National Science and Technology Forum

S.E.T. for socio-economic growth

Message from the NSTF Executive Director

What you should know about science

As I argue with friends, family and strangers about the wisdom of taking the Covid-19 vaccine, I'm continually struck, and amazed, by the impact of misinformation and conspiracy theories, as well as the need to repeat what everyone should know by now.

Isaac Asimov, the great science fiction writer, said: "Anti-intellectualism has been a constant thread winding its way through our political and cultural life, nurtured by the false notion that democracy means that 'my ignorance is just as good as your knowledge'."

That was America in 1980. About 40 years later, it seems to be more the case than ever. It is easy to forget that anti-intellectualism has regularly reared its ugly head throughout history. What is different in our era, is that technology has enabled reigning ignorance to go viral.

In *The End of Eternity*, Asimov's characters look back from far into the future, and regard 2027 as the end of an epoch, after which it is possible to change the past. Will the world's people be less ignorant by then? Or will people have to time travel backwards to try and fix the disastrous results of our ignorance in the present era as in the book?

In South Africa, we need to start the necessary awareness in primary school. Every child should know what a vaccine is and how essential it is. We vaccinate babies, and then neglect to teach them a few years later what it was for. Every child should know about hygiene – not just be instructed to wash their hands and blow their noses in tissues, but the reasons for these instructions. They should know that there are 'germs' (gradually learning about viruses, bacteria, microbes…), that these are invisible to our eyes but visible under a strong microscope. A 'strong microscope' (or even a simple one) will not be available at schools, but can be seen in action on the internet (which is but one of the reasons why connectivity at schools should be a priority for the education system).

Why do so many adults not have this essential knowledge, or reject it in favour of 'rumours'? Of course, most people in South Africa have not been privileged to have quality education (apartheid still has much to answer for, for deliberately under-developing our people), but I suspect that misconceptions and conspiracy theories are not mainly prevalent among the currently disadvantaged. Even people who have had access to relatively good education, and even those who have passed science in matric, are confused or convinced by what they are fed via social media.

Hesitancy

Sometimes vaccine hesitancy is not due to ignorance. Kim Harrisberg reports in a recent news article that vaccine hesitancy is widespread in Africa (specifically the African Union (AU)), and that the use of the AstraZeneca vaccine will be halted. Her summary:

Health experts say urgent public awareness campaigns needed to fight misinformation about the shot

** AU halts plans to secure AstraZeneca vaccine*
** Says decision not linked to possible blood clot links*
** Health experts warn of growing vaccine scepticism*
** Calls for awareness programmes to tackle misinformation*

Globally, more than 700 million vaccine doses have already been administered. Africa accounts for less than 2% of the total compared to North America's 27% and Europe's 20% share. Through the COVAX initiative, 600 million shots are to be provided to about 40 African countries, most of them from AstraZeneca – which is enough to vaccinate 20% of their populations. But Africa wants the choice of vaccines that other countries have, and not have AstraZeneca imposed on it. Ayoade Alakija, co-chair of the AU's Africa Vaccine Delivery Alliance for Covid-19, called for "community engagement with data that is locally owned and adapted to a local context". His opinion is that if Africa had vaccine options, it would help to dispel fears and misinformation.

See Calls to beat vaccine hesitancy as African Union drops AstraZeneca (trust.org), by Kim Harrisberg, Thomson Reuters Foundation. Published on Friday, 9 April 2021.

Why is it that people don't trust science and scientists?

Is the lack of trust related to people's mistrust of their governments? The high rate of hesitancy in South Africa might be related to lack of trust of the authorities that obtain the vaccines and organise their administration. But there are other possible reasons:

The public seems to have difficulty understanding how uncertainty is dealt with in science, how knowledge is generated and verified, how there are checks and balances in the way the global and national science systems work, and why a consensus of many hundreds of scientists is more credible that of a single scientist. In short, people do not know how science works. They view it as single, isolated studies, by scientists working in isolation. They view it as opinions and beliefs, rather than established facts where even the degree of certainty is measured. ('Facts' is not exactly the right word, but it is one that is popularly understood).

People have to be told how science 'works' – this is essential information which people won't know unless taught. Credible sources, such as relatable role models, should convey such knowledge, rather than the government.

What should people know about science?

