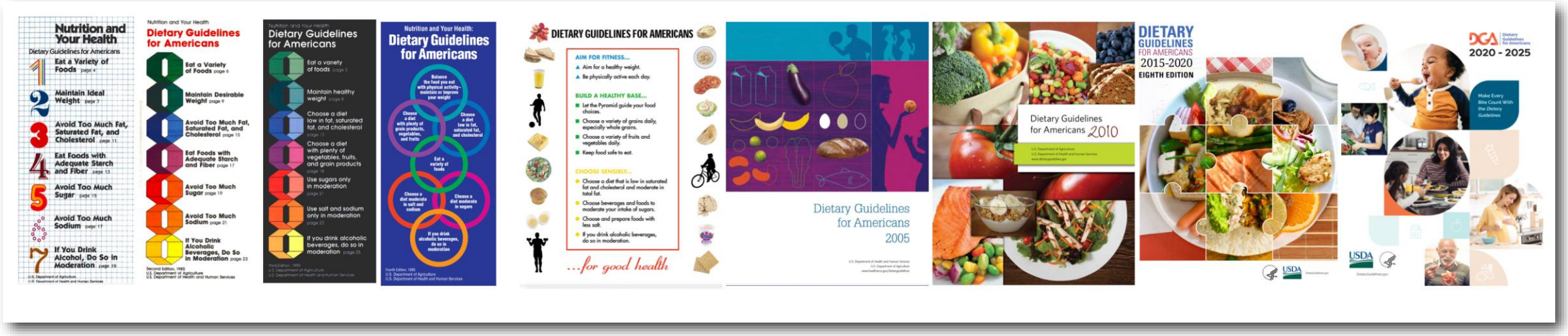
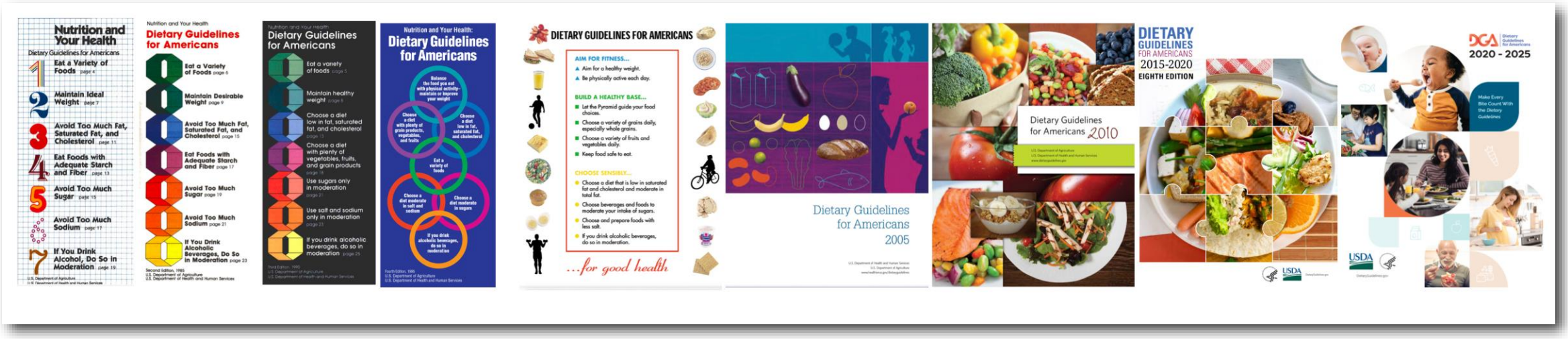
THE DIET-HEART HYPOTHESIS, 70+ YEARS IN?

GARY TAUBES





I then realized that medical decision making was not built on a bedrock of evidence or formal analysis, but was standing on Jell-O.

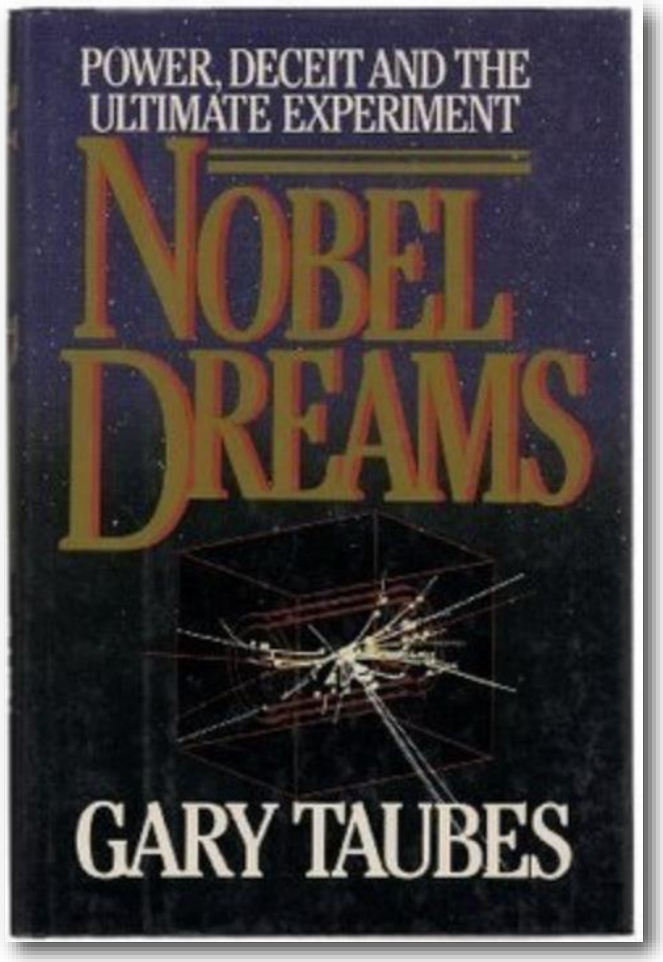
David Eddy, 2013, The Origins of Evidence-Based Medicine

CONTEXT

MY CREDIBILITY?

CONTEXT

MY CREDIBILITY?



