

OUR PSYCHOLOGY DECIDES THE VALUE OF NUMBERS

'One glass of alcohol is one too many.' I saw this headline flash past me on the website of the Dutch national broadcaster NOS in April 2018.¹ Drinking more than one glass of alcohol a day increases your chances of dying early, the report stated.²

The article referred to a study published in the renowned publication *The Lancet*, for which eighty-three studies referring to a total of some 600,000 study subjects had been aggregated.³ Impressive, I thought, but correlation is not the same as causality.

The same thing was spotted by Vinay Prasad. Prasad, an American doctor and researcher, who knows everything there is to know about evidence-based medicine, had delved into *The Lancet* study and tweeted gruffly: 'A team of scientists prove [sic] the human thirst for bullshit science and medicine news is unquenchable.'⁴

He then elucidated his statement in a thread of more than thirty tweets. He mentioned publication bias that we've seen in earlier chapters. He also argued that, in this study, alcohol use had only been monitored for a short time. And although a high mortality risk had been found among beer drinkers, in wine drinkers it turned out to be minimal. It wasn't so much the alcohol, Prasad suggested, but the lower income of beer drinkers that was unhealthy.

I came to the conclusion that there was nothing wrong with a tippie or two.

Why do things keep going wrong?

When I was writing my first articles as the numeracy editor of online journalistic platform the *Correspondent*, I thought I knew the solution to the dogged issue of number misuse: more knowledge. According to the Organisation for Economic Cooperation and Development (OECD), one in four adults in developed countries perform at or below the lowest level of numeracy – they find it difficult to interpret statistics and diagrams.⁵ Mathematics anxiety is such a serious phenomenon, the OECD concluded in 2012, that it occurs in around 30 per cent of fifteen-year-olds.⁶

If only news consumers could understand how numbers work, I thought, everyone would automatically spot their misuse. So I began to write about bad polls, about margins of error, about correlation and causality. And, each time, I tried to explain how to recognise these kinds of errors, to prevent future misunderstandings.

More knowledge as the ultimate solution; it seems so logical. When climate scientists publish temperature graphs, when journalists fact-check political statements, when politicians trot out economic figures in a debate – each time they try to combat mistakes with ever more information.

But the longer I wrote about number misuse, the more I began to doubt whether knowledge was the only solution. I stood in a long line of writers who have wanted to raise awareness about this topic, but little seemed to have changed. Darrell Huff had already outlined the principal pitfalls with numbers more than sixty years ago, in *How to Lie with Statistics*. The book had been a bestseller, but the same mistakes are still being made today. The discussion about IQ and skin colour crops up in every new generation, unrepresentative polls

continue to get far too much attention, and health news that confuses correlation with causality flashes by almost daily.

It's often easy to recognise these errors by asking a few questions. How was the data standardised? How have the figures been collected? Is there a causal relationship? I have discussed these questions extensively in the previous chapters and list them once more at the end of this book.

Yet erroneous conclusions about numbers keep slipping past the scientists, journalists, politicians and newspaper readers. And past me. I wished the ground would open up and swallow me when, after a lecture, I saw that 50 per cent of those attending had not rated my performance as good. But I forgot to take into account that only two people had taken part in the survey.⁷ And I was outraged when I read about a study that alleged that female programmers were undervalued by their colleagues. Later it turned out that the media had misinterpreted the study; programmers were not nearly as sexist as the reporting had suggested.⁸

Over and over again, I fell for the same mistakes I discussed at length in my articles. It was only when I started working on this book that I really began to understand why this was happening. When it comes to numbers, the issue is not only errors in reasoning, as I had thought, but also gut feelings. In numerous instances in this book, researchers were influenced by their – conscious or unconscious – biases and convictions.

And we number consumers are equally prone to this.

An interpretation that isn't good, but feels good

For years, Yale professor Dan Kahan has been investigating how culture, values and beliefs affect your thinking. In one of his experiments he

and his colleagues presented participants with a table showing the results from a fictitious skin cream trial.⁹ In one group, the figures showed an increase in skin rashes; in the other, they had decreased. Does the cream help with the rash, Kahan asked, or does it make it worse?

To find the answer, participants had to make a tricky calculation with the figures shown in the tables. The people who had scored better in an earlier maths test tended to come up with the right answer. Until this point the experiment confirmed what you'd expect: that if you have a better understanding of numbers, you will get closer to the truth.

But there were two further groups of test subjects. They were given the same tables of figures, but this time representing a controversial topic in American politics and media: gun control. It featured a fictional experiment with stricter legislation. The question this time was: does crime go up or down as a result of the new measure?

The answers were as different as day and night from the answers given by the participants in the skin cream 'experiment'. Those who were good at maths performed worse than before. The figures were exactly the same as those presented for the skin cream experiment, but now the participants gave the wrong answers.

