The myth buster

Hans Rosling is on a mission to save the world from preconceived ideas.

BY AMY MAXMEN

Hans Rosling knew never to flee from men wielding machetes. "The risk is higher if you run than if you face them," he says. So, in 1989, when an angry mob confronted him at the field laboratory he had set up in what is now the Democratic Republic of the Congo, Rosling tried to appear calm. "I thought, 'I need to use the resources I have, and I am good at talking.'"

Rosling, a physician and epidemiologist, pulled from his knapsack a handful of photographs of people from different parts of Africa who had been crippled by konzo, an incurable disease that was affecting many in this community, too. Through an interpreter, he explained that he believed he knew the cause, and he wanted to test local people's blood to be sure. A few minutes into his demonstration, an old woman stepped forward and addressed the crowd in support of the research. After the more aggressive members of the mob stopped waving their machetes, she rolled up her sleeve. Most followed her lead. "You can do anything as long as you talk with people and listen to people and talk with the intelligentsia of the community," says Rosling.

He is still trying to arm influential people with facts. He has become a trusted counsellor and speaker of plain truth to United Nations leaders, billionaire executives such as Facebook's Mark Zuckerberg and politicians including Al Gore. Even Fidel Castro called on the slim, bespectacled Swede for advice. Rosling's video lectures on global health and economics have elevated him to viral celebrity status, and he has been listed among the 100 most influential people in the world by the magazines *Time* and *Foreign Policy*. Melinda Gates of the Bill & Melinda Gates Foundation says, "To have Hans Rosling as a teacher is one of the biggest honours in the world."

But among his fellow scientists, Rosling is less popular. His accolades do not include conventional academic milestones, such as massive grants or a stream of publications in top-tier journals. And rather than generating data, Rosling has spent the past two decades communicating data gathered by others. He relays facts that he thinks many academics have been too slow to appreciate and argues that researchers are ignorant about the state of health and wealth around the world. That's dangerous. "Campuses are full of siloed people who do advocacy about things they don't understand," he says.

So now, in the sunset of his career, Rosling is writing a book with his son Ola and his daughter-in-law Anna Rosling Rönnlund to dispel outdated beliefs. It has the working title *Factfulness*, and they hope it will inform everyone from schoolchildren to esteemed experts about how the world has changed: how the number of births per woman worldwide has dropped over the past few decades, for example, and how average life expectancy (71 years) is now closer to that of the country with the highest (Japan, 84) than the lowest (Swaziland, 49). He reasons that experts cannot solve major challenges if they do not operate on facts. "But first you need to erase preconceived ideas," he says, "and that is the difficult thing."

JÖRGEN HILDEBRANDT

LIFE ON THE BRINK

Rosling's ambitions were born from curiosity. As a young boy in Uppsala, he listened intently as his father, a coffee-factory employee, described the hardships of the East African labourers who picked the beans. Rosling and his girlfriend, Agneta Thordeman, joined student protests against South African apartheid and the US war in Vietnam.

The couple studied medicine — she as a nurse and he as a doctor — and travelled through India and southeast Asia on a shoestring budget. In 1972, they were married and seven years later they moved to Mozambique with their two small children.

> "Extreme poverty produces diseases. Evil forces hide there."

Rosling wanted to fulfil a promise he had made many years earlier to the founder of the Mozambican Liberation Front, Eduardo Mondlane. Mondlane had explained that Mozambique's future would be challenging after the country gained independence from Portugal, because the nation was so poor and education levels low. Rosling recalls, "He shook my hand and looked me in the eyes and said: 'Promise you will work with us.'" Mondlane was killed by a letter bomb soon afterwards — he did not live to see independence, which came in 1975 — but Rosling kept his word.

The Mozambican government assigned Rosling to a northern part of the country, where he would be the only doctor serving 300,000 people. Because of the scarcity of health care, patients were often in excruciating pain by the time he saw them. Rosling recalls performing emergency surgery to extract dead fetuses from women on the verge of death. He watched helplessly as children perished from diseases that should have been simple to prevent. "Those years became a sort of trauma," he says.

In 1981, he received a letter from an Italian nun working as a nurse at a remote health post. "Please come," she wrote. People in the surrounding villages had been stricken with sudden paralysis of both legs. Separating from his family, Rosling embedded himself in the crisis.

