

A Healthy Skeptic Looks at Diet Research

What the research settled, what it could not, and what survives of the common advice

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Summary

You have been told to cut fat, cut salt, take fish oil, eat five a day and eat plants instead of meat. I went looking for the studies behind that advice.

I was surprised to find that much of dietary research is highly flawed. Almost none of it is done the way a drug is tested, by putting people on the diet and counting how many have a heart attack or die. Most of it relies on what people say they eat and what happens to them, and that method cannot work here. People cannot remember what they ate. Those who eat the recommended foods also exercise more and smoke less, so the food gets credit for the rest. A trial that could settle the question would take decades. And much of the money comes from the food industry. The few proper trials were conducted on people already in trouble: high blood pressure, early diabetes, a stroke behind them, a missing vitamin. For a healthy adult who eats enough, no study has shown that changing your diet makes you live longer.

There is one more clue, from anthropology. For most of human history, people ate both animals and plants, ate no processed food, and were physically active, and heart attacks were rare.

So after all of it, we are left with the general advice: eat plants and meat in moderation and stay active. That said, as always, this paper is meant to be educational, not medical advice.

Introduction

Cut saturated fat. Eat a Mediterranean diet. Take fish oil. Eat less salt. Bacon causes cancer. A glass of wine is good for the heart, or no amount is safe. Coffee is good for you this year. Take vitamin D. Eat five a day. Go low-carb. Avoid ultra-processed food. Cut sugar. Get your BMI under 25. Eat plants, not meat. Each reaches the public as science, with a percentage attached and a study behind it. Several have reversed inside my lifetime, some more than once. Eggs were dangerous, then fine, then dangerous again. Margarine replaced butter and then turned out to be worse. A drink a day was good for the heart until it was not.

There is another reason to read this literature with care. The National Institutes of Health spend about 2 billion dollars a year on nutrition, about one dollar in twenty of the budget and flat in real terms. Industry pays for much of the rest, and the money shows. Among studies of soft drinks, juice and milk, those funded only by industry had 7.6 times the odds of a conclusion favourable to the sponsor. On the committee that wrote the 2020 US dietary guidelines, 19 of 20 members had financial ties to food or drug companies. Industry money also decides which questions get asked, since it funds research on single products rather than on what people eat.

Sources: 1–3.

I got curious about what the state of this research actually is. Not whether any particular claim is true, which is how these arguments usually run, but what kind of evidence stands behind the advice as a

whole, and how much weight it can carry. So I went through the literature behind the common recommendations.

I read it with six faults in mind. These are the recurring ways medical claims go wrong, and they are set out in full at healthy-skepticism.com:

1. relative reporting,
2. probability reversal,
3. arbitrary categories,
4. the Bernoulli fallacy,
5. the causal leap, and
6. the syndrome trap.

They are numbered here as they are there, so the sections below can point at them. Five of the six turned up. Probability reversal needs a diagnostic test, and no dietary claim rests on one.

What follows is a report on the literature: what the evidence supports and what it does not.

Respect for the problem

We say something is not rocket science when we mean it is easy. However, rocket science is tractable. The equations are known, and the experiments are repeatable. A rocket either reaches orbit or it does not, and you find out within minutes.

Dietary research is harder. Working out what a person should eat to live longer has none of that. A heart attack in a well-fed adult is not a deficiency. It arrives after decades, from many causes, and the plausible effect of any one food is 10 to 30 percent rather than tenfold. The exposure cannot be measured accurately, the subject cannot be blinded, and nobody keeps to an assigned diet for ten years. A trial large enough and long enough to settle it in healthy adults would cost more than anyone has been willing to spend. The Women's Health Initiative cost 415 million dollars and followed 48,835 women for eight years, yet still came out empty.

What follows is not a charge of incompetence. The people doing this work are not fools, and the question they are trying to answer is a very difficult one. Three things stand in the way of settling it:

1. People's metabolisms vary significantly
2. A cohort is not a trial
3. Subjects are unreliable reporters

Each is discussed below. The section ends with why smoking was settled when diet was not.

Sources: 4.

People's metabolisms vary significantly

Given the same slice of bread, one person's blood sugar rises about five times as much as another's. In 800 people wearing glucose monitors through 46,898 meals, the response to a standard bread meal ran from under 15 units in the lowest tenth to over 79 in the highest, and each person's own response was

steady week to week. In 1,002 British adults including 230 twin pairs, the spread between people in the triglyceride response to an identical meal was about as large as the average response.

If a food helps some people and harms others, the average washes out. That explanation has been tested and has not held. In the twin study, measured common genes accounted for 9.5 percent of the variation in the glucose response, 0.8 percent of the triglyceride response and 0.2 percent of the insulin response. The gut bacteria accounted for about 6 to 7 percent. Eating the same meal at lunch rather than breakfast doubled the glucose response.

