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1 99% OF STATISTICS ARE MADE UP

"Nearly one in five British Muslims has some sympathy with those who have fled the country to fight for IS in Syria" – The Sun, 23 November 2015

On 13 November 2015, 130 people were killed in a terrorist attack in Paris. Islamic State (IS; aka ISIS, ISIL, or Daesh depending on who you ask) claimed responsibility. Less than two weeks later, millions of *Sun* readers in Britain learned that *one in five* British Muslims sympathised with jihadis leaving the country to fight for this same organisation. According to *The Sun*, this meant that 500,000 Muslims in Britain supported people like 'Jihadi John', a British Muslim turned ISIS member who had become famous in the UK for his involvement in beheadings of Western journalists and aid workers.

This is frightening news. It's the kind of news that makes people feel differently about the country they are living in. Many of the people reading the story will have had Muslim friends, Muslim neighbours, Muslim co-workers. Readers in big cities like London, Birmingham, and Manchester might well live near (or even in) areas where the majority of the population is Muslim. What were these readers to make of the fact that a *fifth* of these neighbours and colleagues likely sympathised with a violent, jihadist organisation like ISIS?

Predictably, there was anger. Internet commenters suggested that Muslims were hostile to Britain and British culture. Some wanted British Muslims to be deported in the interests of national security. In comments sections and forums people wrote things like 'If it means safeguarding our nation then surely mass deportations must be the answer' and 'best if they all went to a Muslim country'.[1]

People on the other side of the debate were angry too – but mostly at *The Sun* and its readers. On Twitter, they rallied around the #1in5Muslims hashtag to denounce the article as part of *The Sun*'s racist, Islamophobic agenda (and, because this is the internet, to make jokes about cats and Netflix and chill).[2] The battle lines were clear: *The Sun* is Islamophobic and intolerant, or Muslims are dangerous extremists.

Framing the debate this way, however, means losing sight of something important: whether the 'one in five' number is actually accurate.

Set against Big Talk about racism and national security, questioning the specific number in the story can seem somewhat trivial. But in this case, as in so many others, the number *is* the story. If the number were lower, say one in a hundred, there would be no story. One in a hundred is too small a number to be worth putting on the front page of Britain's biggest selling national newspaper. If the number were higher, say one in two, then it's a much *bigger* story. Half of British Muslims support terrorism? That's starting to sound like an existential crisis for the country.

If the number is the story, then our first priority should be to determine whether the number is *true*. At the bottom of all this is a real figure. There is a real number of Muslims in Britain who have some level of support for ISIS, and this number is unlikely to be zero. Once you get into populations of millions, there will be some number of people who support any crazy thing you can think of. The number of Brits who think the royal family are alien lizard-people is not zero. We can therefore legitimately ask how big this number is: how many British Muslims actually do support ISIS? *The Sun* wanted to know, so they did some research and came up with an answer: one in five.

But is this number accurate? Or is it, for want of a better word, bullshit?

On bullshit

The word bullshit has a special place in the world of fact-checking. People who lie with statistics – politicians, business leaders, snake oil salesmen of all stripes – are often quite litigious. They like to sue people who point out that they are liars. To actually prove that someone has lied is a tricky business. You have to show that they *knew* what they were saying was wrong, but that they said it anyway with the express intention of misleading people. You basically have to prove what was going on inside their mind at the time they made the statement. Unless you have an obvious smoking gun – an email in which they say 'I know our product causes 20% of people's skin to fall off, but I'm going to say it's 0.005%. lol ☺' – then you're going to struggle.

Calling something 'bullshit' is different. You're still saying the statement is false, but you're not specifically calling the person making it a liar. This makes it more difficult (though not impossible) for them to sue you.

The short answer to this question is: 'yes, it's bullshit.' The long answer is that it's a special kind of bullshit that requires some time to explain.

