

Covid-19 - a closer look at numbers

numbers can distort the facts that lie below them



Along with the record of low mortality in India, we need to compare the proportion of population that is over 65 years of age, worldwide, and the mortality risk of those in that age group. Chart 1, which describes mortality risk, shows that the elderly face a huge mortality risk that even those in their 40s and 50s. A country that has a larger proportion of older citizens would thus see more deaths than countries with younger populations. Chart 2 shows the percentage of people over the age of 65 in different countries. We can see that the older group in India form just six per cent against as high as 23 per cent in Italy.

These numbers put in perspective the low mortality rate that we see in India. The average mortality among those less than 65 yrs of age, by weights of population, is just 0.25 per cent, and among those older than 65 it could safely be taken as eight per cent. We can then work out what deaths to expect in a population and hence the overall death rate. The working, for a population of 10,000, is in Table 2.

We can see that given the uncertainty of all numbers, the rate in the US and Spain, after adjusting for demographics, are reasonable. It is high in Italy, but Italy was the first affected. France too is exceptional but we see that the figure of 3.3 cannot be taken at face value and our mortality rate is as high as in the rest of the world.

Antibody test

The recommended test to detect Covid-19 is the RT-PCR test. This test is reliable, but it is costly and takes time. For rapid testing, to manage large numbers, another test is the antibody test, which looks not for the virus, but the reaction of the body to the virus, if it is there. This test is fast and simpler, but it is not 100 per cent accurate. Nevertheless, considerable accuracy, as high as 90 to 99 per cent has been reported and the tests are seen as an aid to quick assessment and relief to burdened treatment facilities.

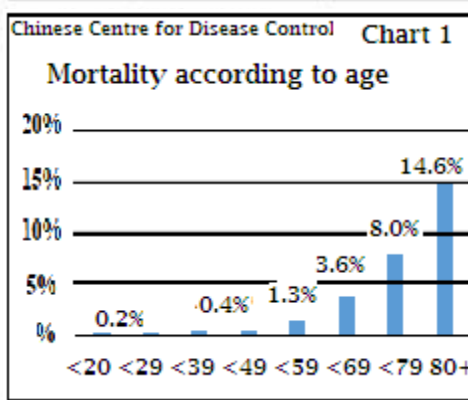
Analysis, however, reveals that even a method that is right 95 per cent of the time in finding a person positive for Covid-19, or otherwise, would not serve the purpose. This can be illustrated with an example of a sample of 1,000 people, among whom 20 per cent or 200 are Covid positive, and 800 are negative. Now, our test, which is 95 per cent accurate, of the 200 positive cases, would find 190 to be positive and there would be 10 "false negatives". Among the 800 Covid negative cases, the test would show 760 people to be negative, but there would be 40 "false positives".

The result is that we have 190+40 positive results, but 40 or 21 per cent, are not really positive. And of the 760+10=770 negative results, we have 10 cases that are not really negative.

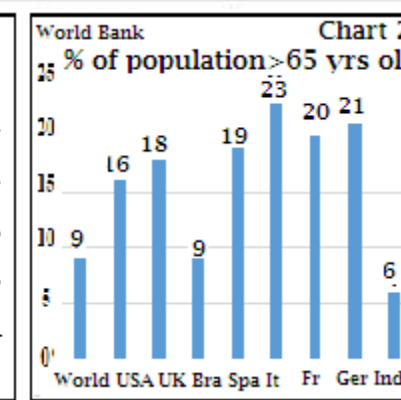
Now let us repeat the exercise with a sample of 1,000, where only 10 per cent or 100 are positive. Now, of the 100 positive cases, the test detects 95 correctly, and there are five false neg-

Country	Number of cases of Covid-19	Number of deaths from Covid-19	% of deaths to the total number
World	8,586,115	456,458	5.3
USA	2,263,749	120,688	5.3
Brazil	983,359	47,869	4.9
Russia	561,091	7,660	1.4
UK	300,469	42,288	14.1
Italy	238,159	34,514	14.5
France	158,641	29,603	18.7
Spain	292,348	27,136	9.3
Mexico	165,455	19,747	11.9
India	381,485	12,607	3.3

Distrib- ution of population	India		Italy		Spain		USA	
	<65yrs	>65yrs	<65yrs	>65yrs	<65yrs	>65yrs	<65yrs	>65yrs
	94%	6%	77%	23%	81%	19%	84%	16%
	9,400	600	7,700	2,300	8,100	1,900	8,400	1,600
Mortality	0.25%	8%	0.25%	8%	0.25%	8%	0.25%	8%
Deaths	23.5	48	19.25	184	20.25	152	21	128
Total	72		203		172		149	
deaths % to expect	Actual: 3.3		3.3x203/72=9.3		Actual: 14.5		Actual: 9.3	



Sample of 1,000 persons - 20% infected	200 real positives		800 real negatives	
	Real positive results	False negative results	Real negative results	False positive results
	190	10	760	40
There are hence 190+40 positive results in all. As 40 are false positive, these make up 21%				



S ANANTHANARAYANAN

Numbers have played an important role in the recent Covid-19 reporting. Right at the start, a somewhat sophisticated concept, of exponential growth, became common knowledge.