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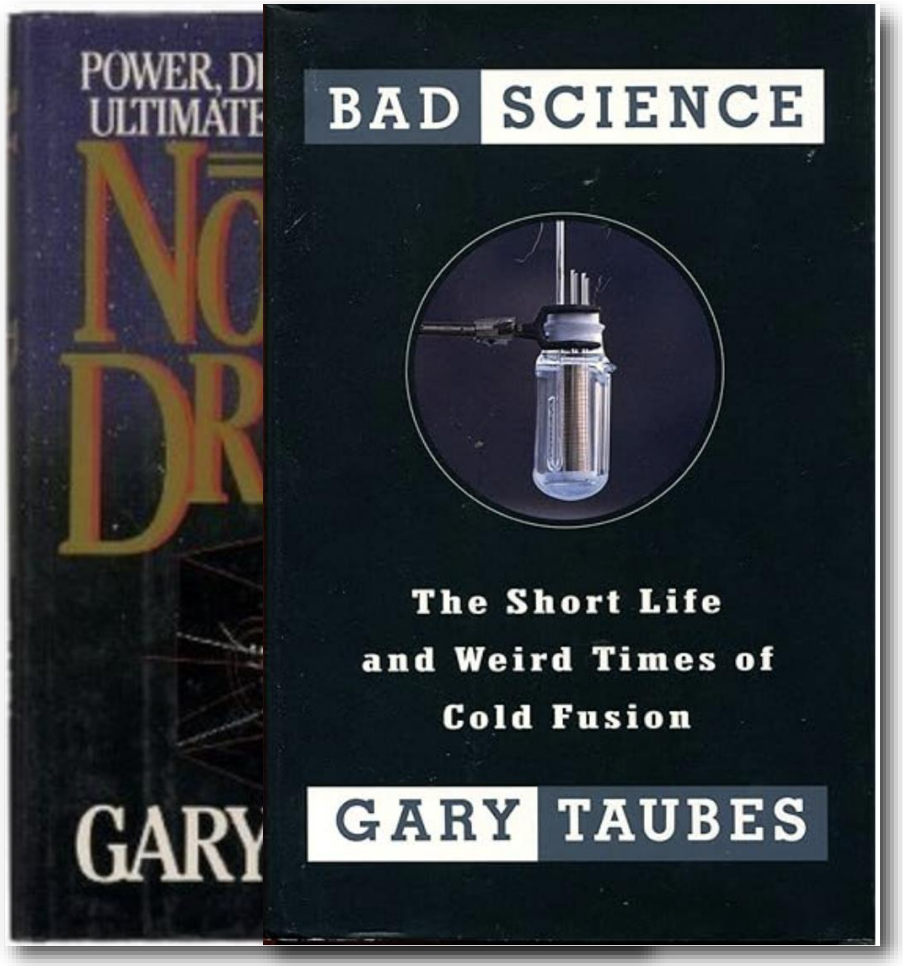

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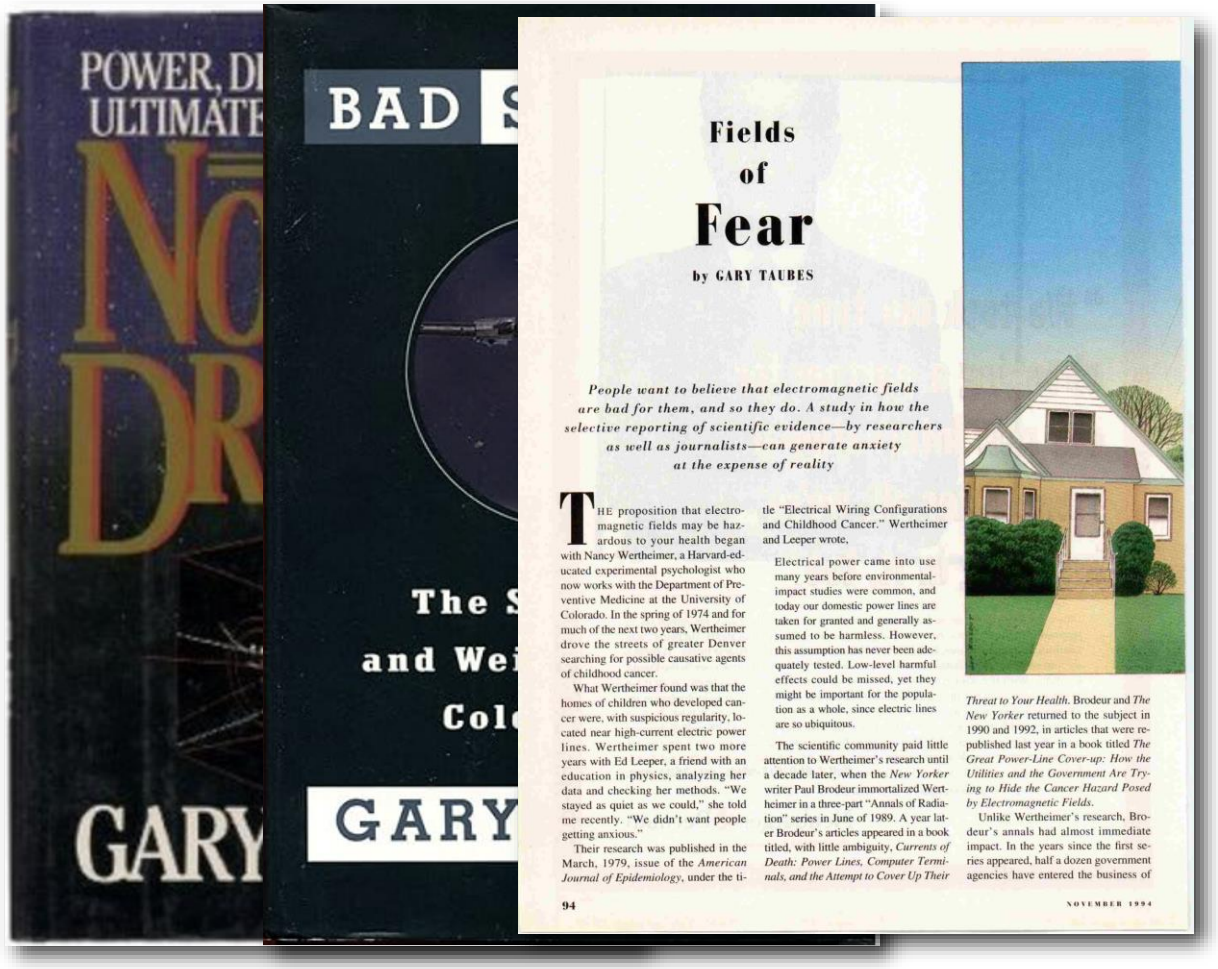


Fields
of
Fear

by GARY TAUBES

People want to believe that electromagnetic fields are bad for them, and so they do. A study in how the selective reporting of scientific evidence—by researchers as well as journalists—can generate anxiety at the expense of reality

THE proposition that electromagnetic fields may be hazardous to your health began with Nancy Wertheimer, a Harvard-educated experimental psychologist who now works with the Department of Preventive Medicine at the University of Colorado. In the spring of 1974 and for much of the next two years, Wertheimer drove the streets of greater Denver searching for possible causative agents of childhood cancer.