Nobody has turned the differences into better advice. DIETFITS sorted 609 people by a genetic pattern meant to predict who does better on low-fat and who on low-carbohydrate, and by how much insulin they released, then assigned the diets at random. Neither predicted who did better. Across 8 trials and 9,563 people, the FTO variant, the gene most tied to body weight, changed how heavy people were to begin with but not how much they lost. In the one trial that compared a personalized diet against a generic one with equal coaching, 204 adults lost 3.3 percent of their weight on the personalized diet and 4.3 percent on the standard low-fat one.

Sources: 5–9.

A cohort is not a trial

Most of the evidence comes from cohort studies, which follow people who chose their own diet. A trial can show cause. A cohort shows only that two things go together. In the Coronary Drug Project, 151 of every 1,000 men who took their placebo faithfully died within five years, against 283 of every 1,000 who did not. The placebo did nothing. Most of the associations in this article are smaller than that gap.

Sources: 10.

Subjects are unreliable reporters

Cohort evidence rests on a questionnaire about the past year. When 484 adults filled one in and then had their true energy intake measured with doubly labelled water, men under-reported by about a third and women by more. The correlation between reported and true intake was 0.21, where 1.0 would be perfect and 0 is noise. With error that size, many of the people labelled high intake belong in the low group and the reverse, and any real difference between the groups shrinks toward zero. A risk that truly doubles, a rise of 100 percent, arrives in the data looking like 10 percent. In 2011 two statisticians found 52 claims from observational studies that had later been put to 12 randomized trials. None was confirmed and five reversed. John Ioannidis added up the pooled cohort estimates for single foods and found that, taken at face value, twelve hazelnuts a day would add twelve years of life.

Sources: 11–14.

Why smoking was settled and diet is not

There is an obvious objection to all of this. Nobody ever ran a randomized trial on smoking. It was settled by watching people who chose for themselves, which is what a cohort study does. So why treat the diet cohorts differently?

The answer is the size of the effect. Austin Bradford Hill gave these figures for British doctors: lung cancer killed 0.07 of every 1,000 non-smoking doctors a year, 0.57 of every 1,000 who smoked up to 14 cigarettes a day, and 2.27 of every 1,000 who smoked 25 or more. Thirty-two fold from bottom to top,

with each step in between where it should be. Set that against the Coronary Drug Project gap of nearly two to one, produced by nothing but the kind of person who takes a pill on schedule. Smoking's signal was about seventeen times that gap. The diet signals are smaller than the placebo gap.

Smoking had more than size on its side. Risk fell after quitting, the carcinogens were found in the smoke, animals exposed to it got tumours, and the same pattern turned up in every population studied. The nearest diet comes is alcohol, where a gene governing how people break it down acts as a natural lottery and shows a more than threefold risk of oesophageal cancer among drinkers who carry it. Hill also warned against dismissing an association merely because it is slight. A small association is not proof of no effect. It is proof that this method cannot separate the effect from the confounding.

Sources: 15, 16.

What has worked

Diet research has produced advice that holds up. All of it applies to someone who already has a problem.

Putting back a nutrient that is missing

In 1882 a Japanese navy ship sailed for nine months on white rice and 449 of every 1,000 sailors got beriberi. In 1884 a second ship sailed the same route with barley and more meat aboard, and 42 of every 1,000 got it. Nobody died on the second ship. In 1914 Joseph Goldberger changed the diet at two Mississippi orphanages and a state asylum. Among people who had already had pellagra, 470 of every 1,000 on the old diet got it again within a year, against 6 per 1,000 on the new one. In Michigan, 386 of every 1,000 schoolchildren had goiter in 1924, the year salt was iodized. By 1951 it was 14.

The modern versions were randomized. Folic acid given to 1,817 women who had already had a pregnancy with a neural tube defect: 35 defects per 1,000 pregnancies without it, 10 with it. Vitamin A for children across 450 Indonesian villages: 10.6 deaths per 1,000 without, 7.8 with.

Sources: 17–21.

Lowering a blood pressure that is already high

In the DASH trial, 459 adults were given all their food for eight weeks with salt and body weight held constant. The diet lowered systolic pressure by 5.5 mmHg across the group, and by 11.4 mmHg in the 133 people who already had hypertension. That is about what one blood-pressure drug does. Across 16 trials, adding potassium lowered systolic pressure by about 5 mmHg in people with hypertension. In the three trials of people without hypertension it did nothing. The food was supplied, so the trial shows the diet works, not that advice about it works. Blood pressure is also a number rather than an event.

Sources: 22, 104.

