



Message from the NSTF Executive Director

The roles of science, scientists, government, and mathematical modelling in handling the COVID-19 pandemic

We have learnt with sadness that COVID-19 has claimed its first victim in South Africa's science community. [Professor Gita Ramjee](#) spent her life fighting another deadly virus, namely the Human Immuno-deficiency Virus (HIV). On behalf of the NSTF, I express my sincere condolences to her family, friends and colleagues.

The novel coronavirus which causes COVID-19 does not discriminate and does not fear knowledgeable, insightful and courageous people like Prof Ramjee. This is because the virus is not really a living thing. It is a mass of genetic material, and reproduces to the exclusion of all the other functions of a living organism.

A sense of agency?

My impression is that people are still grappling with what is true and what is false news, and people don't understand the finer details, which might or might not be important. Fortunately, this is not a country where the government determines everything down to the finest details, or suppresses communications. Although our movement is now restricted under the provisions of the State of Emergency, we still do have a sense of agency – we can search for information, form our own opinions, post these on social media for the world to read, debate, joke and ultimately manage our lives as we see fit (at home, of course). We take individual decisions regardless of the very good advice we get from government.

When I say 'we' in the above paragraph, I am of course discriminating – by 'we' we usually mean people like ourselves. By 'we' I mean people like me, who happen to have a home where they can stay, who have water and sanitation at home, who have enough money to buy food, who have access to the internet (read: data or wifi) to search for information and access social media, and (oh yes) – literacy! You have agency by choice, but when denied basic human rights, you are denied agency in a multitude of ways. When we use 'we' to mean South Africans, it is a very different picture, as millions of us are not in a position to stay at home, nor to access information. Our inequality is our downfall ('our', as in all South Africans).

It does seem to me that the government is doing all it can to address the inequality by providing shelter to the homeless at this time, and quarantine facilities where it is not possible to be quarantined at home, and through the testing campaign implemented by thousands of community health workers. We have not often been able to praise the government, but this time it has acted commendably, taking the most essential steps to slow down the spread of the coronavirus, under the leadership of President Cyril Ramaphosa. It also turns out that the President has some good ministers who are following his lead and pulling in the same direction. It is a relief that they and the Minister of Health are taking research seriously and consulting scientists to inform their pronouncements and actions.

Respect for science

Our current President does not deny the reality and seriousness of the coronavirus pandemic. As Mia Malan says in her article: [The facts beat the quacks: Our #Covid19SA vs. our #HIV response](#), published on 25 March 2020, this is a very different world from that of Thabo Mbeki's time as President, when he and his Minister of Health Manto Tshabalala-Msimang denied that there is a link

between HIV and AIDS, blamed poverty for AIDS, and extolled the virtues of eating beetroot and other foods for prevention of the infections. Malan says now there are no protests and outcries that the government is not listening to the people and to experts; and “No pontifications about potatoes, beetroot, lemon and garlic as excellent means to protect people from a potentially fatal virus.”

The Academy of Science of South Africa (ASSAf) brought out a report at the time, entitled [HIV/AIDS, TB and Nutrition](#), in 2007, which presented the evidence that diet cannot protect against or prevent HIV infection. Its advice was not heeded. At least one colleague in a government department said to me that the Academy is looking for trouble. The government at the time was itself making the same mistakes we see when people take social media advice seriously without checking out reputable sources. When there is urgency and fear, people tend to grasp at straws and gratefully absorb any advice they find that gives one hope of efficient preventative measures or cures.

The journalists and civil society organisations led the way in Mbeki's time, searching and communicating the truth, and debunking the government's myths. In Malan's words: “journalists, scientists and activists who opposed HIV quackery were 'anti-Mbeki people', not just mere supporters of science.

“We were the enemy.”

At the International Aids Conference, in 2000, in Durban, Minister Manto Tshabalala-Msimang reprimanded two world-renowned HIV scientists. She scolded and humiliated Dr Salim Abdool Karim, now the head of the [Centre for the Aids Programme of Research, CAPRISA](#), and Hoosen Coovadia, then from the University of KwaZulu-Natal, in front of Members of Executive Councils (MECs) for Health and other politicians.

“Both were respected health activists who had fought for equal access to healthcare for all races during apartheid,” writes Malan.

Long before Professor Salim Abdool Karim's dressing-down by Tshabalala-Msimang, he was awarded the Reebok Human Rights Award in 1988 as one of the very first recipients.

Prof Abdool Karim went on to win many accolades and awards after his encounter with Minister Tshabalala-Msimang, including an NSTF Award in 2011 together with fellow researcher Quarraisha Abdool Karim, to whom he is married. They won the [2010/2011 NSTF-BHP Billiton Award for Research for Innovation](#), for their team's outstanding contributions to AIDS prevention through the landmark CAPRISA 004 study. In 2011, he had published widely on infectious diseases, including AIDS, measles and hepatitis B and co-edited the textbook that is widely used to teach epidemiology in South Africa.

