

Why everything you know about nutrition is wrong

By Clare Wilson
New Scientist #3238, 13 July 2019

Are carbs good for you? Or eggs? Every week seems to bring contradictory new diet advice. New Scientist unpicks the surprising flaws in nutritional science.

ONE morning a few months ago, I saw a headline that made my heart sink. It claimed that eggs can give you heart attacks.

It wasn't that I was about to eat eggs for breakfast. It was because, as a medical journalist, I knew friends and family would soon ask me what to make of this claim. And I would have a tough time answering. Advice about what to eat seems to change every week.

Eggs are a classic example. They were once seen as wholesome packages of protein and vitamins, a perfect start to the day. But in the 1960s we woke up to the dangers of cholesterol. Eggs, which are rich in this fatty substance, became frowned upon.

But wait! Around 20 years ago, our ideas about cholesterol were revised: the amount in our food no longer mattered, because it didn't really affect the levels in our blood and hence our heart health. In the years that followed, it became OK to eat eggs once more. Then in March, the latest study showed the opposite again – that cholesterol in eggs was bad for us.

Sometimes I wonder if we should believe anything we read about food. That might sound like an overreaction, but perhaps it is a rational stance. A growing number of scientists are now saying nutrition science is so flawed that we can't even trust pillars of advice like eating plenty of vegetables and avoiding saturated fat. Within certain common sense boundaries, they say, it doesn't matter what we eat. But could that really be true?

When I started researching this article, I wondered if the doubters were being unfair. Sure, occasional studies with unusual results get seized on by the media, but maybe they are unrepresentative of the wider field. I discovered that this is the first response of nutrition scientists when a journalist tries to ask them, tactfully, if their field is broken. "You have to be careful about not taking one study and saying that's the be-all and end-all," says Louis Levy, head of nutrition at Public Health England. "You have to look at the broader evidence."

Yet the more I dug into the subject, the more it became clear that, while misleading media coverage is part of the problem, this field's flaws run much deeper. There are huge amounts of research on diet published every year, a lot of it funded by governments concerned about rising levels of obesity and diabetes. But even in the pages of respected science journals, we find conflicting results about much of what we eat and drink potatoes, dairy products, bacon, fruit juice, alcohol, even water. And this isn't just quibbling over details: there is a major fault line dividing the field over whether we should eat food that is low in fat or low in carbohydrates, for example.

Many of the problems stem from the fact that the vast majority of food studies are of a certain kind that makes them easier to carry out but more likely to lead to false conclusions. To understand their weakness, consider the better kind of research, the randomised controlled trial. Here, doctors ask a random half of their subjects to take a new medicine, while the rest take dummy pills that look just like the real ones so no one knows who is taking what. If those that take the real drug end up in better health, there is a good chance the medicine was responsible.

That kind of study is hard to do for food. Few would agree to change their diet for years based on the roll of a dice, and it would be hard to keep secret what they are eating. So instead, nutrition scientists usually observe what people eat by asking them to fill out food diaries, and then track the health of participants.



The big problem with these “observational” studies is that eating certain foods tends to go hand in hand with other behaviours that affect health. People who eat what is generally seen as an unhealthy diet – with more fast food, for instance – tend to have lower incomes and unhealthy lifestyles in other ways, such as smoking and taking less exercise. Conversely, eating supposed health foods correlates with higher incomes, with all the benefits they bring.

“Even the linchpins of dietary advice fail to translate into unambiguous benefits”

These other behaviours are known as confounders, because in observational studies they can lead us astray. For example, even if blueberries don’t affect heart attack rates, those who eat more of them will have fewer heart attacks, simply because eating blueberries is a badge of middle-class prosperity.

Researchers use statistical techniques to try to remove the distorting effects of confounders. But no one knows for certain which confounders to include, and picking different ones can change results.

To show just how conclusions can vary based on choice of confounders, Chirag Patel at Harvard Medical School examined the effects of taking a vitamin E supplement. He used a massive data set from a respected US study called the National Health and Nutrition Examination Survey. Depending on which mix of 13 possible confounders are used, taking this vitamin can apparently either reduce death rates, have no effect at all or even raise deaths.