The first thing to note about *The Sun*'s 'one in five' statistic is that it comes from a **sample survey**. You've almost certainly filled one of these out at some point or another. Someone calls you up, or you go to a website

and you answer a series of questions. 'On a scale from 1–5, how likely are you to visit Big Butt Mountain?',* that kind of thing. When I was a student, I worked for a company which conducted these sorts of surveys. I mostly called people on behalf of their local council to ask if it would be OK to collect their bins less often (in case you are interested, the answer was no. People wanted their bins collected as often as humanly possible. Every day. Every hour. They wanted binmen waiting in the shrubbery, ready to leap out at the merest hint of refuse). A lot of the statistics in the news come from surveys like this, and there are a few important things to keep in mind about them. The first is that not everyone in the country takes the survey. This is an obvious point (otherwise we'd all do nothing but take surveys all day), but it's worth remembering. *The Sun* says that one in five British Muslims sympathise with 'jihadis' in Syria, but clearly they did not call every Muslim in Britain to ask about this. Instead, they (or, more accurately, the company they hired to carry out the survey) spoke to a random (or close to random) selection of about 1,000 British Muslims. About 20% of this sample of 1,000 expressed at least some sympathy with people leaving Britain to go and fight in Syria. *The Sun* took this figure and applied it to the British Muslim population as a whole (which is around 3 million people).

It feels wrong to use the opinions of 1,000 people to make sweeping generalisations about a population of millions. However, this is a common and actually fairly well-accepted practice. If you take a random sample (see Chapter 3) of a decent number of people, their views can be a reasonably accurate representation of the views of a whole population. The same is true if you wanted to know, say, the average height of people in France. You can't go to every French person's house with a tape measure. But if you measured a thousand random French people, this would give you a reasonably good idea of how tall the average French person was. So far, *The Sun* hasn't done anything drastically wrong.**

There is, however, one important detail missing from the story which might change our interpretation of the 'one in five Muslims' number. As well as British Muslims, the survey company *The Sun* hired also conducted the same survey with non-Muslims.[3] On the headline question, 13% of *non-Muslims* were also sympathetic to people leaving to fight in Syria. This is about one in every eight people – not that different from one in five.

You might be wondering why a substantial number of non-Muslims would support people who have left the country to join a radical Islamist terrorist organisation. The answer is that, just like most Muslims,

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*   This is a real place. It's a mountain in North Carolina that is apparently quite nice for hiking. Tourist websites particularly recommend the 'Big Butt trail to Point Misery'.

** We'll return to the issue of samples in Chapter 3.

they wouldn't. Very few British people, Muslim or otherwise, support the worldview or actions of an ultra-violent jihadist organisation like ISIS.

But if that's the case, why did *The Sun*'s survey find such a high level of support for British ISIS recruits? The answer to this is one of the oldest tricks in the book of misleading statistics. To show that a significant fraction of British Muslims 'support ISIS', *The Sun* asked about one thing in the survey, then pretended they'd asked about something else.

Here is the actual question *The Sun* used in their survey:

Which of the following statements is closest to your view?

1. *I have a lot of sympathy with young Muslims who leave the UK to join fighters in Syria*
2. *I have some sympathy with young Muslims who leave the UK to join fighters in Syria*
3. *I have no sympathy with young Muslims who leave the UK to join fighters in Syria*
4. *I don't know*

Twenty per cent of Muslim respondents (and 13% of non-Muslims) picked either 'some' or 'a lot' of sympathy.

It has probably occurred to many of you already, but 'sympathy with' does not mean the same thing as 'support for'. In saying that they had 'some sympathy with' young Muslims leaving the UK to fight in Syria, many people will have meant only that they felt at least a bit sorry for them. Perhaps they felt sorry for people they thought had been brainwashed into travelling to a hellish situation by stories of an 'Islamic paradise'.[4] Or maybe they felt sorry for young Muslims whose lives in the UK were so bad that they thought fighting in Syria offered better prospects. One of the interviewers who conducted the survey made exactly this point in an article for *Vice*.[5] While conducting the survey, the interviewer had spoken to a Muslim woman who had given 'thoughtful, considered answers to every question'. She thought that David Cameron 'would probably be right to bomb Syria, and that Muslims did have a responsibility to condemn terrorist attacks carried out in the name of Islam'. But she also sympathised with young British Muslims who left to go fight in Syria. She said 'They're brainwashed, I feel sorry for them'. So the interviewer ticked the box marked 'I have some sympathy for young British Muslims who go to join fighters in Syria'. This person is one of the 'one in five' Muslims *The Sun* characterised as 'supporting jihadis'.

