## CHAPTER ONE: SAYS WHO?
# HOW WE KNOW WHAT (WE THINK) WE KNOW

In the film *The Road to Wellville*, Anthony Hopkins plays Dr. John Harvey Kellogg, the legendary health promoter whose surname is now synonymous with cereal. The doctor, portrayed as a buck-toothed, bowel-obsessed fanatic who pushes daily enemas as the antidote to just about everything, brags (if that's the right word) that "my own stools . . . are gigantic and have no more odor than a hot biscuit."

Adapted from the satiric novel of the same name, the movie shows patients at Dr. Kellogg's Battle Creek Sanitarium engaged in all kinds of bizarre practices, including rhythmic laughing, exercising in diapers, and sitting in electrically charged tubs of water. (In the process, one patient dies of electrocution.) The scenes, fictional but not far from reality, poke fun at Kellogg's silly ideas and the gullibility of so many people, desperately seeking good health, who embraced them.

Though the film's entertainment value is debatable—the movie is filled with bathroom humor and flopped at the box office—its lessons about health promotion are profound. It reminds us of how far we've come in our quest for wellness and, in many ways, how little some things have changed.

One notable difference is the rationale for health recommendations. In previous eras, appeals for healthy living were based on religion, morality, pseudoscience, anecdotal observations, or the personal experiences of health promoters. Today, in contrast, health advice is typically attributed to a seemingly more objective and sophisticated source: modern scientific research.

While not infallible, it can nevertheless be a powerful tool, unavailable to our ancestors, that helps us discern what's true and what's not.

But too often, health promoters misuse, misrepresent, or disregard research altogether, and we unquestioningly accept what we're told, just as Dr. Kellogg's followers did. If you need evidence of this, look no further than the *New York Times* best-seller list. One of the most popular health books in recent memory is *Natural Cures "They" Don't Want You to Know About*, by Kevin Trudeau, a TV infomercial huckster who has been sued by the federal government for making bogus claims and has served prison time for credit card fraud. Though he assures us that "there are more than 900 studies proving the basis [*sic*] premises in this book," his chapter on prevention, titled "How to Never Get Sick Again," includes a smorgasbord of scientifically unsubstantiated directives. Among them: get your colon irrigated; eat bee pollen; sleep on a magnetic mattress pad; don't use deodorant; avoid air conditioning; throw away your microwave oven; stay away from clothes dryers; don't eat for up to a month; and use a machine that "rebalances" your bodily energy.

When we fall for flapdoodle like this, there's little to separate us from those misguided souls in *The Road to Wellville* at whom we laugh. The joke, it seems, is on us. But by gaining some basic knowledge of research and applying a little critical thinking to what we're told, we have the power to keep history from repeating itself.

## HEALTH PROMOTION HISTORY HIGHLIGHTS

For some perspective on where we find ourselves today, it's helpful to take a brief look at some health promoters of the past, many of them colorful characters like Kellogg who attracted large followings. As you read through this history of human folly (and occasional wisdom), note the parallels with many modern-day teachings as well as the changes over the centuries in how health promoters have justified their ideas.

### ANCIENT WISDOM AND PERSONAL EXPERIENCE

Our journey begins nearly 2,500 years ago with the physician Hippocrates (ca. 460 BC–ca. 377 BC), who recognized and wrote about the influence of

diet, exercise, and environmental factors on health. The Greek physician Galen (AD 129–ca. 199), heavily influenced by Hippocrates, formally codified rules for healthful living, which required attention to six "nonnaturals," as they became known: air; motion and rest; sleep and waking; food and drink; excretions; and passions and emotions. In all areas, moderation was key.

These principles continued to hold sway in the mid-16th century, when the Italian nobleman Luigi Cornaro (ca. 1466–1566) wrote a widely circulated series of essays on wellness and longevity, *Discourses on the Sober Life*. The author, who penned the works in his 80s and 90s, tells how he had previously led an indulgent lifestyle that nearly killed him at age 40. In what might be described as a Renaissance version of *Extreme Makeover*, he then adopted a regimen based on the nonnaturals, strictly limiting his consumption of food and wine and avoiding extreme heat and cold, fatigue, and bad air. Adhering to such rules, Cornaro claimed, gave him physical strength, mental clarity, and inner peace as well as immunity to all diseases.

Invoking the "eminent physician" Galen, Cornaro called himself a "living witness" to the truth of the doctor's teachings. He pointed to his own experience as proof that everyone—even those with a "bad constitution"—could avoid illness and infirmity through proper living. He even promised that anyone who followed his example could live to at least 100—a milestone he achieved himself, give or take a few years. (Accounts of his exact age at death vary.)

