

Media Release
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Actuarial Society releases updated Covid-19 Model

The Actuarial Society of South Africa (ASSA) has released an updated version of its Covid-19 Model for the benefit of actuaries tasked with providing stakeholders with projections for planning purposes and formulating intervention strategies.

Lusani Mulaudzi, healthcare actuary and President of the Actuarial Society of South Africa (ASSA), says following the release of the first version at the end of April 2020, the ASSA Covid-19 modelling working group continued with research into the dynamics of the Covid-19 pandemic. The updated ASSA Covid-19 Model therefore takes into consideration new emerging research as well as the effects that the lockdown had on the spread of the Coronavirus and mortality rates.

Mulaudzi points out that the first version of the ASSA Covid-19 Model was released for comment just three weeks after the country went into lockdown.

According to Mulaudzi, modelling the mechanics of Covid-19 remains complex as the science of the virus and disease is still evolving and data is incomplete and inconsistent. He adds that even “hard data” such as mortality rates is incomplete, whether comparing provinces or countries, due to differing reporting standards.

“Due to the high levels of uncertainty, it remains impossible to present a consensus view on expected Covid-19 related mortality numbers. The ASSA Covid-19 working group will, however, continue to refine the model in an effort to provide actuaries with a useful tool to better understand the dynamics of the disease.”

Mulaudzi says the question is frequently asked why the Actuarial Society bothers to produce models given the high levels of uncertainty, which deliver a wide range of different scenarios? He explains that the modelling exercise enables the pooling of ongoing research and expert insights into something that is instructive and that enables decision-makers to understand the dynamics of a phenomenon, the key factors to be observed, the key variables to influence and the scenarios to be mitigated.

He explains that the ASSA Covid-19 Model was designed as an “open source” model, allowing expert users to input their own parameters to see the effect on projections and download the results.

What has changed?

Mulaudzi says one of the key changes in assumption from the first version of the model is around the levels of susceptibility to the Coronavirus. While the original version assumed that everyone was equally at risk of contracting the virus and developing Covid-19, the revised version of the model allows for different contact and infection rates (heterogeneity and susceptibility).

“The reality is that not everyone comes into contact with the same number of people, and not everyone is equally susceptible to becoming ill after coming into contact with the virus.”

Therefore, while the baseline scenario of the first version of the model assumed that 75% of the population would remain asymptomatic, the updated version introduces a range of percentages of the population contracting the Coronavirus without developing symptoms. "We had to accommodate widely differing views from actuaries involved in the modelling process," explains Mulaudzi.

The updated version of the model is fitted to death data published daily by the National Institute for Communicable Diseases (NICD), with the disclaimer that the official death count is most likely understated. Mulaudzi points out that the true number of deaths probably lies between the NICD figures and the South African Medical Research Council (SAMRC) reported excess deaths. He says future work on the model will look at using adjusted death rates.

Excess deaths

The excess deaths report published weekly by SAMRC provides statistics of all natural deaths per week of people older than one year.

Mulaudzi explains that the differences between excess deaths and confirmed Covid-19 deaths by province together with variations in the Case Fatality Rates by province suggest that there is indeed significant under reporting of Covid-19 deaths, particularly outside of the Western Cape. He adds that the precise degree of under reporting is difficult to determine given the quality of data and reporting delays.

The unknowns

Mulaudzi says while some aspects regarding the Covid-19 disease have become clearer since the first version of the ASSA model was released in April, many other aspects remain unclear. Material uncertainties include the following:

- There is no certainty around the true infection fatality rate by age. Early indications are that in South Africa the mortality experience is heavier than the international baseline in the 40 to 70 age range.
- There have been major developments in effective treatment options since April, improving survival of Covid-19 patients treated in hospital. However, the extent of improvements and the timeframe remain unclear.

Modelled scenarios

Mulaudzi says 30 different scenarios were modelled using an expanded range of assumptions provided for by the updated version of the ASSA Covid-19 Model to show to actuaries using the model the sensitivities to key assumptions. Projections have been made to the end of 2020, but the model can also be used to project to the end of 2021.

The expanded range of assumptions includes the following:

- Proportion of asymptomatic infections set at 35%, 50% or 75%.
- Five different levels of susceptibility to infection ranging from 25% to 100% of the population being susceptible to the virus.

The two scenarios below represent two possible narratives about the progression of the virus in South Africa. Scenario 1 is consistent with a narrative of high asymptomatic proportion of the population and low levels of interactions between infected and uninfected people. Scenario 2 is consistent with a narrative of high proportion of non-susceptible people, moderate proportion of asymptomatic people and moderate levels of interactions between infected and uninfected people.

Scenario 1

This scenario assumes low infection rates due to lockdown and other non-pharmaceutical interventions with 75% of those infected remaining asymptomatic.

In this scenario the number of deaths by the end of the year would be around 27 000, with an infection fatality rate of 0.28%.

The mortality per million lives would be 481. Currently South Africa's death rate per million people is 249 compared to 570 in the U.S. and 612 in the U.K. Belgium recorded a level of 855 deaths per million lives on 6 September 2020, which is among the highest for a country with a population of over a million people.

Scenario 2

This scenario assumes that a large proportion (60%) of the population is not susceptible to the virus, but that only 35% of those who do get infected are asymptomatic.

With this scenario, the number of deaths by the end of the year will be approximately 50 000, with a comparatively high infection fatality rate of 0.49%. The mortality per million lives would be 876, which would currently be amongst the highest in the world.

Mulaudzi comments that the excess mortality figures by year end could come in close to this number.

He says the variance in the number of deaths under the two scenarios above prove how difficult it is to come up with an accurate model given the high level of uncertainties.

The table below summarises the scenarios described above. It is important to note that the cumulative number of infections* in the table below cannot be compared to confirmed number of infections given the low number of tests being conducted countrywide due to testing limitations.

By the end of 2020	Scenario 1 Asymptomatic: 75% Non-susceptible: 0%	Scenario 2 Asymptomatic: 35% Non-susceptible: 60%
Cumulative no. of infections*	15 million	10 million
Cumulative no. of deaths	27 000	50 000
No. of deaths per million lives	481	876

Ends

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