The concept suggested runaway increase in infections, and growth to millions was predicted. That this did not happen is because of proactive measures, which lowered the rate of transmission and so of growth. Other examples of the numbers, or the math, projecting pictures that are different from reality are of the low level of deaths from Covid-19 in India and the hope held

out by the high reliability of the coronavirus antibody tests.

To speak of the first, the low mortality rate, the fatality from Covid-19 in India is assessed at 3.3 per cent, against 5.3 per cent worldwide, 5.3 per cent in the US, a high 14-18 per cent in UK, Italy and France, and nine to 12 per cent in Spain and Mexico, as shown in Table 1. The low figures in India have been viewed with satisfaction, and it has been suggested that Indians have higher immunity, or that the strain of Sars-CoV2 that came to India is less virulent. Analysis of all the numbers, however, paints a slightly different picture.

ALICE GORMAN

Only 566 people have ever travelled to space. Sixty five of them, or about 11.5 per cent, were women.

Nasa recently proclaimed it will put the "first woman and next man" on the Moon by 2024. Despite nearly 60 years of human spaceflight, women are still in the territory of "first".

Valentina Tereshkova, the first woman in space

The first woman in space was cosmonaut Valentina Vladimirovna Tereshkova, who orbited Earth 48 times from 16-18 June in 1963. Her flight became Cold War propaganda to demonstrate the superiority of communism. At the 1963 World Congress of Women, Soviet leader Nikita Khrushchev used Tereshkova's voyage to declare the USSR had achieved equality for women.

Women across the world took heart and dreamed they too might travel to space. Ekaterina Ergardt, a Soviet state farm worker, wrote to Tereshkova, "I am eighty years old. I started to live in the years of the beginning of women's struggle for a life of freedom and equality... now the road to space is open for women."

