphibious species rising dramatically
- Most likely related to industrial runoff of herbicides/pollutants

Sexual Characteristics

- Sperm motility rates declining for 50 years
- 7% of males born with undescended testes
- Menarche occurs at age 12 (age 16 in 1900)
- Rural China 1980s, menarche age 17
- Today, ½ of US girls start breast development before age 10

- Diet? Endocrine Disruptors? Animal Protein?


COURTESY JIM FONTELLA

Camp Lejune

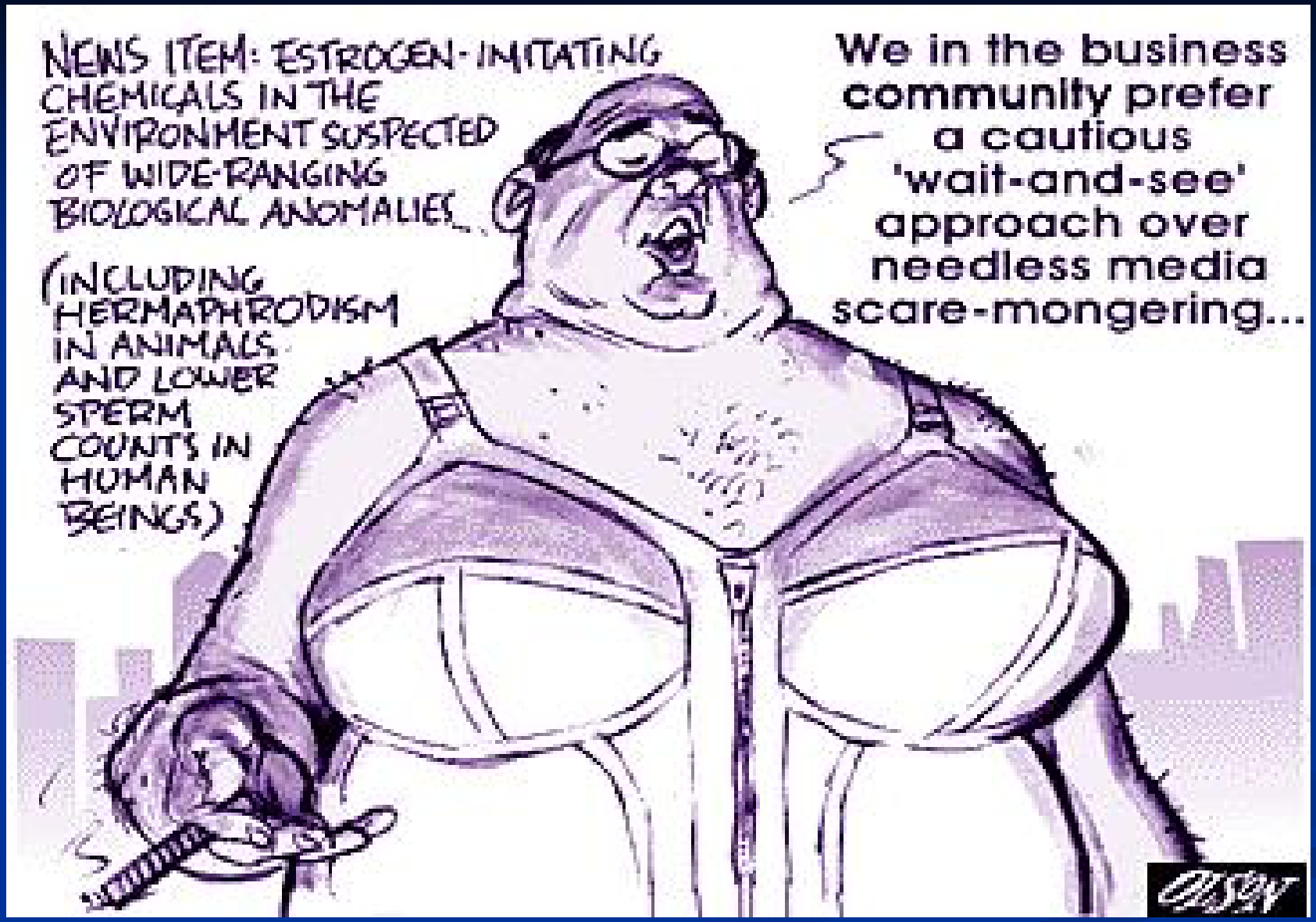
- High incidence of male breast cancer in veterans stationed in Camp Lejune, NC in 1970s/1980s
- Male breast cancer is extremely rare (only 1000 cases/year) in the US
- Some of the men were as young as 30 or 40 at the time of diagnosis
- Levels of benzene and trichloroethylene (TCE) high in groundwater

Camp Lejune

CDC report 2014 showed increased risks of cancer

- 35% increased risk of kidney cancer
- 42% increased risk of liver cancer
- 47% increased risk of NHL
- 68% increased risk of multiple myeloma
- Almost double the risk of ALS in certain cohorts
- Increased risk of childhood leukemia, neural tube defects in children of marines

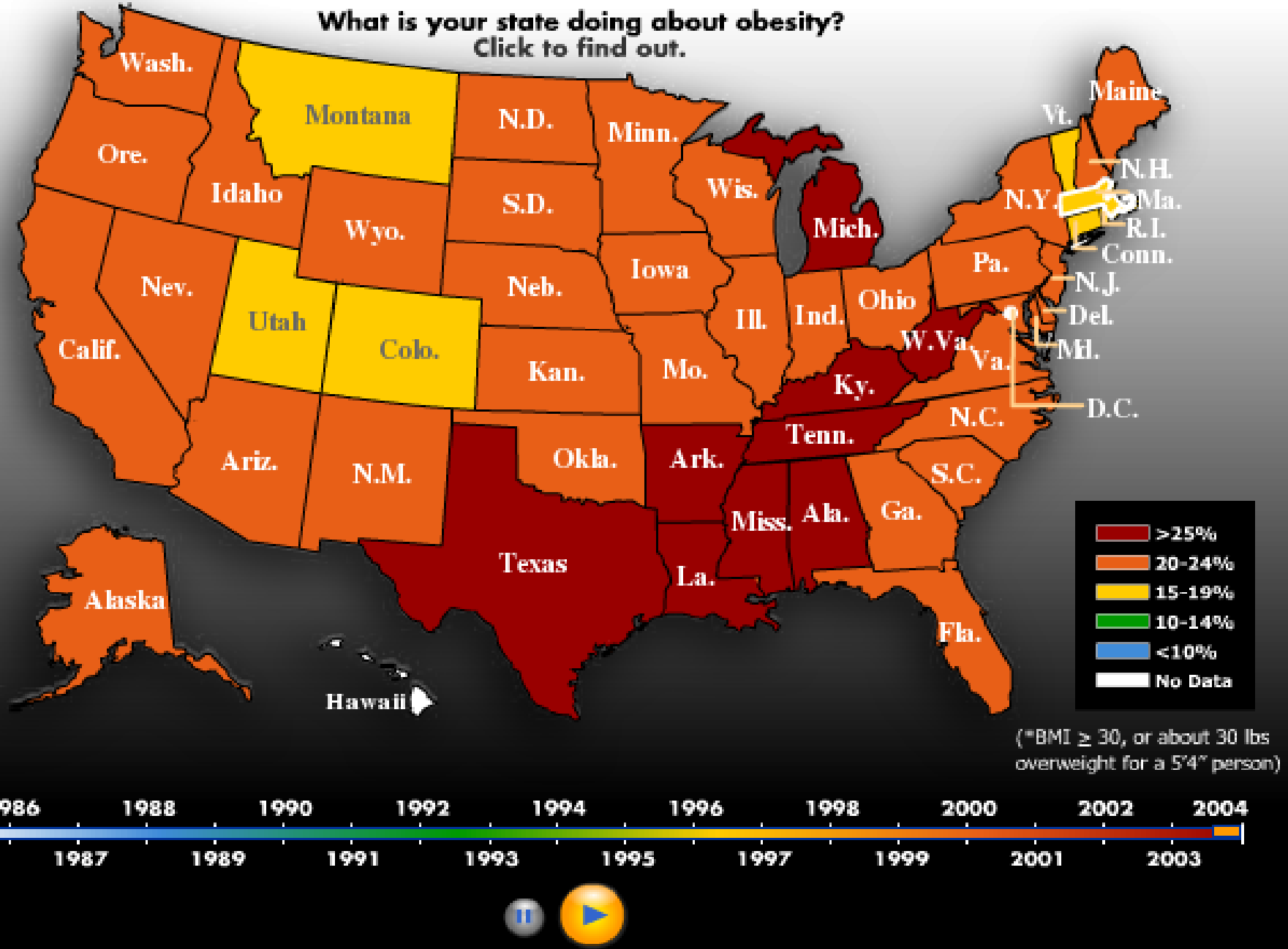

Berkey
Berkey


NEWS ITEM: ESTROGEN-IMITATING CHEMICALS IN THE ENVIRONMENT SUSPECTED OF WIDE-RANGING BIOLOGICAL ANOMALIES
(INCLUDING HERMAPHRODISM IN ANIMALS AND LOWER SPERM COUNTS IN HUMAN BEINGS)
We in the business community prefer a cautious 'wait-and-see' approach over needless media scare-mongering...

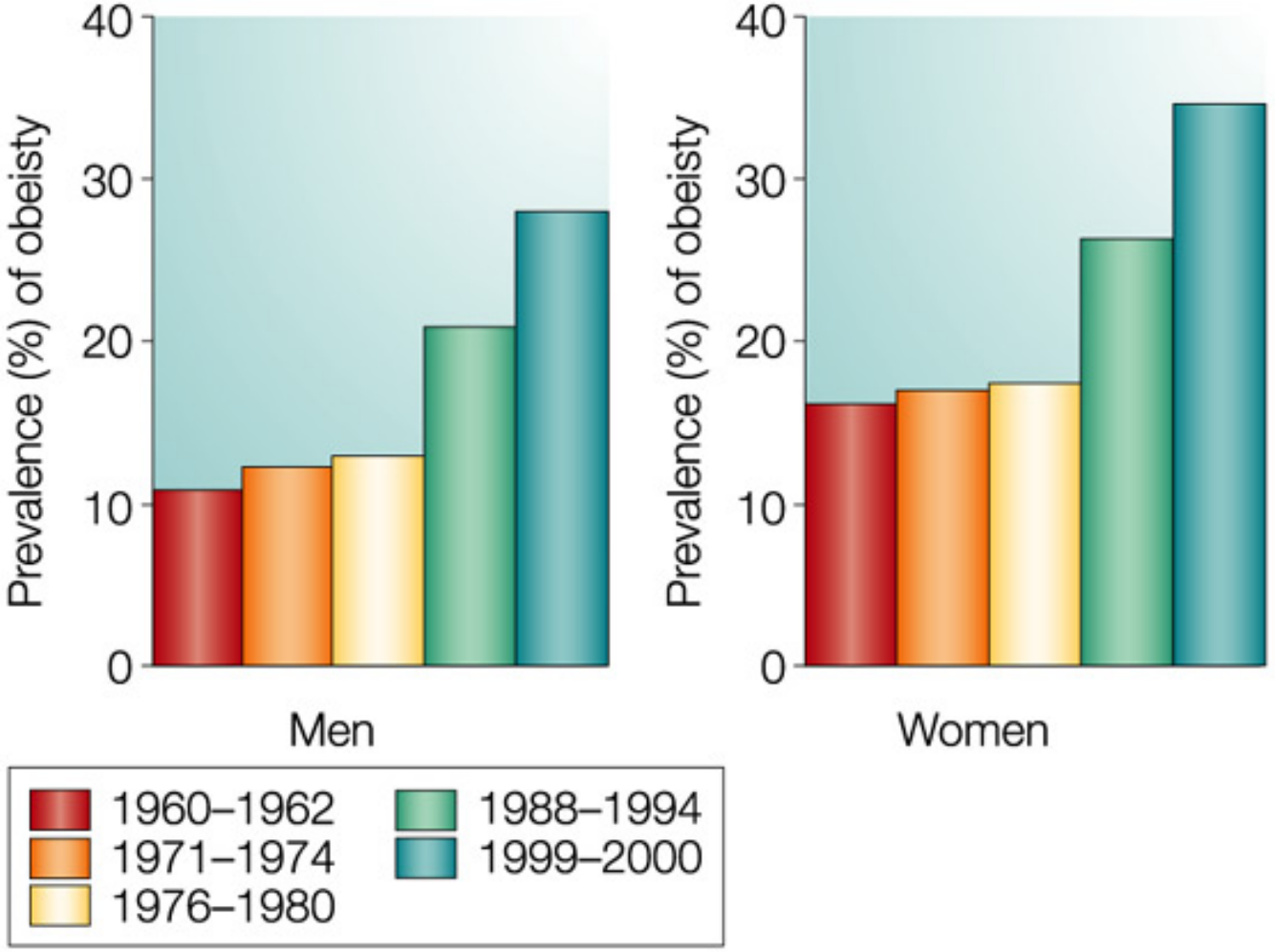
What Else?

Nutrition

OBESITY in America



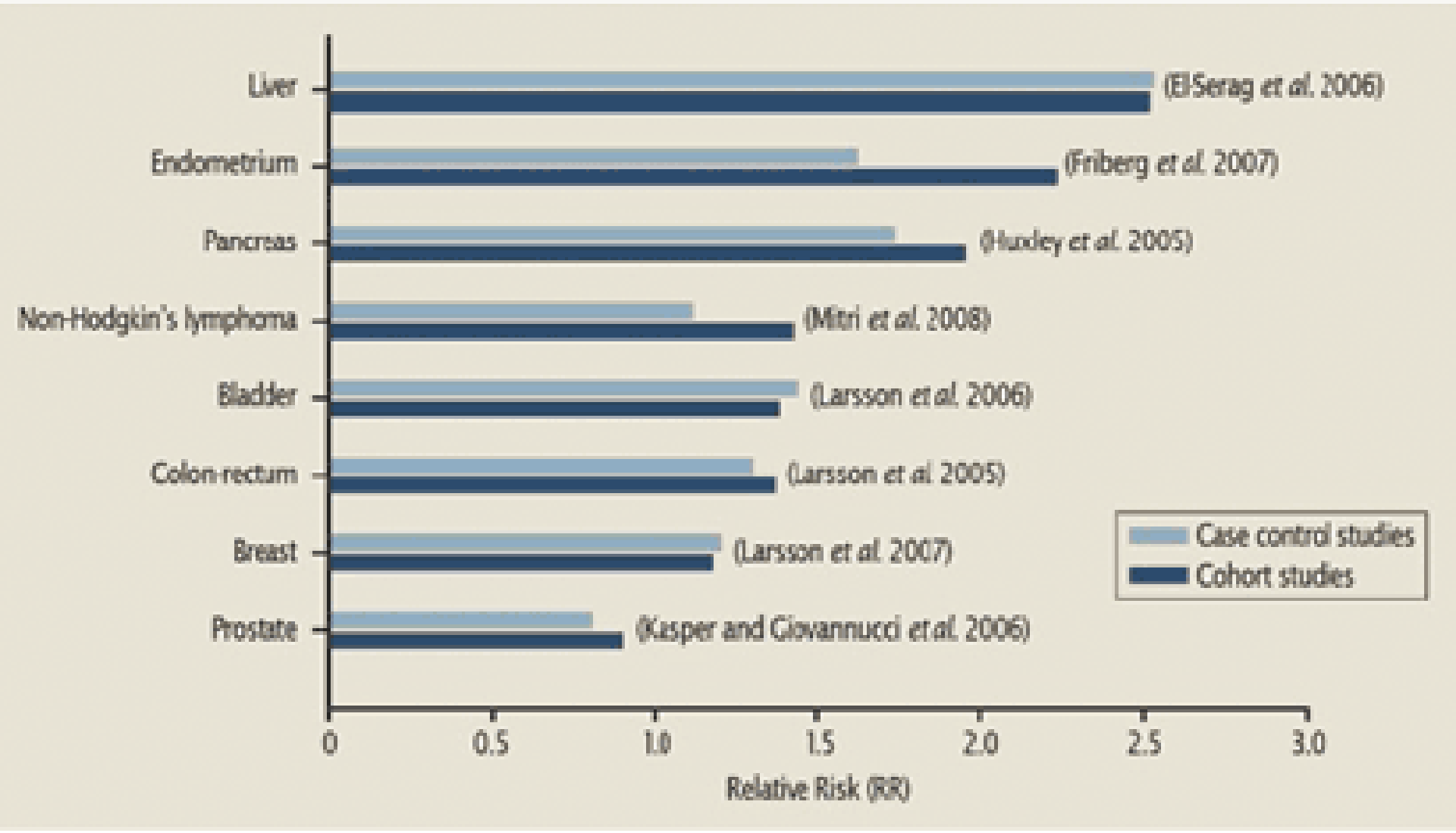
MSN Health & Fitness | Source: Centers for Disease Control and Prevention, *Behavioral Risk Factor Surveillance System Survey Data*



