

# COVID-19: Vaccines and Variants

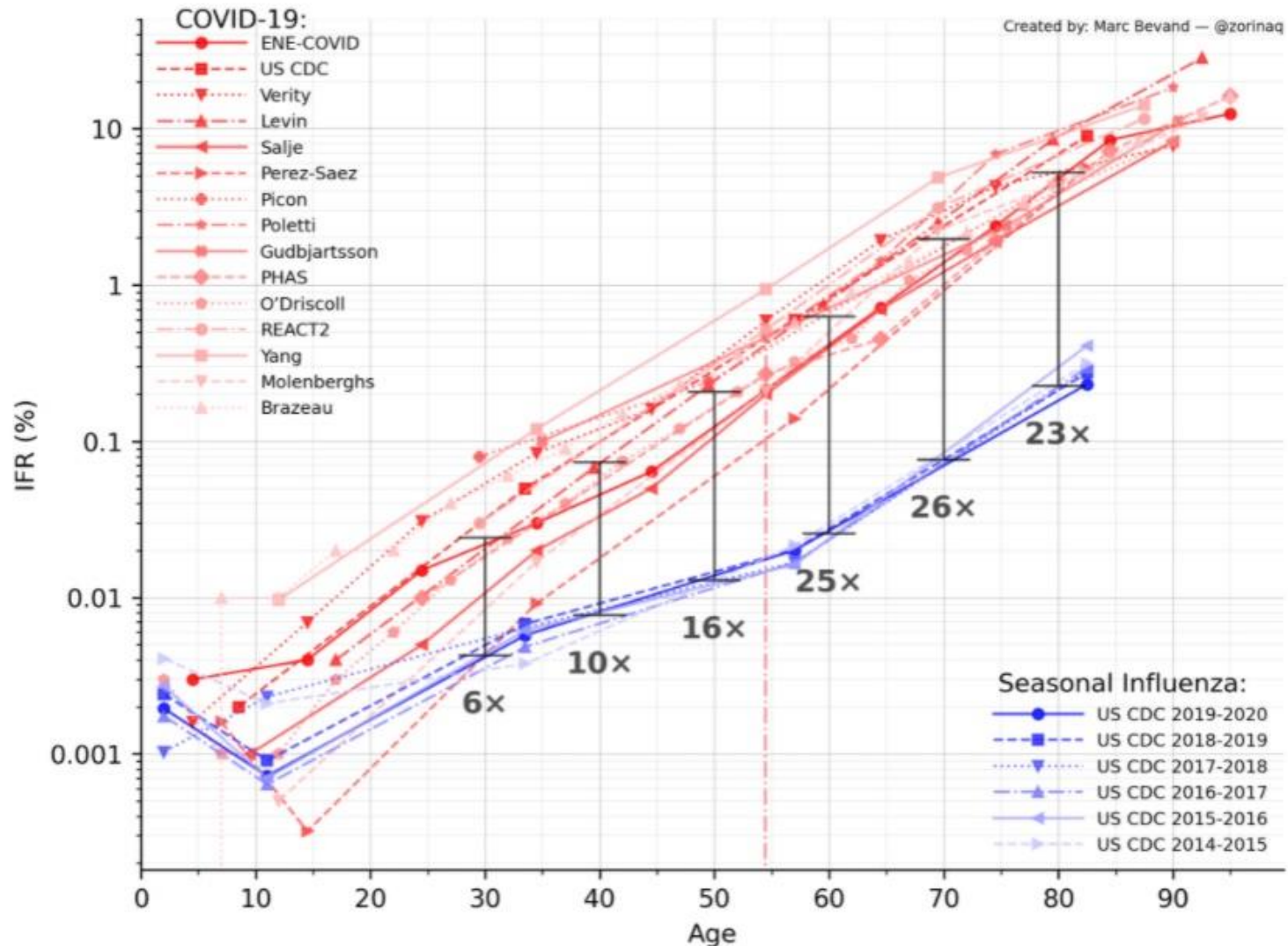
**Professor Ed Rybicki**

**Biopharming Research Unit and  
Institute of Infectious Disease and Molecular Medicine  
University of Cape Town**



# Comparing COVID-19 to seasonal influenza

## Infection Fatality Ratio of COVID-19 vs. Seasonal Influenza



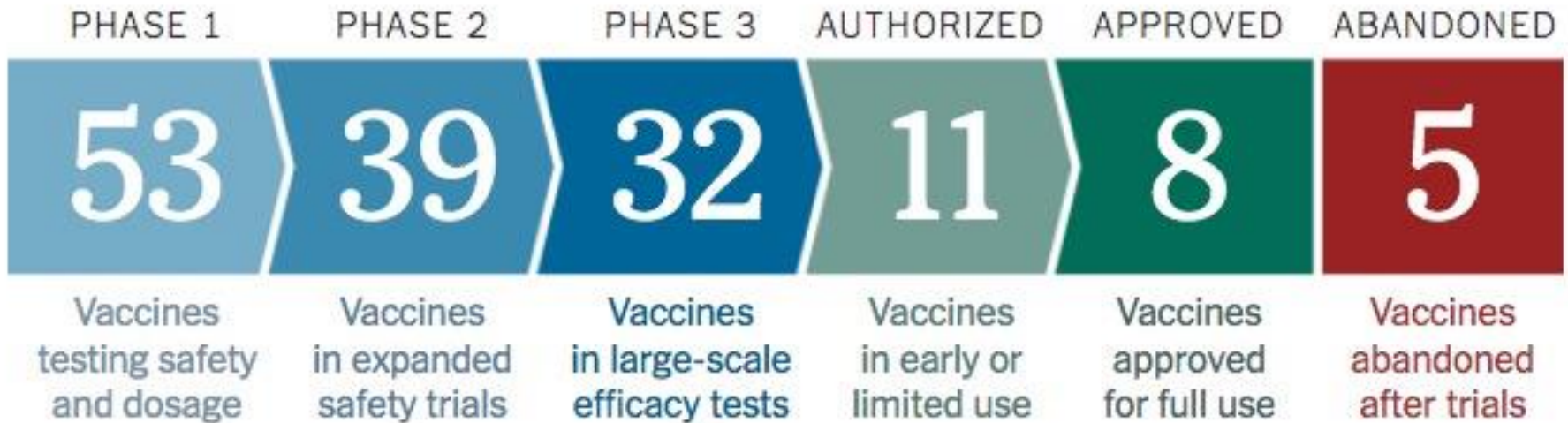
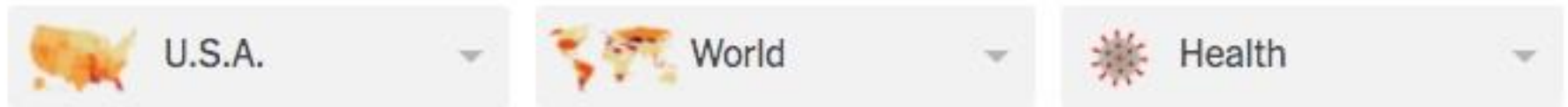
Source: <https://github.com/mbevand/covid19-age-stratified-ifr>

Note: the vertical lines on some COVID-19 IFR curves (Poletti and Brazeau) are caused by the IFR being estimated to be zero for some age groups (respectively 0-49 and 0-4.)

# Vaccines

## Coronavirus Vaccine Tracker












By Carl Zimmer, Jonathan Corum and Sui-Lee Wee Updated July 28, 2021



<https://www.nytimes.com/interactive/2020/science/coronavirus-vaccine-tracker.html>

# Vaccines

## Leading vaccines

Developer	How It Works	Phase	Status
 Pfizer-BioNTech	mRNA	<b>2</b> <b>3</b>	Approved in several countries. Emergency use in U.S., E.U., other countries.
 Moderna	mRNA	<b>3</b>	Approved in Switzerland. Emergency use in U.S., E.U., other countries.
 Gamaleya	Ad26, Ad5	<b>3</b>	Emergency use in Russia, other countries.
 Oxford-AstraZeneca	ChAdOx1	<b>2</b> <b>3</b>	Approved in Brazil. Emergency use in U.K., E.U., other countries.
 CanSino	Ad5	<b>3</b>	Approved in China. Emergency use in other countries.
 Johnson & Johnson	Ad26	<b>3</b>	Emergency use in U.S., E.U., other countries.
 Vector Institute	Protein	<b>3</b>	Early use in Russia. Approved in Turkmenistan.
 Novavax	Protein	<b>3</b>	
 Sinopharm	Inactivated	<b>3</b>	Approved in China, U.A.E., Bahrain. Emergency use in other countries.
 Sinovac	Inactivated	<b>3</b>	Approved in China. Emergency use in other countries.
 Sinopharm-Wuhan	Inactivated	<b>3</b>	Approved in China. Limited use in U.A.E.