Similar rationales were prominent in the writings of George Cheyne (1671–1743), an obese British physician who became famous, ironically, for his diet advice. His popular manual *An Essay of Health and Long Life*, first published in 1724 and reprinted in multiple editions and languages, was organized according to Galen's principles, with each chapter corresponding to a different nonnatural. In extolling the virtues of moderation, Cheyne also rooted his advice in the ancient philosophy of Aristotle, who advocated the golden mean, or nothing in excess. "If men would but observe the golden mean in all their passions, appetites, and desires," Cheyne wrote, "they would enjoy a greater measure of health than they do . . . live with less pain, and die with less horror."

Echoing Cornaro, Cheyne cited personal experience as another basis for his recommendations, informing his readers that "I have consulted nothing but my own experience and observation on my own crazy carcass." His car-

cass tipped the scales at 450 pounds, and Cheyne suffered from repeated bouts of physical and psychological ailments. He recovered (eventually dropping to a svelte 300 pounds) after adopting a relatively spartan diet similar to the one he recommended.

### "TRUST ME, I'M A DOCTOR"

But Cheyne also justified his advice in another way: as a physician, he claimed to have an expert understanding of the body's inner workings. Heavily influenced by the natural philosophy of Isaac Newton, Cheyne envisioned the body as a hydraulic machine that could be understood through mathematical calculations. He believed that the machine consisted of pipes, or "canals," through which juices flowed and that keeping the liquids thin and moving was "the great secret of health and long life." Thick and gooey juices supposedly led to disease and death.

Based on these notions, Cheyne offered a contemporary rationale for Galen's ancient rules. For example, he recommended against oily, fatty foods and those with strong odors and tastes because, he reasoned, their particles stuck together more readily and thickened the fluids. Likewise, Cheyne wrote that exercise was essential for keeping the juices flowing. He was especially partial to horseback riding, which he said was capable of "shaking the whole machine, promoting a universal perspiration and secretion of all the fluids." Even though he had no empirical evidence to support his ideas, Cheyne assured readers that his notions had been confirmed through "infinite experiment, and the best natural philosophy."

Medical authority was also the basis for advice in the first U.S. consumer health periodical, which debuted in 1829. Called the *Journal of Health* and edited by "an Association of Physicians" (which actually consisted of just two doctors), the twice-monthly publication focused on "air, food, exercise, the reciprocal action of body and mind, climate and localities, clothing, and the physical education of children." The authors, influenced by the French medical theorist François Broussais, believed that irritation of the stomach—which supposedly could result from overstimulating foods, beverages, emotions, or exertion—lay at the root of virtually all medical conditions. Thus they recommended a plain diet of fruit, vegetables, and

breads, along with small amounts of meat. Cleanliness and moderate exercise were in; tobacco and extreme emotions were out.

The *Journal of Health* began during the presidency of Andrew Jackson, an era characterized by rising democratic participation and declining deference to elite authority. That authority included the medical profession, which at the time lacked real cures and instead prescribed ineffective (and sometimes deadly) measures like bloodletting, vomiting, purging, and administering toxic substances such as mercury. Many people, wisely leery of such treatments, were turning instead to alternatives, including botanical healing, homeopathy, and self-care. The journal's editors, trying to stem this tide, denounced such practices and stressed the essential role of the trained physician—whom they called the "only competent judge" of disease. Apparently, this was a message the public didn't want to hear: four years after its launch, the *Journal of Health* went out of business.

## GOD'S LAWS

About the same time, Sylvester Graham (1794–1851), most often remembered as the grandfather of the Graham cracker, was rising to prominence. A Presbyterian minister and gifted orator who began his career giving anti-alcohol lectures, he soon broadened his focus to health habits. Unlike the editors of the *Journal of Health*, Graham was not part of the medical establishment and made no attempt to defend it. In fact, he was disdainful of doctors, declaring that "all medicine, as such, is itself an evil."

While others before him had invoked God's laws as a source of their ideas, Graham went further, turning health promotion into a moral crusade. He taught that by living temperate lives according to God's laws of health—rules that just so happened to coincide with God's moral laws—human beings could achieve physical perfection, create heaven on earth, and hasten the Second Coming of Christ. It was a "morally binding duty," Graham's disciples believed, to study and obey the laws "which God has established for the perpetuation of [humankind's] existence."

Under Graham's principles of disease prevention, which he called "the Science of Human Life," just about everything considered immoral was now deemed unhealthful—and that included sex. Warning that sexual

excess caused debilitation, he advised healthy married couples to limit their sexual activity to once a month. Sex outside marriage was even more injurious, he reasoned, because it was more exciting. Worst of all was masturbation because it involved the imagination and therefore inflamed the brain, leading to insanity.