Reversing a recent type 2 diabetes, and delaying one

DiRECT put 149 people with type 2 diabetes of under six years on a formula diet of about 850 calories a day for three to five months, then reintroduced food. At one year, 68 of 149 were in remission and off all diabetes drugs, against 6 of 149 on usual care. At two years it was 53 against 5. At five years, 11 of the 85 still being followed were in remission, against 5 of 93.

For people heading toward a diagnosis, it can be postponed. The Diabetes Prevention Program put 3,234 adults with impaired glucose tolerance through an intensive diet and exercise programme: new diabetes at 48 new cases per 1,000 people a year against 110. Seven people taking part for three years spared one of them a diagnosis. Finnish and Chinese trials found the same. The Chinese trial, Da Qing, is the only one followed long enough to count deaths. Six years of advice given in 1986 to 577 adults, then thirty years of follow-up: 457 of every 1,000 treated died against 563 of every 1,000 controls, and the treated group lived 1.44 years longer, with a margin of error from 0.20 to 2.68 years, meaning the data are consistent with anything in that span.

Sources: 23–29.

After a stroke, and after coronary disease

In 600 rural Chinese villages, 20,995 people cooked with either ordinary salt or a substitute of three-quarters sodium chloride and one-quarter potassium chloride. Nearly three quarters had already had a stroke. Over 4.7 years the substitute came to about 25 fewer deaths per 1,000. They were eating 4.3 grams of sodium a day, nearly all added in the kitchen, so the trial corrects an excess.

CORDIOPREV gave 1,002 Spanish patients with established coronary disease either a Mediterranean or a low-fat diet for seven years. A further event occurred in 87 of 502 against 111 of 500. A Spanish olive oil body funded it, the benefit was confined to men, and the result was marginal.

Sources: 30, 31.

Feeding a patient who is not eating enough

In 2,088 hospital patients judged to be at nutritional risk, feeding support from a dietitian cut deaths within 30 days from 100 per 1,000 to 73. This supports feeding sick people in hospital.

Sources: 32.

Relieving constipation and bowel symptoms

Across 16 trials of fibre for constipation, about 660 per 1,000 responded against 410 on control, with psyllium the best studied. A low-FODMAP diet helps irritable bowel syndrome across 13 trials, on low-certainty evidence.

Sources: 33, 34.

What none of it answers

Every result above comes from someone with a problem already. Nothing in the trials reaches the healthy adult who eats enough.

Flawed examples

The rest of the standing advice is weaker, and each piece fails in the way its faults are named. The food pyramid comes first because it is the most consequential piece of dietary advice ever issued. Seventeen claims follow. Note that the flaws do not mean the claims are untrue, just that they are not backed by the research.

Claim 1. The food pyramid

Arbitrary categories (fault 3): the serving ranges, set before any trial tested them. **The causal leap (fault 5):** scoring how closely people already follow the advice, then reading the gap as the advice working.

The 1977 Senate Dietary Goals turned official advice from getting enough to avoiding excess, and set numbers that still stand: fat down to 30 percent of calories, saturated fat to 10. The six randomized trials that existed when those goals were written covered 2,467 men. Deaths: 370 on the lower-fat diets, 370 on the usual ones.

The pyramid followed in 1992. The Department of Agriculture had it ready in April 1991 and withdrew it the week before release, after the dairy lobby said in public that the shape made milk and meat look undesirable. A year and 855,000 dollars later it was released with 33 changes to the drawings and none to the numbers: 6 to 11 servings of grain at the base, 3 to 5 of vegetables, 2 to 4 of fruit, 2 to 3 each of dairy and meat. The 6 to 11 had been in the department's food wheel since 1984.

No trial has ever put people on the pyramid and counted what happened to them. It was tested by scoring how closely people already followed it. Among 67,272 nurses followed for twelve years, the fifth who followed it most closely had the same rate of major chronic disease as the fifth who followed it least. Among 424,663 older Americans scored on a later version and followed for about ten years, men in the bottom fifth died at 284 per 1,000 and men in the top fifth at 191. The raw gap was 93 deaths per 1,000. Allowing for age, smoking and education left 62. A third of the gap was the kind of person, before anyone asked what the rest was. The pyramid became stripes in 2005, a plate in 2011 and an inverted pyramid in 2026, each without a trial.

What survives: nothing that separates one pyramid from the next.

Sources: 35–40.

Claim 2. "Cut saturated fat to protect your heart"

Relative reporting (fault 1): the 17 percent is 17 people in 1,000 over 4.7 years. **Arbitrary categories (fault 3):** the 10 percent cap, never tested against 8 or 12.