# Vaccine Efficacy

- **Oxford / AstraZeneca:** ~90% against **infection**, near 100% against **severe disease**
- **J&J / Janssen:** 57 – 72% against **infection**, 100% efficacy against **severe disease**
- **Pfizer / BioNTech:** 95% against **infection**, near 100% against **severe disease**

**ALL VACCINES APPEAR TO PROTECT AGAINST DISEASE AND HOSPITALISATION**



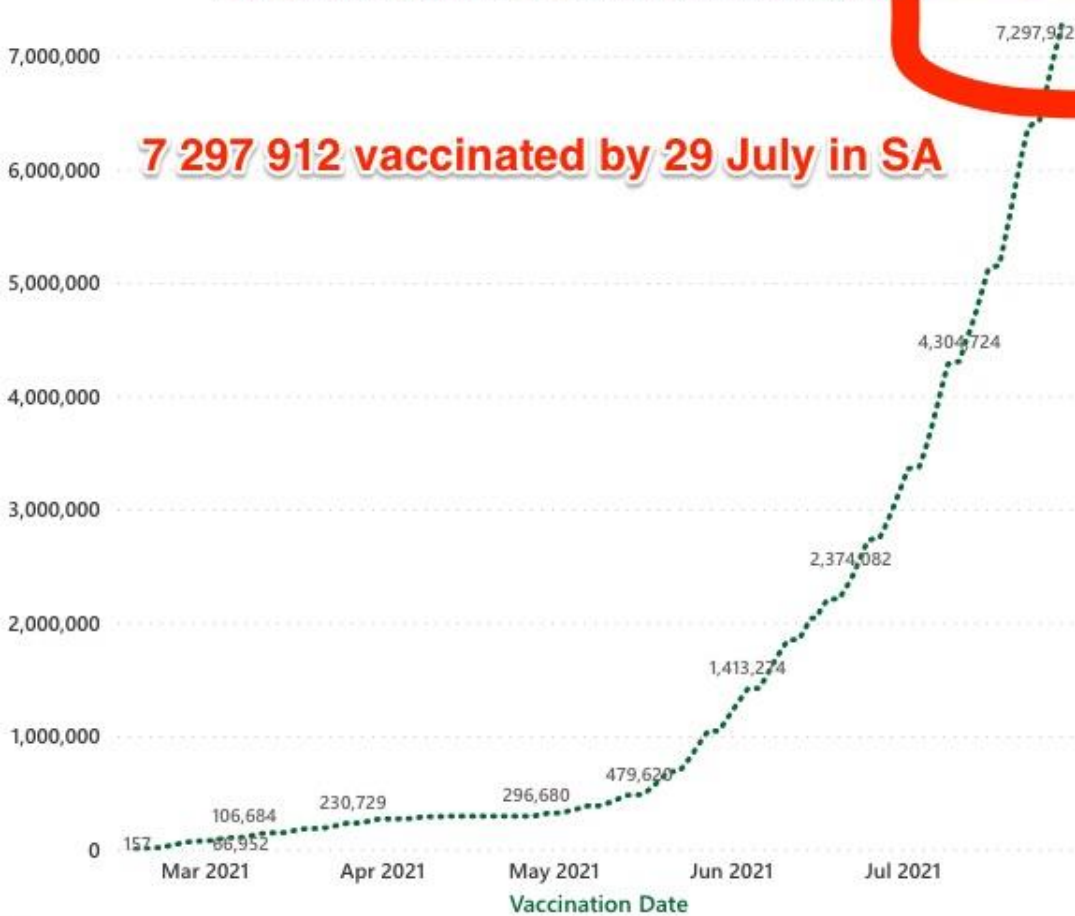


# COVID-19 Cumulative Vaccination Summary as at 17:00 29 Jul 2021

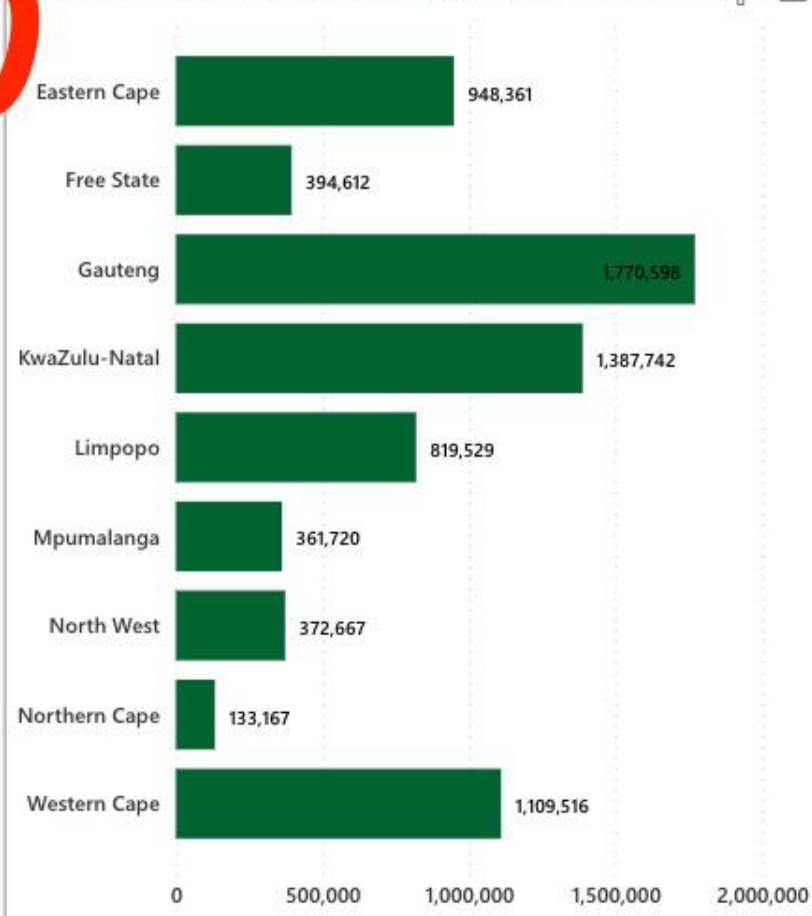
## Cumulative number of Vaccines Administered

