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The BMJ Interview: WHO chief scientist optimistic for a pan-coronavirus vaccine in two years

Soumya Swaminathan tells **Mun-Keat Looi** of her worries about the relaxation of testing for global surveillance and the "two track pandemic"

Mun-Keat Looi

It's a challenging time to be a scientist, let alone the first ever chief scientist at the World Health Organization, a relatively new role. Barely nine months into her tenure Soumya Swaminathan was faced with a once in a century global health emergency and an entirely new virus that would change the face of science and medicine dramatically.

"It is incredible what we've learnt about this virus in just over two years," she tells *The BMJ*, "we haven't learnt as much about some other pathogens in decades of research."

She speaks with awe at the speed at which diagnostics, vaccines, and drugs have been developed and is optimistic that a pan-coronavirus vaccine could arrive much sooner than many might expect. She expresses her admiration for large platform clinical trials, including WHO's own Solidarity and the UK's Recovery trial.[1] "They've provided such valuable information about how to treat patients. That really brought mortality down significantly."

But there are plenty of scientific gaps remaining and Swaminathan has choice words about the "two track pandemic"—the way governments have adapted to the changing scientific evidence and the relaxation of testing as deaths have plummeted.

"We're concerned that many countries have reduced testing and therefore we're not getting a good handle on the stage of the pandemic. This is important because we need to be able to be vigilant and pick up a new variant as soon as it emerges and take appropriate action."

This interview has been edited for length and clarity.

Biography

Born in Chennai, Soumya Swaminathan earnt her medical degree at the Armed Forces Medical College in Pune and her doctorate in paediatrics from All India Institute of Medical Sciences in New Delhi. In 1989 she completed a postdoctoral medical fellowship in neonatology and paediatric pulmonology at the Children's Hospital Los Angeles at the Keck School of Medicine of the University of Southern California.

Her research career focused on tuberculosis and HIV before she served as secretary to the government of India for health research and as director general of the Indian Council of Medical Research from 2015 to 2017—during which time she built research capacity in Indian medical schools and forged partnerships between low and middle income countries in the health sciences.

From 2009 to 2011 she was coordinator of the Unicef, United Nations Development Programme, World Bank, and WHO Special Programme for Research and Training in Tropical Diseases in Geneva, and was appointed the first WHO chief scientist in March 2019.

What do you wish we'd known at the start of the pandemic?

I wish we'd had better preparedness in terms of surveillance—in terms of really understanding what those non-pharmaceutical interventions are that are most effective—because at the beginning of any pandemic you do not have the vaccines and the drugs so you have to rely on public health measures like wearing a mask, physical distancing, ventilation, and so on. A better understanding of things like airborne transmission, for example, right at the beginning of the pandemic [would have been helpful] but also non-pharmaceutical interventions and how they affect people in different socioeconomic conditions—looking more at the social and behavioural sciences, understanding people's behaviour and how to change it. We need to focus on these areas, so we're better prepared for the next pandemic.

Recent data point to the fact that the one factor which had the most impact on how a country managed the pandemic and the toll that it took on its population was trust—trust of people in government and trust in each other.[2] That's telling because many of the interventions are based on science. Sometimes, you do things pre-emptively because it's a serious situation—you don't wait for all the data and evidence. That's a lesson that we should learn—we should be able to take pre-emptive action. Especially if it's a low risk intervention like wearing a mask, which is just common sense, even though there weren't any clinical trials on it at the beginning.

How do you think governments have coped, or not, with gaps in the science?

The governments that did well did a few things right. Firstly, they listened to public health experts.

Secondly, decision making, from a political science perspective, involves not just the pure science behind something but many other interests and conflicts of interest that arise, as well as the impacts on economies, the ethics of certain decisions, and so on. Governments that set up multidisciplinary groups that tried to tackle all these different aspects—taking into account the science behind the virus and the interventions, but also looking at all of these different aspects—made the best decisions.

The governments that did well communicated regularly and transparently. They were open with the data they used to explain to the public what the decisions were based on when they were tightening restrictions or when they were loosening restrictions—explaining the rationale. Those were the governments that took their populations on board and kept the lines of communication open, prioritising the welfare of people.

One thing that has been missing is a global view, especially when it comes to trade and travel and so on. While all leaders want to protect their own citizens, and they're duty bound to do it in a pandemic, one also must look at the impact of one's actions on people in other countries or other parts of the world.