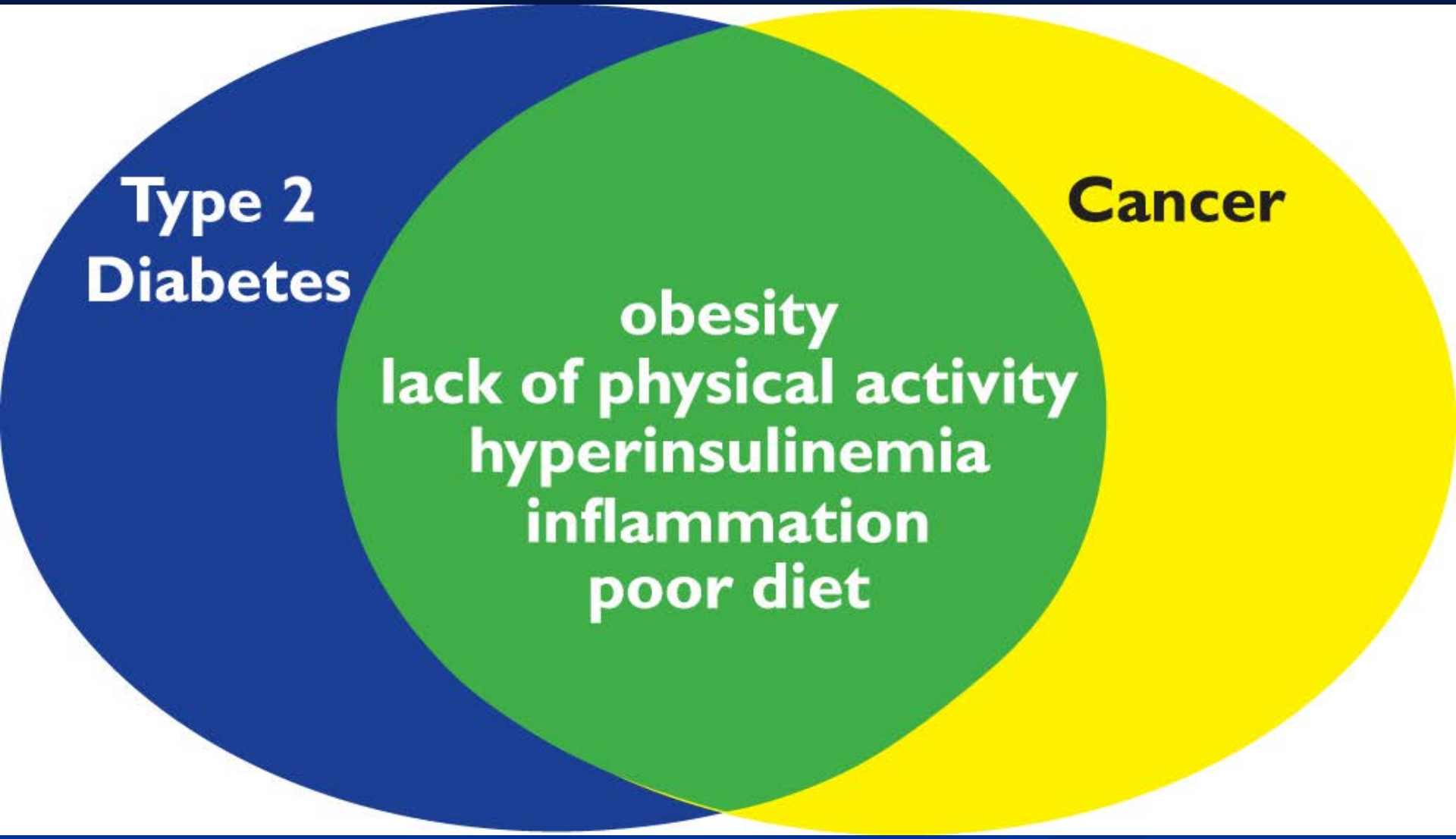
Nature Reviews | Cancer

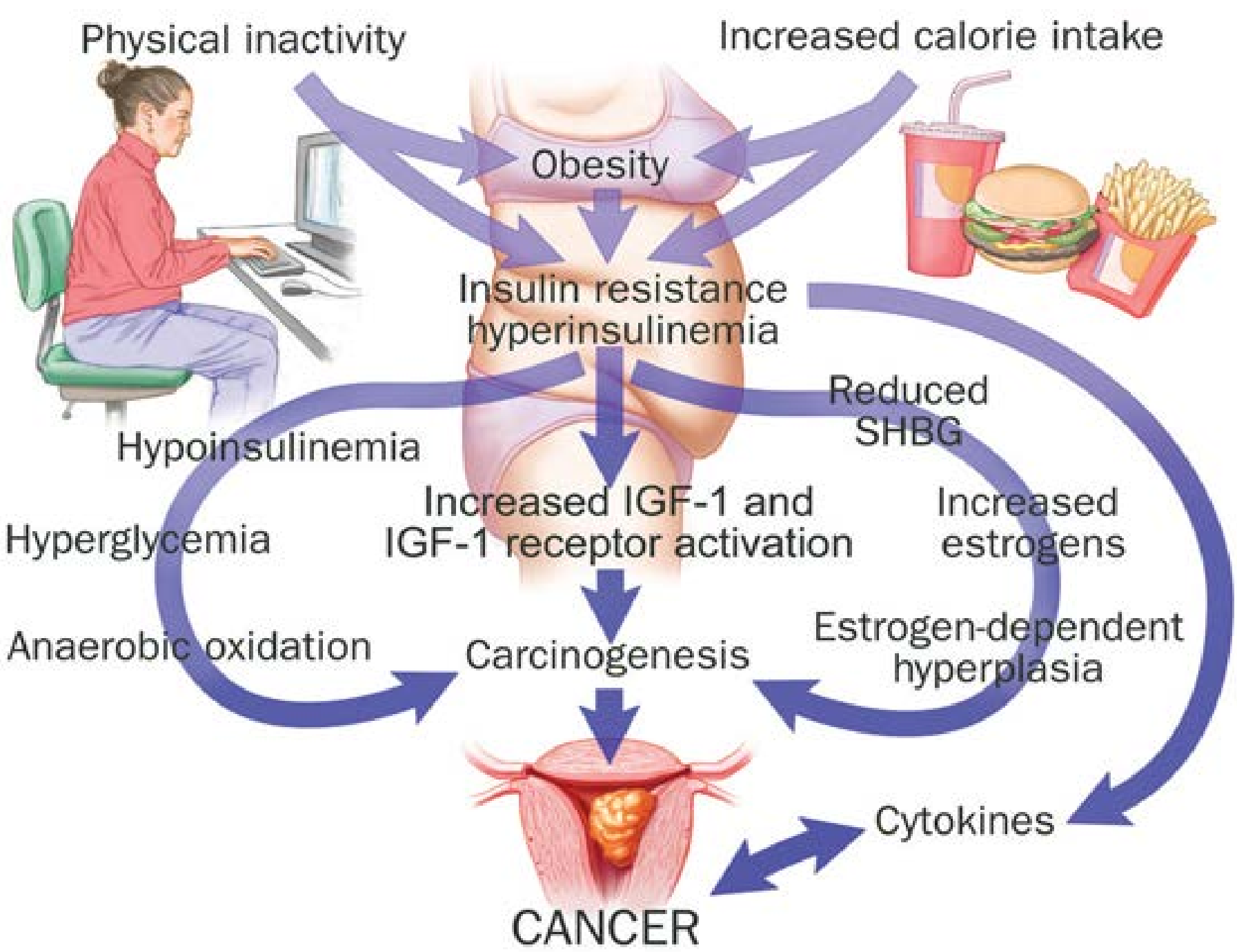
FIGURE 1

Meta-analyses on the relative risk of different cancer locations in patients with type 2 diabetes

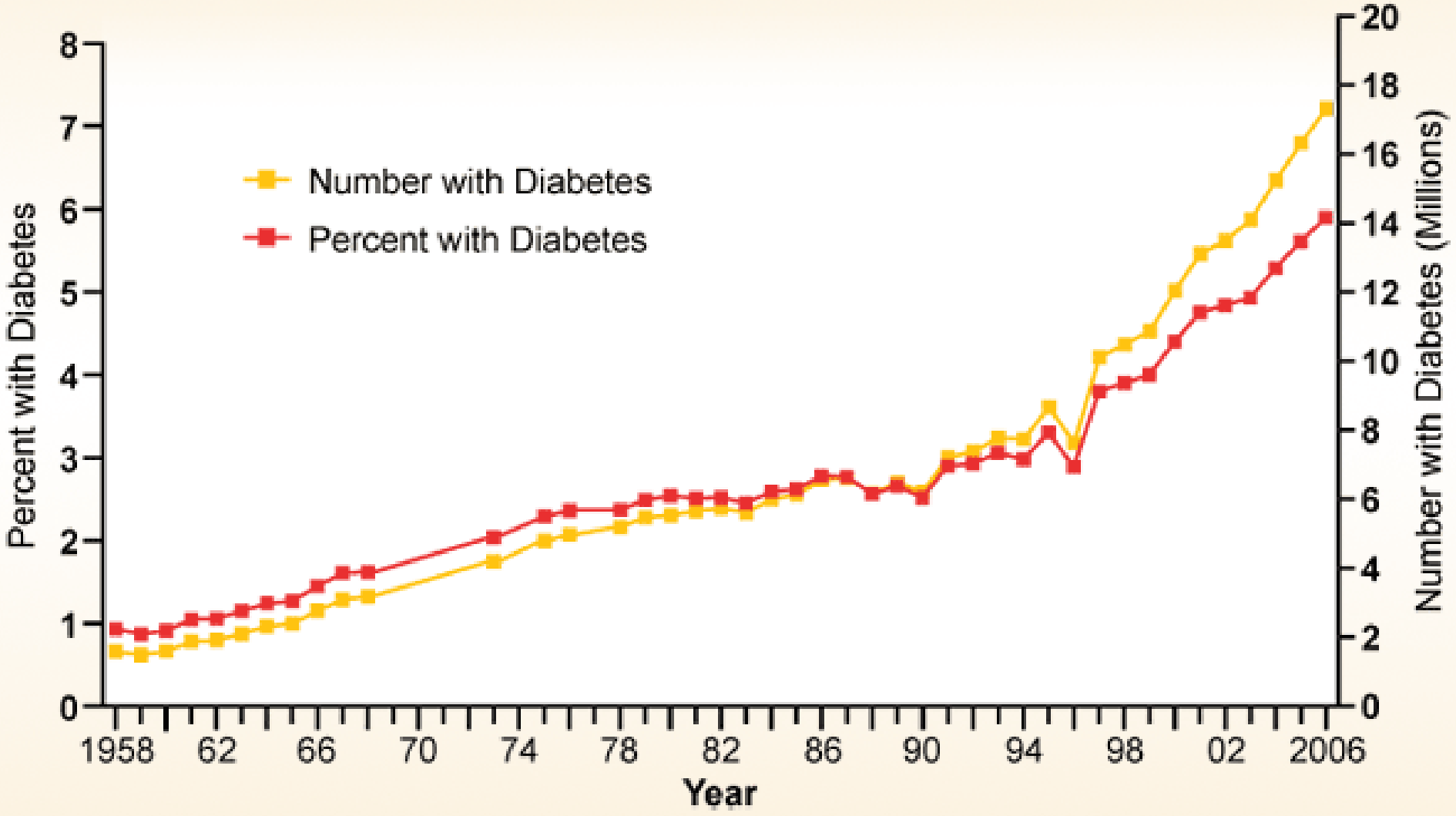


Adapted from Mussig K. et al. Type 2 diabetes mellitus and the risk of malignancy: is there a strategy to identify a subphenotype of patients with increased susceptibility to endogenous and exogenous hyperinsulinism? *Diabet Med* 2011;28:277-86.


Type 2
Diabetes
obesity
lack of physical activity
hyperinsulinemia
inflammation
poor diet
Cancer

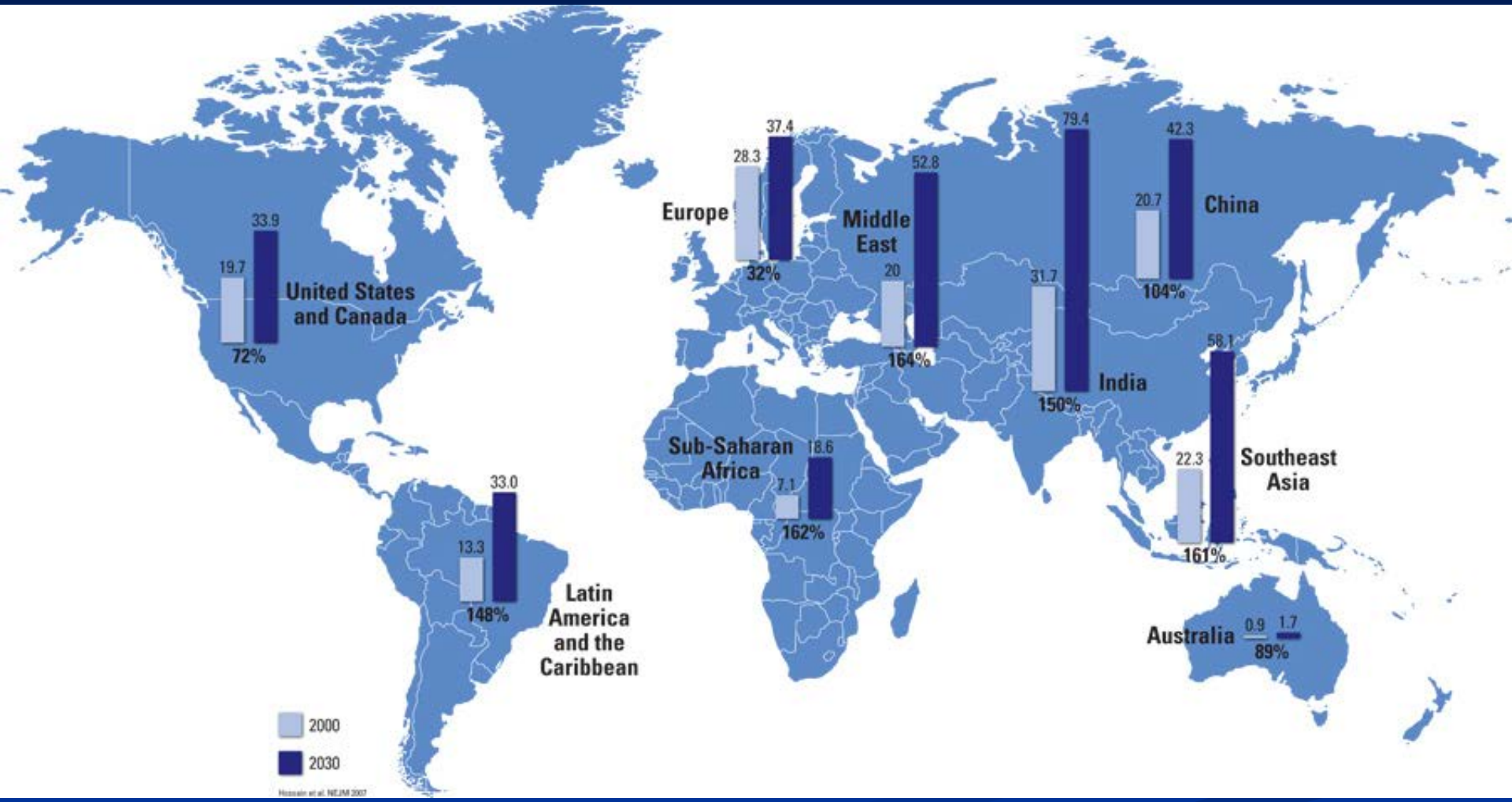

Physical inactivity
Increased calorie intake
Obesity
Insulin resistance
hyperinsulinemia
Hypoinsulinemia
Reduced
SHBG
Hyperglycemia
Increased IGF-1 and
IGF-1 receptor activation
Increased
estrogens
Anaerobic oxidation
Carcinogenesis
Estrogen-dependent
hyperplasia
Cytokines
CANCER

Number and Percentage of U.S. Population with Diagnosed Diabetes

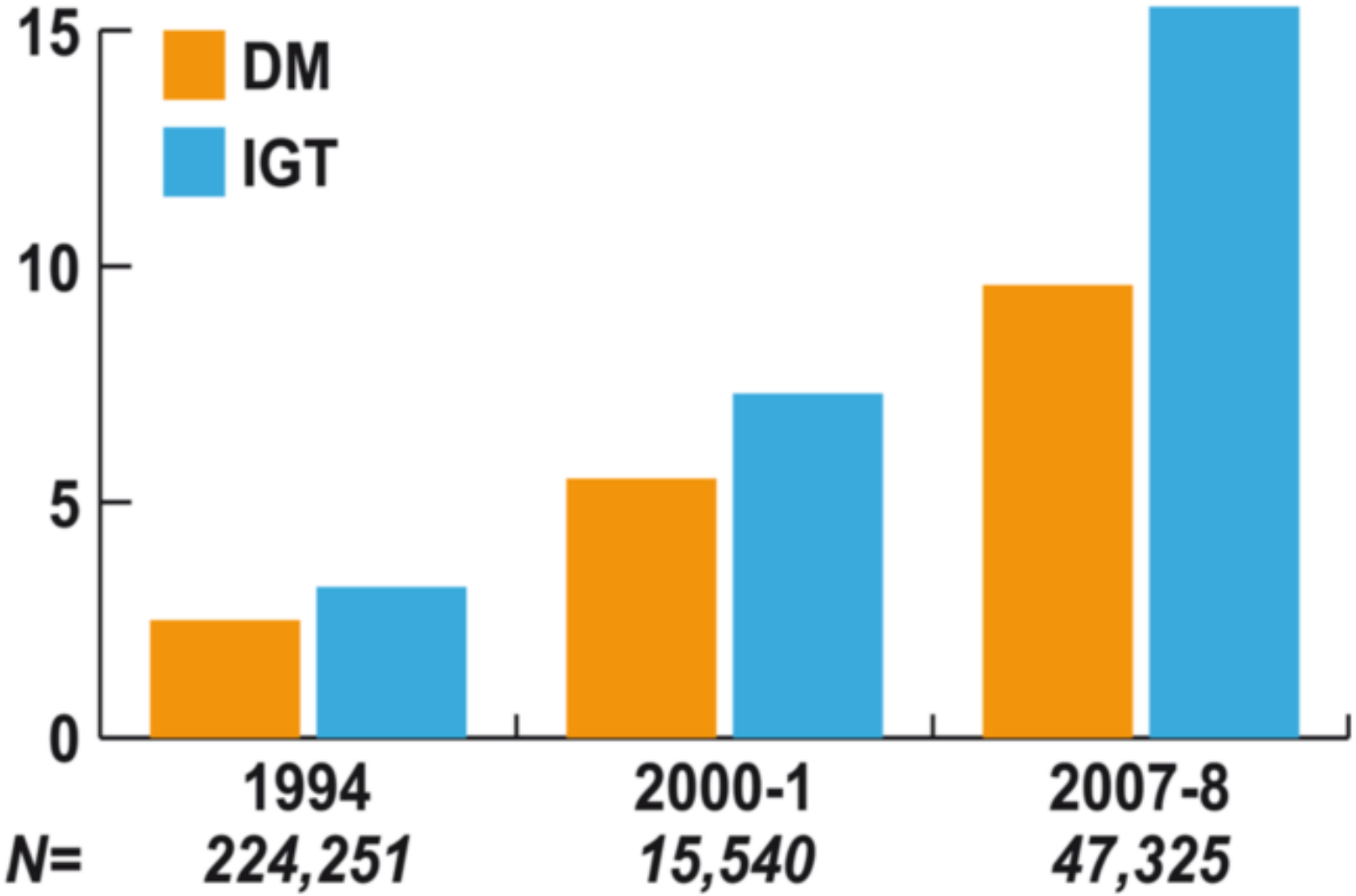


Diabetes

- 1 in 3 children born today will get DM
- 1 in 2 blacks and Hispanics will get DM
- Lifespan could start to DECREASE for first time
- Diabetes and obesity associated with heart attacks, stroke, cancer, blindness, kidney failure