Something else you may have noticed about the question is that the word 'ISIS' does not appear anywhere. It only mentions 'fighters in Syria'. In 2015, when the survey was carried out, ISIS were only one of many groups involved in the Syrian conflict. Not all of these groups could be

characterised as radical Islamist jihadists. In fact, the UK government had been supporting several of them in their fight against Syrian dictator Bashar al-Assad.

If you go back and look at the front-page headline, you can see that *The Sun* were careful to stick to the word 'sympathy'. Perhaps they thought the mismatch with the survey question would be too obvious otherwise. But in the rest of the paper it is clear that by 'sympathy for British Muslims leaving to fight in Syria' they actually mean 'support for ISIS'. The front page is dominated by an image of a knife-wielding Jihadi John, with the caption 'Support … Brit Jihadi John who went to Syria'. Later in the paper, a heading references the survey's finding of 'backing for jihadis'. On page four, a columnist describes her shock that so many Muslims in Britain are sympathetic to the 'murderous, twisted ideology [of ISIS]'.

You may feel that we've strayed from talking about numbers. However, one of the main things to check when critiquing any statistic is whether what is reported matches up with what was actually measured (we'll cover this in more detail in Chapter 4). In the case of statistics based on surveys, this means asking whether what we are being told matches the question that was actually asked. We are being told by *The Sun* (both implicitly and explicitly) that one in five British Muslims support people joining ISIS. As we've seen, this is not what the survey question actually asked about. How a question is worded has a dramatic effect on the numbers you get back. By wording the question the way they did, *The Sun* got a high number. By wording it to more closely match the concept they wanted to measure (support for ISIS), they would have got a much lower one.

A lot of smart people spotted problems with *The Sun*'s 'one in five' figure soon after it was published. Thanks to them, the story has a somewhat happy ending. After a record number of complaints, the Independent Press Standards Organisation (IPSO) ruled against *The Sun*, who were forced to admit that the article was 'substantially misleading'.[6] They subsequently removed all record of the story from their website. This is all well and good, but most bullshit statistics are not so quickly and comprehensively refuted. This was a front-page story in a national newspaper, and Islamist extremism (and Islamophobia) is a highly emotive issue. *The Sun* consequently faced an army of sceptical people ready to dig into the nitty-gritty details behind the figure. Their efforts were aided by the fact that the problems with the statistic were so blindingly obvious. Lower profile claims, or claims with more subtle (though no less devastating) statistical flaws rarely receive the same level of attention. They slide in under the radar to become part of the public discourse on a given topic, helping people to be a little bit more wrong for years to come.

The world runs on numbers

The Sun's bullshit about British Muslims is just one drop in the ocean of statistical claims that wash over us every day. In a 2016 study, researchers at Cardiff University found that one-fifth of all British TV and radio news items included at least one statistical reference. This included three-quarters of all stories about the economy, almost 40% of stories about the environment, and around a third of all stories about the economy.[7] The media is full to the brim with numbers. And it's not just the media. Politicians use statistics to tell us there is a problem that needs solving:

> *"top universities [in the UK] make offers to 55% of white applicants, but only to 23% of black ones"*[8]
>
> *"[in the US] the top 1% … has earned 85% of all new income"*[9]

Or to persuade us to elect them or keep them in power:

> *"We created 800,000 new jobs"*[10]
>
> *"We built almost 2 million homes"*[11]

Companies use statistics to tell us that their product is better than everyone else's:

> *"Duracell batteries last up to 10 times longer"*
>
> *"Pantene conditioner makes hair up to 10 times stronger"*[12]

Doctors use them to inform us about risks to our health:

> *"People who smoke have 25 times the risk of developing lung cancer"*[13]
>
> *"150 minutes of moderate exercise per week reduces the risk of heart disease by 14%"*[14]

The list goes on and on. Our everyday lives are also not a number-free zone. Around the dinner table, or on social media, we've all used some statistic or other to make a point or to win an argument. 'Did you know that 90% of vegetarians eat meat when they're drunk?',* 'Yeah, but it's probably McDonald's and you know that like only 10% of a chicken nugget is meat.'

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* This comes from a real Twitter conversation sparked by a story in the *London Metro* newspaper. The story reported that 34% of vegetarians eat meat when drunk. On Twitter this was discussed variously as '37%', 'almost 40%', and '90%'.