What would you say are the biggest remaining gaps in the science of covid-19?

We still don't completely understand the behaviour of the virus in different populations. We know that morbidity and mortality are correlated with older age. But at the same time, we have to understand that the data that are coming from different countries in different parts of the world are very uneven. And many countries don't have the same type of diagnostics or genomic capacities (see box). So, we still don't understand why and how the waves of this virus are coming through different populations with different periodicity in different countries.

Long covid, we still are learning about: the longer term sequelae of this virus and why, early on, we knew that some people who recovered from infection, particularly those who were more severely ill, had symptoms that persisted for quite some time. Now we're seeing that in large population based studies, incidence of diseases like diabetes and cardiovascular diseases are around two or three times higher in people who had even mild covid. Clearly that's something this virus is doing. It's not affecting only the respiratory tract, it's affecting multiple systems, multiple organs in the body. There have been worrying reports about the impacts on the brain and cognitive function. It may be setting up an autoimmune response, or there may be some kind of viral reservoir with ongoing inflammation—there are many hypotheses, which need further research to unravel. This seems to be very different from other respiratory viruses that we've dealt with.

On the research and development side, developing a pan-coronavirus vaccine that can cover the different variants of SARS-CoV-2 and perhaps even go beyond and be effective against other coronaviruses would be the holy grail. And it appears to be scientifically quite feasible to develop one in the next couple of years—that's partly because of the huge amount of research that's gone into SARS-CoV-2. And also the understanding of immunology as well as on the virus itself. So we're in a good position to be optimistic about a pan-coronavirus vaccine.

The world must build a genomic infrastructure

In March 2022, WHO released a genomic surveillance strategy[3] calling on countries to invest in genomics capacity—not just to track future variants of SARS-CoV-2, but also to be able to detect and understand the epidemiology of other common diseases like dengue fever or tuberculosis. "Also, to understand drug resistance," says Swaminathan, "for example, we know antimicrobial resistance is a big problem, but we don't have good data from many countries."

She emphasises the need to invest not just in hardware but also infrastructure, training, and the workforce, "the experts, the bioinformatics, and the analytical expertise."

"Using the power of genomics and sequencing—the cost of which is coming down and is becoming more accessible—better to understand local epidemiology will enable countries to use it for their own decision making and policy making. But we will also then have platforms where the data is shared rapidly and freely so that there's understanding at the global level of pathogen spread and evolution."

Covid-19 has shown how "once we have the genomic sequence, we can very quickly develop diagnostics as well as vaccines," she says, "But, at this point in time, a third of countries around the world still don't have access to genomics, so there's a big gap. We need global efforts in terms of investments from philanthropists and other global agencies—health agencies as well as national investment."

What do people, even experts, often still misunderstand about the science of SARS-CoV-2 or covid-19?

Immunity after natural infection and the duration of immunity. And that whether or not people have been infected, they need to be vaccinated. And what a full vaccination schedule looks like.

Also, the fact that this virus—different from previous coronaviruses—can be transmitted by people who are asymptomatic. You don't necessarily have to be sick—you can be well and still be spreading it to others, which is why continuing to wear masks, especially if you are in a crowded or poorly ventilated place, is so important, even after mask mandates are limited.

Some east Asian countries did this following SARS in 2003. It is not stigmatising to wear a mask in public and every time you have a respiratory infection, or you're not feeling well, or you are in a very crowded place, you wear a mask and that's just part of normal behaviour. I hope that this behaviour becomes common in other parts of the world, because we can also reduce incidence of diseases like influenza and respiratory syncytial virus, which we have really seen less of over the past two years because of the precautions we've been taking. That's just a sensible way of dealing with respiratory infections, which does not seem to be widely understood.

The world has had plenty of non-covid health emergencies over the past two years. Has the scientific effort for these suffered since covid became the primary focus?

Yes—many researchers stopped doing what they were doing if they were working on other pathogens and tried to help with the covid response. Everything else did take a backseat and we need to pick that back up.

Similarly, we've seen essential health service disruption. WHO has been doing surveys across its member states and has found that over 90% of countries are reporting disruptions in at least one essential health service. Many are reporting disruptions across many services, particularly immunisation, maternal and child health, and cancer treatment.