The explanation for Kahan's results? Ideology.¹⁰ Irrespective of the actual figures, Democrats who identified as liberal, normally in favour of gun control, tended to find that stricter laws brought crime down. For the conservative Republican participants, the reverse was the case. They found that stricter gun control legislation did not work.

These answers are no longer to do with the truth, Kahan argued. They are about protecting your identity or belonging to your 'tribe'. And the people who were good at maths, Kahan also found, were all the better at this. Often completely subconsciously, by the way. It was their psyche that played tricks on them.

Time and again, Kahan saw this result in his experiments; when people know more facts or have more skills, they have more to choose from while deluding themselves.¹¹ Our brain works like a lawyer; it will find arguments to defend our convictions, whatever the cost.

This can even mean that you believe one thing at one point and something else later on. There are American conservative farmers who deny the existence of climate change, for instance, but who take all kinds of measures to protect their business against the effects of a changing climate.¹² This seems irrational, but it isn't, Kahan explains. Much can be at stake if you alter your convictions. The farmer who suddenly believes in climate change is given the cold shoulder by his family, in church, at the baseball club. He puts a great deal on the line but gets nothing in return. It isn't as if he's going to change the climate on his own. The truth will have to wait.

Everyone is susceptible to these kinds of psychological pressures, including Kahan himself. In an interview with journalist Ezra Klein in 2014 he mentioned that he always assumes he will make the same mistakes as the ones he observes in his research.¹³ And he, also, protects his identity with 'facts'. In short, a good interpretation of the figures is not just about what we know, but also about our psyche. So how can you be mindful of your own biases when you come across numbers? Here are three tips.

1. What do you feel?

There are plenty of issues in which the psychological processes from Kahan's study do not play a part. Most people will have a neutral reaction to numbers concerning something like skin cream. But it's the numbers about which you *do* feel something that are susceptible to bias. Racism, sex, addictive substances – the chapters in this book deal with such controversial issues for good reason. They are issues that are closely related to your identity and 'tribe'.

Should you just eliminate these feelings? That would be impossible; they are there, whether you like it or not. And this is a good thing. Without fear we would blindly walk into dangerous situations. Without anger we would not stand up against injustice. And without joy, life would be soulless. Feelings are part of us.

So when you see a number, take a step back and ask yourself: what do I feel? When I saw the alcohol study mentioned above, for example, I became irritated. Especially when I later read the headline 'An extra glass of alcohol can shorten your life by 30 minutes'.¹⁴ This was simply total nonsense. My irritation was a feeling that matched my professional 'tribe' – number sceptics – but also my personal one. When I meet friends, we drink a few glasses of wine or beer. That's what we do. Should I stop doing this? I'd rather not. I felt pleased when I read the tweets from the renowned Vinay Prasad. Relieved; I could carry on drinking.

But I had overlooked an important factor. When I realised that I felt particularly upbeat at the conclusion there was nothing wrong with drinking, I had another look at Prasad's tweets. And I saw that nowhere had he said that drinking was *not* harmful, just that this study was flawed.

As in Kahan's study, I had immediately chosen an interpretation that fitted my 'tribe'. An interpretation that was not necessarily the right one, but that *felt* right. I was good at this kind of thing because, as a result of my work, I knew every argument against this type of study. My brain, too, had worked like a lawyer.

2. Go another click!

At the beginning of 2017 Dan Kahan and his colleagues published a new study.¹⁵ He had asked around five thousand people questions to measure their 'science curiosity' for a project about science documentaries.¹⁶ How often did the respondents read books about science?

Which topics interested them? Did they prefer to read articles about science or about sport?

He also asked a few questions about the respondents' political persuasion and their ideas about climate change. 'How much risk do you believe global warming poses to human health, safety, or prosperity?' was one of them. In the same way that Kahan had used a maths test in his earlier experiments, he was now measuring 'science intelligence' – a skill that was supposed to help with interpreting information about climate change.

Kahan again saw what he had found in earlier research: liberal Democrats saw more risk than conservative Republicans. And the more 'intelligent' the respondents, the bigger the difference between the two groups.

But what if he did not categorise according to intelligence but instead according to curiosity? These two were not the same, he saw in his data. Someone could be very curious about science, but not necessarily be any good at it – and vice versa. When he looked at the correlation between curiosity and the perceived climate change risk, he saw an interesting outcome: the Democrats and Republicans still had different opinions, but the more curious the subjects were, the greater they perceived the risk of the earth warming up. Irrespective of their political convictions.

