Making data dance

Hans Rosling has become an online star by using data visualisations to make serious points about health policy and development

"THE biggest myth is that if we save all the poor kids, we will destroy the planet," says Hans Rosling, a doctor and professor of international health at the Karolinska Institute in Sweden. "But you can't stop population growth by letting poor children die." He has the computerised graphs to prove it: colourful visuals with circles that swarm, swell and shrink like living creatures.

For the past four years Dr Rosling's mesmerising graphics have been impressing audiences on the international lecture circuit, from the TED conferences to the World Economic Forum at Davos. Instead of bar charts and histograms, Dr Rosling uses Lego bricks, Ikea boxes and data-visualisation software developed by his Gapminder Foundation to transform reams of economic and public-health data into gripping stories. His aim is ambitious. "I produce a road-map for the modern world," he says. "Where people want to drive is up to them. But I have the idea that if they have a proper road-map and know what the global realities are, they'll make better decisions."

The realities that Dr Rosling is trying to highlight have been gleaned from decades of studying statistics. They sound simple enough: that it no longer makes sense to consider the world as divided between developing and industrialised countries; and that people everywhere respond similarly to increasing levels of wealth and health, with higher material aspirations and smaller families. "There is no such thing as a 'we' and a 'they', with a gap in between," Dr Rosling says. "The majority of people are living in the middle—although the distance from the very poorest to very richest is wider than ever." The best measure of political stability of a country, he believes, is whether fertility rates are falling, because that indicates that women are being educated and basic health services are being provided. "The only way to reach sustainable population levels is to improve public health," he says. "Child survival is the new green."

Communicating these realities to students in his international-development classes at Uppsala University proved problematic, however. "I used to make huge photocopied sheets of Unicef statistics for the students on income, life expectancy and fertility rates around the planet. But it didn't change their world view, it didn't create another mindset. They still insisted that we were different, that all the Chinese cannot all have a car," says Dr Rosling. He needed a new way to present his conclusions—a way to turn dusty figures into convincing illustrations.

Innovation in infographics has always been driven by the need to explain difficult things, Dr Rosling points out. "Florence Nightingale is known as a nurse, but she also made a new kind of pie chart showing how many soldiers in the Crimean War died from military action and how many from disease." Nightingale's famous "coxcomb" chart from 1858 demonstrated that improving hygiene in British military hospitals slashed mortality rates. She said its design was intended "to affect thro' the eyes what we fail to convey to the public through their word-proof ears."

Epiphany in Mozambique

Like Ms Nightingale, Dr Rosling had his eyes opened to the power of statistics while working far from home. As a visiting district medical officer in northern Mozambique in the early 1980s, he received a note from a remote clinic about women and children infected by an unknown paralytic disease. After screening 200,000 people using community resources and census data, Dr Rosling and a team of Swedish scientists eventually linked the disease to malnutrition and the toxic effects of inappropriately prepared cassava root. "When I went to work in Africa, it was my intention to work as a practising physician who would improve health with existing knowledge," says Dr Rosling. "That epidemic humbled me, and so I became a researcher."

Twenty years later his word-proof students would get something altogether more dynamic than Ms Nightingale's pie charts to demystify global socioeconomic trends. The first graph he designed was a bubble chart that had double logarithmic axes, with income on one axis and health on the other. With help of his son and daughter-in-law, Mr Rosling then developed Trendalyzer software (now called Gapminder) to animate the bubbles.

"It was a conscious intent to make the data look alive," he explains. "My son invented the trails, like patterns in the snow, so you can see how countries have changed. And we could overlay countries historically so that it's clear that, for example, China today is like Sweden in 1948 ▸▸

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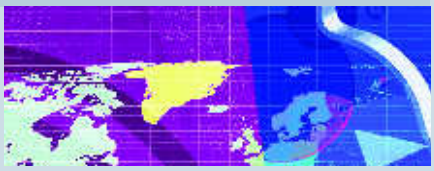

and people in Vietnam now have the same life expectancy as Americans did in 1985. Every country has a graphical path that describes its development."

The software was a hit, first with his classes in Sweden, then worldwide after a video of his 2006 TED lecture was posted online. Dr Rosling was soon helping Al Gore polish up his climate-change presentations and talking about Gapminder with the founders of Google, Larry Page and Sergey Brin. "I could see in their eyes how excited they were, how my software fitted with their ideas about making organised information generally available," he recalls. "We started collaborating and quickly reached the conclusion that it was more rational that Google acquire our technology and the team behind it." Within a year Google had bought Gapminder, and a version of the bubble-graph software is now available free online under the name Google Motion Chart.