Graham claimed that exercise could keep sexual urges in check, as could a nonstimulating diet, which he recommended for everyone. Meat was forbidden, as were mustard, pepper, soups, cream, butter, pastries, tea, and coffee. Graham had special contempt for store-bought white bread, as he believed that stripping bran from flour rendered bread overly stimulating. Instead, he extolled the health virtues of old-fashioned, homemade bread baked with whole-grain flour—what became known as "Graham flour." (Ironically, leading brands of Graham crackers are today manufactured with the type of refined flour Graham abhorred.)

Graham stopped lecturing in 1839, but his cause continued under the leadership of Dr. William Alcott (1798–1859), a prolific author of advice manuals for both adults and young people. Alcott's message generally mirrored that of Graham, though he went even further in portraying himself as a "medical missionary" who was spreading God's gospel of health. For example, defending the idea that people should restrict themselves to monthly sex, he acknowledged that the stricture was unpopular and seemed "rigid." But, he asked rhetorically, "Am I at fault, in announcing it? I certainly *did* not *make* the law. At most, I am but its interpreter." He was, like Moses, simply revealing God's laws.

At the same time, Alcott tried to debunk the popular notion that sickness and death were God's will. "It is much easier, or at least much lazier," he wrote, "to refer all our ills and complaints, as well as their unfavorable terminations, to God or Satan . . . than to consider [ourselves] as the probable cause." This idea of human control over health—that it was possible, indeed obligatory, for human beings to achieve perfect health—was central to Graham's ideology. It grew out of a larger American phenomenon of the early nineteenth century, the Second Great Awakening, a revivalist movement that challenged the Calvinist concept of helpless human beings whose destiny was entirely up to God. Instead, evangelists preached, people had the power and the duty to eliminate the evils they faced—including disease—and thereby achieve salvation.

## GOD SPEAKS

Another product of the Second Great Awakening was the Seventh-Day Adventists, a religious group that focused on preparing for Christ's Second Coming. Its leader, Ellen White (1827–1915), stressed the importance of following God's laws of health, teaching that violating them was akin to breaking the Ten Commandments. But unlike Graham and Alcott, who had become aware of such laws through books, intuition, or observation, White announced that she had been enlightened directly by the Lord.

In a series of "visions"—trancelike experiences in which she claimed to see angels, Jesus, and Satan—White supposedly learned that tobacco, tea, coffee, meat, butter, eggs, cheese, rich foods, and uncleanliness, among other things, were harmful. In her writings and lectures, she often gave physiological explanations for the rules God had revealed to her. For example, she wrote that meat was hazardous because it transmitted disease and stirred up animal passions.

Though White insisted her views had come from God and were "independent of books or the opinion of others," her pronouncements bore a striking resemblance to those of Graham, Alcott, and other like-minded health promoters. She appeared to borrow especially heavily from a physician and preacher named Larkin Coles, who authored a highly successful advice manual, *Philosophy of Health*, in 1854. An analysis of White's writings by historian Ronald Numbers reveals how she frequently lifted passages almost verbatim from Coles's work without attribution.

White was also influenced by James Jackson, who ran a health facility in Dansville, New York, known as Our Home on the Hillside. There, Jackson combined Graham's health regimen with hydropathy, an unorthodox healing method using water as a cure-all. After visiting Our Home, White had a vision that Adventists should establish their own health institution. In 1866, the Western Health Reform Institute (later renamed the Battle Creek Sanitarium) opened its doors in Battle Creek, Michigan.

## SELECTIVE SCIENCE

A decade later, White tapped then 24-year-old Dr. John Harvey Kellogg (1852–1943) to head the institute. He would remain there for 67 years and would become, in the words of medical historian James Whorton,

"the most formidable reformer of American living habits of the twentieth century." During the doctor's long career, medicine would experience remarkable progress, becoming a true science. Unlike White, who had no use for orthodox medicine, Kellogg embraced it, even boasting that he was years ahead of other doctors in incorporating the latest ideas and practices. But in reality, he did so selectively, adopting only those theories that he could apply—or twist—to lend credence to his preconceived notions.

Kellogg, the son of a devout Adventist, was first drawn to those notions as a teenager. As an apprentice typesetter for White's husband, James, who ran the Adventists' publications division, Kellogg worked on a series of health advice pamphlets that included writings by Ellen White, Sylvester Graham, and others. Intrigued at what he read, he delved further into the works of Graham in his spare time and became a vegetarian.

Sent to medical school by the Whites, he found that many of the ideas he'd been exposed to under their tutelage were considered nonsense by mainstream doctors. Still, Kellogg clung tenaciously to those beliefs, forming bonds with professors whose ideas were compatible with his own.

It was a pattern that continued throughout his entire career: Kellogg looked to modern medical science to validate the dogma passed down to him from White and Graham. To lend his old ideas an air of scientific legitimacy, he gave them a new name, "biologic living." And he latched on to any scientific theory that might somehow support his cause. For example, he readily adopted the germ theory as it was just starting to gain acceptance and used it to further his arguments against eating meat. In one "experiment," he "proved" that beefsteak contained more harmful germs than barnyard manure.