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Statistical claims crop up in almost every part of our lives, from our health, to our political views, to what we buy at the supermarket. These numbers are often important – they tell us things we really need to know. Unfortunately, when confronted with statistical claims, many of us suffer from a sort of numerical blindness. The headline says that 'the government will spend an extra £40 billion on schools', or that '80% of politicians are millionaires', but our minds slide off the specific figure and latch on to the gist instead: 'the government will spend a lot on schools', 'too many politicians are millionaires'.

In November 2015, US website *The Onion* reported that 42 million people had died in America's 'Bloodiest Black Friday Weekend On Record'.[15] Many people on social media were aghast at this news. For example, here are a just a couple of the responses that appeared under a Facebook post about the story:

> *"How stupid can you really be people you kill someone over something you don't really need you just want how pathetic are you"*

> *"This is absolutely crazy. All for gifts. So sad what monsters we have become. So much for the spirit of giving. What happened to the true meaning of Christmas????!!!"*

Noble sentiments indeed. But while composing their posts, these commenters might have profited from a moment's reflection on the actual number in the headline. The United States has a population of around 320 million people. The figure of 42 million would mean that around *one in every eight people in the country* had been killed in pursuit of cut-price TVs and *Star Wars* advent calendars. It might also have been worth examining a few previous headlines from *The Onion* (perhaps the world's most famous satirical news site), which have included such gems as 'Study Reveals: Babies Are Stupid' and 'Jurisprudence Fetishist Gets Off on A Technicality' (you might need to let that one sit a little).

I am not holding these people up to be mocked (OK, maybe I am a little …). They are simply an extreme example of our natural tendency to mentally 'skip over' the numbers in a story, and to home in instead on the core message. Does it sound important? Does it sound like a good thing or a bad thing? Doing this doesn't make you stupid – we all do it to some extent or another. But it can cause big problems, as we can see if we look at a more serious example from the world of health.

Sometimes contraception doesn't work

Contraceptive implants are small devices that can be implanted under a woman's skin (usually in the arm). Like the pill, they release hormones into the bloodstream to prevent pregnancy. They last for a few years

and get removed when they run out. Rather than taking a pill every day, it's basically a thing in your arm that does the job for you automatically. In 2011 the BBC,[16] along with several other national outlets in the UK, published news that almost 600 women who'd had these implants installed had become pregnant regardless.

Just as in *The Onion*'s Black Friday story, it's easy to let our minds slip off the number in the headline and just interpret this as a Bad Thing about contraceptive implants. Lots of people are having unwanted pregnancies, so contraceptive implants must be bad (or at least worse than we thought). This is particularly troubling because implants are often described by doctors as being more effective than other forms of contraception, such as condoms and the pill.

But do these figures actually mean there is a problem? Obviously there is a problem for the individual women concerned. They thought they were protected by the implant, but they got pregnant anyway. This is a potentially life-changing event and they deserve a great deal of sympathy. But should this change *our* minds about the effectiveness of contraceptive implants? If you put the pregnancy numbers in context, the answer is: probably not. Investigating the story, the excellent Ben Goldacre (former writer of *The Guardian*'s 'Bad Science' column and all-around expert on dodgy evidence) contacted the UK's Medicines and Healthcare Regulatory Authority (MHRA) and asked how many implants had been sold up to that point.[17] The MHRA put the number at around 1.35 million. Six hundred pregnancies (the exact figure was actually 584) is a tiny fraction of this figure. Based on these numbers, Goldacre calculated the failure rate for the implants as 0.014% per year (the implants last for three years); or **1.4 pregnancies per year for every 10,000 women with implants**.* For comparison, the first-year failure rate of condoms is about 2% for perfect use. That is, in their first year of using condoms, not 1.4, but **200 out of 10,000 women** will get pregnant.[18] And that's only counting people who use condoms *consistently and perfectly*. The failure rate for the pill (again for women who never forget to take it) is 0.3%, or **30 out of 10,000**. Even when used perfectly, condoms and the pill are *much* worse at preventing pregnancy than implants are.