Patel says this shows researchers can get any result they want out of their data, by plugging into their analysis tools whatever confounders give an outcome that fits their favoured diet, be it low-fat or low-carbohydrate, vegetarian or Mediterranean. “We have large studies that measure all things simultaneously – it’s more possible than ever to cherry pick,” he says.

Another source of error is known as publication bias: studies that show interesting results are more likely to get published than those that don’t. So if two studies look at red meat and cancer, for instance, and only one shows a link, that one is more likely to be published.

This bias happens at nearly every stage of the long process from the initial research to publication in a scientific journal and ultimately to news stories, if journalists like me write about it. “What you see published in the nightly news is the end result of a system where everyone is incentivised to come up with a positive result,” says Vinay Prasad at Oregon Health and Science University.



Prasad is an oncologist who has highlighted the lack of evidence behind certain cancer medicines. But he says nutrition research is in a worse state than his own field. “And they don’t seem to want to improve themselves.”

It is impossible to quantify exactly how much confounders and publication bias are distorting the field. But they are enough of a problem that we should be sceptical of all dietary advice, says data scientist John Ioannidis at Stanford University in California.

Food for thought

Out of the roughly 1 million papers that have been published in nutrition, only a tiny fraction, perhaps a few hundred, are large, good-quality randomised trials, says Ioannidis. The rest are mainly observational studies, small or poorly designed trials, opinion pieces, or reviews that summarise the results of other papers, with all their potential flaws. Even national dietary guidelines are based on this kind of work.

And what do the few hundred decent-sized, randomised trials find? Here is the clincher: when the trials test the dietary recommendations based on observational studies, the strategies almost never succeed at

extending lifespan. The studies either find no effect, or one that is much smaller than that predicted by observational studies – so small as to be practically meaningless. Usually any change isn't in rates of deaths, cancer or heart attacks, but in "biomarkers"; these are generally substances in the blood, such as cholesterol, that are thought to affect health outcomes, but the evidence isn't clear-cut. "There is almost nothing that finds you can live longer," says Ioannidis.

Take the idea of vitamin pills for the healthy general population. Many observational studies suggested that taking various vitamin supplements kept people healthier. But when these ideas were tested in trials, the pills either had no effect or actually made people die sooner.

Fish oil supplements, too, have been shown to have no benefit in clinical trials, despite dozens of observational studies claiming the opposite. Yet dietary advice in many countries, including Australia, the UK and the US is still that people should eat oily fish regularly.

Even the linchpins of today's dietary advice fail to translate into unambiguous benefits when put to the test. "There are no randomised controlled trials showing whole grains, fruit and veg or fibre affect mortality or heart attacks or cancer rates," says Levy. "It's just not plausible to do a trial following a large enough group over a sufficient period to see enough deaths."

That's right. Despite all the urging that we should "eat a rainbow" of different-coloured plant foods, aiming for five portions a day – or maybe seven or even nine, depending on who you listen to – no trial has shown that doing so makes us live longer.

The same goes for eating wholegrain versions of foods such as bread, pasta and rice, which is recommended for the fibre content. The best support that randomised trials have given us here is that a type of fibre found in oats, called beta-glucan, brings small improvements in blood pressure and cholesterol levels. But these effects are so small that it is unclear they would protect you from a heart attack, and to achieve them requires eating the equivalent of three bowls of porridge a day – something most people would find hard to swallow.

Then we come to the shambles over advice on fat. Numerous national guidelines say we can prevent heart attacks by avoiding saturated fat, mainly found in red meat and dairy products. Again, not one single randomised trial has shown that doing this saves lives, says Susan Jebb at the University of Oxford, one of the UK's highest-profile nutrition researchers. The problem is that trials generally don't last very long, she says, while diet takes years to affect health. "And people don't necessarily stick to the diet you have recommended."