Likewise, Kellogg championed the theory of a Russian zoologist who argued that bacteria from decaying protein in the colon entered the bloodstream and "poisoned" the body. Kellogg attributed this phenomenon, known as autointoxication, to eating meat and claimed that it caused a wide range of conditions, including skin problems, depression, and liver damage. The solution consisted of a high-fiber, vegetable diet, combined with colon irrigation to promote multiple daily bowel movements.

In his writings, Kellogg often cited the opinions of other physicians to bolster his ideas, including his draconian views on sex. For example, his sex

and marriage manual quoted several "eminent" and "learned" medical authorities to make the case that too much marital sex could be harmful, leading to everything from sore throats to consumption. But his harshest denunciations were aimed at masturbation, which he called "the most dangerous of all sexual abuses." As evidence, Kellogg cited the "testimony of eminent authors," one of whom opined that "neither the plague, nor war, nor small-pox, nor similar diseases, have produced results so disastrous to humanity as the pernicious habit."

To head off this horror, Kellogg invoked yet another so-called expert, Dr. O.W. Archibald, superintendent of the Iowa Asylum for Feeble-Minded Children, who recommended sewing the foreskin shut over the penis in order to make an erection impossible. Another suggested remedy, which Kellogg described as "almost always successful in small boys," was performing a circumcision—without anesthesia. For female offenders, he recommended applying acid to the clitoris, which he found to be "an excellent means of allaying . . . abnormal exciteiment." Apparently with a straight face, Kellogg denounced other (presumably less severe) anti-masturbation measures as scientifically unsound, warning readers to beware of "pretentious quacks" who offered them.

Bolstering Kellogg's claims to being on the cutting edge of science were his numerous inventions, which included everything from surgical instruments to meat substitutes. But his most famous creation was ready-to-eat, flaked cereal, which he developed with his brother Will. (Eventually, Will formed his own cereal business, which became the Kellogg Company that exists today.)

Through the force of his personality and his penchant for self-promotion, Dr. Kellogg managed to gain enormous fame and respect as a medical authority, despite his selective use of science. During his long career, he wrote nearly 50 books, edited a magazine called *Good Health*, and gave thousands of lectures across the country to both professional and lay audiences. Over the years, his Battle Creek Sanitarium (or the "San," as it was known) attracted the rich and famous, including Henry Ford, Thomas Edison, and Amelia Earhart, among its more than 300,000 guests.

A name surely familiar to visitors at the San after the turn of the century was Horace Fletcher (1849–1919), known as "the Great Masticator." A

friend of Kellogg's, Fletcher championed the notion that the secret to health was chewing food until it liquefied. Declaring that Fletcher "had done more to help suffering humanity than any other man of the present generation," Kellogg was so taken with Fletcher's ideas that he wrote a "Chewing Song" for his patients and coined the term "fletcherize," meaning to chew thoroughly.

A successful businessman and former athlete, Fletcher found himself tired, sick, and obese at age 40. After adopting his chewing regimen, he dropped more than 50 pounds within four months and lost 7 inches off his waist. His ailments and fatigue vanished. To spread the word about his remarkable success, he wrote, lectured, gave press interviews, and offered public demonstrations of his vigor, which included backward flips off a diving board, lifting a man on his shoulders, and cycling 190 miles.

Fletcher used his considerable wealth not only to market his health secret but also to buy credibility from the medical establishment. To scientifically test his theory, he funded "studies" at Yale on his own physical fitness. In one, the investigator concluded that the 54-year-old Fletcher had performed "with greater ease and with fewer noticeable bad results than any man of his age and condition I have ever worked with."

Fletcher's explanation was that his interminable chewing prevented solid, decaying wastes from accumulating in his digestive tract and poisoning his body. But for the Yale nutrition expert overseeing the studies, the key wasn't Fletcher's chewing but the fact that his subject had (unwittingly) reduced his protein intake. Further studies, some funded by Fletcher, would eventually lead experts to lower their protein recommendations. In such a way, Fletcher had a lasting impact on science. But the practice of fletcherizing, despite the popularity and buzz generated by its inventor, died when he did.

### ALTERNATIVE "SCIENCE"

Unlike Kellogg and Fletcher, the popular bodybuilding enthusiast Bernarr Macfadden (1868–1955) didn't look to the medical establishment for validation. Instead, he vociferously attacked it, calling it "the science of guessing" that belonged "to the ignorance of the distant past." Believing that

germs didn't pose a threat to healthy people—he privately called Louis Pasteur, the father of the germ theory, "that French quack"—Macfadden strongly opposed vaccines as well as the use of medications and surgery. He accused doctors, especially leaders of the American Medical Association, of being liars and phonies who cared most about their own financial interests.