But we have gained an understanding of the various tools that have been put to good use, the scientific tools and the discoveries that have been made. For example, the longitudinal studies that have been performed at population level, but also things like the adaptive trials platform that had been tried for many diseases at a very small scale and previously barely made it into phase 1 trials. Then, all of a sudden, billions of people around the world have had covid vaccines tested using it, which opens up the possibility of using that same platform for other diseases.

This is the opportunity that we have today, and something that WHO, along with partners like the Coalition for Epidemic Preparedness Innovations and others, are investing in: to use the technologies developed in the pandemic to develop vaccines for other pathogens, which may not cause pandemics but certainly

cause outbreaks, like Ebola, Lassa fever, Marburg virus, dengue, and haemorrhagic fever, year after year. Then, of course, the big ones like tuberculosis and malaria, for which we still don't have good vaccines. The science that's been done during the past two years now provides an opportunity for us to answer some of these other questions.

Has the framework for vaccine evaluation, globally, become stronger because of covid-19?

Clinical research has advanced a lot, including things like frameworks for evaluating drugs, either repurposed or new drugs, as well as for new vaccines for diseases and in many areas. One framework is on designing and the conduct of clinical trials from the traditional double blind randomised controlled trials to thinking about adaptive trial designs—where you could have multiple vaccines or multiple drugs [tested at the same time and compared with a] common control or placebo—and also thinking about what happens in a situation like we're in today when large parts of the world, perhaps people already have antibodies to this virus [and therefore may not be eligible for a trial]. How do you then evaluate new vaccines? Perhaps by using immunobridging studies, by setting up the gold standard, or by defining the assays and the benchmarks so that you could continue to develop better vaccines and new vaccines.

Our understanding now, both of the tools that we have and the scientific processes, has evolved and so has the regulatory system. They've been so nimble, so adaptable, and so collaborative. Regulatory agencies from around the world have come together and agreed on some common standards, and that's accelerated the speed at which people get access to these products. These are all very positive lessons that we've learnt and hopefully will continue to use in the future.

How will the pandemic end?

We're not expecting that this virus is going to be eliminated or eradicated. It's going to stay with us, clearly. It's spread too widely and, unfortunately, infects many animal species.

The best case scenario is that with increasing levels of population immunity, both because of exposure to the virus and because of vaccination, by the end of 2022 the severity of the disease declines even though people may still be getting infected. The worst case scenario is that the next variant is not only more transmissible but more virulent than omicron and is able to evade the immune responses that we've generated thanks to vaccination. And then basically, we start all over again.

The in-between scenario is the virus becomes endemic, you get waves of infection and you may then see an increasing number of deaths as well. This could occur at different time periods in different countries, and it would depend on how quickly immunity wanes and how many susceptible people there are in the population—not just the elderly and those with underlying illnesses and who are immunocompromised, but new birth cohorts who don't have immunity.

SARS-CoV-2 will most likely continue to evolve and variants will emerge from time to time—we're seeing mixes of different variants[4] now and there may be other variants or more components in the future. We must be watchful. We have to continue surveillance, including genomic surveillance. We have to keep our tool kit—and not just vaccines—ready to use. Right now, the drugs are not available in many parts of the world. We need the diagnostics, and to make sure we have the personal protective equipment, the oxygen, and so on to treat people when needed and not go back to the shortages that we had at the beginning.

We are confident of quickly adapting the vaccines and taking them through the regulatory process through immunobridging studies and being able to roll them out fairly quickly. But it means constantly being on top of this pandemic, and not just believing that we have come to the end and relaxing all measures.

1 Stokel-Walker C. On the road to Recovery—the world's biggest covid-19 treatment trial. *BMJ* 2021;373:n1299. doi: 10.1136/bmj.n1299 pmid: 34039591

2 Baum F, Freeman T, Musolino C, etal. Explaining covid-19 performance: what factors might predict national responses?*BMJ* 2021;372:n91. doi: 10.1136/bmj.n91 pmid: 33509924

3 WHO. Global genomic surveillance strategy for pathogens with pandemic and epidemic potential, 2022-2032. 28 March 2022. www.who.int/news/item/30-03-2022-who-releases-10-year-strategy-for-genomic-surveillance-of-pathogens.

4 Mahase E. Covid-19: What do we know about the delta omicron recombinant variant?*BMJ* 2022;376:o792. doi: 10.1136/bmj.o792 pmid: 35331986