- **The importance of rigorous experiments.** Best practice is that experiments are done with large samples and with controls (experiments identical except for one factor, to compare the difference in outcomes, if any). Other scientists must be able to replicate the experiments and obtain the same outcomes. All this has to be explained to the public as it is not obvious why these are requirements for credible studies. People also need to know there is wide-spread adherence among scientists to these requirements, and institutions enforce them. The public should be able to judge for themselves whether a study or a claim to a finding is credible based on these requirements.
- **Clinical trials are done in medical fields and social sciences.** What are the kinds of thresholds for sampling and control groups to give credible results? How do you do representative sampling? Studies with large samples and very representative samples are more credible than small studies with homogenous samples.
- **Scientists reference other scientists.** They have to build on the work of other scientists, and have to know what other related work is being done currently. That is why conferences are arranged and good scientists will regularly attend and present their findings at these. They read as much as possible of what other scientists are doing and have done in fields related to their own. This is an essential part of generating scientific knowledge. Whatever the scientist does, must take into account all the work that has gone before. For the non-scientist this is hard to imagine, especially for the many millions of people who do not read at all.
- **Scientists work together.** They discuss and consult with one another – in writing or in person. They usually work in teams on a project. It is very seldom the case – as so often portrayed – that a single isolated scientist discovers something ground-breaking while working on their own in a lab. If the scientists are working collaboratively instead of in isolation, their results are also more credible.
- **It takes a long period of study and rigorous training to become a scientist.** There are not only the three to five years of basic study (undergraduate, and in South Africa consisting of a

BSc and Honours degree), but this has to be followed by a Masters degree and then a PhD. After which the scientist is formally qualified but not yet qualified to lead scientific studies, and has to do some years of post-doctoral research. The teams of scientists include post-graduate students and post-doctoral researchers, under the supervision of a highly qualified and experienced scientist/s. Thus, it can take up to ten years just to qualify, plus years of research experience. Someone with a doctorate who has done one study and published one paper cannot be regarded as a leading scientist.

- **The peer review process.** Whatever is published should be reviewed by fellow scientists, and critically assessed. The peer review process is (or should be) strict, and gaps in the scientist's processes and thinking should be identified. The author can be criticised and/or the results rejected. This is part of the process. Although no-one wants their paper to be criticised or rejected, and risk having a tainted reputation, it is an opportunity to do further study, correct the problems in the methodology followed, assumptions incorrectly made, or misinterpretations of the literature. If the scientist was dishonest or committed plagiarism, the peer review process should identify this, and the work should be rejected. Even after the peer review process is followed and a paper is approved for publication, problems with the work can come to light. These are usually exposed and the work of the scientist is discredited. So scientists have a way of 'policing' each other's work. A discredited study, paper or scientist does not bear a (figurative) stamp of approval. The public should not take such studies or scientists seriously.

The paper, the 'Plandemic' and the perfect storm

All of the above seems obvious when you are in a scientific field (or close to it), but it is not common knowledge. Here follows an example of how claims on social media can be debunked by some understanding of the way scientific knowledge is generated:

Dr Judy Mikovits claims that she has evidence that another deadly virus is delivered through the anti-Covid-19 vaccines, and that she was victimised and arrested for revealing conspiracies by big pharma. She tells this sad and alarming story quite convincingly in an interview on *Plandemic*, which has since been removed from various websites. (If you still want to see what all the fuss is about: watch Dr Judy Mikovits - PLANDEMIC VIDEO (drjudyamikovits.com). This video became a super-spreader of misinformation. (Please don't share it without explanation!) However, she was already publicising false claims long before the pandemic. Now she is claiming that millions of people will die if they receive the vaccinations.

Her claims have been debunked many times by various fact-checkers. This seems to be the background story which she chooses to deny: She had done scientific work on another virus and published a paper in 2009 (23 Oct): Detection of an Infectious Retrovirus, XMRV, in Blood Cells of Patients with Chronic Fatigue Syndrome | Science (sciencemag.org). Initially the paper was accepted through the peer review process, published and widely welcomed as reporting a ground-breaking discovery. But the study contained a flaw, probably contamination in the lab she was working in, because her findings couldn't be replicated. The study she did was rejected and the paper retracted in 2011 because of this. She refused to accept the rejection, and ten years on, is still spreading false news, in apparent retaliation for her humiliation. She stole data and was suspected of stealing equipment, and when she refused to return these, she was arrested. Many people believe her fabricated story and the videos of interviews with her went viral. People do not read up further on the internet to inform themselves of the circumstances of her 'victimisation'.