Why did curiosity play a part here? In a follow-up experiment Kahan presented respondents with two articles about climate change; one that confirmed the concerns about it, another that was sceptical. The headline of one of the articles had been worded in such a way as to appear surprising: 'Scientists Report Surprising Evidence: Arctic Ice Melting Even Faster Than Expected'. The other article appeared to be reporting nothing that was new: 'Scientists Find Still More Evidence that Global Warming Slowed in the Last Decade'. Which article do you want to read, he asked? And this is where he

discovered the power of curiosity. Curious types did not choose the article with the headline that accorded with their convictions, but the challenging one. For these respondents, curiosity was a stronger force than ideology.

This experiment is educational. If you encounter a number, don't stop and just accept it, but go and explore. Search – on- or offline – for people who look at the number from a different angle. Don't only read articles that confirm what you already think, but look for information that may make you feel uncomfortable, angry or desperate. As writer Tim Harford puts it: 'Go another click.'¹⁷

I put this to the test and began to search for more information about the impact of alcohol on our health. Some googling soon led me to all kinds of studies that suggested a causal link between alcohol and cancer risk. An experiment with a baboon that developed liver disease as a result of alcohol consumption,¹⁸ for instance, and a meta-study that showed a linear correlation between breast cancer risk and alcohol consumption.¹⁹

What became clear to me is that experts have long agreed that drinking has adverse effects. Since 2015, the Dutch Health Council has recommended drinking no more than one glass of alcohol a day, for a reason.²⁰

3. Accept uncertainty

Kahan's research into curiosity is still in its early stages. His experiments have to be repeated, and even if these replications show the same results, his conclusions may yet be invalidated by new studies.

Many of the figures you see in the newspapers are no different. They come from thorough, peer-reviewed research, but they are premature because still more research needs to be conducted. Should you ignore such inconclusive figures? No, like Kahan's studies, they

help us to understand the world a little better. But do take them with a pinch of salt. And bear in mind that, in a few years' time, people may reach different conclusions.

Research into alcohol is much more advanced than Kahan's research into curiosity. When you start to investigate and google 'meta-study' (a study into studies), you soon see that many alcohol studies come to the same conclusion. The causal link between breast cancer and alcohol consumption has now been proven. Alcohol researchers came to the same conclusion as scientists who had examined the stacks of studies about the impacts of smoking: we know enough. But even if the research into alcohol is never definitive, that is the nature of science. There are studies that suggest that moderate alcohol intake even combats some diseases. Moreover, you cannot always disentangle correlation and causality in alcohol studies; research on animals is not the same as research on people, after all; and it's unclear how much alcohol you can drink before it becomes bad for you.

As it turns out, uncertainty is something we do not handle psychologically very well either. There is a reason why people with firm convictions dominate talk shows, political debates and newspaper columns. *I'm sure about this*, each and every one of them projects, *let me tell you how the world works*.

But people who are certain, by definition lack curiosity. If you hang on to your convictions at all cost, you are never receptive to new information. If we want to use numbers well – and information in general – then we have to embrace this uncertainty. I pointed this out earlier: numbers are a window onto reality, but the view they offer is no more focused than that seen through frosted glass. At best, all they show is the general outline.

Do not let yourself be paralysed though. At some point you will have to make a choice. Despite the uncertainty, you will have to decide.

For example, should you drink less? Numbers cannot answer that question for you. They can seem like the ideal excuse to stop thinking, but they cannot provide quick and easy answers. At best, they will help you navigate the terrain.

And it's not just that the figures are inconclusive; other factors play a role that are not captured in the numbers. How important is drinking alcohol to me? How much risk should I take with my health? How healthy am I, generally speaking? These are things you will have to work out for yourself.

In short, be aware of your feelings, investigate the available information and accept uncertainty. And then make your own decision.

A final tip: watch out for a conflict of interest

In June 2018, another report appeared about a study into the effects of alcohol on our health.²¹ This report was not about the results of the study but about the fact that the study had been stopped prematurely. In the experiment, the first of its kind, people had to drink one glass of alcohol every day for six years or, in the control group, none at all.

Previously, there had been commotion over the fact that the American National Institutes of Health had received the better part of a million dollars funding from the alcohol industry. Heineken, Carlsberg and other manufacturers had co-funded the study.²² And now it emerged from internal research by the NIH that the scientists had promised the alcohol industry that the study could give the 'level of evidence necessary if alcohol is to be recommended as part of a healthy diet.'²³

The study had been set up in such a way that all the benefits would be visible, while the harmful effects would be overlooked. The

length of the trial was too short, because many types of cancer develop slowly. Particular groups of people – those with cancer in the family, for instance – were excluded. All this was done under the pretext of safety, but it also reduced the likelihood that cancer would develop and be linked to alcohol consumption.

If you want to recognise number misuse, it is important to grasp errors of reasoning and to understand your own gut feelings. But maybe the most significant question you should ask is: who's behind the number? Does he or she have a vested interest in the outcome?