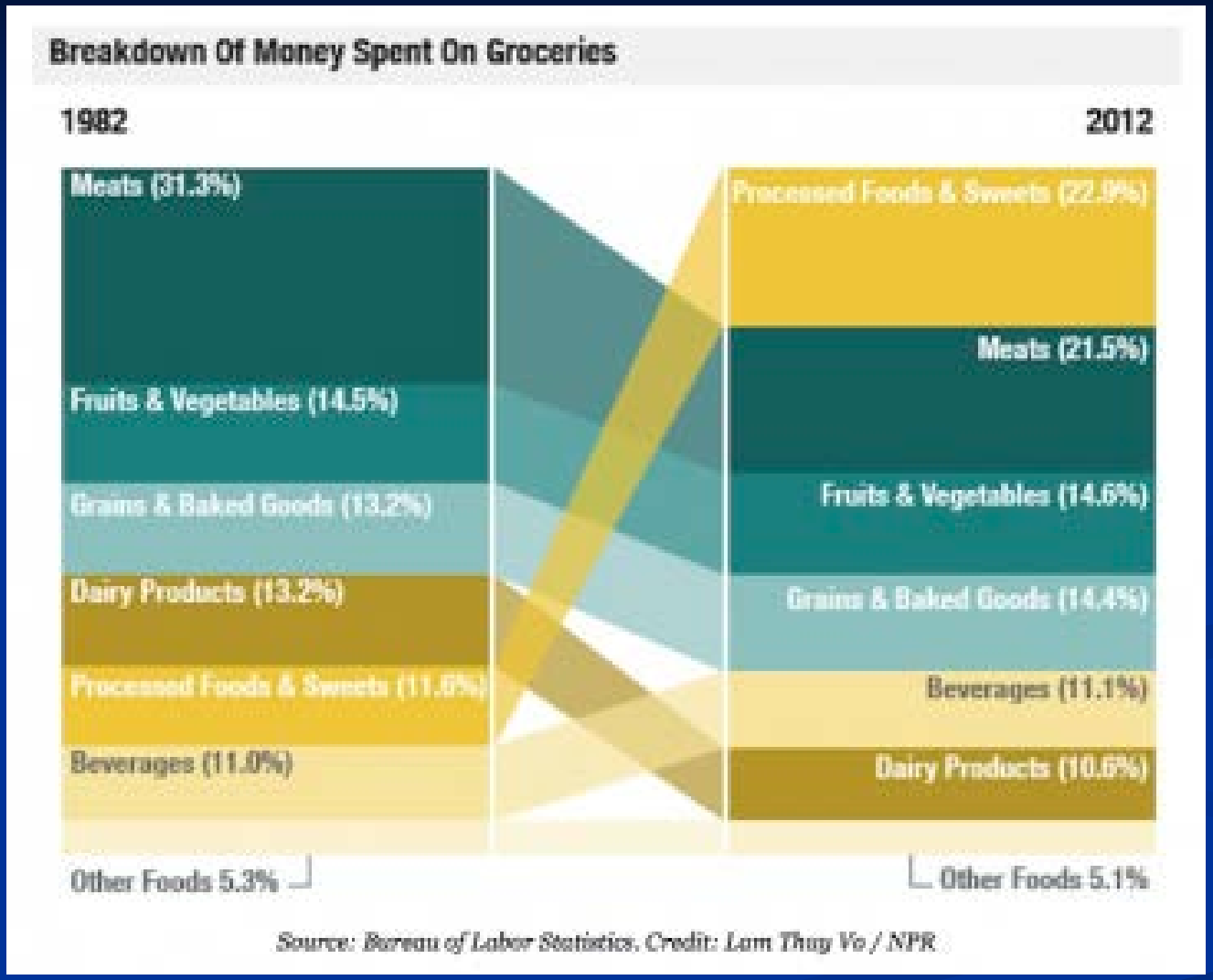

33.9
19.7
United States and Canada
72%
37.4
28.3
Europe
32%
52.8
Middle East
20
164%
79.4
31.7
India
150%
42.3
20.7
China
104%
58.1
Southeast Asia
22.3
161%
Sub-Saharan Africa
18.6
7.1
162%
33.0
13.3
148%
Latin America and the Caribbean
Australia
0.9
1.7
89%
2000
2030

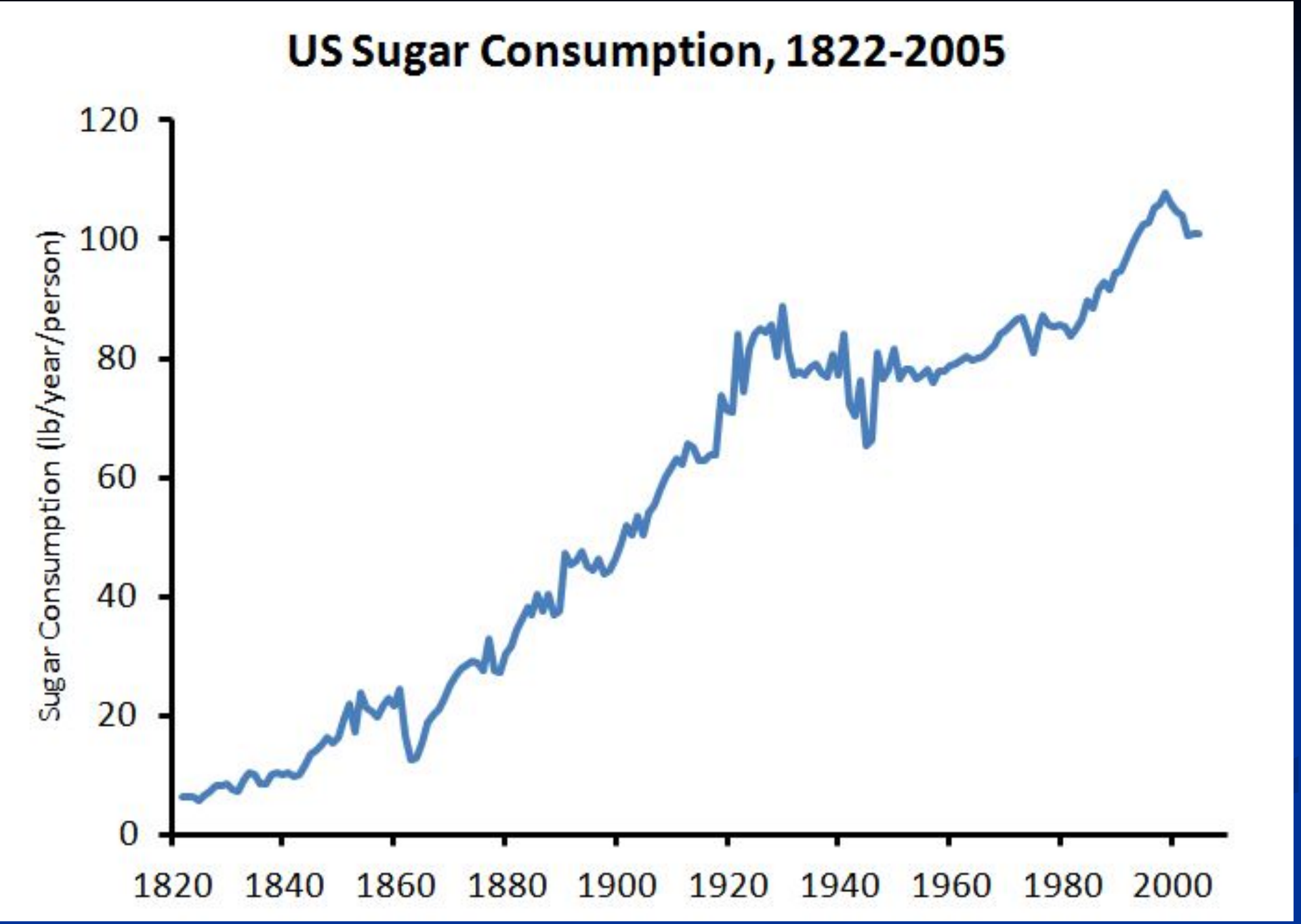
Diabetes in China : 1994-

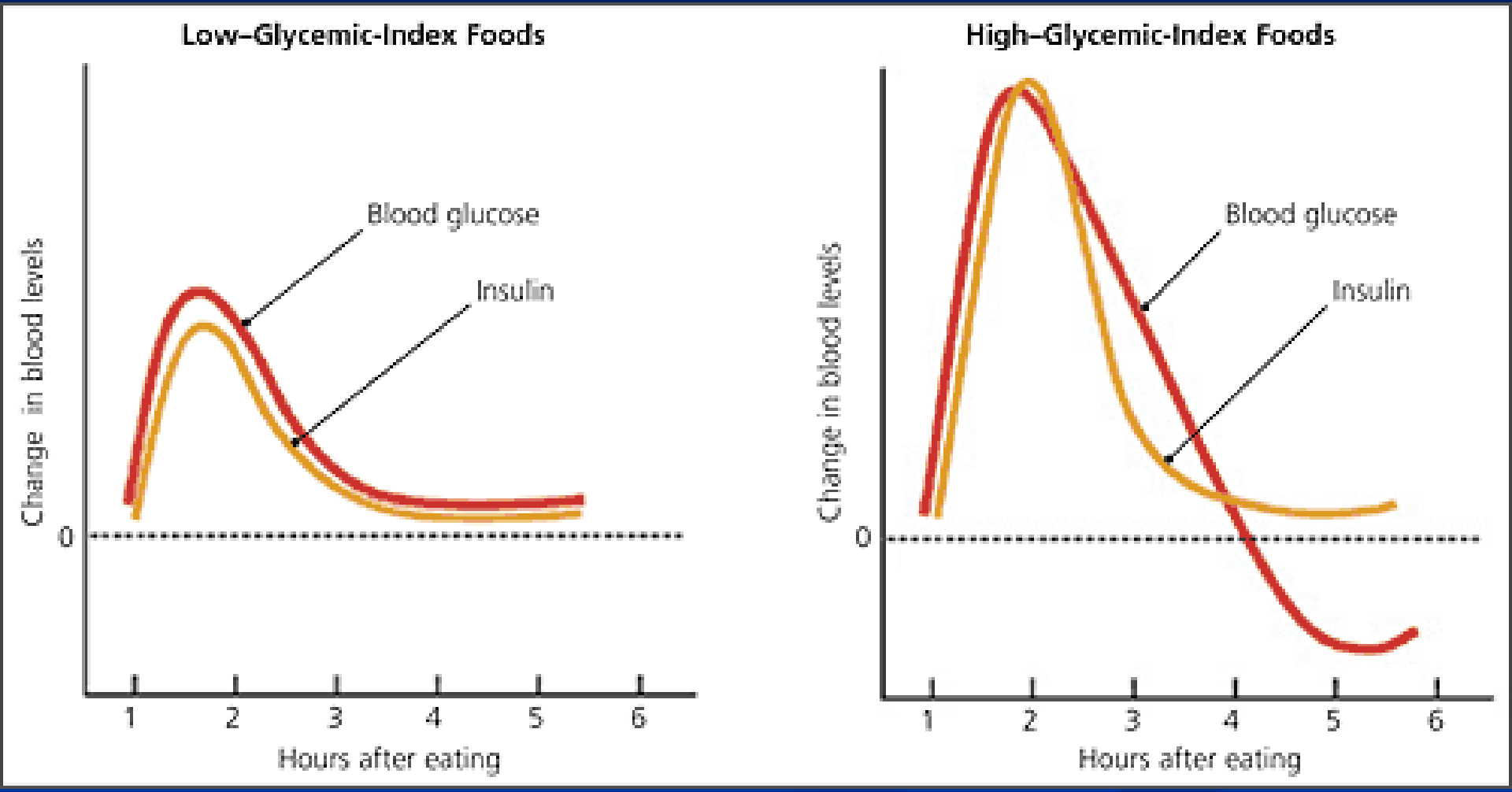


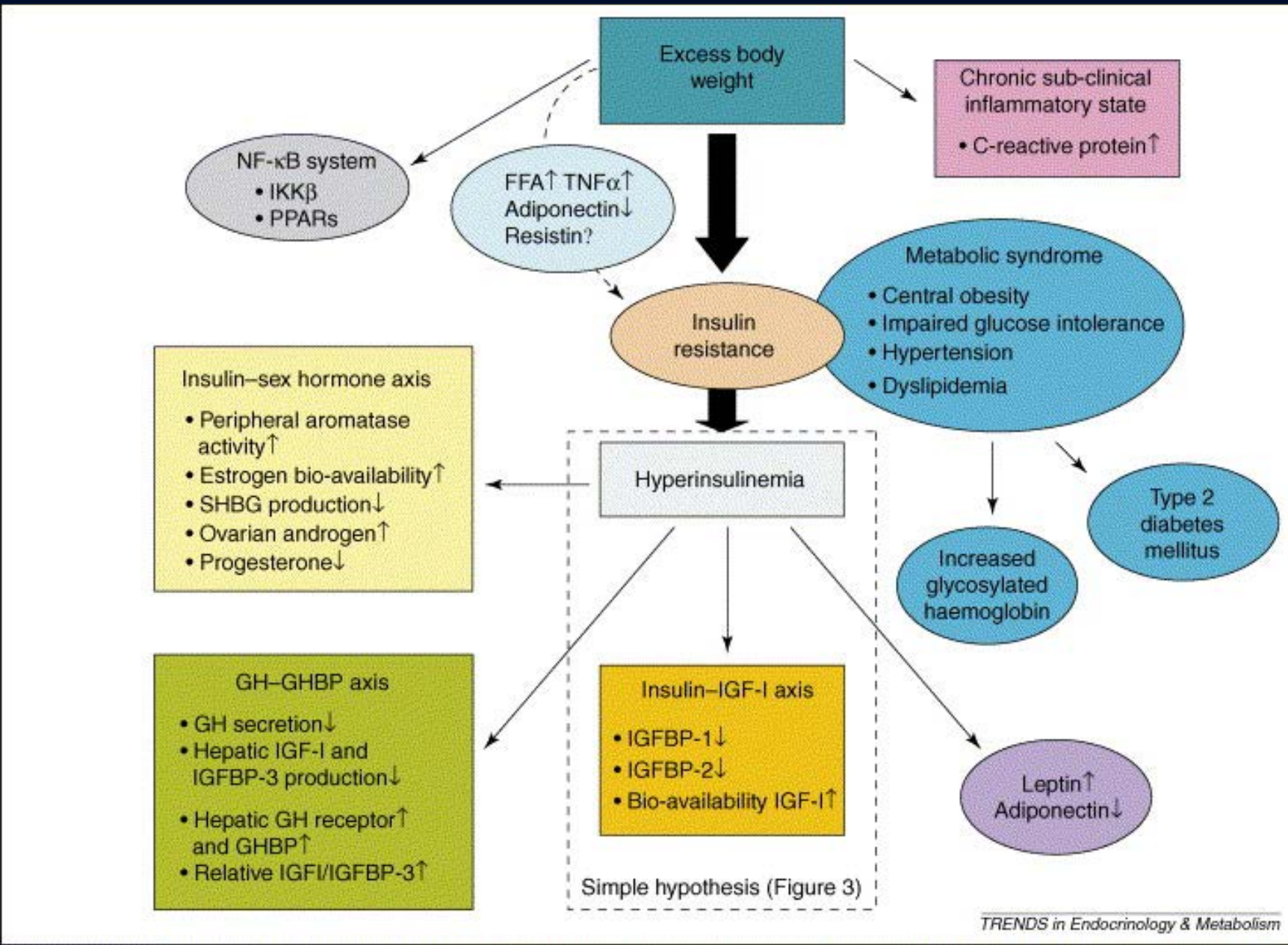
Yang NEJM 2010 362 1090-101

SO WHAT HAS CHANGED IN OUR DIETS?


Breakdown Of Money Spent On Groceries
1982
2012
Meats (31.3%)
Fruits & Vegetables (14.5%)
Grains & Baked Goods (13.2%)
Dairy Products (13.2%)
Processed Foods & Sweets (11.6%)
Beverages (11.0%)
Other Foods 5.3%
Processed Foods & Sweets (22.9%)
Meats (21.5%)
Fruits & Vegetables (14.6%)
Grains & Baked Goods (14.4%)
Beverages (11.1%)
Dairy Products (10.6%)
Other Foods 5.1%
Source: Bureau of Labor Statistics. Credit: Lam Thuy Vo / NPR


US Sugar Consumption, 1822-2005
Sugar Consumption (lb/year/person)
120
100
80
60
40
20
0
1820
1840
1860
1880
1900
1920
1940
1960
1980
2000


Low–Glycemic-Index Foods
Blood glucose
Insulin
Change in blood levels
0
1
2
3
4
5
6
Hours after eating
High–Glycemic-Index Foods
Blood glucose
Insulin
Change in blood levels
0
1
2
3
4
5
6
Hours after eating


Excess body weight
Chronic sub-clinical inflammatory state
• C-reactive protein↑
NF-κB system
• IKKβ
• PPARs
FFA↑ TNFα↑
Adiponectin↓
Resistin?
Insulin resistance
Metabolic syndrome
• Central obesity
• Impaired glucose intolerance
• Hypertension
• Dyslipidemia
Insulin–sex hormone axis
• Peripheral aromatase activity↑
• Estrogen bio-availability↑
• SHBG production↓
• Ovarian androgen↑
• Progesterone↓
Hyperinsulinemia
Type 2 diabetes mellitus
Increased glycosylated haemoglobin
GH–GHBP axis
• GH secretion↓
• Hepatic IGF-I and IGFBP-3 production↓
• Hepatic GH receptor↑ and GHBP↑
• Relative IGFI/IGFBP-3↑
Insulin–IGF-I axis
• IGFBP-1↓
• IGFBP-2↓
• Bio-availability IGF-I↑
Leptin↑
Adiponectin↓
Simple hypothesis (Figure 3)
TRENDS in Endocrinology & Metabolism




GOOD FATS

VS.