For there to be no opportunity for a story about women getting pregnant while having an implant they would have to work flawlessly every time. That's just not going to happen. No drug or device that humans have ever invented meets this standard. Nothing has a failure rate of zero. The '600 pregnancies' number is telling us a real story; it's just not the story the BBC are selling. Putting the number in context, the real

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* Other studies using better data have estimated the failure rate at around 0.05% per year.

news is that 'contraceptive implants work an extremely high percentage of the time, just like we thought they did'. Of course, that's not a headline that's going to attract many clicks.

The difference between these two ways of reading the implants story could make a real difference to people's lives: pushing them away from using implants, and towards using condoms or the pill. It's only by stopping to interrogate the number that we were able to get behind the headline to what was actually going on. As a result, we're that bit better informed about the world, and that bit better equipped to make an informed decision.

If you'll excuse some slight corniness, taking off our number blinders is a bit like a superpower. Unscrupulous people, including politicians, journalists, and annoying men in bars, are counting on us not to question whatever percentage or million or billion they throw out. They are relying on our number blindness to *get things by us*. If we start actually paying attention to their statistics, we might realise just how much bullshit they are trying to get us to swallow. This is particularly important right now, in what future historians will hopefully call 'the short-lived "fake news" era of the early 21st century'.

Statistics in the fake news era

Fake news is a slippery concept. If you define 'fake news' as any article that does not accurately represent reality, then the news media has had a fake news problem for a lot longer than we've been using that phrase. The outlets that make up the 'respectable' press – the same outlets that have lately been so concerned about the rise of fake news – publish false and misleading stories all the time. This is especially true when it comes to stories about numbers. The story with which we began this chapter did not come from some niche anti-immigration blog, or from the depths of Reddit. It came from Britain's biggest national newspaper. The misleading story about contraceptive implants came from perhaps the quintessential respectable source – the BBC. You'll see much more evidence of the unreliability of the mainstream press in the next chapter (and in the rest of the book).

Politicians too – recent vocal converts to the war on fake news – have always been some of the most prolific peddlers of misleading numbers and statistics. In the run-up to the 2016 US elections, the fact-checking organisation PolitiFact published figures on public pronouncements made that year by a group of presidential candidates and former presidents.[19] Former president Bill Clinton emerged as the most honest of the bunch. But even with the decided advantage of neither being in, nor currently running for, political office, almost a quarter of his public statements were rated 'Mostly False' or worse. On the other end of the

scale, 76% of Donald Trump's statements were rated as mostly false or worse, with 19% receiving PolitiFact's lowest possible rating, 'Pants on Fire'. This rating is reserved for statements that are not only false, but are so spectacularly, *heroically* false that they deserve some kind of award. Not all of these false statements were based on statistics, but many were. Putting a number on something makes it sound definitive and 'science-y', so politicians (and journalists, and everyone else) use statistics when they want to sound like they know what they're talking about.

From this perspective, we've been living in a fake news era for a very long time – perhaps as long as 'the news' has existed. However, it is true to say that something has changed in recent years. From 2015 to 2017 we saw a dramatic rise in the number of 'news' sites whose entire MO is the production of false stories. During the seemingly interminable 2016 US election cycle, sites like the *Denver Guardian* and the *Boston Tribune*,* published story after story about Hillary Clinton's failing health, or about Obama's plans to ban the pledge of allegiance, or to cut billions of dollars from veterans' care to give to Syrian refugees. These stories were not simply garbled or misleading presentations of real information (as is common in the mainstream press) – they were made up out of thin air. As Fil Menczer, a professor of information science at the University of Indiana, put it to *The Guardian* (the real one), 'There is a cottage industry of websites that just fabricate fake news designed to make one group or another group particularly riled up.'[20]

Sites like these (and there are many others) represent 'fake news' in its purest form. This is bad enough on its own. However, alongside the pure strain, another, hardier source of fake news has arisen. Mainstream media outlets have always had ideological affiliations of varying strengths. Fox News, MSNBC, the *Daily Mail*, *The Guardian* – we all know which side of the political aisle these organs lean towards. However, recent years have seen the emergence of outlets which take political partisanship to the next level. On the left you have organisations like *The Canary* (UK), *Occupy Democrats* (US), and *Addicting Info* (US). On the right you have equivalents like *Freedom Daily* (US), and *Right Wing News* (US).** These names might not have the brand recognition of the *New York Times* or the BBC, but they wield enormous influence on Facebook (chances are you've scrolled past one of their headlines or videos at least once today). And these days, Facebook is where people get their news.