Macfadden's alternative to medicine was his self-invented science, which he called physcultopathy. Citing his own experiences and those of others to support his theories, he argued that all diseases stemmed from impurity in the blood and that they could be prevented or cured through proper living. That meant a regimen similar to Kellogg's and Graham's, except that Macfadden was not a vegetarian. He also added the practice of regular fasting as a way to eliminate poisons from the body.

The Macfadden wellness regimen was also novel in its emphasis on fitness and strength over everything else—something reflected in the title of Macfadden's highly popular magazine, *Physical Culture*, and in its motto: "Weakness is a crime; don't be a criminal." Beautiful bodies (often displayed scantily clad or nude) were a sign of not only perfect health, he argued, but also strong character. Having changed his birth name of Bernard McFadden to one he thought sounded more powerful, he relentlessly promoted his own perfectly sculpted physique and vitality as firsthand evidence for his theories.

An outlandish and irrepressible showman, Macfadden was a master marketer of his cause. Like other health promoters of his era, he wrote prolifically to promote his ideas, authoring or editing almost 150 books and pamphlets, including a multivolume *Encyclopedia of Physical Culture*. He was also a frequent contributor to *Physical Culture* magazine, just one of many publications he owned.

## FROM BELIEFS TO EVIDENCE

J. I. Rodale (1898–1971), an accountant turned farmer, publisher, and health promoter, considered Macfadden his hero. Like Macfadden, Rodale had his own set of idiosyncratic health beliefs, many of which had little or no solid science behind them. And he too pushed his ideas through the

books and magazines he published. But unlike Macfadden, Rodale created a publishing empire that outlived him, and his company eventually came to offer advice based on more than just its founder's opinions.

An early advocate of organic farming, Rodale believed that chemical fertilizers and pesticides were harmful to both the environment and human health. Going further, he opposed synthetic chemicals of all kinds and warned about health hazards from food additives, plastic utensils, aluminum cookware, and fluoridated water, among other things. He gave his enthusiastic blessing to "natural" food supplements, for which he often made wildly exaggerated claims: sunflower seeds preserved eyesight; bone meal could prevent both asthma and cavities; magnesium was a "miracle mineral"; and hawthorn berries and vitamin E were "an unbeatable combination to combat heart disease." Rodale himself swallowed as many as a hundred supplements a day, including everything from desiccated liver to dolomite.

Like health promoters before him, Rodale had a fairly lengthy list of forbidden foods. At the top was sugar, which he believed caused anti-social behavior. Milk made people too tall, he believed, and white bread led to colds. He was no fonder of wheat, whether in bread or cereal. Negative emotions were also off limits, an old principle that Rodale took to new extremes in an article, and later a book, titled "Happy People Rarely Get Cancer."

To reach such conclusions, Rodale frequently cited testimonials from readers and results from so-called experiments he conducted by monitoring himself. But he also read medical journals and cited mainstream research whenever he could to help make his case. Over time, *Prevention* magazine—the highly popular health publication he founded in 1950—would increasingly use this standard as the basis for its advice, moving away from simply promoting the personal beliefs of the company's founder and toward providing more objective and seemingly evidence-based information.

## "RESEARCH PROVES . . ."

Indeed, most major health promoters today, whether mainstream or not, at least profess to base their recommendations on scientific research. In per-

suading us to follow particular advice, they typically use phrases like "studies show" or "research proves"—modern-day versions of their predecessors' exhortations that "God wants you to do this" or "it worked for me" or simply "trust me." In principle at least, this shift to a more neutral, objective standard is a positive development, taking us out of the realm of faith and belief into that of facts and knowledge.

But if you dig beneath the surface a bit, you'll find that the evidence cited by health promoters doesn't always support their claims. Overstating the strength, certainty, and scope of the science, they may play up studies that are highly preliminary, poorly conducted, or irrelevant, while conveniently ignoring those that contradict their case.

Consider, for example, the popular health promoter Dr. Nicholas Perricone. Through his television appearances and best-selling books (which include *The Perricone Prescription* and *The Perricone Promise*), this celebrity dermatologist peddles the half-baked idea that inflammation is the root of all health evils. The regimen he pushes, which is supposed to make you look younger and live longer, bans a long list of foods, including bananas, grapes, coffee, carrots, peas, popcorn, oranges, raisins, pasta, pickles, and hard cheese. Instead, we're told to eat wild Alaskan salmon—as often as several times a day—and down eight to ten glasses of water (not just any water, but *spring* water) daily. In addition, Perricone recommends taking more than twenty-five supplements, many with tongue-twister names such as benfotiamine and chromium polynicotinate.