He was assigned to lead a survey of 500,000 people and found that populations with the highest rate of the disease survived entirely on bitter cassava, the only crop that could grow when drought struck the region. The plant turned out to contain cyanogenic glucoside, a precursor to cyanide. Typically, soaking cassava roots in water for several days removed the toxin. But with streams running dry and families starving, women who prepared cassava had skipped this step — to their detriment. Dietary amino acids can also detoxify the poison, but people had no access to meat or beans that provide them.

At the end of 1981, owing to a number of circumstances including the death of their third child, Rosling and his family returned to Sweden. Rosling became a lecturer on health care in low-income countries at Uppsala University but spent time in Tanzania and the Congo region as well, studying the paralysing disease he had first observed in Mozambique. He noticed that no matter what country he was in, the towns afflicted looked similarly tragic. Skeleton-thin people hobbled down dirt paths on makeshift crutches, or crawled with their legs twisted and dangling behind them like anchors. One Congolese community called the malady konzo, derived from a word referring to an antelope tethered at its knees. This is the name that Rosling would use in 1990, when he and his colleagues formally defined the disease and laid out the evidence for what causes it (W. P. Howlett *et al. Brain* **113,** 223–235; 1990).

As Rosling travelled, he trained African graduate students who specialized in konzo, and together they found that proper cassava processing was the most realistic method of short-term prevention. However, the message often fell on deaf ears because of hunger and conflict. Rosling became convinced that the real root of konzo resided not in cassava, but in economic devastation. "Extreme poverty produces diseases. Evil forces hide there," he says. "It is where Ebola starts. It's where Boko Haram hides girls. It's where konzo occurs."

THE TRUE PICTURE OF POVERTY

The World Bank defines extreme poverty as a state in which people survive on less than US$1.90 per day. Rosling can recognize it in other ways. He has seen it in people who must walk for hours without shoes to find water or to farm eroded soil. He sees it in those who remain short because of malnourishment, whose babies are born dangerously underweight and who are trapped with no options in life.

Ultimately, he says that eliminating extreme poverty is the only way to cure konzo and prevent other maladies — both social and infectious. Money, politics and culture underlie disease in many circumstances, he argues.

Take an outbreak in Cuba that Rosling investigated in 1992. The Cuban embassy in Sweden had asked him to find out whether toxic cassava could have caused roughly 40,000 people

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Rosling is known for his creative use of visual aids, from sophisticated animations to children's toys.

to experience visual blurring and severe numbness in their legs. On his first morning in Havana, Rosling met local epidemiologists in a conference room. "Then, two men walk in with guns, and in comes Fidel Castro," he recalls. "My first surprise was that he was so kind, like Father Christmas. He didn't have the attitude you might expect from a dictator."

With Castro's approval, Rosling travelled to the heart of the outbreak, in the western province of Pinar del Río. It turned out that there was no link with cassava. Rather, adults stricken with the disorder all suffered from protein deficiency. The government was rationing meat, and adults had sacrificed their portion to nourish children, pregnant women and the elderly.

Reporting back to Castro, Rosling couched his conclusions carefully: "I know your neighbours want to force their economic system on you, which I don't like, but the system needs to change because this planned economy has brought this disease to people." After his presentation, Rosling went to the toilet. A Cuban epidemiologist approached him to thank him. He and his colleagues had come to the same conclusion several months earlier, but they were removed from the investigation for criticizing communism. Corroboration of their work from Rosling and other independent researchers supported the policy changes that stemmed the outbreak.

IGNORANCE ABOUT IGNORANCE

Back in Sweden, Rosling continued to teach global health, moving to the Karolinska Institute in Stockholm in 1996. But he came to realize that neither his students nor his colleagues grasped extreme poverty. They pictured the poor as almost everyone in the 'developing world': an arbitrarily defined territory that includes nations as economically diverse as Sierra Leone, Argentina, China and Afghanistan. They thought it was all large family sizes and low life expectancies: only the poorest and most conflict-ridden countries served as their reference point. "They just make it about us and them; the West and the rest," Rosling says. How could anyone hope to solve problems if they didn't understand the different challenges faced, for example, by Congolese subsistence farmers far from paved roads and Brazilian street vendors in urban *favelas*? "Scientists want to do good, but the problem is that they don't understand the world," Rosling says.

> "Global health seems to have entered into a post-fact era."