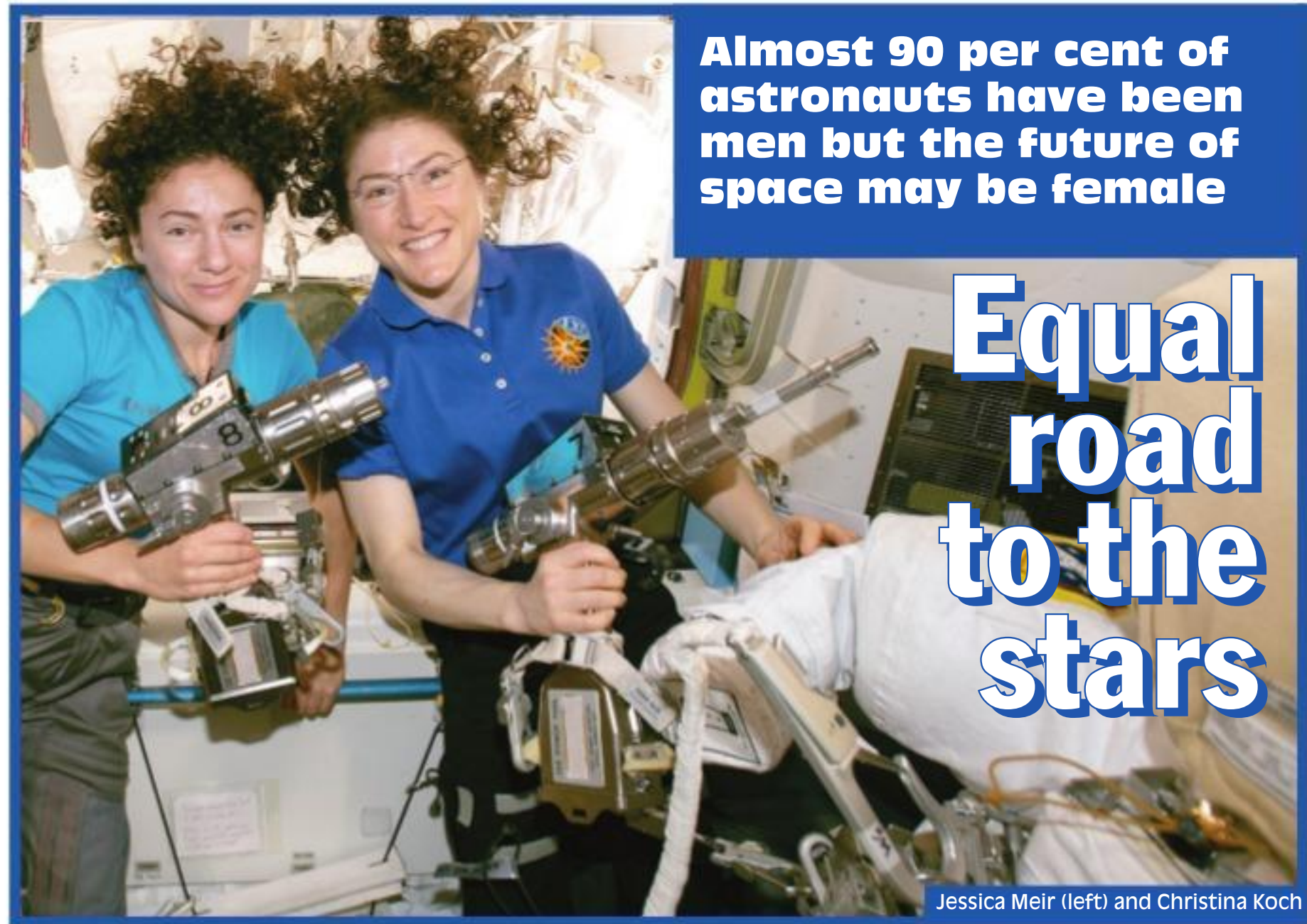
Earthbound again

Despite this optimism, it was 19 years before another woman was allowed to venture beyond Earth.

In the US, women were excluded from space by the restriction that astronauts had to be military test pilots -- a profession barred to them.

While the first American astronauts -- known as the Mercury 7 -- were training in the 1960s, aerospace doctor Randy Lovelace recruited 13 women pilots and put them through the same paces as the male astronauts. The "Mercury 13" outperformed the men on many tests, particularly in how they handled isolation.

But Nasa wasn't convinced. A congressional hearing was held to investigate whether women should qualify to be astronauts. In her testimony, Mercury 13 astronaut candidate Jerrie Cob said, "I find it a little ridiculous when I read in a newspaper that there is a place called Chimp College in New Mexico where they are training chimpanzees for space flight, one a female named Glenda. I think it would be at least as important to let



Almost 90 per cent of astronauts have been men but the future of space may be female

Equal road to the stars



Valentina Tereshkova

has been for men.

However, women in many ways are ideal astronauts. Physical strength and height are not advantages in microgravity. Women use less food and oxygen, maintain their weight better on restricted diets, and create less waste. In the words of Ride, "weightlessness is a great equaliser".

Space4Women

Women's access to space, not just as astronauts but as users and creators of space services like Earth observation and satellite telecommunications, is still far from equal. But there are signs of progress.

One is the Space4Women programme run by the United Nations Office of Outer Space Affairs, which aims to ensure "the benefits of space reach women and girls and that women and girls play an active and equal role in space science, technology, innovation, and exploration."

As Unospace director Simonetta di Pippo has noted, 40 per cent of the targets of the UN's sustainable development goals rely on the use of space science and technology.

Nasa's plan to land a woman on the Moon is another positive sign. On her post-orbit world tour in 1964, Tereshkova expressed her own desire to go to the Moon, but she never made another spaceflight.

Now aged 83, Tereshkova has had a distinguished career in science and politics and remains a sitting member of the Russian parliament. To see a woman set foot on the lunar surface within her lifetime would truly be a ground-breaking moment.

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the women undergo this training for space flight."

She was prepared to take the place of a chimp, if that was the only way to get into space.

Message in a bottle

Historically, even those like Lovelace who believed women should go to space have seen their role as helping men, acting as a civilising influence, or providing sex.

In one sense the first women on the Moon were Playboy playmates, in the form of pictures jokingly included in the Apollo 12 astronauts' checklists. Their names were Cynthia Myers, Angela Dorian, Reagan Wilson, and Leslie Bianchini. The women's bodies were likened to the lunar landscape -- both the object of male conquest.

In popular culture in the 1960s, women were often associated with magic and emotion rather than science and technology. The sitcom *I Dream of Jeannie* depicted the relationship between a US astronaut and a magical djinn or genie, imaginatively named Jeannie. Nasa was an advisor for the series, which mirrored real space events. Jeannie represented

seductive oriental femininity in opposition to the strait-laced, masculine, all-American astronauts.