Although they can't show that saturated fat reduction saves lives, some trials have at least changed cholesterol levels in ways that should, in theory, cut heart attacks, says Jebb. Yet here the evidence is contradictory from one trial to the next. There is no help even from meta-analyses, which combine the results from multiple trials to try to get an overall picture. One meta-analysis concludes that replacing saturated fat with unsaturated is good for our cholesterol and another shows no effect. To add to the confusion, we lack a clear understanding of how cholesterol affects our arteries, making it unreliable as a biomarker for heart health.

Then there is the low-carbing craze. Some trials show that people can lose weight and reverse diabetes by eating a diet that is low in carbohydrates, but high in saturated fat. And it doesn't raise cholesterol levels, contrary to what government dietary guidelines suggest, although it isn't known if the approach would be safe in people with a genetic condition that causes high cholesterol. It should also be noted that low-carbing hasn't been shown in trials to extend lifespan any more than "traditional" low-fat diets. And low-carbing isn't the only way to lose weight or manage diabetes: people can do the same on a low-fat diet.

This is why one week we will hear that experts recommend low-carbing, and the next, a different set of experts will be telling us to avoid meat and eat a low-fat, plant-based diet. "You can find evidence to back up any position you want to confirm your existing beliefs," says Anthony Warner, a UK food industry chef who skewers fad diets in his books and blogging. "The one conflict of interest that's never mentioned is people's ideologies – there's a lot of ideology in diet."

The simplest explanation for this mess of contradictions is that there are no underlying truths waiting to be discovered, says Ioannidis. It is all just random noise in the data.

That doesn't mean we can now eat as much cake as we like, because when we become seriously overweight, it physically strains the circulatory system and joints. But it does suggest that within limits of common sense and moderation, one way of eating is about as good as another. "If you overeat massively, that's going to be unhealthy. And there's a floor beneath which you really can't go. But if you do everything in moderation, you'll be fine," says Amy Tuteur, a former obstetrician and writer who is another critic of nutrition research.

It would be unfair to conclude that nutrition science has taught us nothing, though. It was thanks to dietary studies that we identified the vitamin deficiencies of malnutrition, such as rickets, caused by a lack of vitamin D. More recently, it was nutritionists who showed that pregnant women could protect their babies from the spinal disorder spina bifida by taking folic acid supplements, and that people with high blood pressure can bring it down by cutting salt intake. Interestingly, these last two findings have been demonstrated in randomised trials, showing that they can be done, when there is a real effect to find.



But these successes came some time ago. "Nutrition science did an amazing job in terms of addressing deficiencies," says Warner. "But when we started having enough to eat, that science tends not to give as many clear answers."

Ioannidis says nutrition researchers need to universally adopt the good research practices seen elsewhere, such as pre-registering all studies, including stating which confounders they will use, to prevent cherry-picking after the results come in. Prasad goes further, saying there should be a moratorium on observational studies until the problems are fixed. "The public is becoming so fatigued with flip-flopping advice that they are losing faith in science more broadly."

In the meantime, common sense and moderation feel like an unsatisfyingly vague set of dietary principles. And of course, many of us have reasons other than health for eating one way or another, such as forgoing meat for ethical or environmental reasons. Dietary fibre helps prevent constipation, and no one needs a randomised trial to prove that.

Can it really be safe to just follow our gut? Duane Mellor, a spokesperson for the British Dietetic Association, says that it might be a reasonable strategy if it weren't for the fact that we are now surrounded by tempting high-calorie foods, and lots of us simply can't help overeating. "If we had no food guidelines at all, what would regulate industry?" he says. I can't think of a good answer.

I must admit to some biases of my own. I am happy to accept the evidence that saturated fat has been unfairly maligned all these years, which conveniently means I can eat things like red meat and butter. Yet I find it hard to let go of the idea that it is good for me to eat whole grains and fruit and veg. I try to eat quite a lot of these foods, mainly because I like them or perhaps because I am middle class. I will probably continue, even though I accept that there is little evidence to support doing so. It looks like I'm not immune to ideology either.