## Sanne Blauw

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# CONTENTS

FOREWORD

# CAPTIVATED BY NUMBERS

She entered the dusty office through the sliding door and shook my hand. 'Juanita.'[1] In her oversized, faded jumper she looked even smaller than she was. Once she had seated herself on the folding chair opposite me, I explained to her in Spanish that I was doing research in Bolivia into happiness and income inequality for a Dutch university. I said I wanted to ask her a few questions about her own life and her country.

This wasn't the first time I had done this little spiel. For ten days I had been interviewing the inhabitants of Tarija, a Bolivian town close to the Argentine border. I had spoken to female market traders, drunk beer with strawberry farmers, barbecued with families – all to collect as much data as possible. Now I had arrived with my stack of questionnaires at the office of a women's organisation, whose director had offered to put me in touch with *empleadas domésticas*, female domestic workers. Women like Juanita.

'Let's start,' I said. 'How old are you?'

'Fifty-eight.'

'Which ethnic group do you belong to?'

'Aymara.'

Aha, I thought, she belongs to one of the indigenous populations. This was something I hadn't yet encountered.

'What's your marital status?'

'Single.'

'Can you read?'

'No.'

'Write?'

'No.'

My questions continued along these lines – her profession, her education, whether she had a mobile phone, refrigerator or television.

'I earn two hundred boliviano a month,' she told me when I asked what her salary was. This was far below the minimum wage of 815 boliviano that President Evo Morales had introduced not long before. 'I'm afraid that my boss will sack me if I ask for more money. I live in a *carpita*.' I noted down the word but did not know what it meant until I looked it up afterwards. She lived in a tent.

Eventually I got to the crux of my research: happiness and income inequality. Behind my desk on the eleventh floor of Erasmus University in Rotterdam, I had created five PowerPoint diagrams. Each one represented a different income distribution.

Only one day into the start of my research project in Bolivia I had noticed that my question about income inequality did not work for everyone. The market traders I had interviewed did not understand what the diagrams were meant to represent. How could I expect Juanita – who was not able to read or write – to understand this question? I decided to skip this part.

But before I could continue, she began to talk. 'Do you know what the problem is with Bolivia?' She sat up straight. 'There is a very big group of poor people and a very small group of rich people. And these differences are only getting bigger. Are you surprised no one in this country trusts anyone any longer?'

Without knowing, she had described diagram A. And in the process, she had answered two of my other questions as well, about her outlook on the future and trust in her country. I had totally underestimated her. My face flushed, but I continued with the interview as if nothing had happened. Time for the last questions.

'On a scale of one to ten, how happy are you?'

'One.'

'And how happy do you think you'll be in five years' time?'

'One.'

I think that it was during this interview in 2012 that I began to develop misgivings about numbers. Until then, I had been primarily a consumer of numbers. I came across them reading the paper or watching the news. For assignments during my degree

course in Econometrics, I had been handed files with numbers by my professors or I had downloaded official data from the websites of organisations such as the World Bank.

But this time I was not given a ready-made spreadsheet. Now I was the person collecting the data. I was a year into my PhD; numbers had become my expertise. But my conversation with Juanita made my faith waver. I was researching her happiness but had found there was no number to express her life spent living in a tent. I listened to her opinion about income inequality, but was only able to choose from diagram A, B, C, D or E. Much of what she told me could not be counted, but did count.

Juanita taught me something else. I exerted a strong influence on what the figures looked like. *I* had decided that happiness was important and that it could be quantified. *I* had come up with the idea to ask this abstract question using diagrams. *I* thought that Juanita was not intelligent enough to have something to say about income inequality. I, I, I. Someone else, with the same research questions, but with a different worldview or angle, would probably have come up with different results. Numbers were supposed to be objective, but I suddenly saw how strongly they were linked to the researcher.

After my chat with Juanita, I typed her data into row 80 of my Excel sheet: 58 for age, 200 for salary, 1 for happiness. It looked as neat and tidy as all the other spreadsheets I had downloaded over the years. But it suddenly struck me how misleading my orderly rows and columns of numbers were.

I was already a number nerd as a toddler. As soon as I learnt to count, I devoured join-the-dots books. One of my first memories is of a holiday in the Black Forest in Germany, during which I spent countless hours tracing numbers to create a never-ending succession of snowmen and clouds. A few years later, my grandparents gave me a radio alarm clock. At night, I would lie in bed staring at the LED-illuminated clock and formulate all sorts of sums from those four digits. Maths was my favourite subject at school, and I would ultimately go on to study and get a PhD in Econometrics. I learnt everything about the statistics behind economic models. I calculated, analysed, programmed. And so I

found myself again doing what I had done in my time connecting the dots: finding patterns.