What Wertheimer found was that the homes of children who developed cancer were, with suspicious regularity, located near high-current electric power lines. Wertheimer spent two more years with Ed Leeper, a friend with an education in physics, analyzing her data and checking her methods. "We stayed as quiet as we could," she told me recently. "We didn't want people getting anxious."

Their research was published in the March, 1979, issue of the *American Journal of Epidemiology*, under the title "Electrical Wiring Configurations and Childhood Cancer." Wertheimer and Leeper wrote,

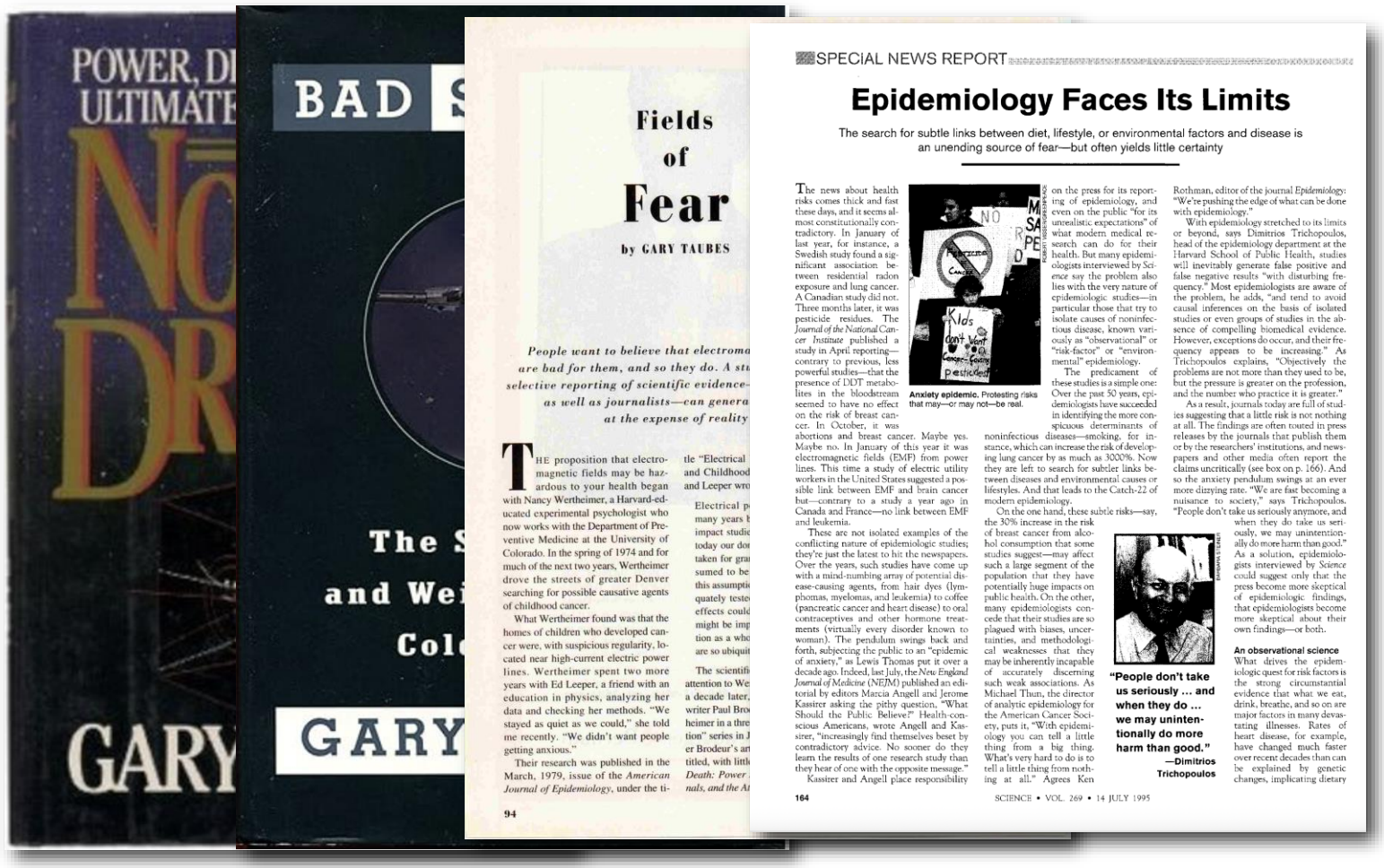
> Electrical power came into use many years before environmental-impact studies were common, and today our domestic power lines are taken for granted and generally assumed to be harmless. However, this assumption has never been adequately tested. Low-level harmful effects could be missed, yet they might be important for the population as a whole, since electric lines are so ubiquitous.

The scientific community paid little attention to Wertheimer's research until a decade later, when the *New Yorker* writer Paul Brodeur immortalized Wertheimer in a three-part "Annals of Radiation" series in June of 1989. A year later Brodeur's articles appeared in a book titled, with little ambiguity, *Currents of Death: Power Lines, Computer Terminals, and the Attempt to Cover Up Their Threat to Your Health*. Brodeur and *The New Yorker* returned to the subject in 1990 and 1992, in articles that were republished last year in a book titled *The Great Power-Line Cover-up: How the Utilities and the Government Are Trying to Hide the Cancer Hazard Posed by Electromagnetic Fields*.

Unlike Wertheimer's research, Brodeur's annals had almost immediate impact. In the years since the first series appeared, half a dozen government agencies have entered the business of

CONTEXT

MY CREDIBILITY?



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SPECIAL NEWS REPORT

Epidemiology Faces Its Limits

The search for subtle links between diet, lifestyle, or environmental factors and disease is an unending source of fear—but often yields little certainty

The news about health risks comes thick and fast these days, and it seems almost constitutionally contradictory. In January of last year, for instance, a Swedish study found a significant association between residential radon exposure and lung cancer. A Canadian study did not. Three months later, it was pesticide residues. The *Journal of the National Cancer Institute* published a study in April reporting—contrary to previous, less powerful studies—that the presence of DDT metabolites in the bloodstream seemed to have no effect on the risk of breast cancer. In October, it was abortions and breast cancer. Maybe yes. Maybe no. In January of this year it was electromagnetic fields (EMF) from power lines. This time a study of electric utility workers in the United States suggested a possible link between EMF and brain cancer but—contrary to a study a year ago in Canada and France—no link between EMF and leukemia.