Cochrane pooled 15 randomized trials of at least two years, 56,675 people. Over an average of 4.7 years, 84 of every 1,000 on their usual diet had a heart attack, stroke or similar event, against 67 on the reduced-fat diet, margin of error 56 to 79. Deaths did not move: 62 per 1,000 against 60. Most of the trials are from the 1960s to the 1980s. The largest modern one, the Women's Health Initiative, put 48,835 women on a lower-fat diet for eight years and found coronary events at 6.5 per 1,000 per year against 6.3. The 10 percent cap entered US policy in 1977 from correlations across countries, and no trial has tested 10 against 8 or 12.

What survives: less than the headline. 17 fewer events per 1,000 over 4.7 years in the old pooled trials, none in the largest modern one, and no fewer deaths anywhere.

Sources: 41, 42.

Claim 3. "The Mediterranean diet cuts heart attacks and strokes by 30 percent"

Relative reporting (fault 1): the 30 percent is 7 to 11 people in 1,000 over five years. The causal leap (fault 5): carrying a result from high-risk adults to everyone else by way of cohort studies.

The 30 percent comes from one trial. PREDIMED randomized 7,447 Spanish adults aged 55 to 80, all at high risk, for 4.8 years. Heart attacks, strokes and cardiovascular deaths came to 45 per 1,000 in the control group, 38 with olive oil and 34 with nuts. Nearly all the difference was strokes. Deaths from any cause were 47, 46 and 47 per 1,000. The trial was retracted in 2018 after 425 people were found to have been given a family member's diet instead of being randomized and one site had assigned whole clinics. The authors removed 1,588 people and republished with the same result and a wider margin of error. Producers donated the olive oil and nuts. Everyone in it was 55 to 80, with diabetes or at least three risk factors.

What survives: 7 to 11 fewer events per 1,000 over five years in high-risk adults, on one trial with a troubled history, and no effect on deaths. Untested in anyone healthier.

Sources: 43, 44.

Claim 4. "Fish oil protects the heart"

The Bernoulli fallacy (fault 4): one significant trial among four, promoted over the three that found nothing. Relative reporting (fault 1): the 25 percent is 48 people in 1,000 over five years.

Three large trials came out level. VITAL, 25,871 adults over five years: 30 major cardiovascular events per 1,000 on fish oil, 32 on placebo. ASCEND, 15,480 people with diabetes over 7.4 years: 89 against 92. STRENGTH, at a drug dose in 13,078 high-risk patients over 3.5 years: 120 against 122, stopped for futility. One trial stands apart, and it is the one the advertisements cite. REDUCE-IT found 172 events per 1,000 against 220, but its placebo was mineral oil, which raised LDL about 10 percent in the placebo group, and the maker funded it. STRENGTH found atrial fibrillation in 22 per 1,000 against 13.

What survives: nothing for the capsules in ordinary adults. A prescription product may help some patients with high triglycerides, on one disputed trial.

Sources: 45–48.

Claim 5. "Keep salt under 2,300 mg a day, or 1,500"

Arbitrary categories (fault 3): 2,300 and 1,500, neither drawn from disease. The causal leap (fault 5): no trial has put people on less salt and counted what happened.

One trial counted events, the Chinese salt-substitute trial described earlier, and it cannot say whether less sodium or more potassium did it. Americans eat about 3.4 grams of sodium a day, seven tenths of it in packaged and restaurant food, where a substitute in the kitchen does not reach. The 1,500 mg figure began in 2005 as the amount judged adequate for a healthy diet, not a limit drawn from disease. In 2013 the Institute of Medicine found the outcome evidence insufficient to say whether going below 2,300 mg helps or harms.

What survives: a salt substitute prevented strokes and deaths in a high-salt, high-risk population. The numbers 2,300 and 1,500 have no outcome evidence behind them.

Sources: 30, 49, 50.

Claim 6. "Processed meat causes cancer"

Arbitrary categories (fault 3): Group 1 says how sure the panel is, and the public reads it as how big the risk is. **Relative reporting (fault 1):** the 18 percent is 10 people in 1,000 over a lifetime. **The causal leap (fault 5):** nobody was assigned to eat bacon.

In 2015 the International Agency for Research on Cancer put processed meat in Group 1, carcinogenic to humans, alongside tobacco. The group says how sure the panel is that there is an effect, not how big it is. The size: about 56 of every 1,000 people who eat the least processed meat get bowel cancer in their lifetime, and about 66 of every 1,000 of the heaviest eaters. All of this comes from cohorts. In 2019 an independent panel graded the whole body of meat evidence low or very low certainty, worked out that cutting three servings a week would prevent about 7 cancer deaths per 1,000 over a lifetime, and advised people to carry on. Nobody disputed the numbers.