BAD FATS




Types of Fats

Saturated fats

Animal fat: milk, meat, eggs, butter, and cheese; lard (pork fat), tallow (beef and lamb fat),

Tropical oils: coconut and palm oil

Monounsaturated fats

Olive oil

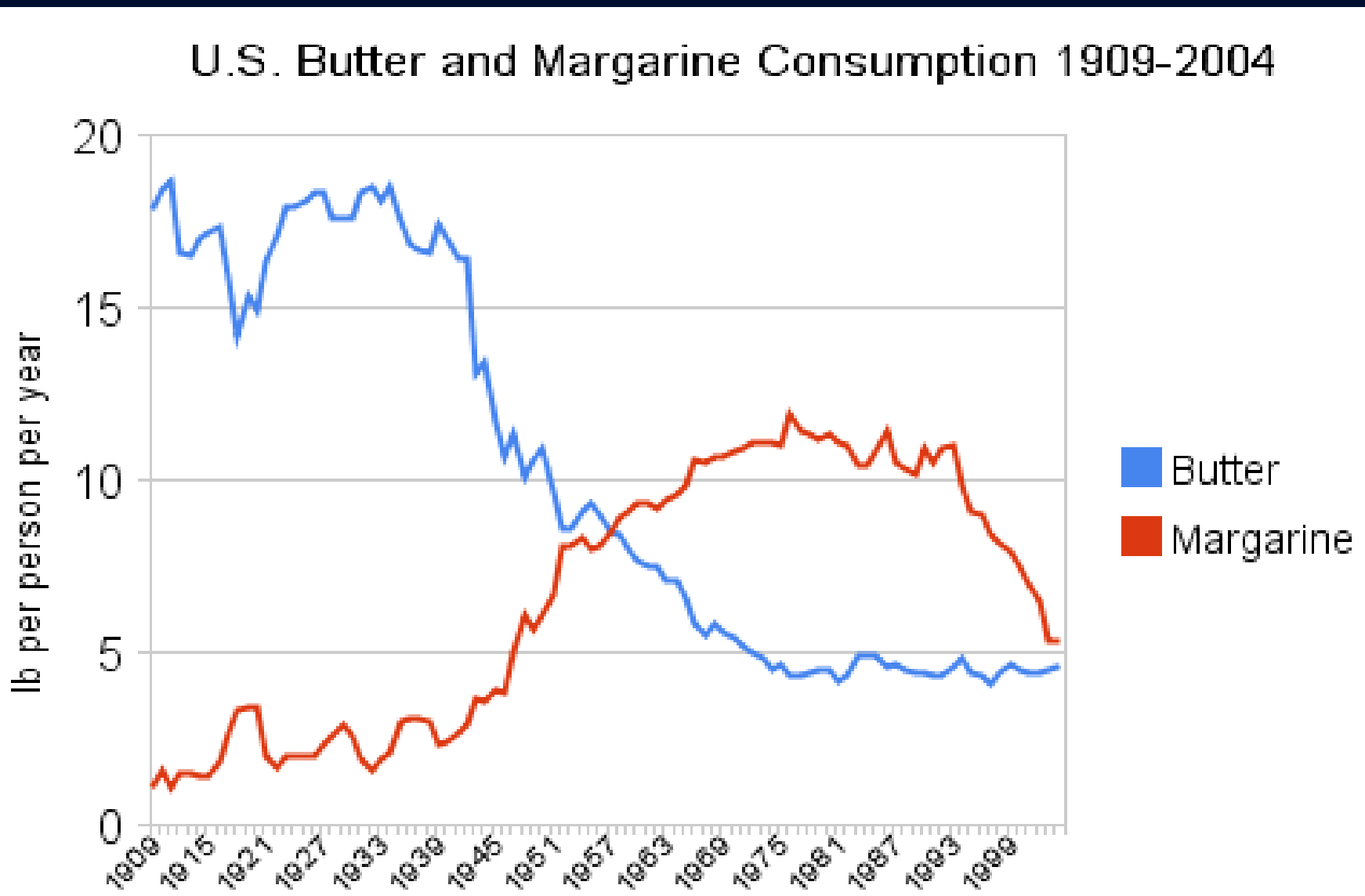
Polyunsaturated fats

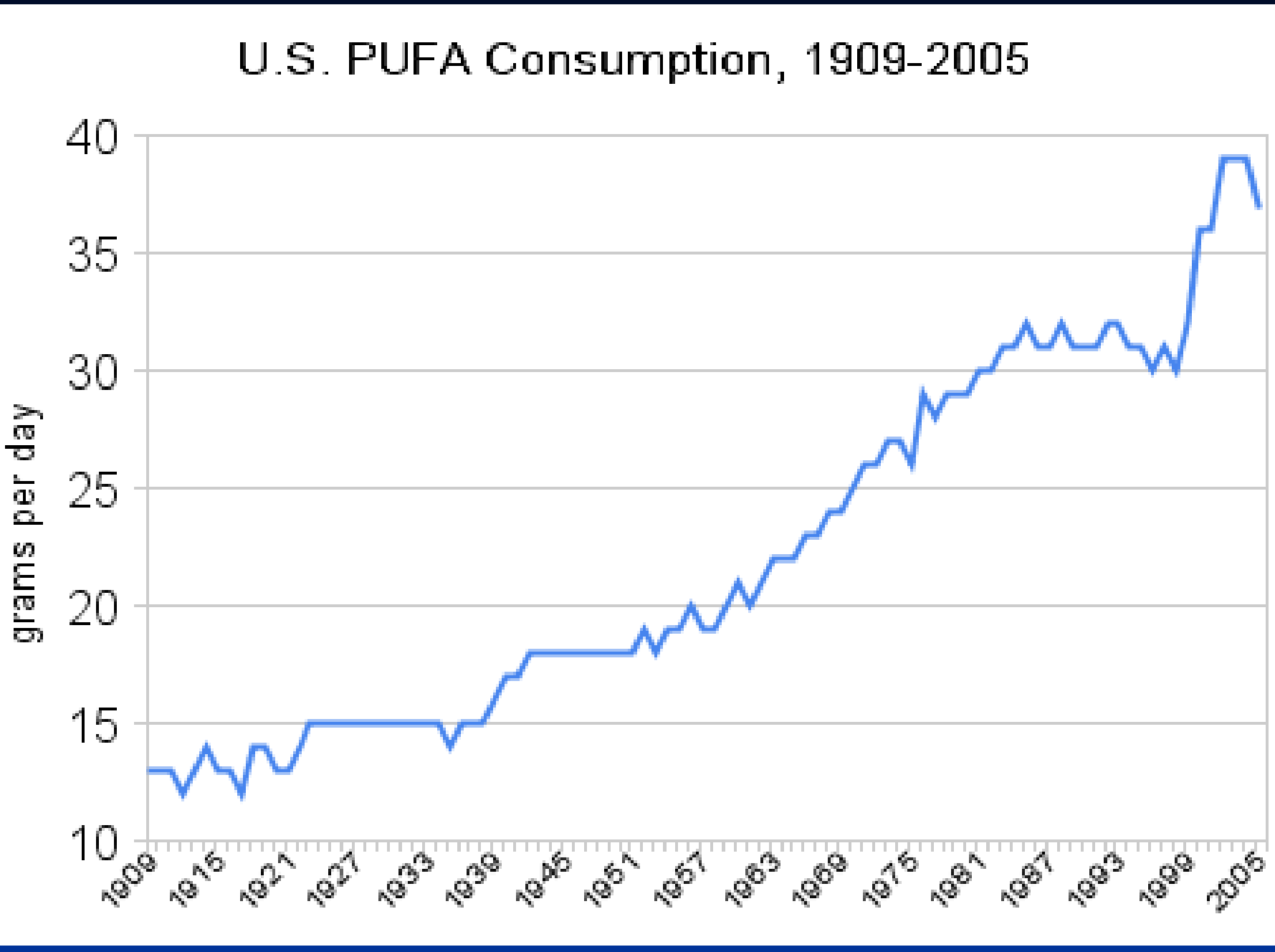
Omega 6: Vegetable oils (soybean, safflower, sunflower, corn, cottenseed, peanut, Canola)

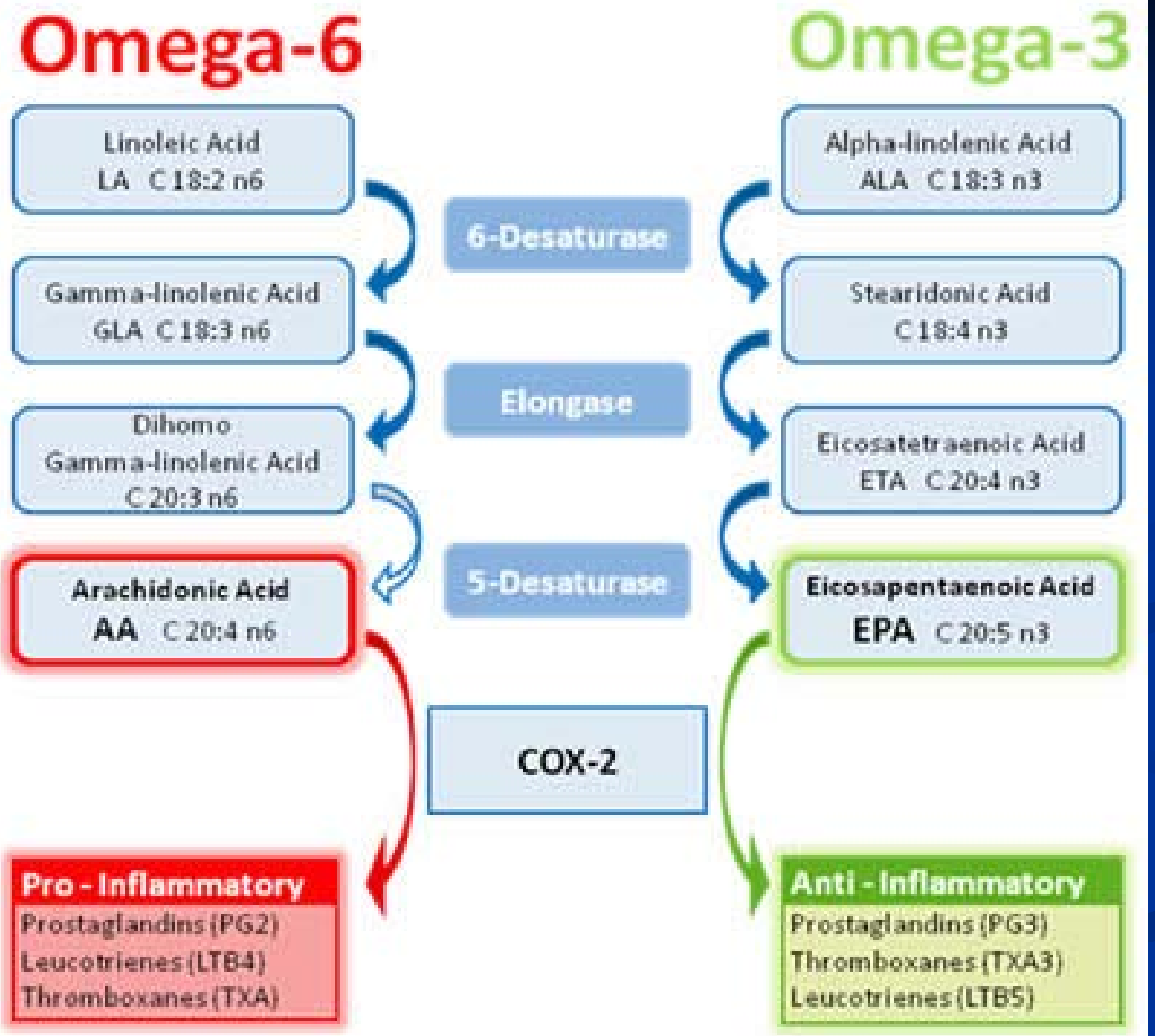
Omega 3: Fish oils

Trans fats

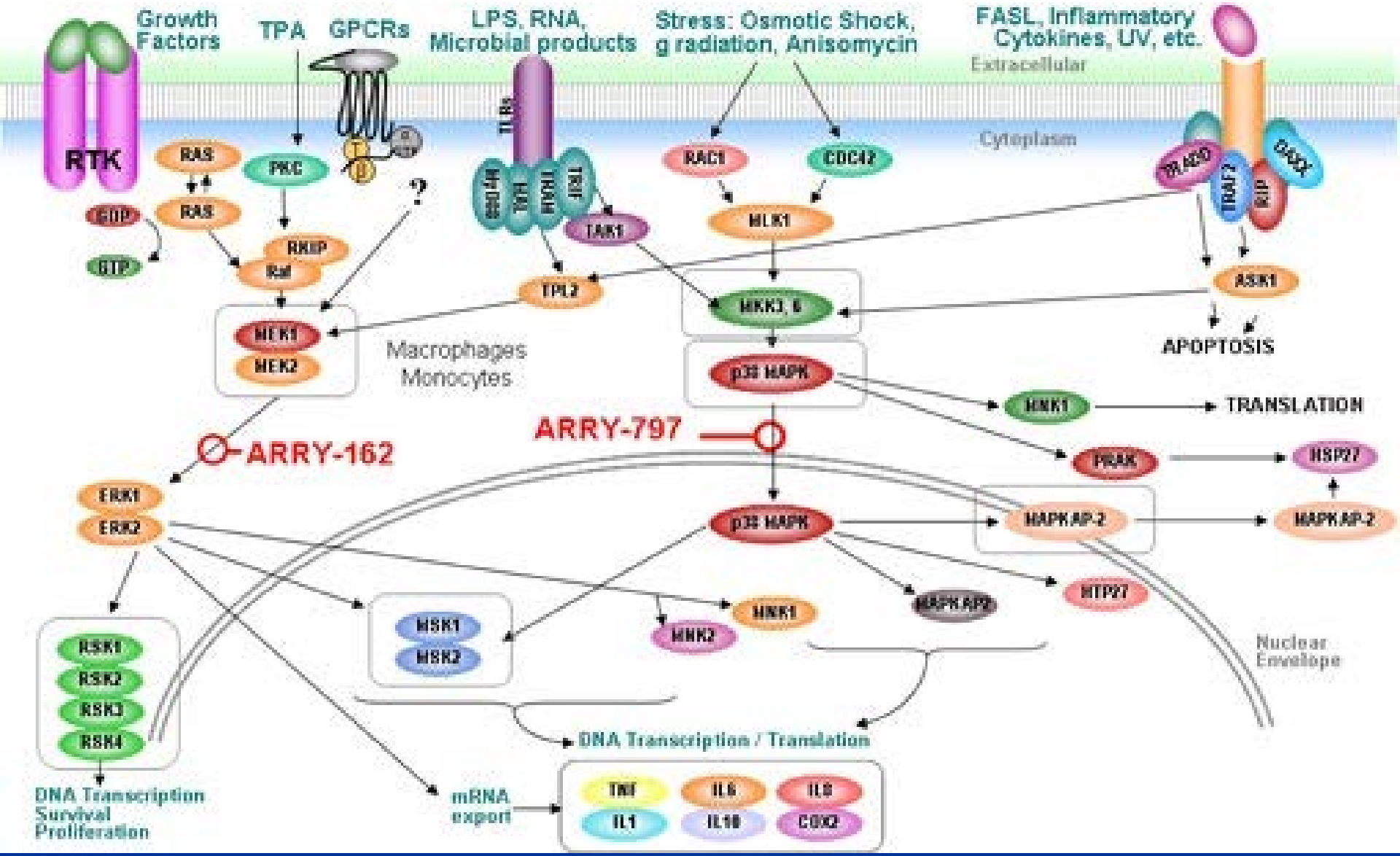
Margarine; in bakery products, snack chips, imitation cheese, and other processed foods.

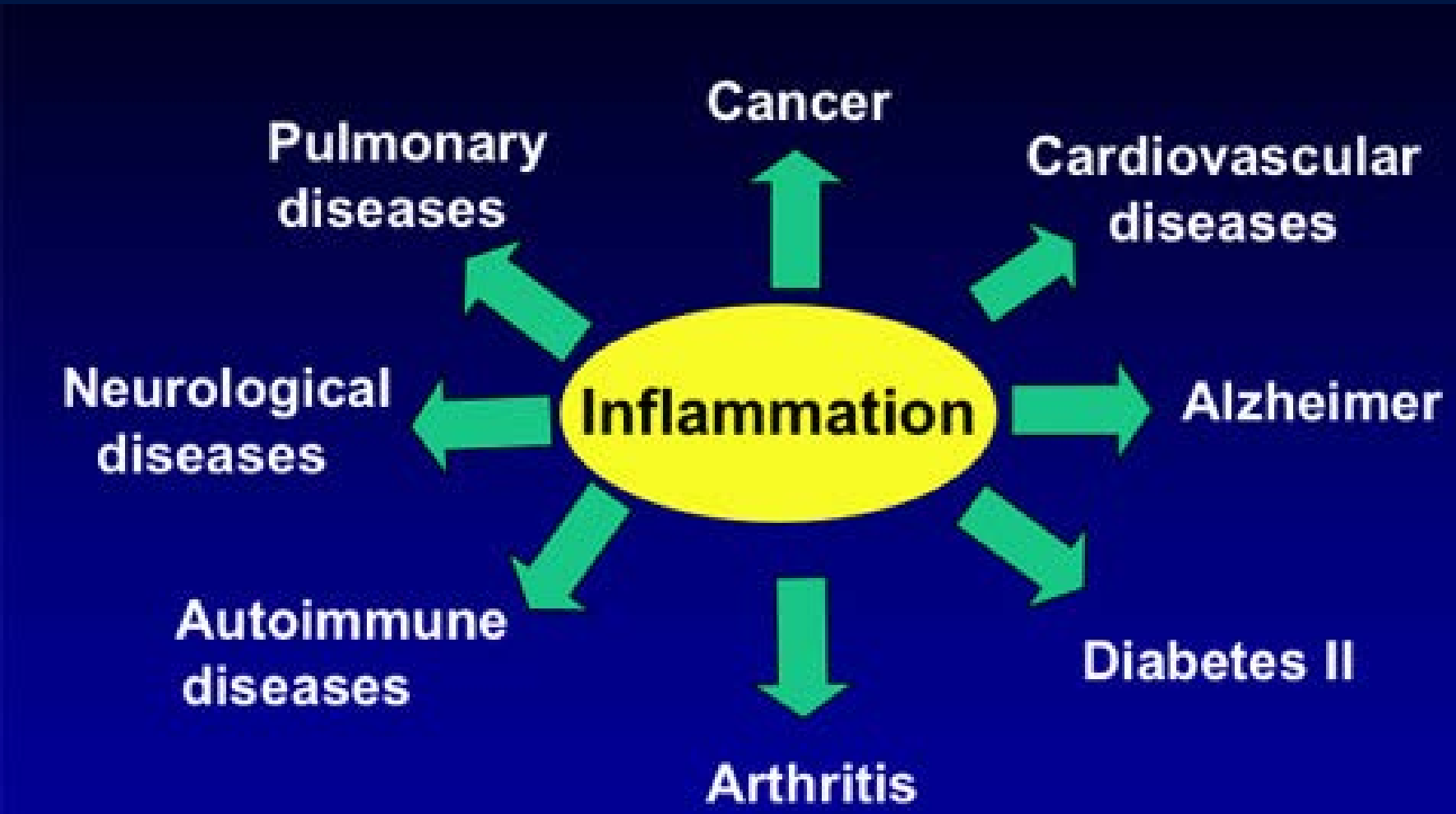

U.S. Butter and Margarine Consumption 1909-2004
lb per person per year
20
15
10
5
0
1909
1915
1921
1927
1933
1939
1945
1951
1957
1963
1969
1975
1981
1987
1993
1999
Butter
Margarine