Sound familiar? Elements of Perricone's regimen bear a striking resemblance to the spoutings of Sylvester Graham (good and evil foods), John Harvey Kellogg (a one-size-fits-all theory of disease), and J. I. Rodale (life-saving supplements). The difference is that Perricone's books are filled with references to research studies, giving his ideas the veneer of scientific legitimacy. But Drs. Harriet Hall and Stephen Barrett of Quackwatch, an organization that exposes health fraud, aren't fooled. Calling Perricone's recommendations a "fanciful interpretation of selected medical literature," they point out that he "cherry picks possibly supportive studies from the literature and ignores contradictory studies. He cites lots of lab studies . . . but few that demonstrate any clinical effects in humans." In short, they write, Perricone "has mixed a pinch of science with a gallon of imagination."

## ASSESSING THE SCIENCE

To assess the legitimacy of claims by Perricone and other health promoters, it's important to have at least a basic understanding of how research is conducted and how to interpret findings. When you hear that "studies prove" something to be true, consider the following eight key questions before drawing any conclusions. This assessment may require some digging, and the answers won't always be available, but the extra effort will pay off by empowering you to make smarter decisions about your health.

### 1. WHAT KIND OF STUDY IS IT?

Much of the research cited by health promoters comes from the field of epidemiology, the study of disease patterns and their contributors in populations. Typically, epidemiological studies are observational, meaning that scientists measure something but don't intervene. While such research can identify probable health risks and benefits, it can't definitively prove cause and effect. Types of observational studies include the following:

*Population studies.* These usually compare groups in different geographic areas, looking for differences both in disease rates and in some factor or factors (known as exposures) that might be responsible. An example is the so-called Seven Countries Study, which found that nations like Finland, where heart disease rates were relatively high, had higher-fat diets than places like Japan, where heart disease was less common. The research appeared to support the idea that dietary fat caused heart disease. The problem with such studies is that the apparent suspect—in this case, fat—may not be the real culprit. For example, populations who consume less fat might also get more physical activity, eat more fish, or have other unknown, unmeasured characteristics that actually cause the lower rates of disease. These extraneous factors, known as confounders, can make population studies—as well as other observational studies—tricky to interpret.

*Case-control studies.* Researchers select two groups that are similar in all ways except that the members of one (the cases) have the disease in question and the members of the other (the controls) do not. Information is then gathered about the subjects' past habits to find differences

that may explain the occurrence of disease. For example, case-control studies have found that women with bladder cancer are more likely to have used permanent hair dye than those without the disease. While this suggests a possible connection, it is not proof. When asked to recall their habits from years or decades ago, people often have fuzzy memories. Those with the disease who are searching for a cause may remember (or think they remember) things that controls don't. It's also possible that the two groups aren't as similar as the researchers believe. Perhaps the cases are different from the controls in some way, aside from the exposure, that affects their risk of illness.

*Cohort studies.* These studies, in contrast, are typically forward looking. Healthy people are evaluated for various exposures and then followed for years or decades to see who gets the disease(s) in question and who doesn't. A classic example is the ongoing Framingham Heart Study, begun in 1948. At the start of the study, 5,000 residents of Framingham, Massachusetts, who were free of heart disease were questioned extensively about their lifestyle habits and given tests measuring blood pressure, cholesterol, and other characteristics. Periodically over the following years, information was updated and tests were repeated. The study found, for example, that residents who smoked or had high blood pressure or high cholesterol were more likely to develop heart disease than nonsmokers or those who had normal blood pressure and cholesterol. Though cohort studies are considered more definitive than case-control studies, they too have potential drawbacks. Among other things, keeping track of thousands or tens of thousands of people for many years is a huge challenge, and if enough subjects fall off the radar, it can skew the results.

In contrast to observational investigations, other types of studies involve an intervention by the researcher:

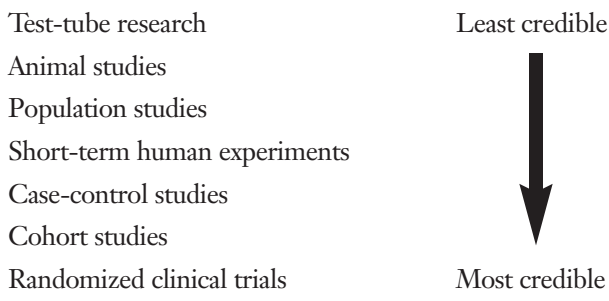
*Randomized clinical trials.* In these studies, individuals are randomly assigned to receive either the factor being tested (the experimental group) or a fake look-alike called a placebo (the control group). Typically, neither subjects nor researchers know who has been assigned to

which group—a practice known as double-blinding. The two groups are then followed for a period of time (sometimes many years) to determine whether they fare differently. Randomized clinical trials can confirm or refute associations revealed by cohort studies and provide proof of a cause-and-effect relationship. But even randomized trials aren't foolproof; a flawed study design can produce flawed results. What's more, clinical trials generally are not appropriate for confirming suspected risks, as intentionally exposing people to potential harm would be unethical.