Hyper-partisan outlets like *The Canary* and *Freedom Daily* are not pure-bred fake news – they are not in the business of cynically creating sensationalist stories from whole cloth. However, what these sites do have

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* Fake news sites often purposefully choose titles (and purchase web domains) that make them sound like legitimate newspapers.

** Some would likely also include higher profile sites like *Breitbart* on this list.

is an overriding allegiance to one particular political team.* And when your main purpose is not to convey information, but to support a team, then you tend not to put too much effort into checking your facts. This is how you get stories like these:

> *"Bloomberg puts Trump's current net worth at $2.9 billion ... If Trump had just put his father's money in mutual fund that tracked the S&P 500** and spent his career finger-painting, he'd have $8 billion"* – Occupy Democrats Facebook post, 2 December 2015

> *"U.S. Police killed more people in just one month than the U.K.'s did in over a century"* – *Addicting Info* Facebook post, 14 April 2015

> *"OUTRAGE: Before Leaving, Obama Enacts Rules to Take $3,000 From EVERY American"* Conservative Tribune, 1 December 2016

> *"Tens of Thousands Of Scientists Declare Climate Change A Hoax"* – YourNewsWire.com, 2 September 2016

All of these stories were widely shared on Facebook. All of them are false.*** And these stories are not exceptional. In 2016, *Buzzfeed* analysed the output of the six biggest hyper-partisan Facebook pages (including *Occupy Democrats, Addicting Info*, and Freedom Daily) for a period of seven days. They found that between 20% and 30% of the hundreds of headlines they published over this time were either mostly or substantially false.[21]

There are plenty of liars out there. They are the people who will feed us numbers and statistics they *know* to be false because they want us to click on their website, buy their product, or support their cause. Some of these liars write headlines for fake news websites. Some write for respectable newspapers. Some of them hold high political office. However, most fake news doesn't come from people who are intentionally trying to deceive us. It comes from people who *just don't care if what they are saying is true.*

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*   Some of this is genuine. The *Occupy Democrats* page, for example, is run by a left-wing advocacy organisation. However, some hyper-partisan sites take sides purely for the clicks. For example, the seemingly ideologically opposed sites *Liberal Society* and *Conservative 101* are both run by a single media company, American News LLC. Companies like this make their money by generating outrage-inducing partisan click-bait for both left and right.

** A simple type of investment that makes or loses money based on the combined performance of the 500 largest companies on the stock-market.

*** The Trump investment figure conflates inheritance Trump received from his father with income from the Trump business, which the junior Trump was involved in running. The number of people killed by UK police in the last century is a very fuzzy number indeed. The $3,000 figure relates to business regulations enacted over Obama's terms and is not a sum to be paid by 'every American'. Tens of thousands of scientists believe climate change is a hoax only if you count random people with an undergraduate degree in a semi-scientific subject as 'scientists'.

They believe their policy prescription is the right one, or that their cause is righteous, or that it just doesn't matter because they get paid either way. They are the bullshitters, and they have always existed. But now they've taken over our news feeds.

Don't be part of the problem

Faced with this tide of misleading numbers, what should we do? We could be forgiven for becoming pure cynics, mistrusting any number that might cross our path – it's all lies, damned lies, and statistics. But this would mean missing out on a lot of important information: real problems in society, genuine insights into human nature, authentic scientific breakthroughs. If we disbelieve every number we read, we're going to be in the dark about a lot of things. But there is an alternative to being cynical, and that is to be *critical*. Don't believe everything you read – but don't automatically disbelieve it either. Instead take steps to try and figure out what's true and what's not.

Of course, most people already do this to some extent. It's a rare individual who trusts absolutely everything they hear without question. For example, let's say I come across a headline in my news feed which tells me that 'world wildlife populations have dropped by 50% in the last 40 years'. That sounds bad, but before I pass it on I'm going to make at least some effort to see if it's true. I take a quick look at the source: it's a BBC news article, so it seems legitimate. The statistic also resonates with my feeling that human beings are doing terrible damage to the environment. And what's more, it fits solidly within the belief structure of my political 'team'.* That's probably enough to warrant a like or a share.