The Gapminder Foundation lives on, says Dr Rosling, "as a kind of museum, in the tradition of museums that provide basic existing knowledge in an easily digestible way to large user groups, but based on modern technology." As this virtual museum's digital curator, Dr Rosling's attention turned to the data underpinning his presentations. "Statistics constitute a bulk of information that is surprisingly badly organised," he says. "It's not like a map, where every position can be defined by longitude, latitude and altitude. Public statistics are both socio-economic and environmental, and stratified into infinity. It's sex, age, occupation, employment, where you live, whether you're an immigrant or disabled. It's who you voted for, what associations you're a member of and so on."

Mind the gap

Much of the really useful information was hidden away in different systems around the world, and Dr Rosling found that even the biggest institutions were reluctant to share their findings. "Most public data was not made available in a licence where you were allowed to redistribute it. Neither was it in a unified structure or technological format," he says. "It was better at a national level but at the international level it was awful. The UN, the World Bank and the IMF get free data from member countries, use taxpayers' money to compile it and then sell it in an inefficient, stupid system. For instance, trade data makes up 80% of public statistics. This is what humans do: they produce and consume stuff. We have new software that can help poor countries understand the fragmentation of their trade but UN Comtrade (the world's trade database) is still hoarding bulk data. We need to have that data free."

When the World Bank even threatened to sue Dr Rosling if he shared their data on global development, he decided to take action. "I had to become the Robin Hood for free data," he says of his campaigning efforts. "At the Gapminder Foundation, we won't display any data that is not freely available to everyone. The only place in the world I can get free data on oil and gas is BP because the International Energy Agency sells their data. Institutions are five to ten years behind what new technology makes possible—but we are winning the fight." After several years of intense lobbying from the Gapminder Foundation, the World Bank opened up its databases of key development indicators in April.

Developers can now create web software, mobile apps or Google Motion Charts based on World Bank data. "This was not a compromise. It was a full 180-degree switch," says Dr Rosling. "It's happening in science, too. The Bill and Melinda Gates Foundation demands that every research project it funds has to make its full data set freely available, like open-source software code."

These vast clouds of new information are revealing facts that Dr Rosling dispenses like thunderbolts. Shanghai is as wealthy and healthy as the Netherlands! Iran has fewer children per woman than Sweden! The AIDS epidemic in Tanzania is levelling off! Before their shock and dazzle fades, he races on to discuss the success of mosquito nets in Africa, how Indian students read more (and thicker) textbooks than their European counterparts, and the latest trends in cancer rates in Vietnam and mobile-phone innovation in Sudan.

Dr Rosling loves to stitch hundreds of such seemingly disparate details into larger narratives, and his next project is his most sweeping and ambitious yet: an attempt to use statistics and data visualisation to explain the entire world from 1800 to 2050. "The richest countries are enormously short-sighted. I'm going back to working with a few indicators—energy, economy, health, population growth, education—over a 250-year period to really make people see the future. The world population can balance out at 9 billion in 2050 and oil will be finished. I'm going to zoom in on that and see what happens. I will use our animations and split nations into subgroups to explain the relationship between social investment, economic investment and political change, the whole big story."

Do the data give any sneak previews of our future? "For most of human history, the world has been dominated by Asia, and it will be again within 40 years," he says. "While nothing now can stop the surge to 9 billion, if the poorest 2 billion get improved child survival and the ability to buy bicycles and mobile phones, population growth will stop. We cannot have people at this level looking for basics like food and shoes. Lower-middle income countries will also forge forward—but only if we invest in the right technologies to avoid severe climate change."

Dr Rosling claims to be neither an optimist nor a pessimist but a "possibilist". "We can stop population growth, we can eradicate poverty, we can solve the energy and the climate issues but we have to make the right investments," he says. "I know a good world is possible if we leave emotion aside and just work analytically."

His ability to set aside his own emotions remains to be demonstrated. Like Florence Nightingale before him, what gives his work its persuasive force is not just rock-solid data and beautiful graphics but his personal passion and enthusiasm. "The people who create statistics are very often not the same kind of people needed to communicate them," notes Dr Rosling. But fortunately, sometimes they are. ■

A selection of Hans Rosling's presentations can be found at http://economist.com/node/21013330