Anxiety epidemic. Protesting risks that may—or may not—be real.

These are not isolated examples of the conflicting nature of epidemiologic studies; they're just the latest to hit the newspapers. Over the years, such studies have come up with a mind-numbing array of potential disease-causing agents, from hair dyes (lymphomas, myelomas, and leukemia) to coffee (pancreatic cancer and heart disease) to oral contraceptives and other hormone treatments (virtually every disorder known to woman). The pendulum swings back and forth, subjecting the public to an "epidemic of anxiety," as Lewis Thomas put it over a decade ago. Indeed, last July, the *New England Journal of Medicine* (*NEJM*) published an editorial by editors Marcia Angell and Jerome Kassirer asking the pithy question, "What Should the Public Believe?" Health-conscious Americans, wrote Angell and Kassirer, "increasingly find themselves beset by contradictory advice. No sooner do they learn the results of one research study than they hear of one with the opposite message."

Kassirer and Angell place responsibility on the press for its reporting of epidemiology, and even on the public "for its unrealistic expectations" of what modern medical research can do for their health. But many epidemiologists interviewed by *Science* say the problem also lies with the very nature of epidemiologic studies—in particular those that try to isolate causes of noninfectious disease, known variously as "observational" or "risk-factor" or "environmental" epidemiology.

The predicament of these studies is a simple one: Over the past 50 years, epidemiologists have succeeded in identifying the more conspicuous determinants of noninfectious diseases—smoking, for instance, which can increase the risk of developing lung cancer by as much as 3000%. Now they are left to search for subtler links between diseases and environmental causes or lifestyles. And that leads to the Catch-22 of modern epidemiology.

On the one hand, these subtle risks—say, the 30% increase in the risk of breast cancer from alcohol consumption that some studies suggest—may affect such a large segment of the population that they have potentially huge impacts on public health. On the other, many epidemiologists concede that their studies are so plagued with biases, uncertainties, and methodological weaknesses that they may be inherently incapable of accurately discerning such weak associations. As Michael Thun, the director of analytic epidemiology for the American Cancer Society, puts it, "With epidemiology you can tell a little thing from a big thing. What's very hard to do is to tell a little thing from nothing at all." Agrees Ken Rothman, editor of the journal *Epidemiology*: "We're pushing the edge of what can be done with epidemiology."

"People don't take us seriously ... and when they do ... we may unintentionally do more harm than good."
—Dimitrios Trichopoulos

With epidemiology stretched to its limits or beyond, says Dimitrios Trichopoulos, head of the epidemiology department at the Harvard School of Public Health, studies will inevitably generate false positive and false negative results "with disturbing frequency." Most epidemiologists are aware of the problem, he adds, "and tend to avoid causal inferences on the basis of isolated studies or even groups of studies in the absence of compelling biomedical evidence. However, exceptions do occur, and their frequency appears to be increasing." As Trichopoulos explains, "Objectively the problems are not more than they used to be, but the pressure is greater on the profession, and the number who practice it is greater."

As a result, journals today are full of studies suggesting that a little risk is not nothing at all. The findings are often touted in press releases by the journals that publish them or by the researchers' institutions, and newspapers and other media often report the claims uncritically (see box on p. 166). And so the anxiety pendulum swings at an ever more dizzying rate. "We are fast becoming a nuisance to society," says Trichopoulos. "People don't take us seriously anymore, and when they do take us seriously, we may unintentionally do more harm than good." As a solution, epidemiologists interviewed by *Science* could suggest only that the press become more skeptical of epidemiologic findings, that epidemiologists become more skeptical about their own findings—or both.

An observational science

What drives the epidemiologic quest for risk factors is the strong circumstantial evidence that what we eat, drink, breathe, and so on are major factors in many devastating illnesses. Rates of heart disease, for example, have changed much faster over recent decades than can be explained by genetic changes, implicating dietary

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CONTEXT

MY CREDIBILITY?

CONTEXT

MY CREDIBILITY?

CONTEXT

MY CREDIBILITY?

COMPETING HYPOTHESES/PARADIGMS?

COMPETING HYPOTHESES

THE DOMINANT HYPOTHESIS: THE DIET-HEART HYPOTHESIS

Fat (saturated fat) raises **LDL cholesterol** and causes heart disease.
The dense calories of fat make us fat.

The less fat we eat (and particularly saturated fat) and, so, the *more* carbohydrates we eat—fruits, vegetables, whole grains, legumes—the healthier and leaner we'll be.

COMPETING HYPOTHESES

THE ALTERNATIVE HYPOTHESIS: A DIET-INSULIN HYPOTHESIS

Carbohydrates—particularly refined grains and sugars—cause **insulin resistance and Metabolic Syndrome** and so obesity, diabetes *and* heart disease.

The *fewer* carbohydrates we eat—particularly refined grains and sugars— and so the *more* fat, the healthier and leaner we'll be.

A BRIEF HISTORY OF THE DIET-HEART HYPOTHESIS

COMPETING PHILOSOPHIES OF SCIENCE

Diet-Heart Hypothesis

We don’t have time to wait for “definitive scientific evidence” because people are dying out there.

''It's an imperfect world. The data that would be definitive is ungettable, so you do your best with what is available.''

Basil Rifkin, 2002

The 1950's

Keys at WHO meeting in Amsterdam:
"fatty diet, raised serum cholesterol,
atherosclerosis, myocardial infarction."

1952

1951

Ancel Keys and his wife Margaret visit Naples, Italy. They assess the cholesterol and fat content of the diet among workers & wealthy. Margaret Keys measures cholesterol levels.

1957

A 15-page AHA report criticizes Keys for taking "uncompromising stands based on evidence that does not stand up under critical examination."

The 1960's & 1970's

1961

Keys: the ideal heart-healthy diet should be almost 70% carbohydrate and only 15% fat.

The American Heart Association, part 1
Report "that Americans would reduce their risk of heart disease by reducing the fat in their diets, and replacing saturated fats with polyunsaturated fats."