This process has at least one thing going for it: it's quick and easy to apply. A few seconds of thought, a tap or a click, and I'm on to the next thing (and the next, and the next). But this quick and easy process also has quite an important downside, in that it's a *terrible* way to determine whether something is actually true. Just because a source 'feels' legitimate is no guarantee that it actually is: as we've already established, even the most legitimate sources (like the BBC) often publish false or misleading facts and figures. Whether a fact fits with your existing beliefs about how the world works is also a very bad guide as to its truthfulness.** What the quick and easy approach to factual claims amounts to is a

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*   Of course you might have the exact opposite reaction. You might consider the BBC to be part of the biased liberal media, and as such dismiss this statistic as another part of the great climate change hoax.

** In case you are wondering, the wildlife fact is not completely false. However, an investigation by the BBC's *More or Less* programme showed that it's not exactly true either (whatever else you might want to say about the BBC, they are pretty good at self-criticism).

sure-fire recipe for believing (and spreading) a lot of comfortable facts that aren't true, while missing a lot of surprising (and sometimes difficult) things that *are*.

The alternative is to take the time to delve into the details behind the claims we hear, and to determine for ourselves what they mean and don't mean. This is, admittedly, a harder path to walk. But it's worth it. It *matters* whether the things we read are true or false. It matters whether 50% of the world's wildlife has disappeared or not. It matters if the richest 1% of the world's population earns 85% of all the income. It matters if the government have built 2 million homes or if they've actually built a lot less. Knowing what's real and what isn't protects us – from duff products, from dodgy health advice, from mendacious politicians – but it also protects everyone else. The decisions we make – about how to vote in an election or a referendum, about which charities and causes to support, about which products to buy – have consequences. If we want our actions to do more good in the world than harm, we have to start from a position of understanding how the world actually works. A good first step is therefore to abdicate our role in propping up the bullshit information economy.

If you're someone who is not particularly comfortable with numbers and statistics, you may be thinking that you don't have the skills or the expertise to take this on. But piercing the veil of numerical nonsense that surrounds us doesn't need to involve equations and complex maths. A few tricks and some simple concepts are all you really need to decipher the vast majority of statistical claims you'll encounter. These tricks and concepts are what this book is about.

These techniques are particularly important for students in the social sciences. Students taking courses in psychology, anthropology, sociology, criminology, politics, social work, and so on, need to get to grips with quantitative evidence (see the box below for more on this). These students are the primary intended audience of this book (hence the exercises at the end of each chapter). However, numbers and statistics are such a big part of our everyday lives that statistical skills are increasingly essential not just for students, but for all of us. In 1903, H.G. Wells predicted that 'statistical thinking will one day be as necessary for efficient citizenship as the ability to read and write'.* With so much of the information we receive – about politics, about the economy, about the environment; about everything – coming in the form of statistics, it's safe to say that day has arrived.

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*   Actually Wells didn't really say this. He said something very similar, but a lot wordier – and hence harder to quote. In the 1950s the president of the American Statistical Society shortened it to this pithy one-liner and this is the version that has stuck around. This happens a lot. Gandhi never said 'Be the change you wish to see in the world'. Mary Antoinette never said 'Let them eat cake'. It's not only statistical bullshit you have to watch out for.

Statistics for social science students

Numbers and your degree

Social scientists are interested in a lot of different things: What is personality and why do people end up with the personalities they have? Why do people become terrorists? Why do women earn less than men? Should we give more money to unemployed people, or less?

There are two broad approaches researchers take to try to answer questions like these. One approach is based on collecting **qualitative** data. Qualitative research might involve spending long periods embedded within a specific community, like hunter gatherers in the Amazon, or sex workers in New York City (this is called ethnography). Or it might involve conducting a series of in-depth interviews with a particular group of people, like athletics coaches or survivors of terrorism (these are called qualitative interview studies). The purpose of this kind of work is not to produce statistics (20% of terrorism survivors think X; the average income of sex workers is Y). Instead it is to get at the subtle and complex nature and meaning of people's experiences.