But numbers also played another role in my life. They helped me to find my place. Between the ages of five and twenty-six I was awarded marks and grades at school and university. I used them as a yardstick for how I was doing. If I got a low mark, I'd be down in the dumps. A high mark and I was flying. It did not bother me that I'd forgotten the material within days, as long as I had a decent overall average. Outside school, too, numbers grounded me. When I returned from Bolivia I checked myself on the scales: 56 kilograms. I knew that would make a BMI of 18.3 – I was so proud.

I was not the only person taking my cue from numbers. Colleagues at university were promoted if they had published lots of papers in scientific journals. In the hospital where my mother worked, they awaited with trepidation the annual Top 100 Hospitals ranking. And my father had to retire the day he turned sixty-five.

It only struck me later that my exchange with Juanita had revealed something significant about these kinds of numbers. Just as I had shaped the numbers I had collected, so others influenced the numbers people used all around me as a guide for their lives. Teachers would calculate the correct mark for an exam, doctors the optimum BMI level, policy-makers the age at which you should stop working.

After I finished my PhD in 2014 I decided to go into journalism, because I had learnt something else from my conversation with Juanita: I found the stories behind the numbers even more interesting than the numbers themselves. At the *Correspondent*, an online journalistic platform, I started working as the numeracy correspondent. Not only did I want to explain to readers how numbers are calculated, I also wanted to question their importance in our society. Should we not put a stop to the dominance of numbers?

It soon became clear that my idea had struck a chord. Readers sent me skewed polls, shaky scientific research, misleading graphs. Many of the errors were ones I had made during my PhD research. At conference talks and in reviews of my articles, it became clear to me that my samples had not been representative and that I had

mixed up correlation and causation. Now I saw the exact same mistakes appear in the numbers journalists used to interpret the world, Members of Parliament to make policy choices, and doctors to make decisions about our health. The world proved to be rife with false numbers.

Other kinds of reports about numbers also troubled me. I heard about parents whose nursery would hand them a school report for their one-year-old child, police officers who issued fines to meet quotas, Uber drivers who were sent packing when their ratings were too low.

It became increasingly clear to me that – from pension age to Facebook clicks, from GDP to salary – numbers determine how the world works. And the power of numbers only appears to be increasing. Big data algorithms are mushrooming in the public and private sectors. More and more, it is not people, but mathematical models that call the shots.

It's as if we have been hypnotised en masse by numbers. Whereas words are picked apart at the drop of a hat, numbers are given considerable free rein. After a few years as a journalist I have come to the conclusion that numbers have far too much influence in our lives. They have become so powerful that we can no longer ignore their misuse. It's time to end the dominance of numbers.

But, don't get me wrong, this is not a book against numbers. Like words, numbers are innocent. It's the people behind the numbers who make the mistakes. This book is about them, about their mistakes in reasoning, their gut feelings, their interests. We will be meeting psychologists who couch their racism in statistics, a world-famous sexologist with a shady data collection process, and tobacco magnates who massage their figures and ruin millions of lives as a result.

This book is also about us: number consumers. Because we allow ourselves to be led and misled by numbers. Numbers influence what you drink, what you eat, where you work, how much you earn, where you live, who you marry, who you vote for, whether you get a mortgage, how you pay for your insurance. They even influence whether you fall ill or recover, whether you live or die.

You have no choice; even if you're not a numbers person, numbers rule your life.

This book sets out to demystify the world of numbers, so that *everyone* can distinguish when they are being used correctly or when they are being misused. And so that we can all ask: what role do we want numbers to play in our lives?

It's time to put numbers in their place. Not on a pedestal, not out with the rubbish, but where they belong: alongside words.

Before we reach that point, though, we need to go back to the beginning. Where and when did our obsession with numbers begin? Allow me introduce you to the most famous nurse in history: Florence Nightingale.

# CHAPTER 1

# NUMBERS CAN SAVE LIVES

She would never forget the living skeletons.[1] The British soldiers languishing on rotten wooden camp beds, vermin crawling all over them. They died, one after another.

Slaughterhouses, that is what they were, the overcrowded hospitals in which Florence Nightingale worked during the Crimean War, the war between Russia and Britain, France, Sardinia and Turkey. Since the end of 1854, Nightingale had been stationed as the Nursing Superintendent of the military hospital in Scutari, to the east of what is now called Istanbul. But British military health care was so badly organised that she had to do much more than just nursing: cooking, washing, requisitioning for the stores. On some days she would work for twenty hours. After a few weeks she cut off her thick brown tresses because she did not have time for long hair. Her black dresses gradually became dirtier; a hole appeared in her white bonnet. If she managed to eat at all, in between mouthfuls she wrote letters to the outside world. Everything to keep her soldiers alive.