A BRIEF HISTORY OF THE DIET-HEART HYPOTHESIS

U.S. TRIALS OF CHOLESTEROL-LOWERING DIETS (P/S RATIO INCREASED)

1961

Anti-Coronary Club

Heart disease reduced among intervention group

Caveat: total mortality increased

8 of the intervention group die of heart attacks; none of the controls

1969

Los Angeles VA Hospital

Cholesterol reduced. CHD mortality reduced

Caveat: cancer mortality increased

No difference in total mortality

Christakis et al, 1966. *JAMA.* Nov 7;597-604.
Christakis et al, 1966. *Am J Public Health Nations Health*. Feb; 299-314.
Dayton et al, 1969. *Circulation*. Jul;II-1-62.

A BRIEF HISTORY OF THE DIET-HEART HYPOTHESIS

U.S. TRIALS OF CHOLESTEROL-LOWERING DIETS (P/S RATIO INCREASED)

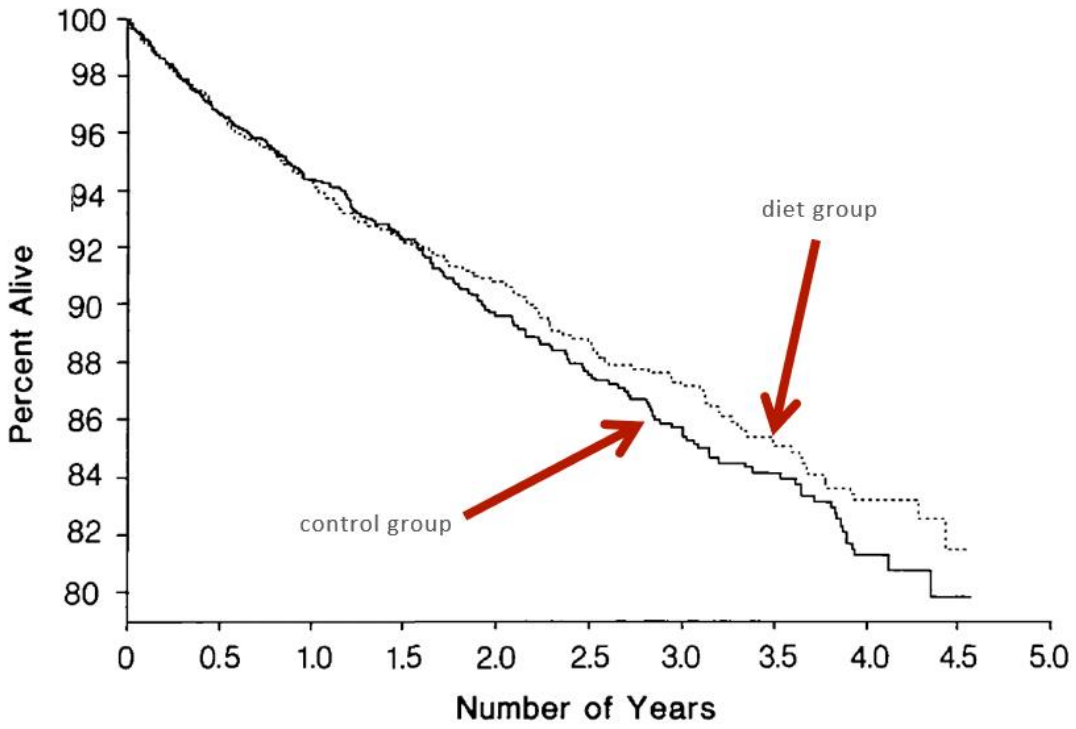


Figure 6. Life-table presentation of percent of men and women of all ages still living. Treatment, (—) and Control, (- -).

1973

Minnesota Coronary Survey

9000 men and women

269 deaths in intervention group. 248 in controls.

Caveat: The results go unpublished for 16 years.

Why?

"We were disappointed in the way they turned out."

Ivan Frantz, Jr., principal investigator.

Frantz et al, **1989**. Arteriosclerosis. Jan-Feb; 129-35.

The 1970's

An AHA committee recommends low-saturated-fat diets (less than 10% of calories) for every American, including "infants, children, adolescents, lactating and pregnant women, and older persons."

1970

1977

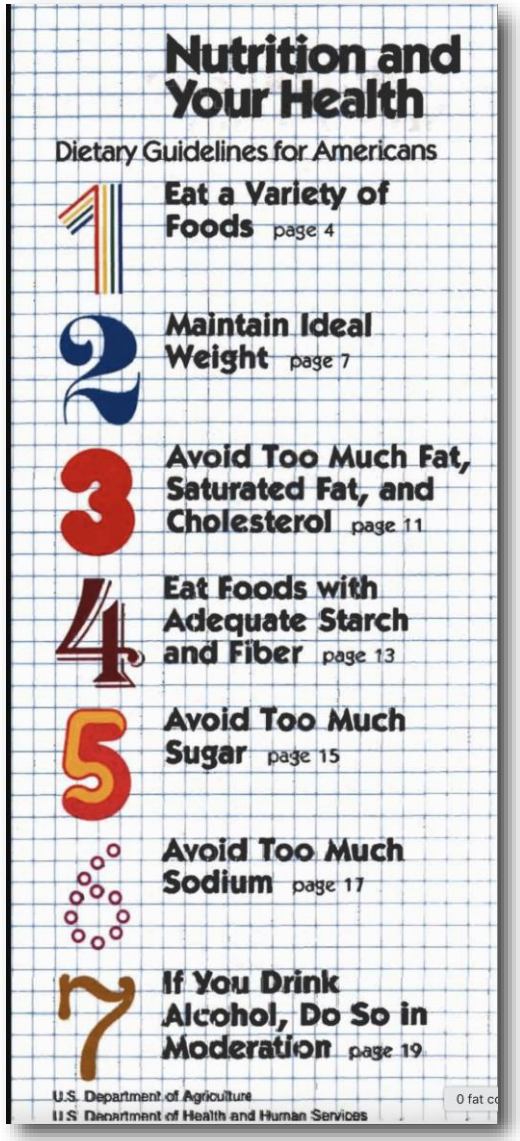
Dietary Goals for the United States

"The first comprehensive statement by any branch of the Federal Government on risk factors in the American diet."