Ola, his son, offered to help explain the world with graphics, and built his father software that animated data compiled by the UN and the World Bank. Visual aids in hand, the elder Rosling began to script the provocative presentations that have made him famous. In one, a graph shows the distribution of incomes in 1975 — a camel's back, with rich countries and poor countries forming two humps. Then he presses 'go' and China, India, Latin America and the Middle East drift forward over time. Africa moves ahead too, but not nearly as much as the others. Rosling says, "The camel dies and we have a dromedary world with one hump only!" He adds, "The per cent in poverty has decreased — still it's appalling that so many remain in extreme poverty."

Rosling's online presentations grew popular, and the investment bank Goldman Sachs invited him to speak at client events. His message seemed to support advice from the firm's chief economist, Jim O'Neill. In 2001, O'Neill had coined the acronym BRIC for the emerging economies of Brazil, Russia, India and China, often considered part of the developing world. He warned that financial experts ignored these rising powers at their peril. "I used to tease my colleagues who thought in a traditional framework," O'Neill says. "Why are we talking about China as the developing world? Based on the rate of economic growth, China creates another Greece every three months; another UK every two years."

Rosling welcomed the new audience. "They request my lectures because they want to know the world as it is," he says. The private sector needs to understand the economic and political conditions of current and potential markets. "To me it was horrific to realize that business leaders had a more fact-based world view than activists and university professors."

O'Neill left Goldman Sachs in 2013, and went on to lead a committee on global antibiotic resistance. He looked to Rosling for a big-picture view. "I wish there were more people like him," says O'Neill. "He genuinely thinks about the future of all seven-plus-billion of us, rather than so many who claim they do but actually come at it with a narrow and national perspective."

Rising wealth pleases Rosling because he wants extreme poverty to disappear. To help get there, he celebrates improvements. He calls the UN's push to eradicate extreme poverty by 2030 an entirely reasonable goal because the proportion of people living in extreme poverty has declined by more than half in the past quarter of a century, and the strategies needed to help the remainder are known.

His attitude aligns him with Steven Pinker of Harvard University in Cambridge, Massachusetts, who wrote *The Better Angels of our Nature* (Viking, 2011). In the book, Pinker argues that global rates of violence are much lower than they were in the past. The two met at a TED conference in 2007, when Pinker took the stage after Rosling ended his talk by swallowing a sword (whatever grabs attention). Pinker says that Rosling made him think that "the decline in violence might be a part of an even bigger story about humans gradually making progress against other scourges of the human condition".

Both have been criticized as being Pollyannaish about the global situation in the face of tragedies such as the conflict in Syria. "People think that if you emphasize how things have gone well it is the same as saying no problems remain. That's not true," Pinker counters. "In fact, I strongly suspect that people are more motivated to reduce problems like poverty and

violence if they think there is a good chance they can succeed."

And as a cognitive scientist, Pinker admires the animations that Rosling uses. One, which depicts countries as bubbles that migrate over time according to wealth, life span or family size, allows viewers to grasp multiple variables simultaneously. "It's a stroke of genius," Pinker says. "He gets our puny human brain to appreciate five dimensions."

In 2005, Rosling, Ola and Anna founded the non-profit Gapminder Foundation in Stockholm to develop the 'moving-bubble' software, Trendalyzer, and to spread access to information and animated graphs depicting world trends. Google acquired Trendalyzer in 2007, and Gapminder has successfully pressured the World Bank to make its data free to the public.

HOW TO DISMANTLE THE POPULATION BOMB

Rosling's charm appeals to those frustrated by the persistence of myths about the world. Looming large is an idea popularized by Paul Ehrlich, an entomologist at Stanford University in California, who warned in 1968 that the world was heading towards mass starvation owing to overpopulation. Melinda Gates says that after a drink or two, people often tell her that they think the Gates Foundation may be contributing to overpopulation and environmental collapse by saving children's lives with interventions such as vaccines. She is thrilled when Rosling smoothly uses data to show how the reverse is true: as rates of child survival have increased over time, family size has shrunk. She has joined him as a speaker at several high-level events. "I've watched people have this 'aha' moment when Hans speaks," she says. "He breaks these myths in such a gentle way. I adore him."

The appreciation extends to the World Health Organization: director-general Margaret Chan says that Rosling provides facts for decision-makers to consider. "He makes the case that as people grow in wealth, they grow in health," she says. And his talks help her to convince governments that data collection can help them to track whether they are getting returns on their investments in global health.