What survives: about 10 more bowel cancers per 1,000 over a lifetime of daily processed meat, if all of it is causal, on low-certainty evidence.

Sources: 51–53.

Claim 7. "A drink a day is good for your heart," and "No amount of alcohol is safe"

The causal leap (fault 5): abstainers who had quit because they were ill. **The Bernoulli fallacy (fault 4):** each new study read as settling it, which is why the advice reversed. **Relative reporting (fault 1):** no safe level is 4 more problems per 100,000 a year at one drink.

For forty years the cohorts showed moderate drinkers outliving abstainers. The abstainer group contained people who had quit because they were sick. When 107 cohorts covering 4.8 million people were re-analysed with former drinkers set aside, drinkers under two drinks a day had no survival advantage the analysis could detect. In 512,715 Chinese adults, self-reported drinking showed the familiar curve, but drinking predicted from two genes that govern alcohol metabolism showed stroke risk rising from zero with no dip.

The estimate behind the phrase no safe level was 914 alcohol-related problems a year per 100,000 non-drinkers, against 918 at one drink a day and 977 at two. A woman's lifetime breast cancer risk runs from 113 per 1,000 at under one drink a week to 131 per 1,000 at one a day.

What survives: the heart benefit does not. The harm does, and grows with the dose: about 18 more breast cancers per 1,000 women over a lifetime at one drink a day.

Sources: 16, 54–56.

Claim 8. "Coffee is good for you" (it used to be bad for you)

The causal leap (fault 5): coffee drinkers smoke, and adjusting for it flips the sign. **The Bernoulli fallacy (fault 4):** one 1981 study that made the front pages.

In 402,260 Americans followed for 14 years, coffee drinkers died more often than non-drinkers until the analysis adjusted for smoking. Then they died less often. One confounder flipped the sign. In the UK Biobank the association for two to three cups a day comes to roughly 3 fewer deaths per 1,000 over a decade on a baseline of 29, if every bit of it were the coffee. No trial has been run, and the genetic studies that stand in for one find nothing. The bad-for-you years came from one 1981 study of 369

pancreatic cancer patients whose controls were other patients of the same gastroenterologists, many of whom had been told to give up coffee.

What survives: coffee is probably harmless. No benefit has been shown by a study that could show one.

Sources: 57–59.

Claim 9. "Take vitamin D" (and a multivitamin)

The causal leap (fault 5): illness lowers vitamin D, so the sick sit at the low end of the curve. The Bernoulli fallacy (fault 4): cohort findings taken as settled, then reversed by the trials.

Cohorts found that people with low vitamin D died sooner. VITAL gave 2,000 units a day or placebo to 25,871 Americans for five years. Cancers: 61 per 1,000 against 64. Cardiovascular events: 31 against 32. Deaths: 37 against 38. Fractures: 60 against 60. D-Health, in 21,315 Australians over 60 followed for five years: 53 deaths per 1,000 against 51. Illness lowers vitamin D, and so does staying indoors. Beta-carotene shows where that leads. Cohorts had shown people with high levels dying less, so trials gave it to smokers. In 29,133 Finnish smokers followed for six years, lung cancer came to 33 per 1,000 on beta-carotene against 28 on placebo, and an American trial in 18,314 smokers stopped early for the same reason.

What survives: nothing, for prevention in adults who are not deficient.

Sources: 60–64.

Claim 10. "Eat five servings of fruit and vegetables a day, and more fibre and whole grains"

Arbitrary categories (fault 3): five, 400 grams and 25 grams, each set before the evidence. The causal leap (fault 5): the people at the top of the curve also smoke less and earn more.

These three recommendations usually arrive together, and each had its number before it had its evidence. Five a day began as a California marketing campaign in 1988. The 400 grams of fruit and vegetables comes from a 1990 WHO expert report. The fibre targets of 25 to 30 grams came from committees. The cohort curves run straight past all three.

The evidence comes from cohorts, and its headline figure fails the test I have applied to every other claim. The largest review, commissioned by WHO, pooled 185 prospective studies. It reports 13 fewer deaths per 1,000 people among the highest fibre eaters than the lowest, and 26 fewer among the highest whole-grain eaters. The review gives both figures per 1,000 participants over the duration of the studies, and does not say what that duration was. A count of people without a period is not a count.

The trials tested something narrower. The Polyp Prevention Trial put 2,079 people on a high-fibre, high-produce, low-fat diet for four years, and polyps came back in 397 per 1,000 against 395. The Women's Health Initiative found bowel cancer in 10 per 1,000 against 9.5 in 48,835 women over eight years. Both counted growths in the bowel rather than deaths, so the mortality association has never been put to a trial. The people at the top of these curves also smoke less, exercise more and earn more.