1. Increase carbohydrate consumption to 55 to 60 percent of calories
2. Reduce fat consumption to 30 percent of calories

The 1980's

THE TIPPING POINT? FIRST DIETARY GUIDELINES



1980

USDA Dietary Guidelines for Americans

The 1980's

CLINCAL TRIALS: 1977-1984

1984

LRCCPPT ($150 million)

3,800 middle-aged men with cholesterol > 265.

Intervention: cholestyramine, a cholesterol-lowering drug.

Results:

38 definite CHD deaths in control vs. 30 in intervention

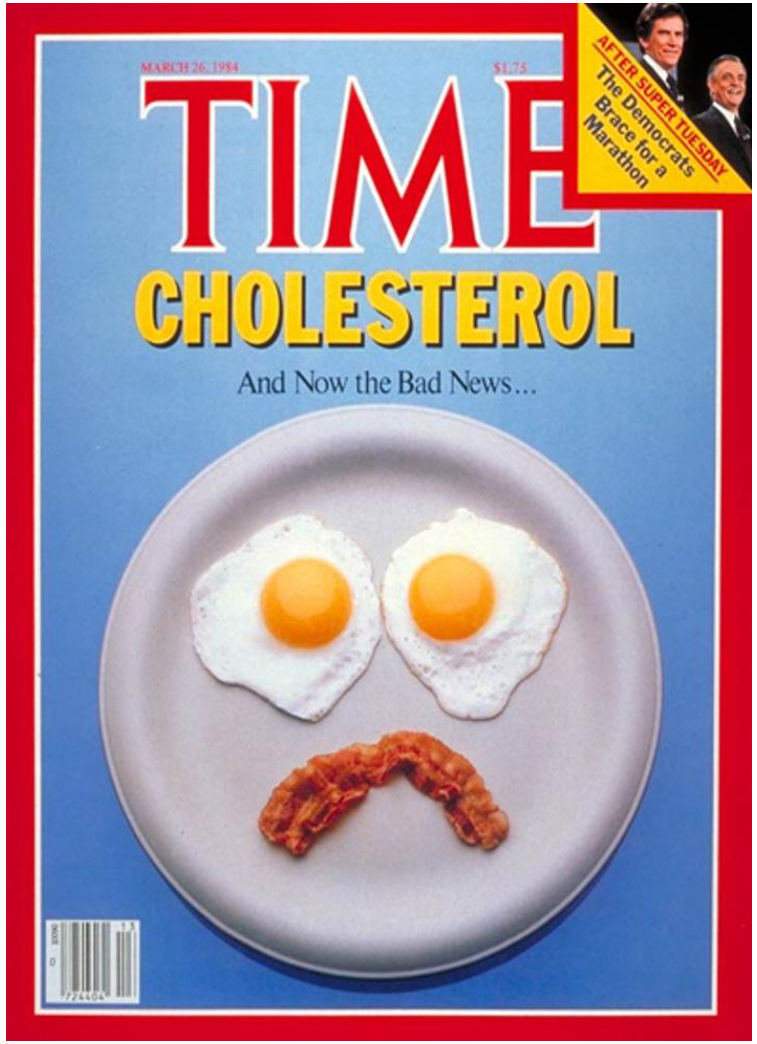
158 vs. 130 nonfatal heart attacks

Caveat: No difference in all-cause mortality

LRC Program, 1984. *JAMA*. Jan 20; 351-64, 365-74.

The 1980's

1984: THE TIPPING POINT TIPS



The LRC findings are extrapolated from a drug to a diet.

"It is now *indisputable* that lowering cholesterol with diet and drugs can actually cut the risk of developing heart disease and having a heart attack."

Basil Rifkind, NIH director of the trial, in *Time*

Anon, 1984. *Time*. Jan 23:30.
Consensus conference, 1985. *JAMA*. Apr 12;253(14):2080-6.

The 1980's

1984

The NIH consensus conference conclusion:
There is "no doubt" that a low-fat diet "will afford significant protection against coronary heart disease" to *every* American over the age of two.

1987

National Cholesterol Education Program
"The guidelines urge that all Americans, starting at age 20, have their cholesterol levels tested as part of a general medical examination."

1988

Surgeon General's Report on Nutrition and Health
The "disproportionate consumption of food high in fats" is held responsible for two-thirds of the 2.1 million deaths in the U.S. that year.

1989

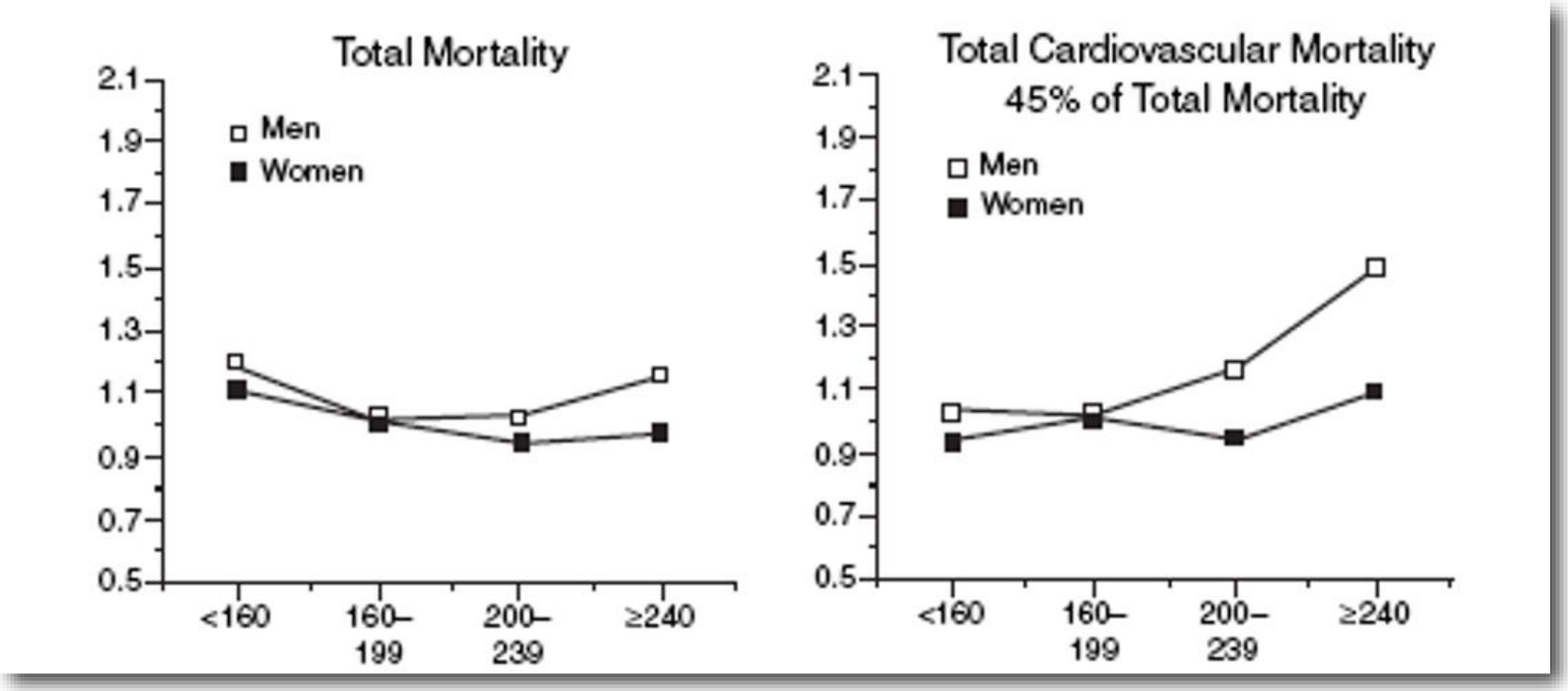
National Academy of Sciences
"Highest priority is given to reducing fat intake, because the scientific evidence concerning dietary fats and other lipids and human health is strongest and the likely impact on public health the greatest."