7,297,912

Total Cumulative Number of Vaccines Administered by Day



Total Cumulative number of Vaccines Administered by Province



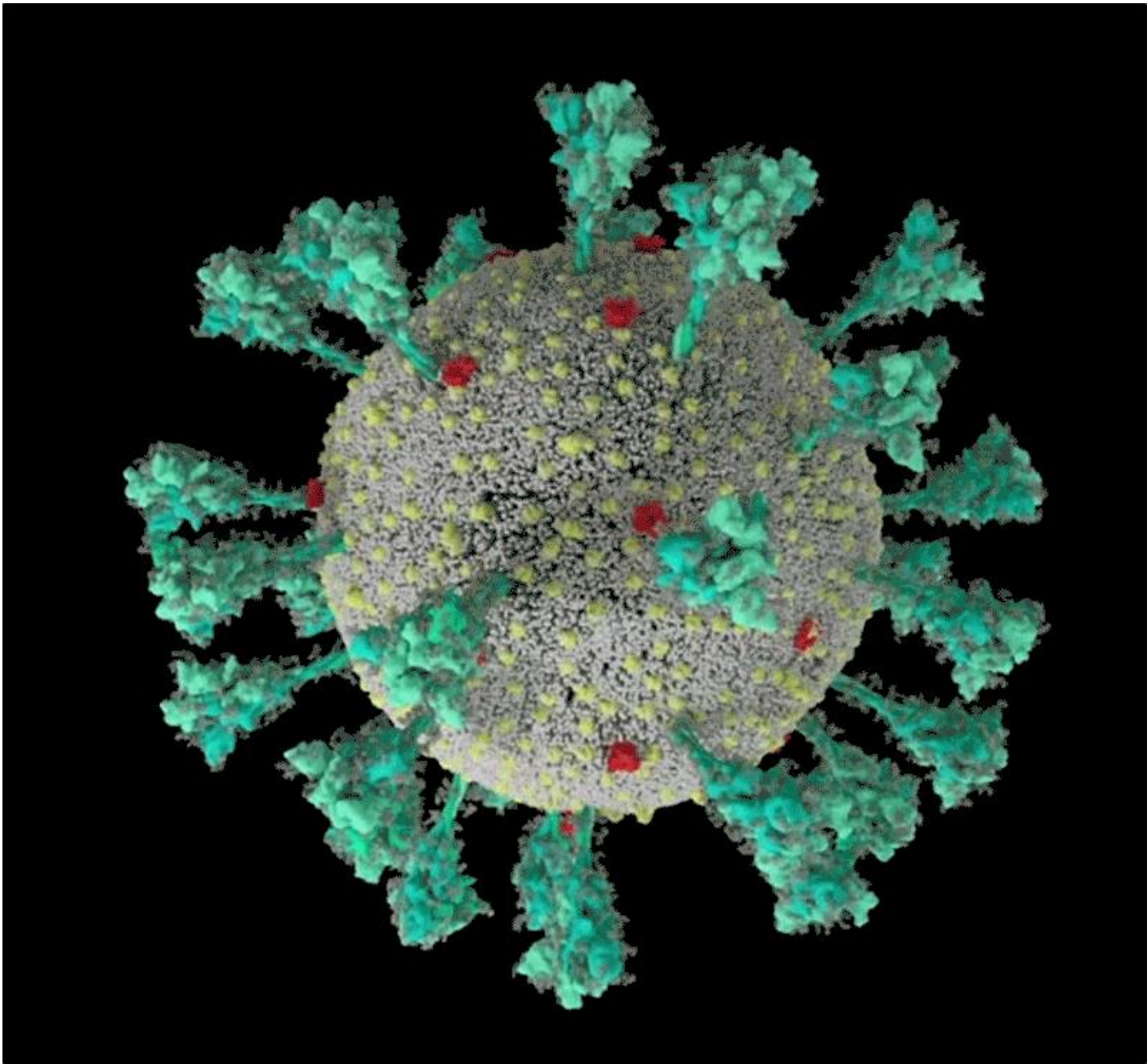
# Variants

## Variants of concern

Name	Lineage	Status
Alpha	B.1.1.7	Emerged in Britain in December and thought to be roughly 50 percent more infectious. Now dominant in the U.S.
Beta	B.1.351	Emerged in South Africa in December. Reduces the effectiveness of some vaccines.
Gamma	P.1	Emerged in Brazil in late 2020. Has mutations similar to B.1.351.
Delta	B.1.617.2	Prevalent in India. Carries the L452R spike mutation, among others.

## Variants of interest

Name	Lineage	Status
Epsilon	B.1.427, B.1.429	Common in California and thought to be about 20 percent more infectious. Carries the L452R mutation.
Zeta	P.2	First documented in Brazil.
Eta	B.1.525	Spreading in New York. Carries some of the same mutations as B.1.1.7.
Theta	P.3	First documented in the Philippines.
Iota	B.1.526	Spreading in New York. One version carries the E484K mutation, another carries S477N.
Kappa	B.1.617.1	Prevalent in India. Carries the L452R spike mutation, among others.



<https://www.nature.com/articles/d41586-021-02039-y> Janet Iwasa, University of Utah



NEWS | 27 July 2021

# COVID vaccines slash viral spread – but Delta is an unknown

Studies show that vaccines reduce the spread of SARS-CoV-2 by more than 80%, but the Delta variant is creating fresh uncertainty.

Smriti Mallapaty

<https://www.nature.com/articles/d41586-021-02054-z>

# Vaccines and Variants



“Only modest differences in vaccine **effectiveness** [2xAZ or Pfizer] were noted with the Delta variant as compared with the Alpha variant after the receipt of two vaccine doses”