What survives: an association whose size cannot be stated, and which no trial has tested. Fibre relieves constipation, as described earlier.

Sources: 65–68.

Claim 11. "Low-carb is the diet that works" (or low-fat, or keto, or fasting)

The syndrome trap (fault 6): obesity as one label for people whose response to the same diet differs by 40 kilograms. The causal leap (fault 5): from losing weight to preventing a heart attack.

DIETFITS randomized 609 adults for a year: 5.3 kilograms lost on a healthy low-fat diet, 6.0 on a healthy low-carbohydrate one, a difference of 0.7 with a margin that includes zero. POUNDS LOST found 3 to 4 kilograms in every one of four groups at two years. Within each DIETFITS arm people ranged from losing 30 kilograms to gaining 10, while the diets differed by 0.7. The label obesity bundles people whose response differs by 40 kilograms. Look AHEAD, the one trial that asked whether losing weight by diet prevents heart attacks, found about 157 events per 1,000 against 162 over ten years and was stopped for futility.

What survives: a few kilograms in the first year, most of it back by the second. No diet beats another, and losing weight by diet has not been shown to prevent a heart attack.

Sources: 7, 69, 70.

Claim 12. "Ultra-processed food is killing us"

The syndrome trap (fault 6): one label covering whole-grain bread and soda. The causal leap (fault 5): every disease claim comes from cohorts. Relative reporting (fault 1): the higher risk is 14 people in 1,000 against 13 over five years.

The NOVA system puts mass-produced whole-grain bread, flavoured yogurt and soda in one group. When French nutrition specialists sorted 231 foods, their agreement was 0.32 on a scale where 0 is chance, and the 2025 US advisory committee graded the evidence limited for lack of a clear definition. Two trials measured intake. At the NIH, 20 adults ate 508 more calories a day on a processed diet over two weeks and gained 0.9 kilograms. A British trial of 55 people over eight weeks found 2.1 percent of body weight lost on the minimally processed diet against 1.1. The disease claims come from cohorts: a 2024 review pooled 45 analyses covering 9.9 million people and rated 41 low or very low certainty, and in the French cohort behind much of it cardiovascular disease came to about 14 per 1,000 in the heaviest consumers over five years and 13 in the lightest.

What survives: heavily processed food makes people eat more, by about 500 calories a day in the one careful test. The disease claims rest on cohorts and an unworkable category.

Sources: 71–75.

Claim 13. "Sugar causes obesity, diabetes and heart disease"

Arbitrary categories (fault 3): 10 percent, 5 percent and 10 grams a meal, none with a number behind the number. The causal leap (fault 5): from a kilogram of weight to diabetes and heart disease.

Across 30 trials, adults told to cut sugar while eating what they liked lost 0.8 kilograms, margin 0.4 to 1.2. When sugar was swapped for other carbohydrate at the same calories, weight did not change. In 641 Dutch children given a daily sugar-free drink in place of a sugared one for 18 months, weight gain was 6.4 kilograms against 7.4. No trial has counted diabetes or heart disease. WHO grades its own 10 percent limit moderate, resting on tooth decay, and its 5 percent figure very low. The 2026 US rule of 10 grams a meal cites nothing.

What survives: sugar is calories, and cutting it takes off about a kilogram. Diabetes and heart disease from sugar itself have not been tested.

Sources: 76–78.

Claim 14. "A BMI over 25 is overweight, and you should lose weight"

Arbitrary categories (fault 3): 25, moved down from 27.8 in 1998. The causal leap (fault 5): illness causes weight loss, which seats the sick among the thin. The syndrome trap (fault 6): one label for clinical and preclinical obesity.

Overweight had meant a BMI of 27.8 for men and 27.3 for women. In 1998 the National Institutes of Health lowered it to 25 for everyone, and about 29 million Americans became overweight without gaining a pound. The mortality curve has no step there. Across 239 cohorts and 10.6 million people, counting only never-smokers with no prior disease who survived five years, the lowest death rate ran from BMI 20 to 25 and rose gently from there, steeply above 35. In January 2025 a Lancet commission split obesity into clinical and preclinical and said BMI alone does not tell you which. The first trial to show that losing weight prevents heart attacks used a drug, not a diet: semaglutide in 17,604 adults over about three years, major events in 65 per 1,000 against 80. The drug does more than shed weight.

What survives: the number 25 has no evidence behind it. Risk rises gently from there and steeply above 35. Weight loss by drug prevented events in one trial, by diet in none.

Sources: 79–82.

Claim 15. "Eat plant protein instead of meat"

The syndrome trap (fault 6): plant-based covers a lentil and a bottle of soda. The causal leap (fault 5): vegetarians differ from meat eaters in everything, not only the meat.