EVIDENCE POST-CONSENSUS

EVIDENCE POST-CONSENSUS

Total mortality vs. CHD mortality vs. serum cholesterol (1990)

Data from 19 cohort studies worldwide, as reported at the 1990 NHLBI conference on Low Blood Cholesterol: Mortality Associations.



Jacobs et al. 1992. *Circulation*. Sep;86(3):1046-60.

EVIDENCE POST-CONSENSUS

2001

Cochrane Collaboration review of “Reduced or Modified dietary fat for preventing cardiovascular disease”

27 well-controlled randomized trials

10,000 subjects followed for an average of three years each.

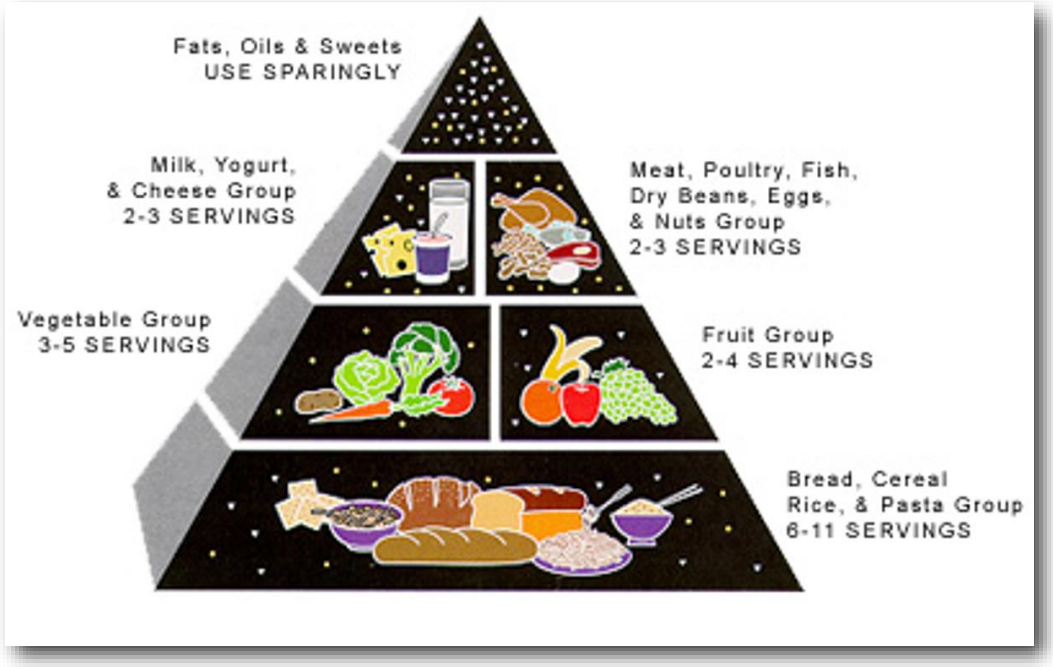
No effect on longevity.

No “significant effect on cardiovascular events.”

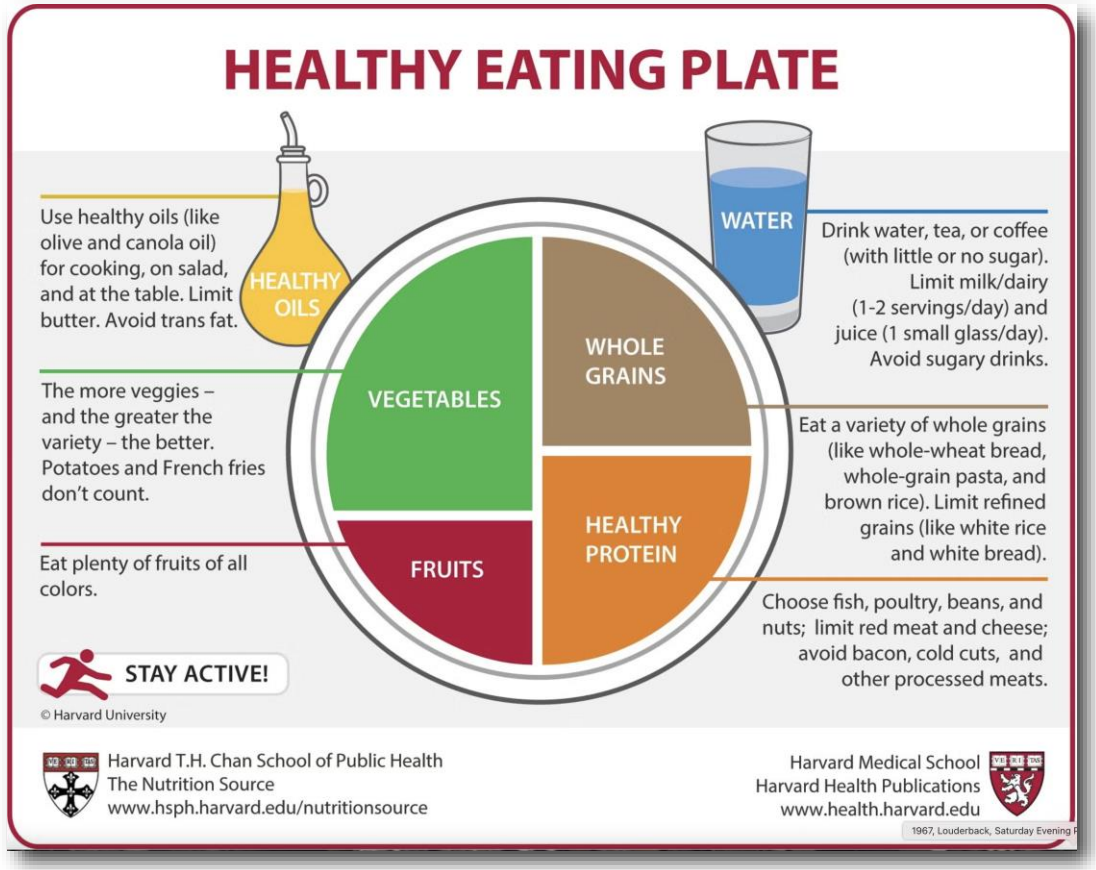
Hooper et al, 2001. *Cochrane Database Syst Rev.* (3):CD002137