U.S. PUFA Consumption, 1909-2005
grams per day
40
35
30
25
20
15
10
1909
1915
1921
1927
1933
1939
1945
1951
1957
1963
1969
1975
1981
1987
1993
1999
2005

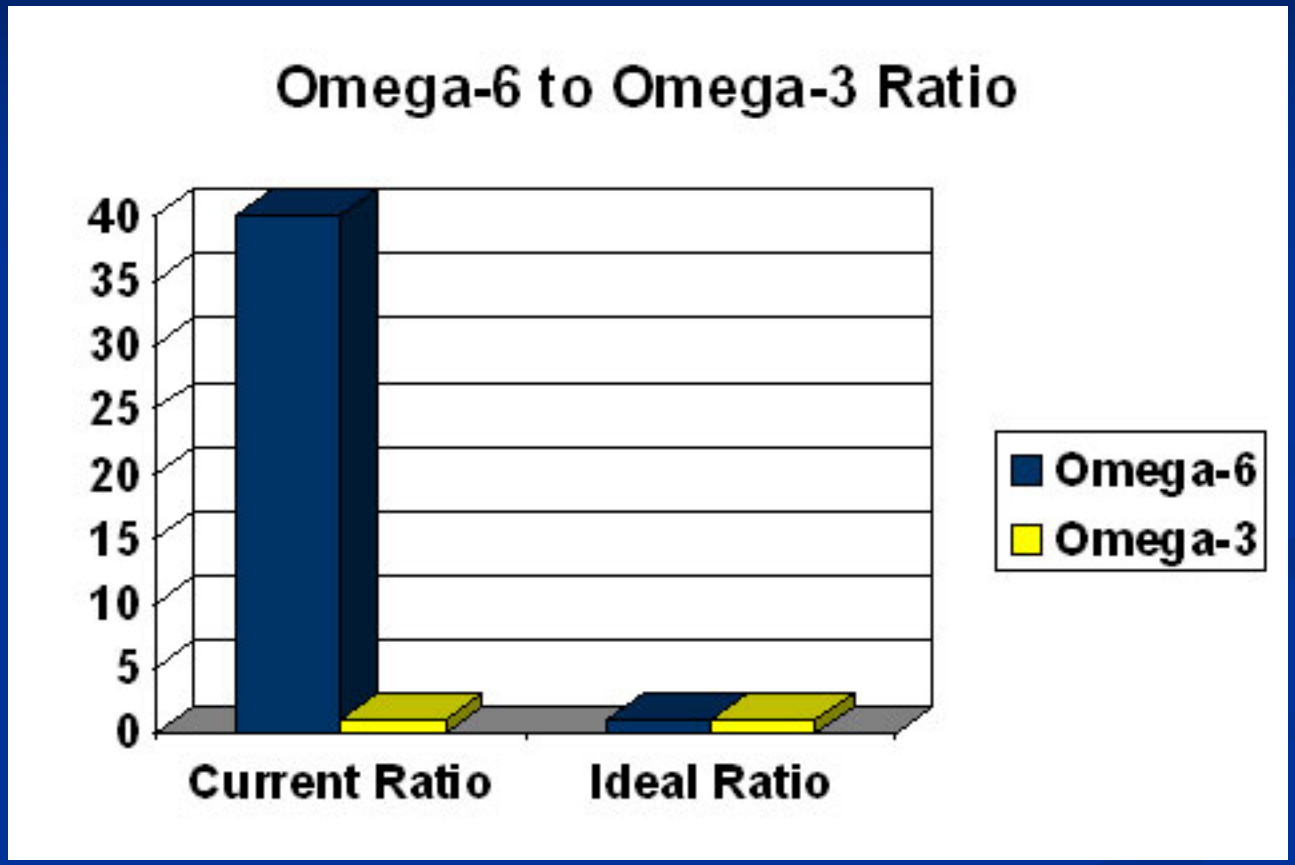

Omega-6
Omega-3
Linoleic Acid
LA C 18:2 n6
Alpha-linolenic Acid
ALA C 18:3 n3
6-Desaturase
Gamma-linolenic Acid
GLA C 18:3 n6
Stearidonic Acid
C 18:4 n3
Elongase
Dihomo
Gamma-linolenic Acid
C 20:3 n6
Eicosatetraenoic Acid
ETA C 20:4 n3
Arachidonic Acid
AA C 20:4 n6
5-Desaturase
Eicosapentaenoic Acid
EPA C 20:5 n3
COX-2
Pro - Inflammatory
Prostaglandins (PG2)
Leucotrienes (LTB4)
Thromboxanes (TXA)
Anti - Inflammatory
Prostaglandins (PG3)
Thromboxanes (TXA3)
Leucotrienes (LTB5)

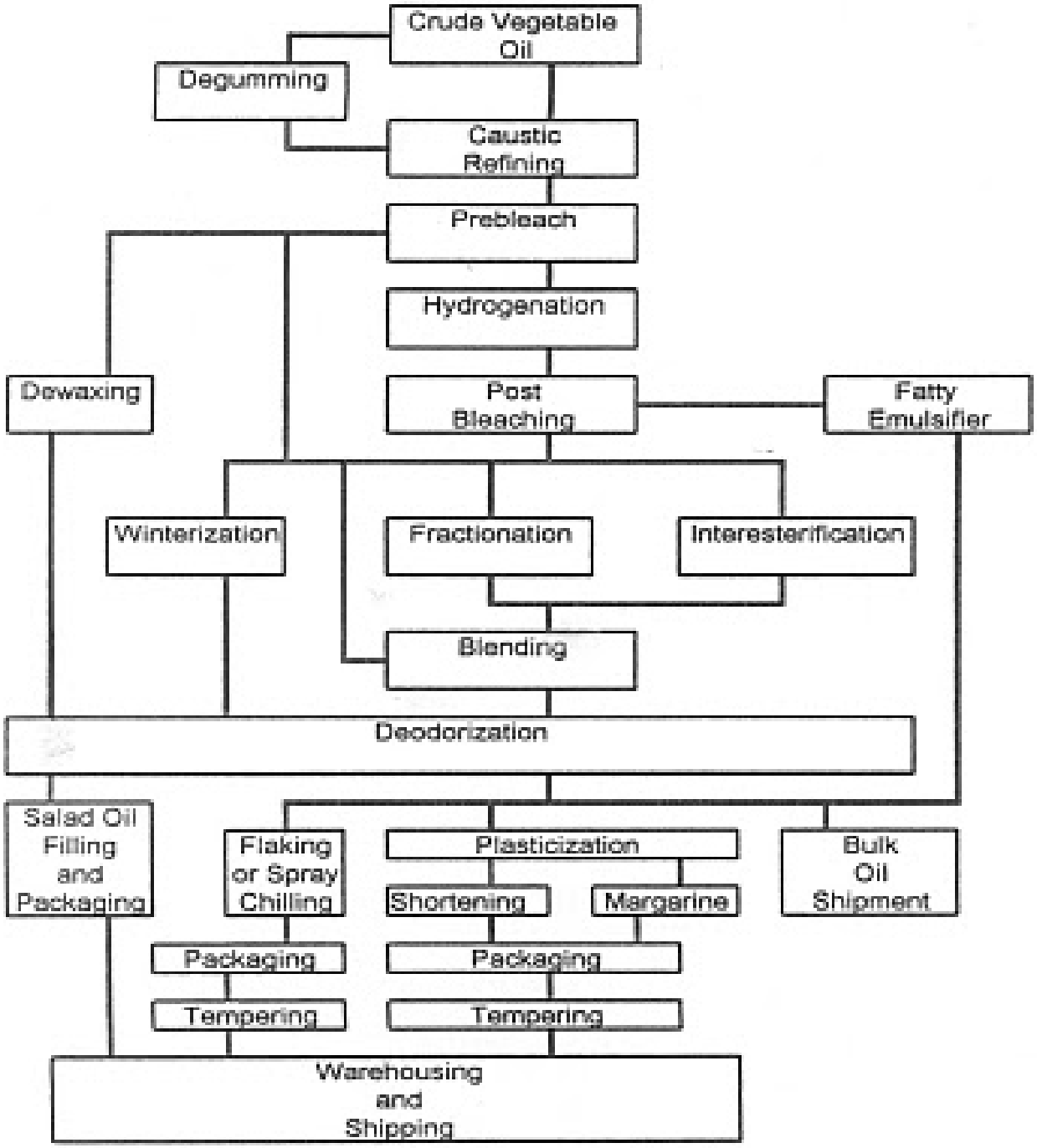
Inflammation




Cancer
Pulmonary diseases
Cardiovascular diseases
Neurological diseases
Inflammation
Alzheimer
Autoimmune diseases
Diabetes II
Arthritis

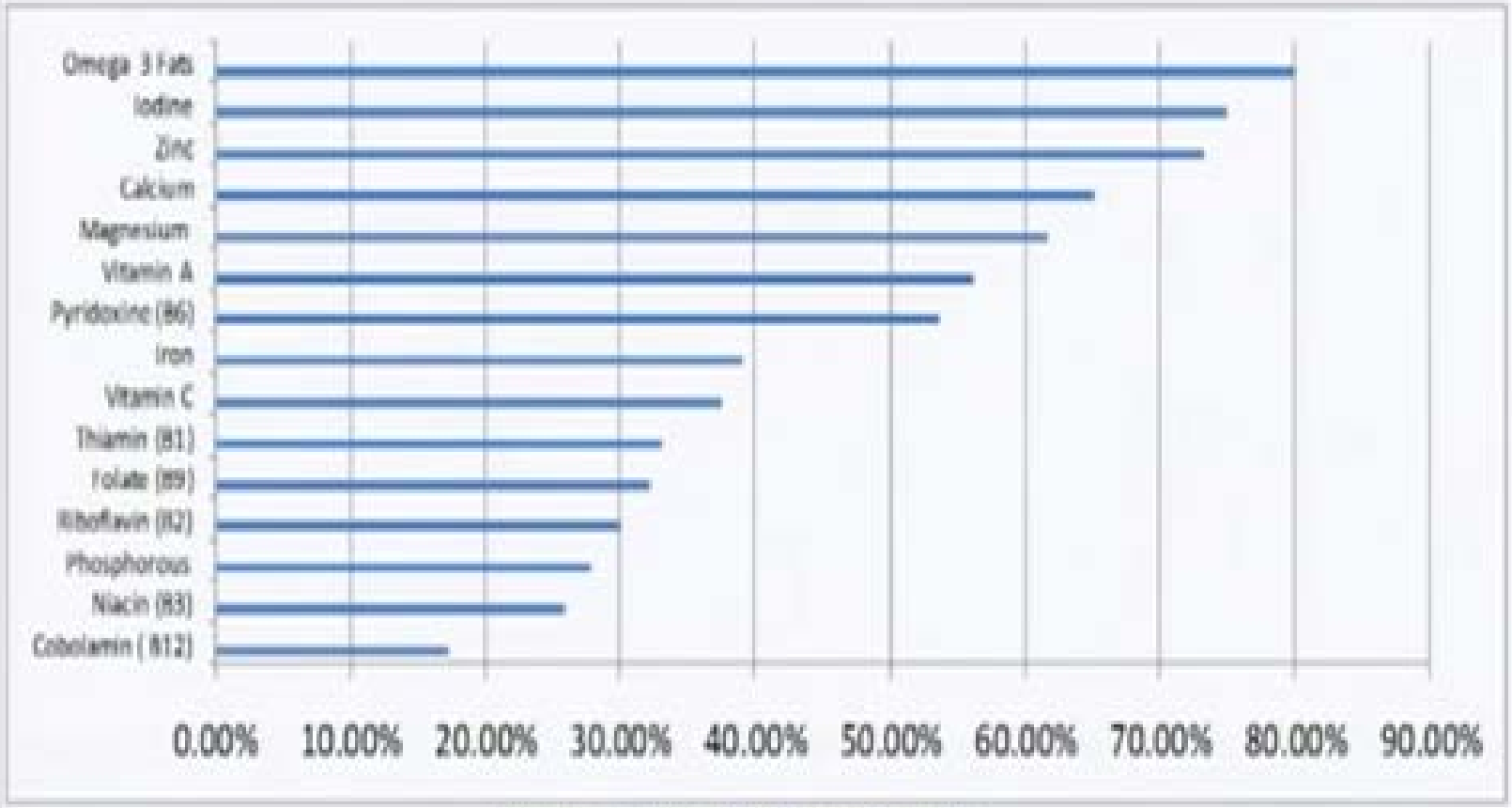

IDEAL RATIO
omega 6
1 : 1
omega 3


Omega-6 to Omega-3 Ratio
40
35
30
25
20
15
10
5
0
Current Ratio
Ideal Ratio
Omega-6
Omega-3


Crude Vegetable Oil
Degumming
Caustic Refining
Prebleach
Hydrogenation
Dewaxing
Post Bleaching
Fatty Emulsifier
Winterization
Fractionation
Interesterification
Blending
Deodorization
Salad Oil Filling and Packaging
Flaking or Spray Chilling
Plasticization
Bulk Oil Shipment
Shortening
Margarine
Packaging
Packaging
Tempering
Tempering
Warehousing and Shipping


Lay's
Wavy
TEXAS

% Americans with Intake Below Recommended Daily Allowance



Origins and evolution of the Western diet: health implications for the 21st century.


Weetabix
Bakers
CoCat
WALKERS
Mars
Twirl

Nutrition and Cancer

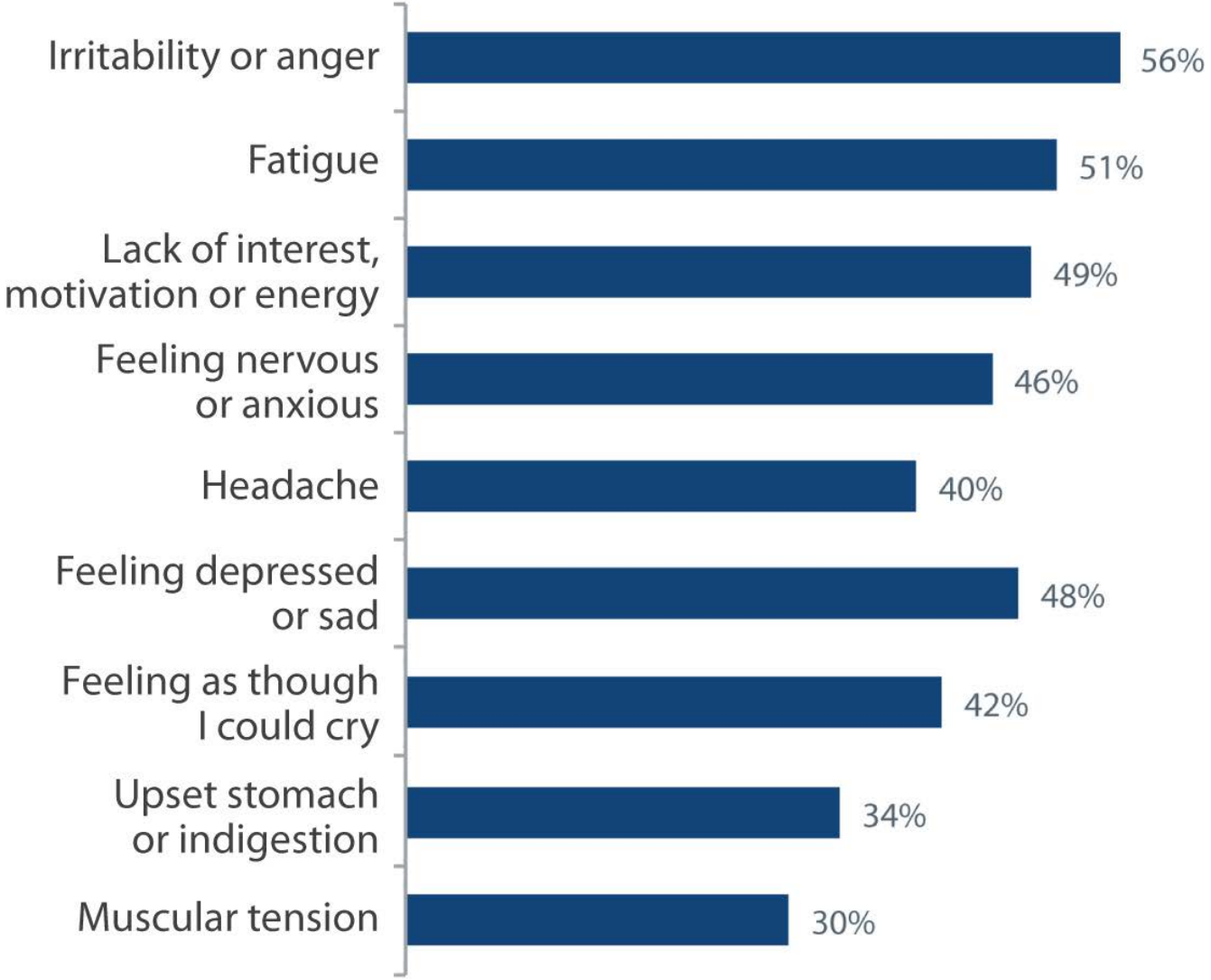
- Weight matters (aim for BMI under 25)
- Source of food matters
- Exercise is associated with a decreased incidence of cancer
- Nutrient Density matters
- Diet is complex but we are eating more:
  - Sugars/Simple Carbohydrates
  - Processed Food
  - Industrially Processed Oils


YOU ARE WHAT YOU EAT!

Stress

- … any event in which environmental demands, internal demands, or both tax or exceed the adaptive resources of an individual – Richard Lazarus

Physical Symptoms of Stress for Adults with a Fair/Poor Health Rating



BASE: Fair/Poor (n=280)
Q810 Which of the following, if any, have you experienced in the last month as a result of stress?