No trial has assigned anyone to a plant-based diet and counted heart attacks or deaths. EPIC-Oxford followed 48,188 Britons for 18 years: compared with meat eaters, the vegetarians and vegans had about 10 fewer cases of coronary heart disease per 1,000 per decade, about 3 more strokes, 19 more fractures among the vegans, and the same death rate. That cohort was recruited partly through health-food shops. In the American Adventist cohort, with a different comparison group, vegetarians died at 5.3 per 1,000 a year against 6. When the Harvard cohorts split the label, whole plant foods went with fewer coronary events and refined ones with more.

What survives: nothing that separates plant from animal protein. Whether the vegetarians lived longer depends on which cohort you read.

Sources: 83–87.

Claim 16. "The paleo diet"

The syndrome trap (fault 6): one label for diets that run from seal fat to honey, and 2 of 11 foraging groups fit it. The Bernoulli fallacy (fault 4): a 13-person trial carrying the diabetes claim.

Every randomized trial of a paleo diet pooled comes to four trials and 159 people, none longer than six months. Waists came out about 2 centimetres smaller, triglycerides lower, and blood pressure 2 to 4 mmHg lower with margins that cross zero. The longest trial put 70 obese women on paleo or standard advice for two years: 4.6 kilograms of fat lost against 2.9, a difference that did not reach significance. The diabetes claim rests on 13 people for three months. No trial counted a heart attack, a stroke or a

death. The diet itself is a modern recipe. Of 11 foraging peoples whose food has been measured, 2 eat anything like it.

What survives: a few months of weight and triglyceride change in small trials. Nothing about disease, and the diet being sold is not the one anyone's ancestors ate.

Sources: 88–91.

Claim 17. "Eggs raise your risk of heart disease"

Relative reporting (fault 1): the 17 percent is about 32 people in 1,000 over 17.5 years. **The causal leap (fault 5):** nobody was assigned to eat eggs. **Arbitrary categories (fault 3):** the 300 mg line, in use since 1968 with no threshold behind it. **The Bernoulli fallacy (fault 4):** a 48-person trial read as proof that cholesterol does nothing.

The advice has reversed three times. Eggs were limited for fifty years because they carry cholesterol. A 2019 headline said they raise heart disease by 17 percent. By 2025 the headlines said the scare was a myth. The 17 percent came from a cohort of 29,615 Americans followed about 17.5 years: 180 per 1,000 got cardiovascular disease, and each extra 300 mg of dietary cholesterol a day, about one and a half eggs, went with about 32 more per 1,000, margin 14 to 51. The egg link vanished once the authors corrected for total dietary cholesterol, so the eggs were standing in for the cholesterol they carry, and other cohorts in the US and China found no link or the reverse. No trial has assigned anyone to eat eggs and counted heart attacks.

What the feeding trials do show is small and steady. Each egg a day raises LDL by about 4 to 9 mg/dL, the liver makes less when you eat more, and past two or three eggs the rise flattens. The 300 mg limit was in American Heart Association advice by 1968 and nobody can say where it came from. The 2025 Australian trial whose abstract was titled "eggs do not raise blood cholesterol" had 48 people, found a 3 mg/dL difference, and a p-value of 0.42, which is what a real effect that small looks like in a trial that small. The official advice went from 300 mg a day, to as little as possible in 2015, to no mention in 2025, while the feeding evidence barely moved.

What survives: eggs raise LDL a little. Whether that reaches a heart attack has never been tested, and the three reversals came from cohort data alone.

Sources: 92–97.

A signal from anthropology

The claim that hunter-gatherers and other traditional populations were free of arterial disease goes back to field medicine in the middle of the last century. Doctors working in rural Africa, the Arctic, the New Guinea highlands and the Kalahari reported that heart attacks and angina were rare or unseen in their clinics. Burkitt and Trowell collected the reports under the name Western diseases. Eaton and Konner turned them into the Paleolithic prescription in 1985 and 1988, and O'Keefe and Cordain restated it in 2004. From there the claim passed into the reviews and the textbooks. The press coverage of the Tsimane study in 2017, the healthiest hearts ever studied, is the recent version.

What those reports support is that the events were rare. Where anyone examined the arteries themselves, the disease was there. In 1972 Mann autopsied 50 Masai men, pastoralists living on milk and meat. Their aortas showed extensive atherosclerosis and their coronary arteries were thickened to

the degree seen in old American men. Yet heart attacks were seldom seen among them. The vessels had enlarged with age, and the authors put the protection down to fitness. Arterial disease was not absent. Heart attacks were rare, and the disease came late.

Sources: 98–102.

This is a signal, not a result. A mixed diet of animal and plant food, no processed food, and an active life goes with few heart attacks and late arterial disease in the populations that have been studied. The pattern is consistent. Which part of it matters, and how much, no trial has tested.