It is the peers of this scientist who rejected her work, with the science system fulfilling its function of checking up on the work of fellow scientists.

For more information see: Was a Scientist Jailed After Discovering a Deadly Virus Delivered Through Vaccines? (snopes.com), by Alex Kasprak, Published 8 December 2018, updated 6 May 2020. Also see Wikipedia: Judy Mikovits - Wikipedia and Plandemic - Wikipedia.

Other examples of dilemmas experienced by the non-scientifically minded:

1. **Spanner in the works at an NSTF presentation.** If a scientist's work simply negates the work that is done elsewhere or that preceded his/hers, it is not scientific. Scientific studies should be provided when refuting previous and current work in the field. An example is the scientist who volunteered to present at one of NSTF's events, who called climate science into question. He was refuting what the top climate change expert, internationally respected and NSTF Award winner in the Lifetime category (2015), Prof Bob Scholes, had presented with detailed evidence and sound arguments about the climate change that is happening and how it is expected to escalate. You would think it obvious that our audience would choose Prof Scholes' opinions, which are corroborated by hundreds of scientists internationally, and by the evidence. However, some people at the event without a scientific background chose on this occasion to embrace the doubt sown by the (very brief) presentation of the interloper! (NSTF discussion events are open to a wide range of stakeholders and the public).
2. **'We don't want to be guinea pigs'.** People are indignant that the Johnson and Johnson vaccine was being administered in South Africa as a continued phase of the clinical trials in which SA was participating. "We are guinea pigs!", they say, and they think their suspicions about the vaccination programme are confirmed. What they do not understand is that the risk of ill effects is very low, given the part of the clinical trials already completed with about 43 000 people around the world and including South Africa. Proper clinical trials, in phases, are to ensure that medicines or vaccines are close to 100% safe – they are not the first experiments with the medicines/vaccines. Under the circumstances it was wholly justified to vaccinate the health workers in SA in particular, as part of the clinical trials, to save their lives. See Wikipedia: Johnson & Johnson COVID-19 vaccine - Wikipedia. The vaccine has now been declared safe and effective and emergency use authorisation has been given in various countries: On 29 January 2021, it was announced that it has 85% efficacy in preventing severe Covid-19, and 100% efficacy in preventing hospitalisation or death caused by the disease Already, the results of the Phase I–IIa clinical trial had confirmed the safety and effectiveness of this vaccine. "The interim analysis was based on 468 cases of symptomatic COVID-19 among 43,783 adult volunteers in Argentina, Brazil, Chile, Colombia, Mexico, Peru, South Africa, and the United States. No deaths related to COVID-19 were reported in the vaccine group, while five deaths in the placebo group were related to COVID-19.[53]" The European Commission approved the vaccine (which is actually called Janssen) on 11 March 2021. In the United States: On 26 February 2021, a meeting of the Vaccines and Related Biological Products Advisory Committee (VRBPAC) voted unanimously for an Emergency Use Authorisation (EUA) for the vaccine. The Food and Drug Administration (FDA) granted the EUA for the vaccine the following day. On about 17 February 2021, the vaccine received emergency authorisation in South Africa.

3. **Microchip conspiracy.** Somehow the bizarre story of a microchip inserted with the vaccine has spread around the globe, and people still believe it. (I also heard a version from an Uber driver, that when the microchip is 'switched off', the host instantly dies!) Firstly – there is a shortage of microchips due to increasing demand for electronic gadgets to do online learning, studying and working from home, and perhaps the rise of manufacture of electric vehicles. This should reassure people that already there aren't enough microchips to go around for the usual uses – there is not an infinite supply after all. Secondly, the costs of injecting microchips into everyone would be exorbitant. You cannot believe that the pharmaceutical companies just want to make money, and at the same time believe that they would incur the expenses of such a dubious project. See Debunking the COVID-19 vaccine microchip tracker conspiracy theory (abc4.com).