The past few years have brought new challenges. In 2014, Ebola was spreading in West Africa, and Rosling's liver was failing. A hepatitis C infection that he had mysteriously acquired in his youth was becoming lethal. He travelled to Japan to receive the newest treatment, not yet approved in Sweden. By October, he found himself fretting, from afar, over discrepancies in official reports on the number of suspected and confirmed Ebola cases. "I realized my skills were needed," he says.

As soon as the drugs cured him, Rosling flew to West Africa to join the Liberian government's epidemiological-surveillance team. The team wanted to consolidate data, but struggled with the disparate ways in which international agencies collected information. "We were losing ourselves in details," says Rosling. "I saw this was a war situation: all we needed to know is, are the number of cases rising, falling or levelling off?" After a few months, it became clear that the rate of new cases had diminished. Rosling was rewarded with a traditional chieftainship by the Liberian government.

Now, at the age of 68, Rosling has retreated to his red wooden house in Uppsala with Agneta. He continues to work and plugs away at his "factfulness book on megamisconceptions". Every now and again, he stirs the pot. In October, he published a piece in *The Lancet* identifying a misleading statistic in a widely cited report from an advocacy organization launched by the UN (H. Nordenstedt and H. Rosling *Lancet* **388,** 1864–1865; 2016). The group claimed that 60% of maternal deaths occur in settings of conflict, displacement and natural disaster. Rosling checked the numbers and calculated that the true amount was no more than 17%. A UN spokesperson explains that part of the discrepancy derives from the fact that in the original figure, women who gave birth in nations affected by crises were included — even if their region had not been directly impacted.

Rosling blames the popularity of the dramatic-sounding statistic on the desire to raise funds at a time when refugee crises garner financial support. "Global health seems to have entered into a post-fact era, where the labelling of numerators is incorrectly tweaked for advocacy purposes," he wrote in the *Lancet* article with Helena Nordenstedt, a colleague at the Karolinska Institute. The majority of maternal deaths occur among the extremely poor, they added. Those remote populations are hidden even from the aid community.

Rosling prods academics when he can (see 'Test your world knowledge'). For instance, at a Nobel-laureate meeting in Lindau, Germany, in 2014, he quizzed the audience of leading scientists on the average life expectancy in the world today. Out of three choices, just over one-quarter of the crowd picked the correct answer of 70. That's less than would be expected by chance. The quiz spurred laughter in Lindau, but scientists are generally not his audience. Rosling is rarely invited to give keynote lectures or departmental seminars because he doesn't push a single field forward; he has not made fundamental discoveries since his konzo days. Researchers agree that he is a good communicator — but not the kind to teach scientists.

"People like Hans Rosling face the criticism of being too superficial," explains Peter Hotez, a tropical-disease scientist at Baylor College of Medicine in Houston, Texas. "It's the dilemma of the public intellectual," he says, describing academics who bridge several disciplines rather than excel at one.

Rosling says he never cared much about his academic reputation. He was lucky to receive steady support from the former head of the Karolinska Institute, Hans Wigzell, who encouraged him to seek outside funding so that he could pursue whatever he deemed most important. After Rosling decided that that meant teaching broadly, he walked away from research entirely.

He also differs from global-health experts who have stepped outside academia to change policies. He hasn't worked to expand access to HIV medication, for example. He has not — like Hotez — put neglected tropical diseases on the world health agenda. And konzo still exists. But Rosling has had success; it's just that the impact becomes harder to measure the broader his goals become. Now that he has decided that the public at large must buy into ending extreme poverty and creating a sustainable world, he has dedicated the last chapter of his career to education. With the right facts, he hopes, people will make the right decisions — he just needs to face down the misconceptions.

Who is better suited to the task than a man able to stave off machetes with the power of a few pictures and his words? ■

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QUIZ

Test your world knowledge

In some of his talks, Hans Rosling likes to explore the audience members' misconceptions about the world. He finds that people often perform worse than predicted by chance.

In the past 20 years, the proportion of the world population living in extreme poverty has roughly…

- Doubled
- Remained the same
- Decreased by 10%
- Decreased by half

Globally, men aged 25 and older have spent about 8 years in school on average. How many years have women that age spent in school?

- 2 years
- 3 years
- 5 years
- 7 years

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