The purpose of **quantitative** research on the other hand *is* to produce statistics. This may strike you as a little reductive – turning people into numbers. But the truth is that we need numbers to answer some of the most important questions in social science. If you want to understand why women tend to earn less than men, you'll need statistics on how much men and women earn in different types of jobs (we'll come back to this question in Chapter 10). If you want to know whether the death penalty really dissuades people from committing crimes, you'll need to compare crime statistics in different places and at different times. If you want to know whether politicians are really in the pockets of their rich donors, then statistics on donations and voting patterns are a great place to start.

At bottom, a social science degree is about understanding what we know about how people and societies operate. This painstakingly accumulated knowledge is written in books, reports, and academic papers, and a good part of it is based on numbers. If you read this research without understanding the numbers, you're only getting half the story (or even less). That's why almost every social science degree – whether it's in psychology, sociology, criminology, politics, or any other subject – requires students to take at least one course in statistics. Traditionally, these courses have been quite dry and technical – dwelling excessively on the abstract mathematics behind the numbers. This book takes a different approach – focusing on real-world stories of statistics gone wrong, and using these stories to illustrate the fundamental statistical principles you really need to know.

Numbers and your career

Many of us, as teenagers sitting staring at equations in maths class, asked ourselves 'What's the point of this? When are we going to use this in real life?' Maths teachers, by ancient tradition, are required to tell us that of course it is all useful. We need quadratic equations to work out profit margins, or the velocity of a thrown object! We can use differentiation to work out the maximum area you can fence off with a given length of fence!

The trouble is, as we get older, most of us notice that these predictions of practical usefulness have not really come true. We are not out there with a pen and paper using differential equations to work out how big a field of wheat we can plant. And if for some reason we do need a difficult equation solving, a computer can do it for us. There are good reasons to learn advanced, abstract maths, but everyday usefulness is not one of them.

But just because abstract maths is practically useless in most people's lives does not mean that all maths is. Basic numeracy is obviously important in all kinds of situations. If you want to work out anything involving time, distance, or money, you need to be able to add up. Splitting a restaurant bill is much less painful if someone in your group has a good mathematical head on their shoulders. Beyond basic numeracy, I hope this chapter has shown that an understanding of statistics is also important if you want to know what's really going on in the world (and avoid falling for people's BS). But the importance of numbers and statistics extends beyond everyday life to getting (and keeping) a job after university.

Almost all jobs require some understanding of numerical and statistical information: even jobs you wouldn't expect. Maybe you want to work for a charity – where you'll be travelling to exotic locations and helping the world's less fortunate. These things might be part of your job, for sure. But you also need to understand how money is raised and spent, how to interpret research relevant to your area, and how to conduct new research of your own to help people understand your cause (have a look at the 'research' sections on the websites of a few famous charities).

Or maybe you want to be a journalist. We've already talked about how much of the news is based on numbers, and if you want to write about them competently then you'll need to understand them (a lot of current journalists aren't great at this part of their jobs, but this is becoming less and less acceptable). Or maybe instead of writing the news you want to make it, with a high-profile career in business or politics. Again, a good understanding of statistical information is crucial.

Employers in all sorts of fields, from publishing to PR to medicine to marketing (and all points in between), are crying out for graduates

with numerical and statistical skills. Survey after survey has shown that companies see quantitative skills as among the most important things graduates need to have to be employable.[22] Put simply, in every field you can imagine, it is a distinct advantage to be able to look at a bunch of numbers in a report or a presentation and actually understand what they mean. If you go into an interview able to prove you know this stuff, you're going to get picked over someone who doesn't. It's as simple as that.

So statistics are important in your everyday life, for your degree, and for your career prospects. This might be starting to sound like an 'eat your vegetables' type of a deal. Learn statistics or Bad Things Will Happen. But carry on through the rest of this book and I think you'll see that this is not really the case. It's deeply satisfying to finally see the real world through the hail of statistical bullshit pelting down on you every day. And proving somebody wrong through your superior knowledge of numbers is just plain good fun. Honestly, even if understanding statistics was irrelevant to your degree and did nothing for your career, I'd learn it anyway just for that.

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www.macmillanihe.com/devries-critical-statistics

ONLINE RESOURCES AVAILABLE

Go to the book's companion website for further examples, data, links, and other useful resources.

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