In the similar sitcom *Bewitched*, the witch Samantha travelled to the Moon for picnics before she renounced her craft to be a regular housewife.

The message was clear in popular culture -- women needed to stay in the kitchen or the boudoir. These sitcoms are still aired around the world.

From aprons to spacewalks

By the 1970s, the women's movement had made great strides and Nasa had to adapt. The first women were admitted to astronaut training in 1978. Not to be outdone, the USSR rushed more women into its own programme.

In 1982 Svetlana Savitskaya visited the Salyut 7 space station, becoming the second woman in space and the first to perform a spacewalk. But she wasn't allowed to forget the nature of women's work -- when she arrived, her male colleagues presented her with an apron.

The following year, Sally Ride flew as a mission specialist on the

Space Shuttle Challenger, becoming the first US woman in space. The first American woman to spacewalk was Kathryn Sullivan in 1995.

In the 21st century, there are still barriers to women's equal participation in space. In March 2019 the first all-woman spacewalk was cancelled because there were not enough medium-sized spacesuits. Astronauts Christina Koch and Jessica Meir subsequently accomplished the feat in October 2019.

Discussing the cancellation, Nasa administrator Ken Bowersox made clear the ideal astronaut body is still male. He blamed women's smaller average stature, saying they were less able to "reach in and do things a little bit more easily".

'Weightlessness is a great equaliser'

Is it women's bodies that are the problem, or a space world built for men? What would space technology designed by and for women look like?

There is a massive gender data gap in space. There has been much research on the effects of microgravity on women's bodies than there

PLUS POINTS

For clean water



Researchers from the Indian Institute of Technology-Madras have shown that simple copper-coated jute beads are highly effective in protecting water and preventing microbial contamination. The IIT-Madras team seeks to solve the problem of water contamination and water-borne diseases in India.

The researchers have developed easy methods to coat cuprous oxide or copper on little beads of jute that float on water. They chose jute because of two reasons -- jute floats on water and jute sticks are an agricultural waste product that is affordable and available at low costs.

In many parts of the country, water is often collected and stored in containers for consumption. Such stored water can be easily contaminated due to the transfer of microbes from the air into the water, even if the container is kept closed. The traditional water purification method of boiling is economically and environmentally unsustainable.

Besides, the water continues to be vulnerable to microbial contamination after cooling. Water purification units such as filters and RO units may not be affordable to all and often, techniques like RO (reverse osmosis) produce a lot of unusable wastewater during the process of purification.

This research was led by Dillip Kumar Chand, department of chemistry, IIT-Madras and his research student Randhir Rai. The paper has been co-authored by Chand, Rai and Sathyanarayanan N Gummadi, department of biotechnology, IIT-Madras, who helped with microbial assays. The results have been published in the peer-reviewed journal *ACS Omega*.

Rai said, "To prove the disinfectant properties of the copper-coated jute beads, we took four beakers of clean water, added uncoated jute beads to one, jute beads coated with copper to the second, jute beads coated with copper oxide to the third and left the fourth beaker as it was, and studied the microbial content in all the beakers periodically."

When the beakers were kept uncovered for 24 hours, the one with the copper and copper oxide-coated beads did not have any microbial growth while the one without the beads and the one with uncoated jute beads had significant microbial growth. After five days, the microbial contamination in the water with coated beads were far less than in the beaker without the coated beads.

The US Environmental Protection Agency recommends that the amount of copper in water be below 1.3 parts per million for safety. The researchers showed that the copper that was coated on the jute beads did not leach to a large extent into the water, and even after five days, the amount of copper in the water was only around 0.8 ppm, far below the EPA mandate.

"Our study shows a simple and cost-effective way to keep water safe and empowers households and communities that lack potable water to protect themselves against a variety of water-borne pathogens," said Rai.

Solar corona



Researchers at the University of Hawaii Institute for Astronomy have been studying the solar corona, the outermost atmosphere of the Sun that expands into interplanetary space. The properties of the solar corona are a consequence of the Sun's complex magnetic field, which is produced in the solar interior and extends outward into space.

The institute's graduate student Benjamin Boe conducted a new study that used total solar eclipse observations to measure the shape of the coronal magnetic field with higher spatial resolution and over a larger area than ever before, said the University of Hawaii at Manoa in a statement.

Significant technological advances in recent decades have shifted a majority of analysis to space-based observations at wavelengths of light not accessible from the ground. Despite those, some aspects of the corona can be studied only during total solar eclipses.

The work has further implications in other areas of solar research -- including the formation of solar wind, which impacts the Earth's magnetic field and can have effects on the ground, such as power outages, the university said.