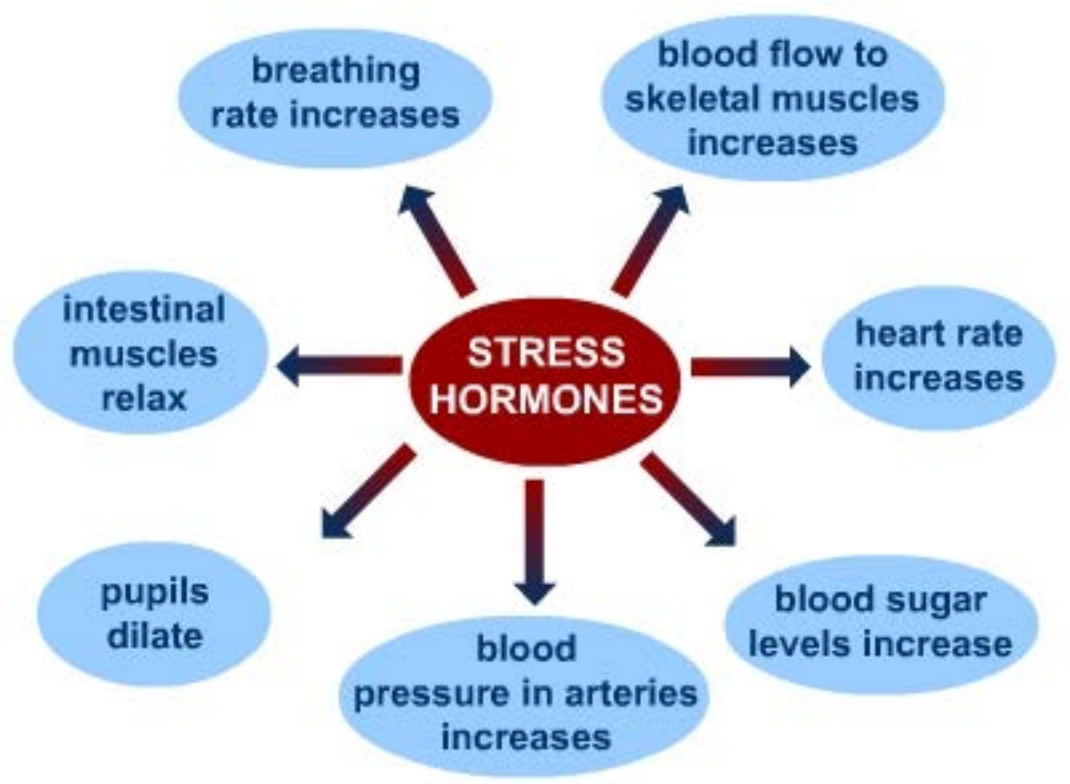
FIGHT

Flight

or

Stand your ground, defend your position, attack, dig in, persevere!

Give way, retreat, discard, remove yourself, give up, move on.


breathing rate increases
blood flow to skeletal muscles increases
intestinal muscles relax
STRESS HORMONES
heart rate increases
pupils dilate
blood pressure in arteries increases
blood sugar levels increase


Sick
Tired
Dread
Health
No Time
Headache
Fear
Time Management
Bills
Payments
Stress
Stress
Debt
No Sleep
Work
Anxiety
Fear
Worry
Job
Late Nights
Anxiety

What effect is stress having on your LONG TERM health?

Brain: Depression, Anxiety, Insomnia, Low Energy, Migraines

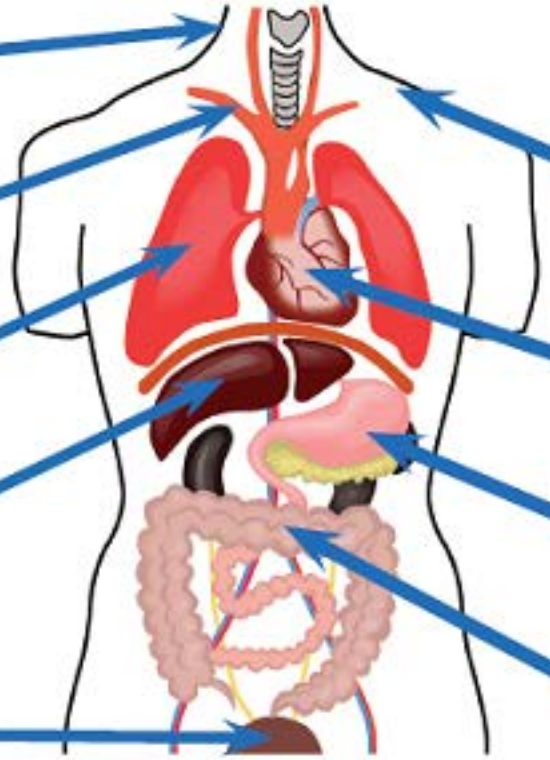
Neck:
Hypothyroidism,
Sore Throats,
Mouth Ulcers

Arteries:
High Blood Pressure,
Cholesterol, Stroke

Lungs:
Coughs, Colds,
Asthma

Liver & Pancreas:
Liver Disease,
Diabetes

Sex Glands:
PMT, Irregular Periods,
Low Libido, Prostatitis,
Night Sweats



Hair:
Hair Loss,
Thinning

Muscles & Joints:
Pain, Tension,
Fibromyalgia,
Fluid Retention

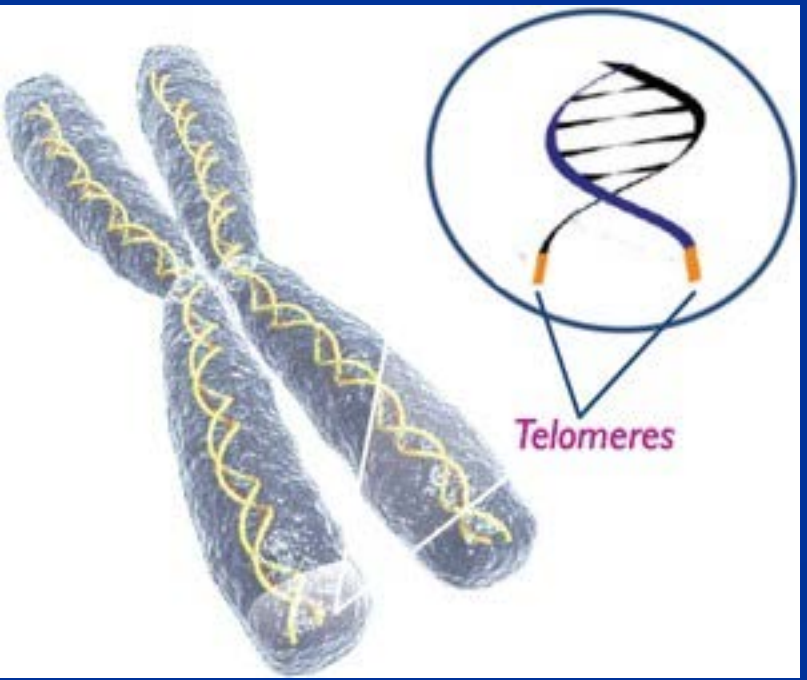
Heart:
Heart Disease,
Irregular Heart Beat

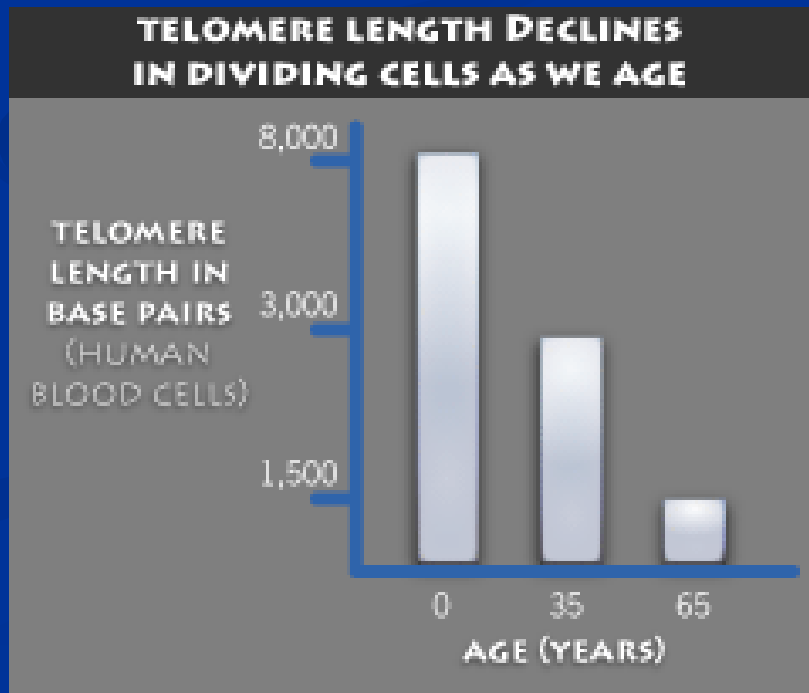
Stomach:
Ulcers, Malnutrition,
Anorexia, Constipation,
IBS, IBD

Weight Gain:
Fat around
the Middle

Skin: Ageing, Acne Rosacea, Eczema, Psoriasis, Allergies

Stress and Aging





SOME FACTORS IN AGING

Telomere Shortening

chromosomes lose telomeres over time

Chrono-logical Age

risk factors increase over time

Oxidative Stress

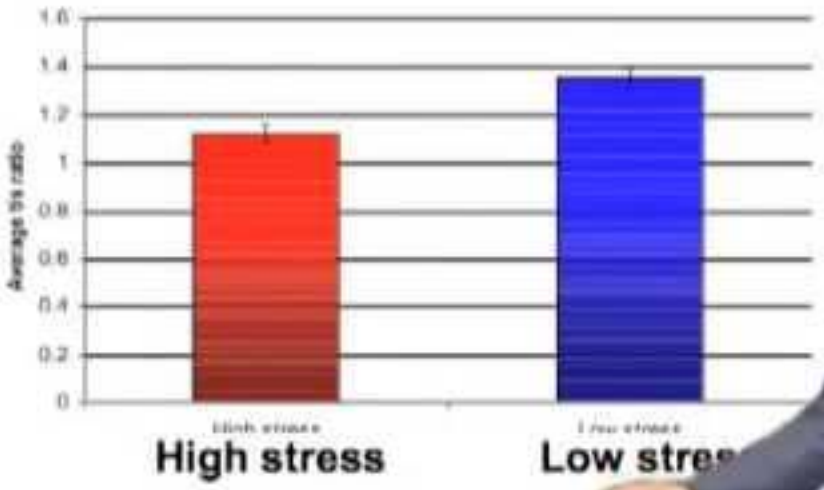
oxidants damage DNA, proteins and lipids

Glycation

glucose sugar binds to and inhibits DNA, proteins and lipids

Caregiver mothers and chronic stress

More telomere shortening in high stress group (equiv. 9 - 17 yrs of extra "aging")

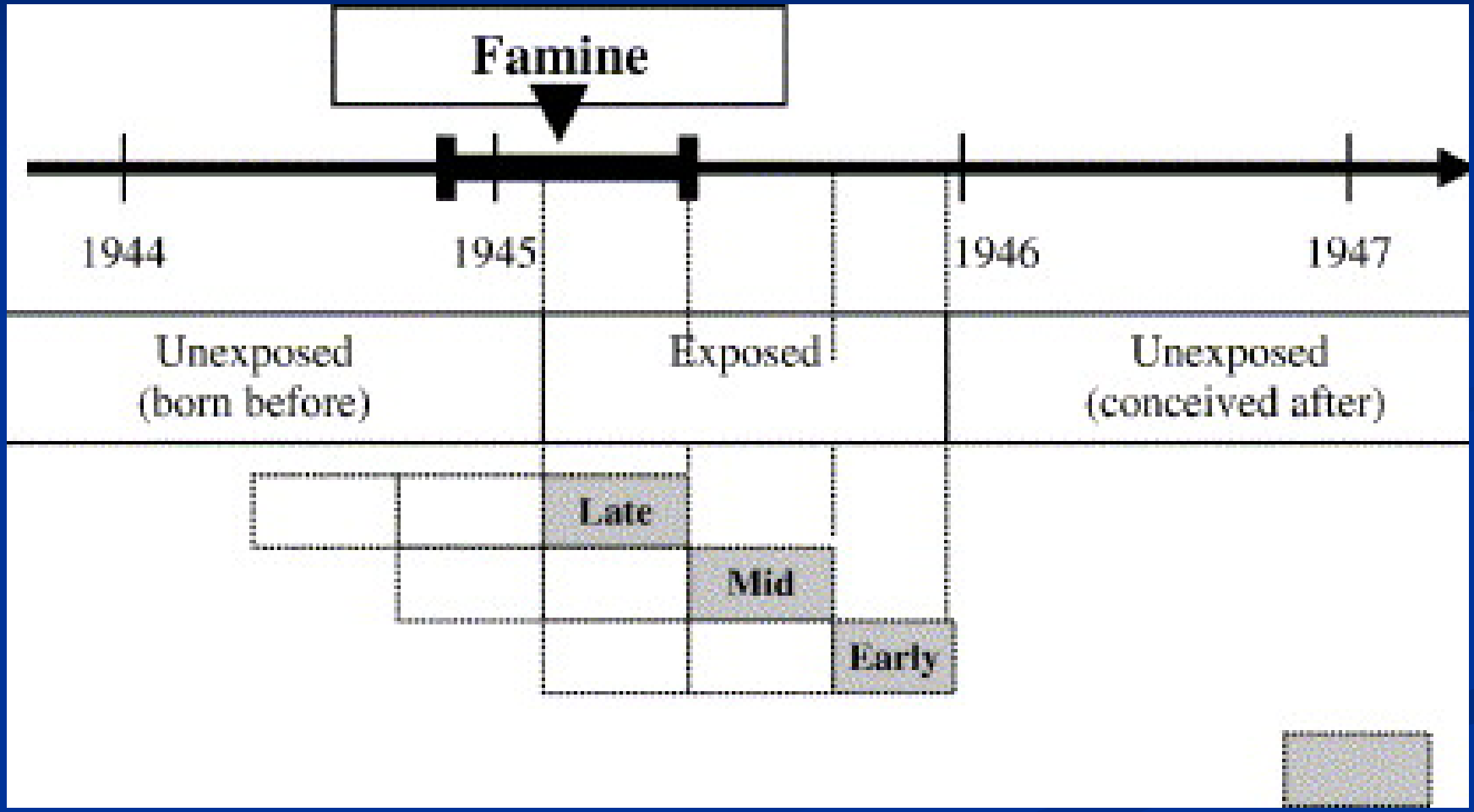


Telomeres in the lowest and h tress
quartiles of the whole sample are compare

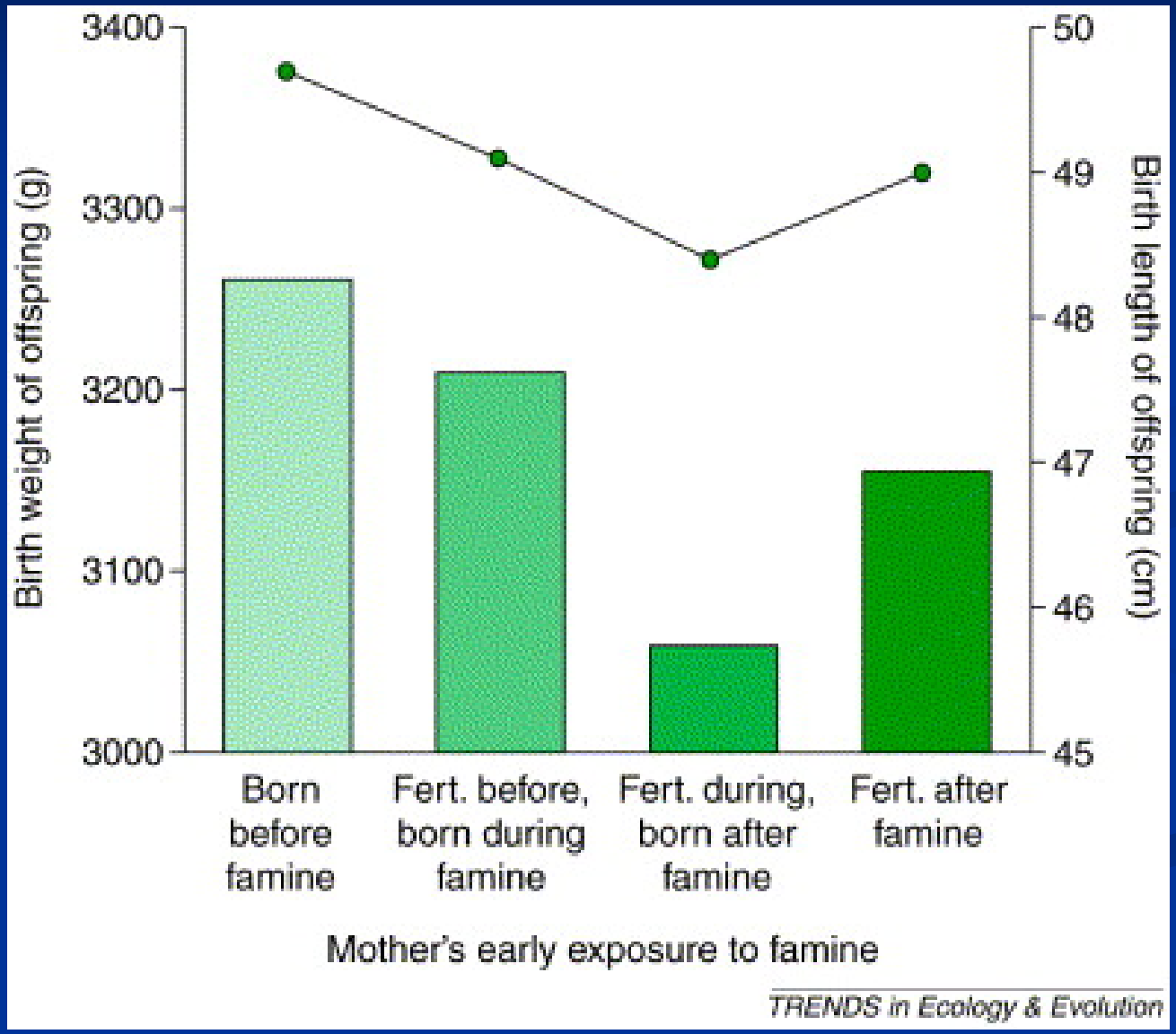
controlling for age and body mass index: F 1