By that time he had already received the World Academy of Science ([TWAS](#)) Prize in 2008, and he and Quarraisha received a standing ovation at the [XVIII International AIDS Conference, 2010](#) for the results of their [CAPRISA 004](#) study.

And now, during the pandemic, Minister Zweli Mkhize is taking his advice from the previously maligned Abdool Karim.

Top scientists

South Africa has many award-winning scientists, particularly in medical science. Just have a look at the list of scientists who have been given [NSTF Awards](#) over the past 22 years. This is one reason (among others) for being extremely proud to be South African.

The Wits Communications team, which won the NSTF Communication Award [last year](#), have profiled the [Wits academics](#) who have been doing research related to the novel coronavirus. It is an impressive assembly of scientists, and Wits is not the only university that can boast about such researchers.

Models and simulations

When I wrote about the [novel coronavirus at the end of January](#), I couldn't find much in the way of models of the spread of the virus. Today there is no shortage of these on the web!

The remarkable thing for me about this deluge of models, is that non-mathematical people, in their millions, are taking note of 'the curve'. They are not even thinking about it as 'mathematical'. Everyone now also knows about 'flattening the curve', which in mathematical terms would require some fancy abstract manoeuvres. When I first saw a graphic illustrating this, I was sceptical that the general public would understand it. Since then the 'general public' seems to have mastered it admirably. And they will never forget it, no matter how poorly they did at school maths!

However, the concept of exponential growth seems to be puzzling to most people. This is perhaps why some don't understand that taking a loan and having to pay it back with interest, makes you much – *much* - poorer than you were before. This is why the daily jumps in the number of coronavirus cases, and the critical patients and the deaths 'surprise' us. Even if you know the exponential graph, the news is a daily shock.

I'm reminded of the famous [Chessboard puzzle](#), which is best presented with a story, such as: There once was a King (or Sultan, or Chief) who needed urgent help – such as recovering his daughter from a dragon, or slaying an enemy. A poor but very brave man heeded the King's cry and succeeded in the difficult task the King required him to do. "What do you want in return?" asked the King. The poor man said – "I don't need much, just some rice (if he was in China or India) or wheat (if he was in Europe). The amount I need is a chessboard full, calculated in the following manner: you put a grain of rice on the corner of a chessboard, and then 2 on the next square, and 4 on the next, just doubling the number of grains of rice until all the squares of the chessboard have rice". Oh, thought the King, this peasant does not know how to do sums! It is such a bargain. So the King started with the grains of rice on the chessboard, watching the number of grains on the squares grow. He soon got to a stage where he had to call a servant with a bag of rice, to be scooped out with a cup. He suspected that he had been conned, but checked the numbers on each square and found that they were correct. Before too long he had to call for a bucket of rice, then a wheelbarrow, and could not believe it when a whole silo of rice was required! Thus the poor man not only had enough rice to feed his large family for 21 days, but for a whole year, and he could share the spoils with his relatives and neighbours too. I would like to think the royal family went hungry, but they had probably done much more stockpiling of other foods than rice.

The Chessboard puzzle is a good way to teach the exponential concept, function and graph, and it should be fun to get children involved in putting out the (small) numbers of rice/grains. They can record the numbers and draw a graph. It will look just like the coronavirus graph. It so happens that the number of coronavirus infections increase by slightly more than doubling each time.

Here then, is another opportunity to learn from our crisis. A pandemic is an excellent example of exponential growth, and can be taught in order to master large numbers, exponential functions and graphs, statistics, and the concept of a mathematical model. Teachers – and parents – take note!

For some interactive graphs and simulations, try out the following

- [Corona simulator](#)
- World Economic Forum: [tracking the coronavirus around the world](#)
- [Spread of COVID-19 globally](#) – see the last map on the page.
- [Coronavirus growth](#) (MSN Lifestyle)

For further reading:

[Mathematics of life and death](#): How disease models shape national shutdowns and other pandemic policies, by [Martin Enserink](#), [Kai Kupferschmidt](#), Mar. 25, 2020

Sources:

Bhekisisa Centre for Health Journalism: bhekisisa.org

Wikipedia: https://en.wikipedia.org/wiki/Salim_Abdool_Karim

https://en.wikipedia.org/wiki/Reebok_Human_Rights_Award

Learning materials of the Freudenthal Institute, Utrecht University, The Netherlands

The opinions expressed above are those of the Executive Director, Ms Jansie Niehaus, and do not necessarily reflect the views of the [Executive Committee](#) or [members](#) of the NSTF.