'Playing ball on running water'

(From the title of the popular book written by D.K. Reynolds: *Playing Ball on Running Water: The Japanese Way to Building a Better Life)*

Things changed very fast over the past year – not least of all the 'scientific' advice to governments and the public. Scientific advice has to be adapted over time because scientific findings change – this has always been the case, but science has developed in fast-forward mode over the past year-and-a-bit. This has created the illusion that scientists 'don't know themselves what's going on' and that 'science is unreliable/made-up/has ulterior motives', etc. The decision makers at all levels are faced with the practical dilemmas of how to deal with the Covid-19 regulations and guidelines, and how to communicate to and guide their people at the same time. Because of the changing nature of the scientific advice, and the omni-presence of non-scientific advice, people have all become sceptics and turned against authority. Everyone has become their own expert, trusting in their own common sense or imagination, and whatever comes up on an internet search or on social media, in preference to science.

In March last year it was commonly accepted:

- At first, that masks won't help at all and will provide no protection to the wearer. Luckily, it didn't take long to change this to 'Everyone should wear a mask'!
- Everyone should frequently clean their hands (20 seconds with soap and water, or rubbing with 70% alcohol mixture).
- Social distancing of 1.5 or 2 metres apart.
- That you should isolate if you are ill, or have Covid-19, or suspect you have it, or are particularly vulnerable to such an illness.
- All surfaces that are commonly touched should be sanitised. (This was taken to extremes by sanitising floors, bookshelves, car seats etc).
- It was commonly believed that the virus did not hang around in the air. It was thought to drop to the ground/floor in moisture droplets that are too heavy to float. (Nevertheless, entire rooms, buildings, schools, shops, etc were fumigated, even if they had been standing empty).

Expert advice is currently:

- Everyone should (still) wear a mask
- Everyone should (still) frequently clean their hands
- Social distancing of 1.5 or 2 metres apart should (still) be maintained
- Isolate if you are ill, or have Covid-19, or suspect you have it, or are vulnerable to such an illness. (This is still the advice to follow.)
- It is not that important to sanitise surfaces. (Surprise!)
- Good ventilation indoors and doing many activities outdoors instead of indoors (wherever possible). This is a relatively NEW requirement, but arguably the most important guideline of all.

It's not that anyone was deliberately misleading the public, and there was some certainty among the disagreements about what was to be done. To err on the side of safety, the current best practice guidelines from the WHO and other countries were adopted and enforced. This included spaces, surfaces and objects being sanitised to kill anything that could ever live on or in them. (See Another Covid Myth Dies the Death – AIER.) During lockdown, I think many people discovered the hidden, efficient cleaner identity in their personalities, and scrubbed down their homes daily!

There's a problem here that has been obvious for many years, but not it seems, generally known. The cleaning materials that claim to kill 99%, or 99.9%, or even 99.99% of germs (microbes) do not create a healthy living environment. The air around us, all surfaces, and all objects naturally have many millions of microbes living on/in them. We as human beings contain even more of these inside us and on our skins. Likewise, our animals do too. Most microbes are harmless. Many microbes are beneficial and we actually need them. Harmless and beneficial microbes should NOT be killed, because they fend off the harmful ones through natural competition. In

places where there is constant and thorough sanitising, like in clinics and hospitals, the most robust microbes are still capable of living, breeding and infecting people.

So not only is it unnecessary to sterilise every nook and cranny – it is actually problematic to do so. The schools we closed down for every case of Covid-19, should have stayed open. The millions that were spent in Gauteng for the sanitising of schools could have been saved to a very large extent.

Conclusion

- Science is 'way' better than ignorance!
- Scientific findings change and there is nothing wrong with that.
- Scientists are policed by their peers.
- Guidelines exist for best scientific practice and for judging the credibility of studies and publications. These are long-established and widely followed.
- Check up on all claims made on social media.
- Open the window, wear that mask, wash those hands, keep your distance!

For more reading on evidence-based communication, see:

- The Undisputed Truth About Human Behavior and COVID-19 | Psychology Today - Why blaming and shaming won't promote solidarity. By Linda Esposito, LCSW, a psychotherapist in Pasadena, CA, Posted Aug 11, 2020 | Reviewed by Ekua Hagan
- PERC | Prevent Epidemics - Partnership for Evidence-Based Response to COVID-19
- COV050_PERC_DashboardBriefing.pdf (preventepidemics.org) - A Decision-Making Dashboard for COVID-19 Response in Africa

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.