It was not enough; too many lives slipped through her fingers. 'We bury every twenty-four hours', she wrote in one of her many desperate letters to Sidney Herbert, the British Secretary of War. During the worst month, February 1855, more than half of the soldiers that were brought in died. Most did not die from their wounds, but from diseases that could have been prevented. The drains were so badly blocked that the ground underneath the building had become one big cesspool; faeces flowed directly from the latrines into the water tanks. Something had to change.

Meanwhile in Britain, the government collapsed following criticism of the shoddy warfare in Crimea. New Prime Minister Henry John Temple decided on a different course of action. He set

up a 'Sanitary Commission' to prevent so many soldiers from dying in Scutari. And so, on 4 March 1855, four months after Nightingale arrived in Scutari, help finally arrived.

The commission found the situation in the hospital 'murderous' and set to work. They cleared more than twenty-five dead animals (including a horse in an advanced state of decomposition that was blocking the water supply). They drilled holes in the hospital roofs for better ventilation, whitewashed the walls, removed rotting floors. Towards the end of the war, in 1856, the military hospital in Scutari had been transformed beyond recognition. It was clean, well-organised, and the mortality rate had been drastically reduced. Not only the royal commission, but Nightingale too, had played a decisive role in this metamorphosis. Without her lobbying, the commission would probably never have made it to Scutari. Upon arrival in Britain, she was greeted like a heroine, a 'guardian angel'.

And yet she thought she had failed. 'Oh my poor men who endured so patiently,' she wrote in her diary after she left, 'I feel I have been such a bad mother to you, to come home and leave you lying in your Crimean graves.'

She was haunted by the needless deaths, the overcrowded wards, the vermin. The situation in the Scutari hospital may have improved, but care of the sick and wounded soldiers in the army was still organised in a woefully inadequate way. This cost lives.

Nightingale decided to fight for reform. She would use her experiences, network and newly acquired star-status to convince the powers that be of the dire need for better hygiene. And in her battle she would use a razor-sharp weapon: numbers.

## The origins of our mania for numbers

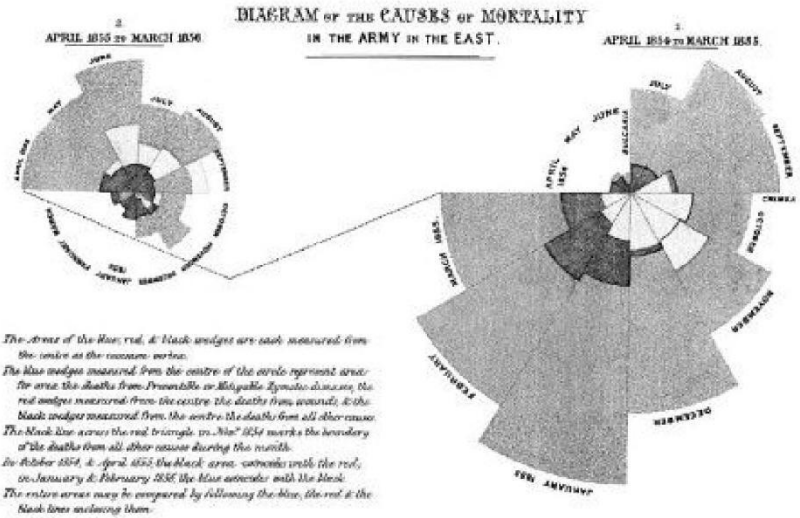
Florence Nightingale was born in 1820 and grew up in a well-to-do British family. Her father was a progressive man: he believed girls were as deserving of an education as boys. So Florence and her sister Parthenope – both named after the places where they were born – were taught physics, Italian, philosophy and chemistry.

Florence was also taught mathematics, a subject in which she excelled. From an early age, she had harboured a fascination for

counting and categorising. She started to write letters from the age of seven, in which she would often include lists and tables. And she was a great fan of puzzle books with riddles such as: 'If there are six hundred millions of Heathens in the world, how many Missionaries are needed to supply one to every twenty thousand?'

She would never lose her interest in numbers. When the then Minister of Defence asked her in 1856 what the situation was like in Crimea, she seized her opportunity. Over a period of two years she wrote an 850-page report in which she made use of numbers to show what was wrong with medical care in the army.[2] Her most important conclusion: many soldiers died from preventable causes such as wound infections and contagious diseases. Even in peacetime, British soldiers – who were being nursed in military hospitals – died in greater numbers than sick civilians. *Twice* as many. No less criminal, Nightingale thought, 'as it would be to take 1100 men per annum out upon Salisbury Plain and shoot them'.