Sources: 91, 103.

What the literature comes to

Of the common advice, two claims are backed by trials that counted events, both in people already at high risk: a Mediterranean pattern, at 7 to 11 fewer events per 1,000 over five years, and a potassium salt substitute, at about 25 fewer deaths per 1,000. The Mediterranean trial did not reduce deaths. Everything else comes from cohorts, where the associations run 10 to 30 percent and sit inside the range the difference between people can produce on its own. The thresholds fare worst: ten percent of calories, 2,300 milligrams, five a day, 25 grams of fibre, a BMI of 25. Each is a round number on a smooth curve, and most of the guideline documents say so.

Claim	Verdict
Cut saturated fat	Unproven. Old pooled trials: 17 fewer events per 1,000 over 4.7 years. The largest modern trial: none. No fewer deaths.
Mediterranean diet, adults over 55 with diabetes or several risk factors	Survives. 7 to 11 fewer events per 1,000 over five years. No fewer deaths.
Mediterranean diet, everyone else	Unproven. No trial.
Salt substitute, stroke survivors and older people with high blood pressure, eating 4.3 g of sodium a day	Survives. 25 fewer deaths per 1,000 over 4.7 years.
Cutting salt, everyone else	Unproven. No event trial in a Western population.
The 2,300 and 1,500 mg limits	Does not survive. No outcome evidence below 2,300 mg.
Fish oil capsules	Does not survive. Three large trials level. More atrial fibrillation.
Vitamin D, multivitamins	Does not survive. Trials level on cancer, events, deaths and fractures. Beta-carotene harmful in smokers.
A drink a day helps the heart	Does not survive. The benefit was the abstainers being sick. Harm rises with dose.
BMI 25 as the line	Does not survive. Moved from 27.8 in 1998 with no step in the mortality curve.
Losing weight by diet prevents heart attacks	Does not survive. The one trial that asked found 157 against 162 events per 1,000 over ten years.
One diet beats the others	Does not survive. 0.7 kg apart at one year. Level at two.

Claim	Verdict
Sugar and processed food add calories	Survives. About 1 kg from cutting sugar. 500 more calories a day on processed food. No outcome trial.
Processed meat causes cancer	Unproven. About 10 more bowel cancers per 1,000 over a lifetime, from cohorts, graded low certainty.
Fruit and vegetables, fibre, whole grains	Unproven. The review reporting the benefit gives it per 1,000 people over no stated period.
Ultra-processed food causes disease	Unproven. No trial, and the category cannot be applied consistently.
Coffee is good for you	Unproven. Probably harmless.
Plant protein over meat	Unproven. The answer depends on the comparison group.
The paleo diet	Unproven. Small trials, six months, weight and triglycerides only. Two of 11 foraging peoples eat anything like it.
Eggs raise heart disease	Unproven. About 32 more events per 1,000 over 17.5 years in one cohort, none in others. Eggs raise LDL by 4 to 9 mg/dL each. No trial.
The food pyramid and its successors	Unproven. Never tested.
Diet for blood pressure (supplied food)	Survives. 11.4 mmHg lower systolic in people with hypertension. A number rather than an event.
Formula diet for recent type 2 diabetes	Survives. Remission in 68 of 149 against 6 of 149 at one year.
Diet and exercise to delay diabetes	Survives. 48 against 110 new cases per 1,000 people a year.
Mediterranean diet after coronary disease	Survives. 87 of 502 against 111 of 500 over seven years.
Feeding hospital patients at nutritional risk	Survives. 30-day deaths 73 per 1,000 against 100.
Fibre for constipation	Survives. 660 per 1,000 responded against 410. A symptom rather than an event.

Survives means a trial assigned the diet and counted fewer events, deaths or new cases, or, where the row says so, measured a number or a symptom. Does not survive means the trials were run and found nothing, or the association vanished when the comparison group was fixed. Unproven means the claim rests on cohorts alone.

Conclusion

I went into this expecting to find a few solid results under the advice. I found fewer than that. Where diet has been tested properly, it helps people who already have something wrong: high blood pressure, early diabetes, a stroke behind them, a missing vitamin. For the rest of us, no study has put people on a diet and shown that they lived longer. The studies that fill the gap watch what people eat, and the people who eat well also live well in other ways, so the food gets credit it may not have earned. People also differ in how they respond, and nobody has found a way to tell in advance who will respond to what.

The one thing I would add is the long view. For most of our history people ate animals and plants, ate no processed food, and were physically active, and the evidence says heart attacks were rare. Whether it was the food or the activity, nobody has checked. After all this research, what we are left with is this: eat plants and meat in moderation, and stay active.

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