*Short-term human studies.* Like large clinical trials, these studies may have randomly assigned placebo and control groups. They typically include relatively small numbers of subjects who are exposed to the factor in question. After hours, days, or months, researchers then measure some marker, such as the level of a particular substance in the blood, to determine the factor's physiological effects. Many foods and dietary supplements believed to confer health benefits are tested this way. While such research can be valuable by providing hints of an effect on disease, the evidence is generally considered preliminary. That's because demonstrating a short-term change in blood chemistry, for example, is a far cry from showing a change in subjects' rates of disease.

*Laboratory research.* Studies conducted on animals or on human cells and tissues (so-called test-tube research) can help establish hypotheses about possible risks or benefits that require further investigation in human trials. They can also help corroborate epidemiological findings by providing a biological explanation. What's more, lab research can come in handy when human studies aren't possible or ethical. Its main advantage is that researchers can control exactly what happens, eliminating the impact of extraneous factors that so often plague human experiments. Its disadvantage is that such research may have limited relevance to human beings in the real world. A laboratory rat is not a person, after all, and what causes disease in one may not do so in the other.

In general, here's how the different types of studies rank in terms of the credibility of evidence they produce:




### 2. HOW BIG IS THE EFFECT?

Generally, the larger the effect, the more believable it is. In observational studies, an association (typically expressed as a "relative risk") that's strong is less likely than a weak one to be influenced by confounding factors. For example, male smokers are 23 times more likely than male nonsmokers to die from lung cancer (or, put another way, smoking increases men's risk of dying from lung cancer by 2,300 percent). This relative risk of 23 is so large that no extraneous, unmeasured factor is likely to account for it. But the same can't be said for the association between breast cancer and alcohol consumption among women. According to one study, postmenopausal women who drink are 1.3 times more likely to develop breast cancer—that is, alcohol consumption increases women's risk of developing breast cancer by 30 percent. That relative risk of 1.3 is so small that it could be partly or completely due to confounders. Broadly speaking, many epidemiologists consider any increase in relative risk under 3 (or 300 percent) to be relatively small and worthy of extra skepticism. The same goes, they say, for any decrease in risk that's less than 50 percent.

In addition to knowing the relative increase (or decrease), it's crucial to find out the absolute difference in risk. For example, let's assume that people exposed to substance X have a 300 percent greater risk of contracting disease Y. At first glance, this certainly sounds scary. But if you also learn that the prevalence of this particular disease is one in a million among unexposed people and three in a million among those who were exposed, there's less reason for concern: the absolute increase in risk is just two cases per million, or .0002 percent. It's an illustration of how the relative risk, viewed in isolation without the absolute numbers, can be highly misleading.

### 3. COULD THE FINDINGS BE A FLUKE?

Researchers try to determine the validity of their findings through measures of statistical significance—an often-misunderstood concept. In research, the term "significance" doesn't denote importance or size, as it does in everyday use; instead, it refers to the role of chance. When results are statistically significant, there's only a very small probability—typically less than 5 percent—that the findings are a fluke. While this provides some assurance that the outcome was not determined by chance, it doesn't rule out the possibility completely, nor does it address whether confounders or other problems may have skewed the results.

### 4. WHO WAS STUDIED?

To figure out whether findings might apply to you, it's important to consider who was studied. Researchers often study homogeneous populations in order to minimize the possible role of confounding factors. But what's true for healthy college students or middle-aged white men or postmenopausal women may not be so for others. For example, high blood pressure affects African Americans differently than it does those of other races. It's therefore important to be careful in extrapolating findings from one group to another.

### 5. IS THERE A GOOD EXPLANATION?

Findings from observational studies are more credible if there's a known (or at least plausible) biological explanation for them. When studies yield findings that don't make sense biologically, they should be interpreted with great caution, especially when the association is weak and therefore possibly the result of confounding factors.

### 6. WHO PAID FOR THE RESEARCH?

Many studies are funded by organizations with a vested interest in the outcome, such as drug companies, food producers, dietary supplement manufacturers, or consumer activists. Such sponsorship doesn't necessarily render the findings invalid, but it does raise the possibility that the study's methods or conclusions were either directly or indirectly influenced by the funder's agenda. Research supported by more neutral entities such as the

Centers for Disease Control and Prevention or the National Institutes of Health is therefore sometimes considered more credible.