Dutch Famine of 1944

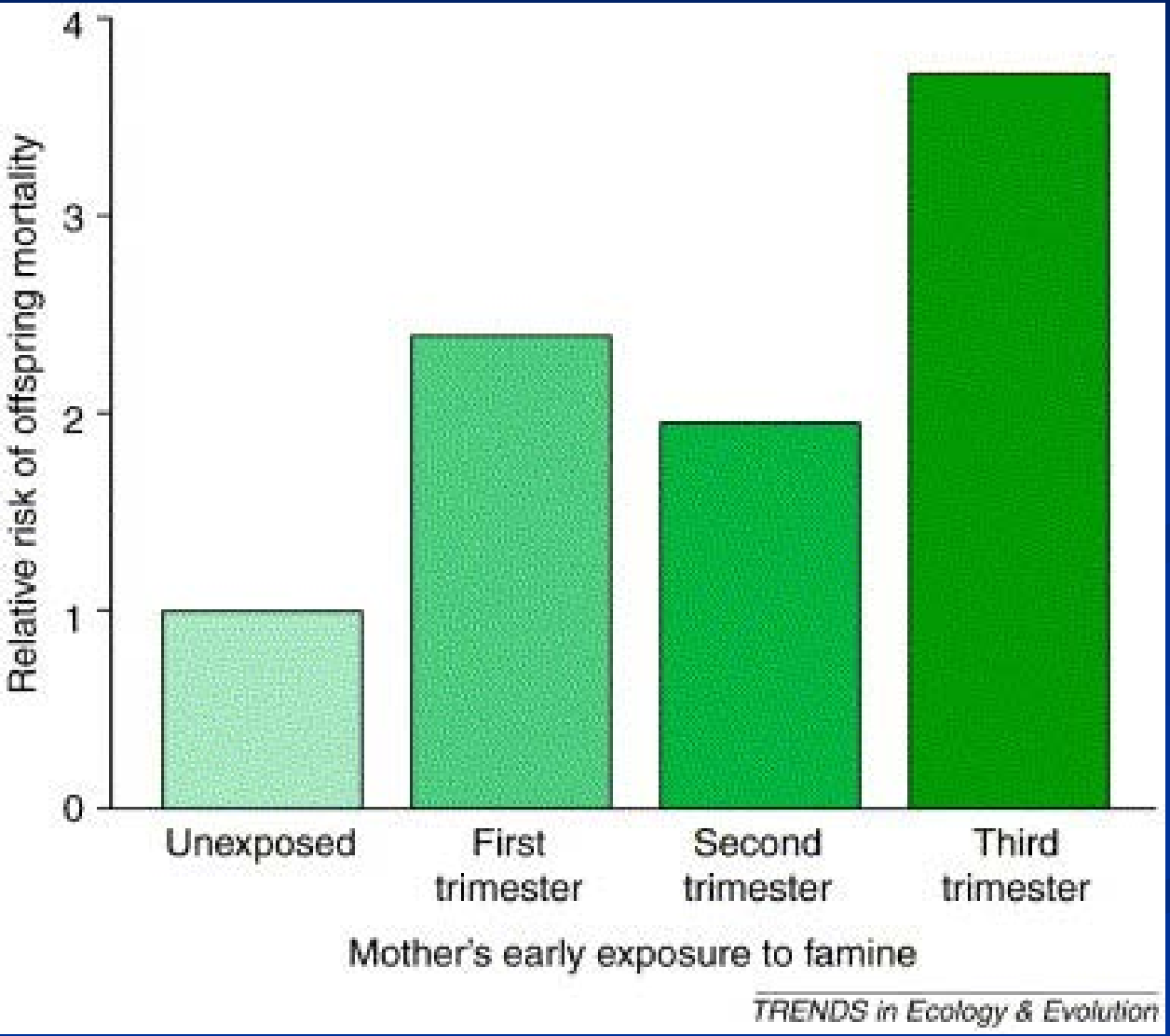
Dutch Famine



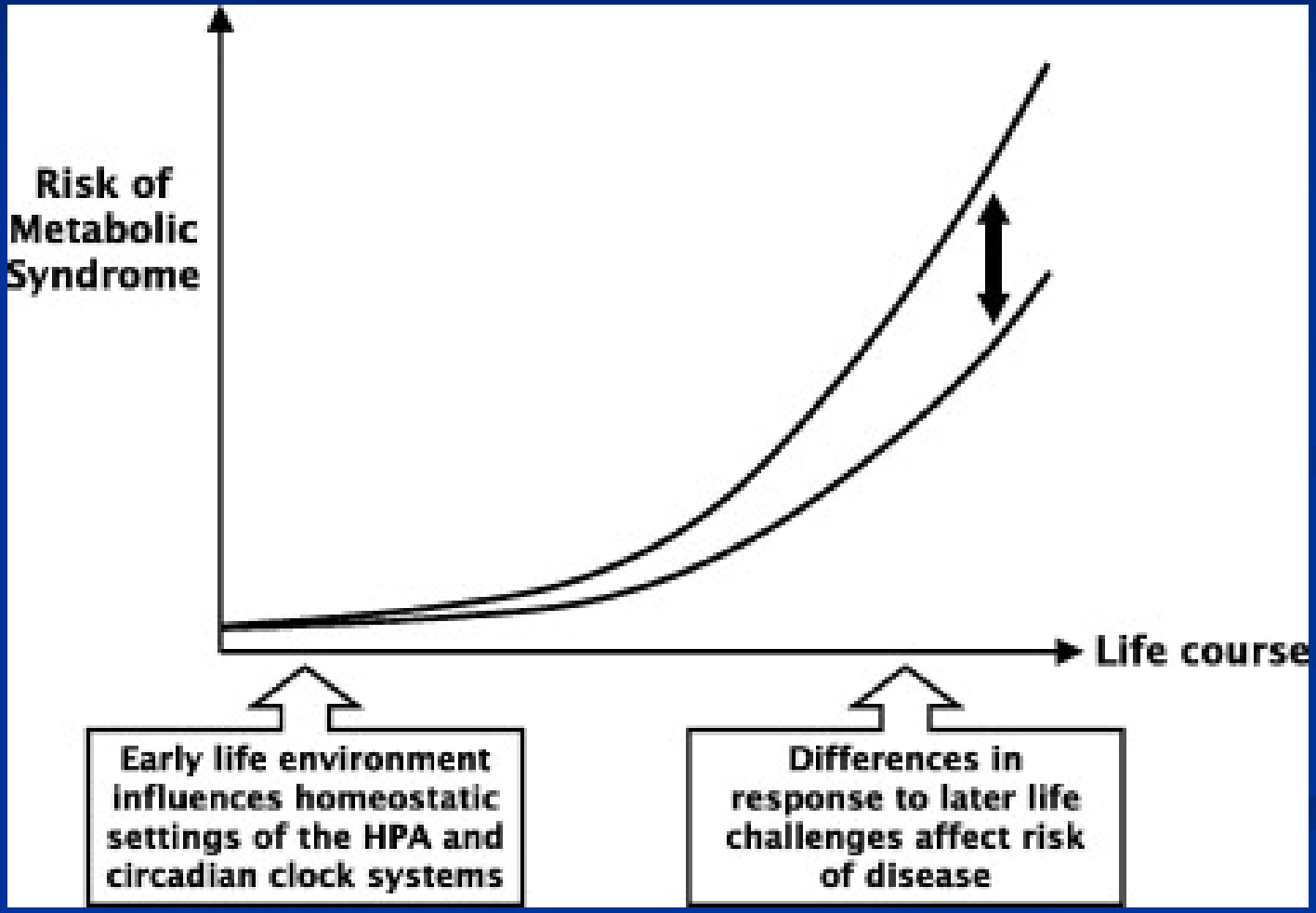
Dutch Famine



Dutch Famine



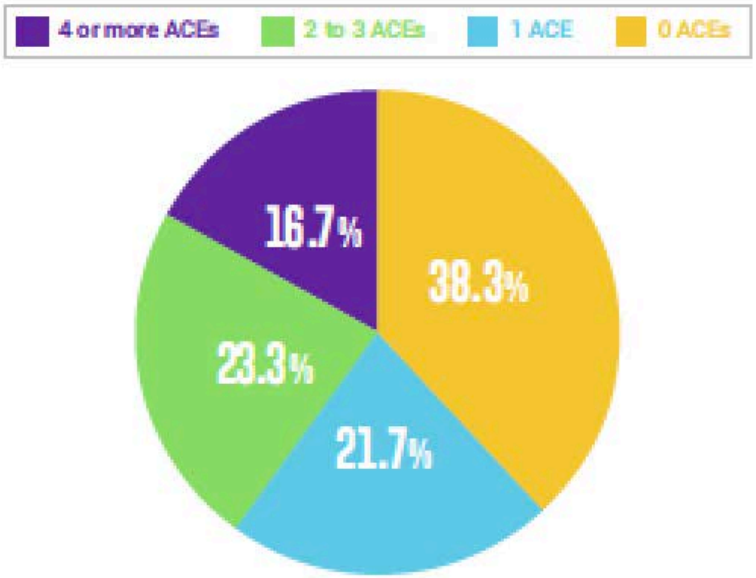
Dutch Famine



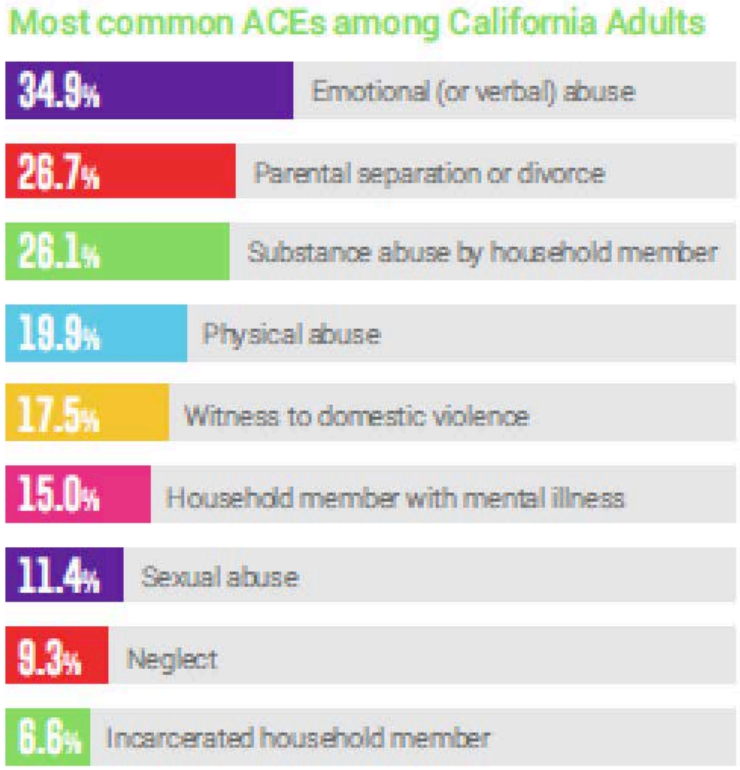
ADVERSE CHILDHOOD EXPERIENCES STUDY (ACES)

KEY FINDINGS

In California, **61.7%** of adults have experienced at least one ACE and **one in six**, or 16.7%, have experienced four or more ACEs. The most common ACE among California adults is emotional (or verbal) abuse.



Prevalence of number of ACEs among California adults

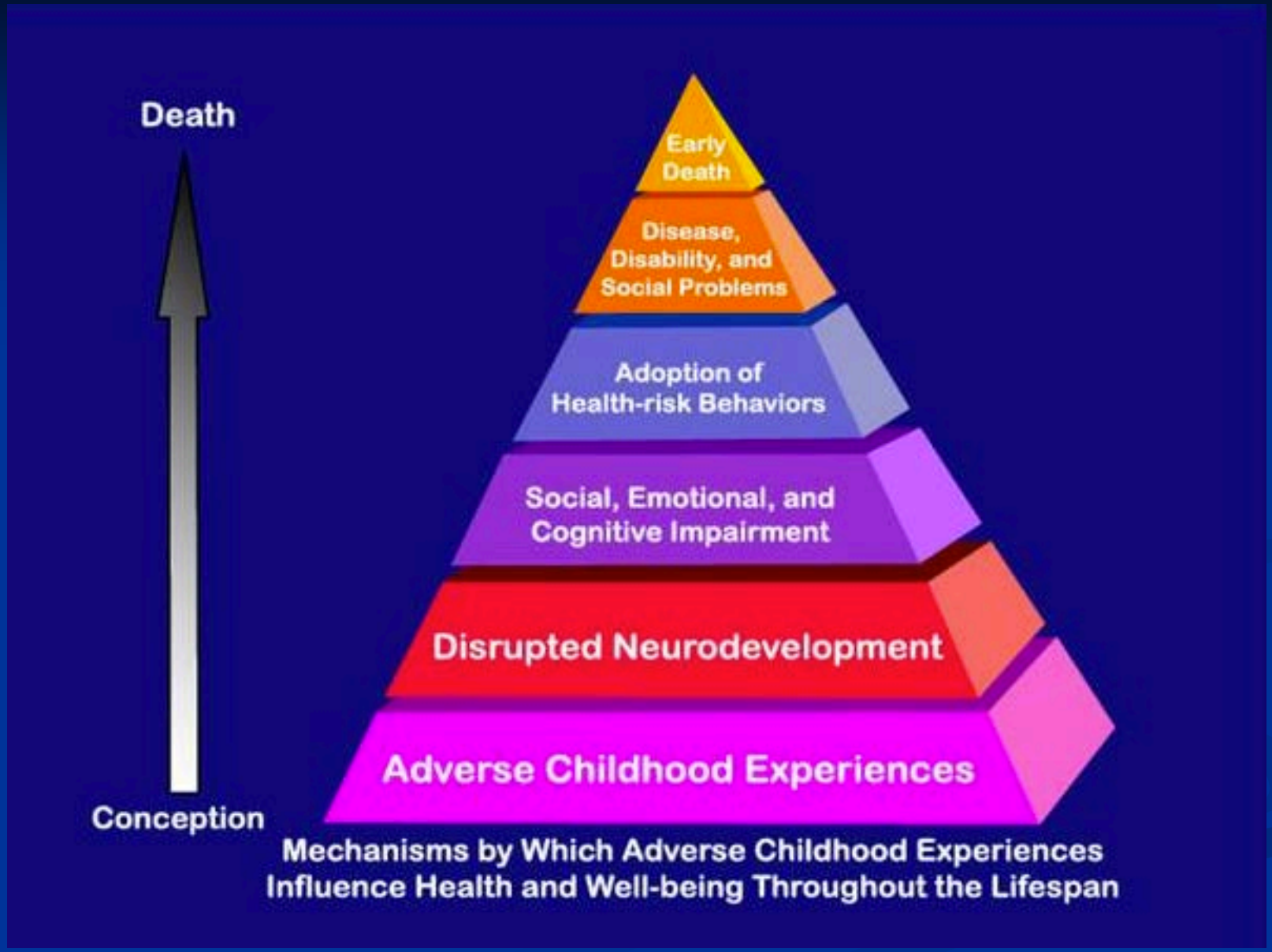


Most common ACEs among California adults

Probability of Outcomes

Given 100 American Adults

33 No ACEs	51 1-3 ACEs	16 4-8 ACEs
WITH 0 ACEs	WITH 3 ACEs	WITH 7+ ACEs
1 in 16 smokes	1 in 9 smokes	1 in 6 smokes
1 in 69 are alcoholic	1 in 9 are alcoholic	1 in 6 are alcoholic
1 in 480 uses IV drugs	1 in 43 uses IV drugs	1 in 30 use IV drugs
1 in 14 has heart disease	1 in 7 has heart disease	1 in 6 has heart disease
1 in 96 attempts suicide	1 in 10 attempts suicide	1 in 5 attempts suicide



Mechanisms by Which Adverse Childhood Experiences Influence Health and Well-being Throughout the Lifespan

'Didn't you always know that not applying for that promotion would kill you in the end?'
Independent on Sunday

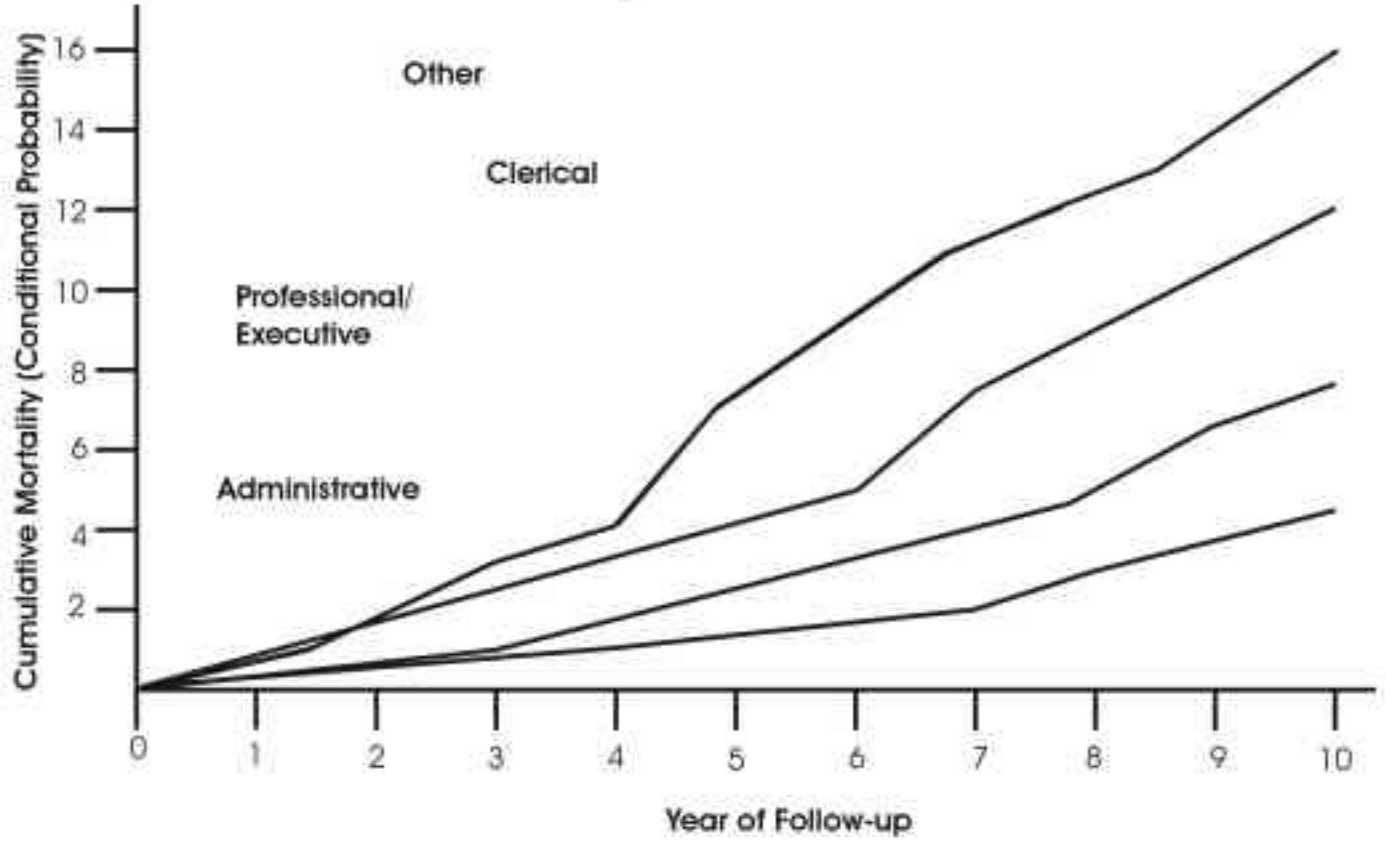
STATUS SYNDROME

MICHAEL MARMOT

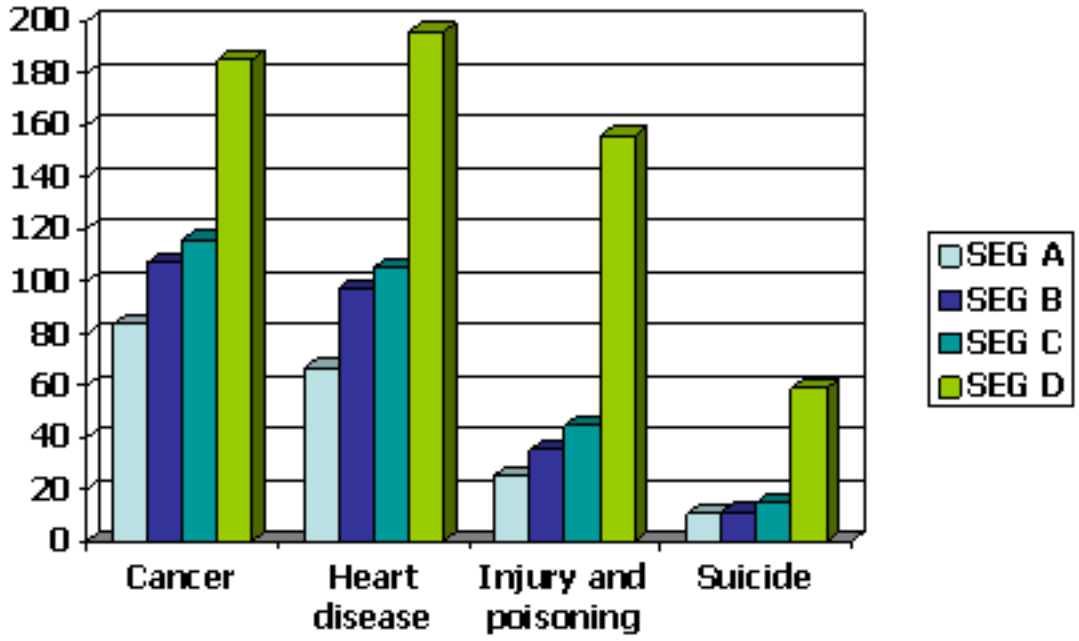
How your social standing directly affects your health