WHERE WE ARE TODAY

THE DIET-HEART HYPOTHESIS APPLIED TO DIET

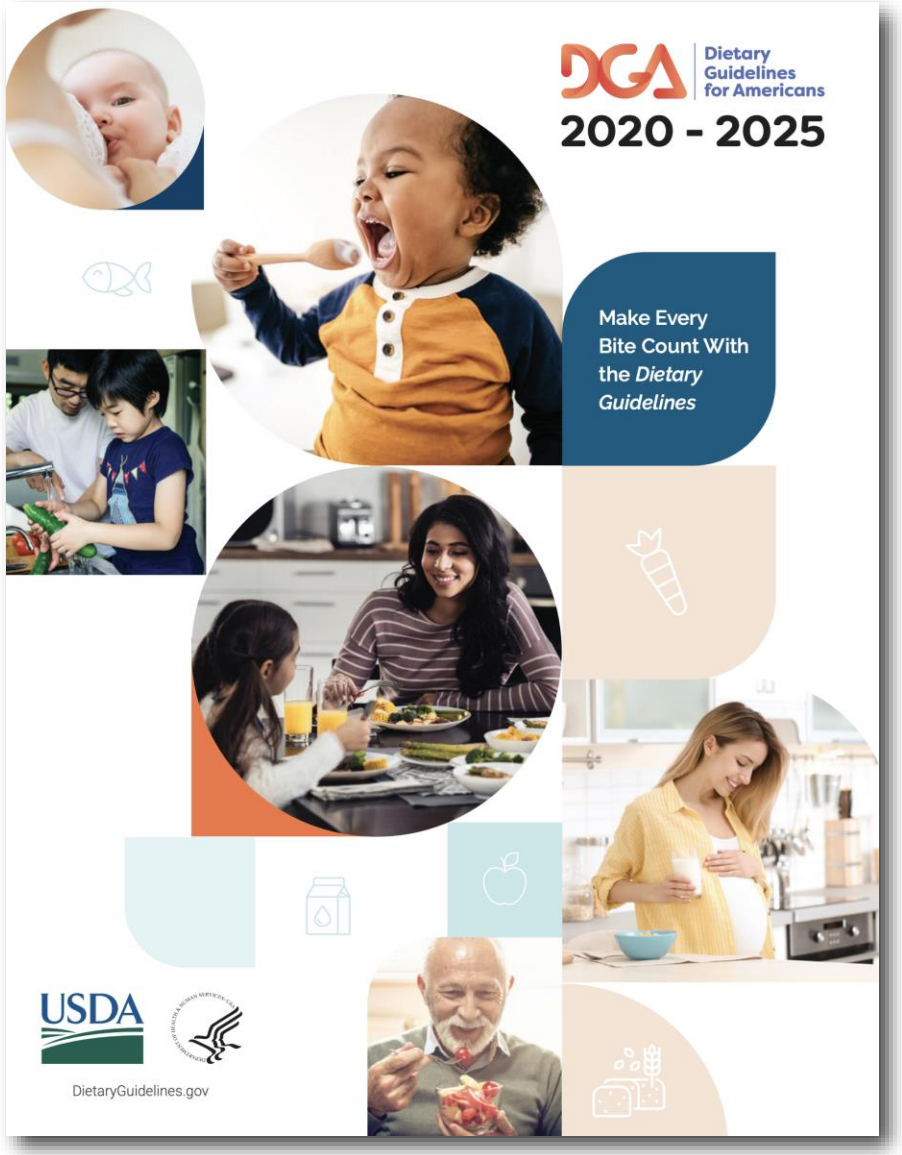


1992



2011

2020-2025 USDA DIETARY GUIDELINES FOR AMERICANS



Saturated Fat

For those 2 years and older, intake of saturated fat should be limited to less than 10 percent of calories per day by replacing them with unsaturated fats, particularly polyunsaturated fats.

2026-2030 USDA DIETARY GUIDELINES FOR AMERICANS

Saturated Fat

In general, saturated fat consumption should not exceed 10% of total daily calories. Significantly limiting highly processed foods will help meet this goal. More high-quality research is needed to determine which types of dietary fats best support long-term health.

STATE OF THE EVIDENCE

COCHRANE COLLABORATION, 2020 (LATEST) REVIEW

Authors' conclusions

The findings of this updated review suggest that reducing saturated fat intake for at least two years causes a potentially important reduction in combined cardiovascular events.

STATE OF THE EVIDENCE

COCHRANE COLLABORATION, 2020 (LATEST) REVIEW

Main results

The included long-term trials suggested that reducing dietary saturated fat reduced the risk of combined cardiovascular events by 17%

There was little or no effect of reducing saturated fats on non-fatal myocardial infarction

We found little or no effect of reducing saturated fat on all-cause mortality or cardiovascular mortality.

SUMMARY: COMPETING PHILOSOPHIES OF SCIENCE

COMPETING PHILOSOPHIES OF SCIENCE

Alternative Hypothesis

If we don’t have definitive scientific evidence, we don’t know if we’re right.

“The first principal of science is that you must not fool yourself– and you’re the easiest person to fool.”

Richard Feynman, 1974