As shocking as this conclusion may have been, Nightingale feared that it would get lost in the hundreds of pages of words and statistics. So she decided to cast her statistics in colourful graphics that would convey her point at a glance. Her most famous graphic shows two diagrams representing the two years of the Crimean War. Nightingale shows what soldiers had died from each month. Time and again most men died from diseases that could have been prevented.




'Diagram of the Causes of Death or Mortality of the Army in the East', the graphic that Florence Nightingale published in her hefty report about medical care in the British Army.

Source: *Notes on Matters Affecting the Health, Efficiency, and Hospital Administration of the British Army* (1858).

She sent these and other charts to influential people, such as former Secretary of State Sidney Herbert, who by then was presiding over the Royal Commission on the Health of the Army. She also leaked her findings to the press,[3] and asked the writer Harriet Martineau to write an article for the wider public about the need for reforms.[4]

Nightingale was ultimately able to convince the authorities with her figures. During the 1880s, many problems had been solved: soldiers were better fed, had more opportunities to wash themselves, and their barracks were cleaner.[5] The situation improved so much that the newly built hospitals soon proved too big. 'Really it is not our *fault* if the number of sick has fallen so much that they [the Army Medical Department] can't fill their hospitals,' Nightingale remarked wryly.[6]

In the same way that you cannot understand each other if you do not speak the same language, you cannot enter into agreements if you use figures in different ways.[16] In 1999 an incident took place that showed how dangerous it can be not to have a common number language. That year, the space probe Mars Climate Orbiter was due to reach Mars. But on 23 September 1999 the probe disappeared off the radar. The spacecraft was never found again. How could this have happened? To operate the probe, two computer programmes had to communicate with each other. One measured in 'pound-force seconds', as the American–British system dictated, while the other used the internationally accepted 'newton seconds'. The result of this miscommunication was that the probe flew 170 km lower than planned and was probably destroyed in Mars' atmosphere.[17]

Fortunately, such problems are the exception rather than the rule these days, because almost every country in the world now uses the International System of Units. But this shift did not happen without incident – it even required a revolution. After the French Revolution (1789–99), the revolutionaries decided to ditch all local units of measurement. They came up with a new proposal: the metric system. Units such as the metre and the kilogram dovetailed neatly with the ideas of the scientists of the time, plus – an important consideration – they would make the country more governable.[18]

How can you levy taxes as a state, if everyone uses a different measure for distance? You can't, of course, but a solution was found. It took a while, but eventually the metric system – later the International System of Units – would spread from France to almost all the countries in the world. Just three countries – United States, Liberia and Myanmar – use different official measures, such as pounds and miles.[19]

This was the first development underpinning Nightingale's thinking: we began to standardise. In other words, we agreed on how we would measure a particular concept. The metre and the kilogram were just the beginning. In Nightingale's time, half a century later, there was a craving for more numbers. Migration from the countryside meant that cities were bursting at the seams, and all kinds of problems coalesced and became visible: poverty,

criminality, disease.[20] Where did those problems come from? And how should they be tackled? More and more people began to question this, within and beyond government.

To be able to gauge the seriousness of the problems, clear categories had to be devised: when was someone poor, criminal or ill? For instance, William Farr, a famous statistician who helped Florence Nightingale with her report, together with his colleagues, came up with a list of recognised diseases, which would eventually be taken up by the World Health Organization (WHO). Nightingale also used categories in her charts when she showed how many men had died of (1) preventable diseases, (2) war wounds and (3) all other causes.

On the face of it, the definition of a concept such as 'disease' or 'cause of death' appears to bear no relation to figures, but nothing is further from the truth. Something can only be made quantifiable when a clear definition is used. In the words of the philosopher Ian Hacking: 'Counting is hungry for categories.'[21]

As a result of standardisation we ended up speaking the same number language. Today, throughout the world, people speak of metres and kilograms, GDP growth and IQ points, $CO_2$ emissions and gigabytes. And so the most widely spoken language in the world did not become Chinese, English or Spanish, but numbers.[22] And this number language enabled the next development: we began to collect numbers on a large scale.

## We began to collect numbers

As we saw from Kushim's clay tablet, numbers have been collected and recorded for millennia. But in the case of Kushim, it was still only a small-scale measurement (historians think he may have been responsible for a storehouse for beer-making ingredients).[23] During subsequent millennia, authorities began to collect numbers on a larger scale. One of the most famous stories from Western culture, the birth of Jesus Christ, would never have happened in Bethlehem if the Romans had not wanted to know how many people lived in their empire. History is peppered with such censuses – from ancient Egypt to the Inca Empire, from Han China to medieval Europe.[24]