The Founders' Network

U.K. CIVIL SERVICE Mortality - All Causes



Impact of the social gradient on health



Cause of death in working age males by social class, Ireland 1989-1998

Gut Microbiome

NEWS

My Microbiome and Me

Zhao Liping combines traditional Chinese medicine and studies of gut microbes to understand and fight obesity

SHANGHAI, CHINA—In some ways it's a familiar story. In 1987, Zhao Liping married Ji Liuying, a college classmate. Within 2 years, they had a daughter and Zhao finished his Ph.D. Under new pressure and eating richly—Ji is a good cook—the microbiologist put on weight. By 1990, when he started an environmental microbiology lab at Shanxi Academy of Agricultural Sciences in Taiyuan, China, Zhao had grown from 60 to 80 kilograms. Later, on a postdoctoral fellowship at Cornell University, he put on another 10 kilograms. By the time he returned to China in 1995, his waist measured a corpulent 110 centimeters and his health was poor.

But in 2004, he read a paper that eventually changed the shape of his career—and his body. Jeffrey I. Gordon, a microbiologist at Washington University School of Medicine in St. Louis, Missouri, and colleagues showed a link between obesity and gut microbiota in mice (*Science*, 29 May 2009, p. 1136). Zhao was curious whether that link extended to himself and decided to find out. In 2006, he adopted a regimen involving Chinese yam and bitter melon—fermented prebiotic foods that are believed to change the growth of bacteria in the digestive system—and monitored not just his weight loss but also the microbes in his gut. When he combined these prebiotics with a diet based on whole grains, he lost 20 kilograms in 2 years. His blood pressure, heart rate, and cholesterol level came down. *Faecalibacterium prausnitzii*—a bacterium with anti-inflammatory properties—flourished, increasing from an undetectable percentage to 14.5% of his total gut bacteria. The changes persuaded him to focus on the microbiome's role in his transformation. He started with mice but has since expanded his research to humans.

Zhao—now a slim, soft-spoken 49-year-old with flat-top hair and a square jaw—has become an unlikely spokesperson for a burgeoning field. In 2010, he presented his weight-loss story at the Human Microbiome Project meeting in St. Louis, Missouri, at the invitation of George Weinstock of Washington University in St. Louis. Gordon's research had set off a flurry of new studies, but Weinstock says scientists had reached something of an impasse. The "field had been standardized to some extent by the early researchers following the same path," Weinstock says, and Zhao's willingness to dive in and experiment on himself "brought a breath of fresh air." Even more refreshing was that Zhao presented his findings in a "detached, agnostic, scientific way," Weinstock adds. "He was not religious about it at all."

The science of shrinking. Microbiologist Zhao Liping, shown here before and after a change in diet, thinks he lost 20 kilograms by regulating his gut microbiota.

Now associate director of Shanghai Jiao Tong University's Shanghai Center for Systems Biomedicine, Zhao oversees several clinical studies that look at the role of the microbiome in diabetes, obesity, and liver function. But his work remains grounded in his personal story—which friends say reflects a willingness to explore uncharted territory through raw trial and error. "As a scientist," he says, "you should work on questions for which there is very little evidence but that you believe are important."

Uncertainty about cause and effect is what plagues the field right now. It is difficult to prove, for example, that *F. prausnitzii* facilitated Zhao's slimming and didn't just show up once his gut was healthy. "The list of the diseases that the microbiome may play a role in is just growing and growing," says Lita Proctor, director of the U.S. National Institutes of Health's Human Microbiome Project in Bethesda, Maryland. "But the problem is that we're only able to look at associations of the microbiome with disease and aren't yet able to conduct cause-and-effect studies. What we're witnessing is a very young field trying to figure out 'Okay, what's the right way to approach [these] data?'"

For Zhao, the way involves transferring his weight-loss program to hundreds of human subjects and drawing on animal studies to decide what metabolic parameters to monitor in people. While his ultimate goal is to establish a molecular pathway connecting the microbiota to obesity, his e-mail signature reads: "EAT RIGHT, KEEP FIT, LIVE LONG, DIE QUICK."

Faith in traditional medicine

Zhao grew up in a small farming town in Shanxi Province. Like most Chinese born on the eve of the Cultural Revolution, he and his two younger brothers had a simple upbringing. His father was a high school teacher and his mother worked in a textile factory. Both of his parents were firm believers in traditional remedies. Zhao remembers watching his father try to fight a hepatitis B infection by drinking a pungent, murky herbal concoction twice a day.

A good student, Zhao earned a Ph.D. in molecular plant pathology from Nanjing Agricultural University. When he returned to Shanxi to start his lab, he focused on using beneficial bacteria to rein in plant pathogens.

CREDITS: COURTESY OF ZHAO LIPING (2)

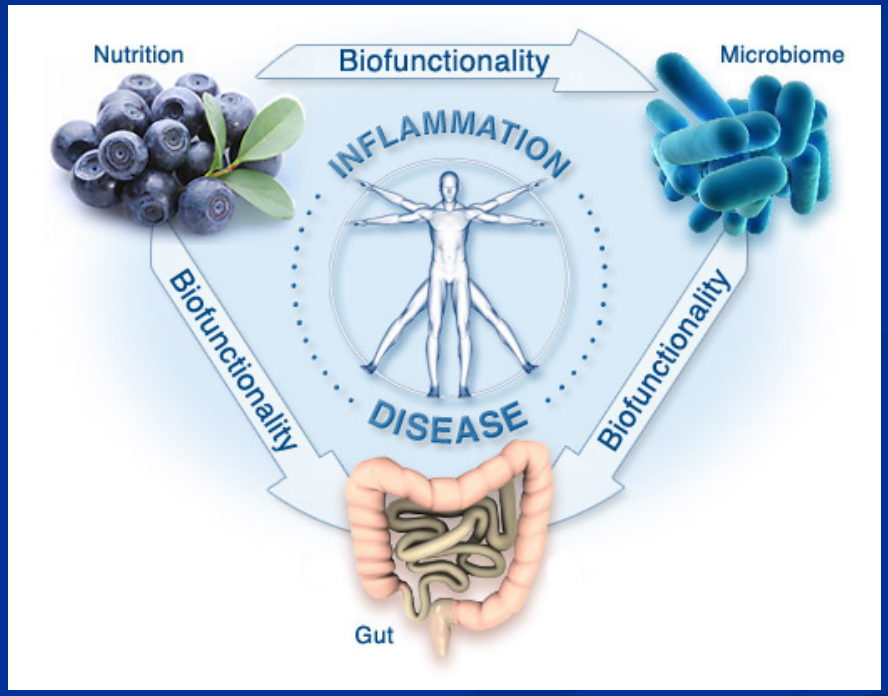
Published by AAAS

Things That Affect Gut Microbiome

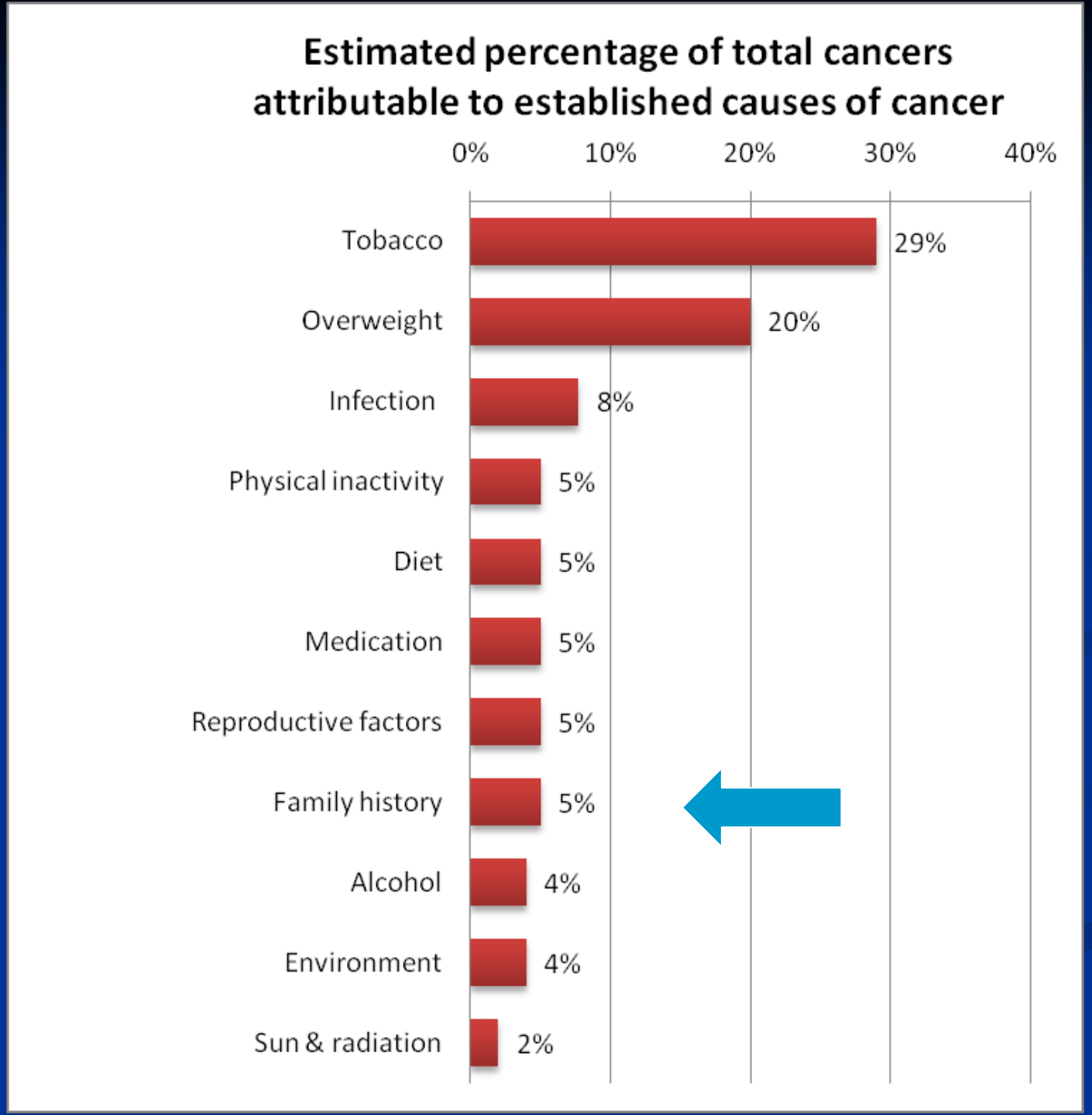
- Diet
- Antibiotics
- STRESS
- Travel
- Colonization at birth (gut flora of mother)
- Host Genetics

Gut Microbiome and Stress

HUMAN MICROBIOME PROJECT

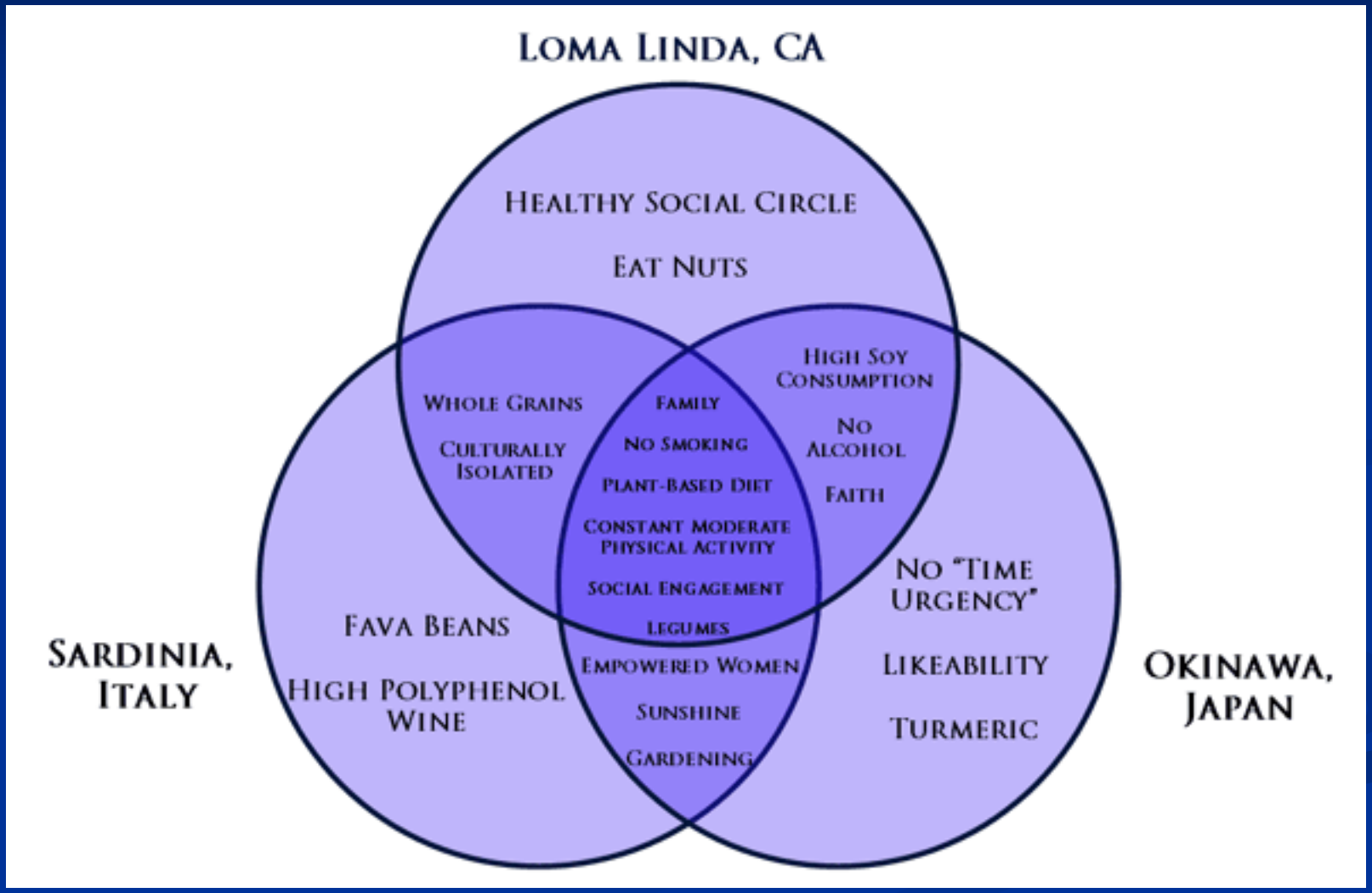


So What Am I Trying to Say?


Estimated percentage of total cancers attributable to established causes of cancer
0%
10%
20%
30%
40%
Tobacco
29%
Overweight
20%
Infection
8%
Physical inactivity
5%
Diet
5%
Medication
5%
Reproductive factors
5%
Family history
5%
Alcohol
4%
Environment
4%
Sun & radiation
2%


LOMA LINDA
CALIFORNIA
SARDINIA
ITALY
ICARIA
GREECE
OKINAWA
JAPAN
NICOYA
COSTA RICA
BLUE ZONES
LONGEVITY HOTSPOTS
BLUE ZONE LIFE LESSONS
MOVE NATURALLY
RIGHT TRIBE
RIGHT OUTLOOK
EAT WISELY

BLUE ZONES OF HIGH LONGEVITY



Summary

- Most of chronic diseases, including cancer, are a function of lifestyle and environment NOT GENETICS
- EPIGENETICS play a huge role
- Much of this is related to the ARTIFICIAL manipulation of our world and environment
- Especially in regards to our FOOD and WATER supply
- YOU can take simple steps to improve your health and reduce risk

Summary

- DON'T SMOKE!!!
- Drink ALCOHOL in moderation
- Try to EAT NATURALLY as possible
- Cut out sugar, refined flour and PROCESSED oils
- Use natural cooking and cleaning products
- Exercise
- Social support and connection is so critical to our mammalian brains
  - In utero
  - During childhood development
  - Stress management as adults

Parting Thoughts

- "Let food be thy medicine and medicine be thy food" – Hippocrates
- "The doctor of the future will give no medicine but will interest his patients in the care of the human frame, in diet and in the cause and prevention of disease" – Thomas Edison
- "All truth passes through three stages, 1st, it is ridiculed, 2nd, it is violently opposed, 3rd, it is accepted as self-evident" - Schopenhauer

"IF MAN MADE IT, DON'T EAT IT!!!" – JACK LALANNE
(1914 – 2011)

Questions