### 7. WAS IT PEER REVIEWED?

To determine whether a research paper is worthy of publication, most journals—though not all—subject it to the scrutiny of outside experts, who dissect the methodology and the author's interpretations. Although this process by no means guarantees that a study is flawless (plenty of questionable ones make it through peer review), it does add an extra layer of credibility. Studies are sometimes presented at scientific conferences—and cited by media reports and health promoters as evidence—before full peer review and publication. Because many such studies end up never making the cut and getting published, they deserve to be taken less seriously than thoroughly peer-reviewed research. The same goes for industry-conducted research that's shielded from outside evaluation.

### 8. HOW DOES IT SQUARE WITH OTHER STUDIES?

This is perhaps the most crucial question. Rarely is any study, by itself, definitive. Instead, each is a piece of a puzzle. Only when a sufficient number of pieces have been assembled does a clear picture emerge. That's why interpreting a study requires knowing how it fits with others that came before it. How does it add to what's already known? Is it consistent with previous findings? If it conflicts, why? To get to the truth, it's necessary to examine the research as a whole—what scientists call the totality of the evidence. Viewing a study in isolation, like seeing just one piece of a puzzle, can give an erroneous impression.

## SHADES OF GRAY

Getting answers to these eight questions can go a long way toward helping you determine the credibility and relevance of a health claim. But it's not as simple as plugging your responses into a formula and calculating the final answer. Figuring out what to make of a study—or a series of studies—and how to respond is still a judgment call. For most issues, we don't have large, randomized clinical trials that provide incontrovertible evidence, so we have

to make decisions based on something less. Part of being a healthy skeptic is understanding that studies, when honestly interpreted, don't always produce the definitive "yes or no" answers we'd like.

This can certainly be frustrating. Throughout this book, you'll repeatedly encounter less than conclusive statements such as "studies suggest" this or "there's little evidence" of that. You'll also see references to areas of research in which some studies show one thing, while others show the opposite—the classic "coffee is bad for you . . . wait, it's good . . . no, it's bad" flip-flops we so often encounter. If you're tempted to respond by throwing up your hands and saying, "I give up," remember that changing how you think about health information, which is necessary to becoming a healthy skeptic, takes time and patience. Rather than demanding black and white answers, we have to learn to live with, and distinguish among, various shades of gray.

How much gray is acceptable can differ depending on the issue and the individual. For example, to justify taking preventive medication such as hormone replacement therapy, a healthy woman might rightly look for ironclad evidence of considerable benefits that greatly outweigh any risks. But when faced with a potential hazard, she may have a somewhat lower burden of proof, opting to act before there's an absolutely airtight case. After all, no one wants to repeat the mistake of those (including some doctors) who for years refused to accept that smoking caused cancer because it hadn't been proven in clinical trials. Whatever the circumstance, however, a healthy skeptic doesn't jump to premature conclusions based on evidence that's preliminary, weak, or nonexistent.

Recognizing that most people don't like ambiguity, health promoters tend to give us simplistic pronouncements—"blueberries fight cancer," "high cholesterol is a killer," "this test will save your life"—that don't convey the full truth. Instead of balanced assessments of science, which is what we need to make informed decisions, we get dogmatic decrees.

When we unquestioningly accept such advice, we're hardly more enlightened (despite our illusions to the contrary) than previous generations who didn't have the benefit of research. If we're told that walnuts will ward off illness, and we believe it without really understanding the evidence, are we any more savvy than the followers of Sylvester Graham who put their

faith in whole flour simply because he (or God) told them to? If we believe a claim that cosmetics will give us cancer without scrutinizing the scientific basis for such a statement, are we much different from the disciples of John Harvey Kellogg who believed, based on his assurances, that sex would do them in?

By giving us the unprecedented ability to separate beliefs from facts, scientific research represents the best hope we have—and have ever had—for determining what really helps and harms our health. It can make us smarter than our ancestors, but only if we, as healthy skeptics, put it to proper use.

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## TRUSTWORTHY SOURCES OF INFORMATION

PubMed (www.pubmed.gov), a service of the U.S National Library of Medicine. PubMed allows you to search for just about any published health or medical article according to topic, author, or journal. You can get abstracts, and in some cases entire articles, free of charge.

The Cochrane Collaboration (www.cochrane.org). A highly respected organization that reviews and summarizes evidence on a variety of health issues.

Health News Review (www.healthnewsreview.org). This award-winning Web site evaluates the accuracy, balance, and completeness of news reports about research findings.

*Know Your Chances: Understanding Health Statistics,* by Steven Woloshin, Lisa Schwartz, and H. Gilbert Welch (Berkeley: University of California Press, 2008). This is an informative, easy-to-understand guide on interpreting information about health risks and benefits.

Quackwatch (www.quackwatch.org), a group whose mission is to "combat health-related frauds, myths, fads, fallacies, and misconduct." Its Web site includes detailed analyses of numerous questionable claims.


**"If you'd like a healthy alternative, we can wrap your cheeseburger, french fries, and fruit pie in a low-fat tortilla."**