NEJM July 21 2021 DOI: 10.1056/NEJMoa2108891

Effectiveness measured as **PREVENTING INFECTION**  
**PREVENTING DISEASE** essentially equivalent for **ALL**  
variants with **ALL** vaccines

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## Virological and serological kinetics of SARS-CoV-2 Delta variant vaccine-breakthrough infections: a multi-center cohort study

 Po Ying Chia,  Sean Ong, Calvin J Chiew, Li Wei Ang, Jean-marc Gilbert Chavatte, Tze Minn Mak, Lin Cui Shirin Kalimuddin, Wan Ni Chia, Chee Wah Tan, Louis Yi Ann Chai, Seow Yen Tan, Shuwei Zheng, Raymong Tzer Pin Lin, Linfa Wang, Yee-Sin Leo, Vernon J Lee, David .Chien Lye, Barnaby Edward Young

doi: <https://doi.org/10.1101/2021.07.28.21261295>

**Conclusion** The mRNA vaccines are **highly effective** at **preventing** symptomatic and **severe** COVID-19 **associated with B.1.617.2 infection**. Vaccination is associated with faster decline in viral RNA load and a robust serological response.

**Academy of Science of South Africa (ASSAf)**

**ASSAf Research Repository**

**<http://research.assaf.org.za/>**

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B. Academy of Science of South Africa (ASSAf) Events

I. Other

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2021

# Launch of Essential facts about Covid-19 Booklet

Academy of Science of South Africa (ASSAf)

Academy of Science of South Africa (ASSAf)

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Academy of Science of South Africa (ASSAf), (2021). Launch of Essential facts about  
Covid-19 Booklet [Online] Available at: <http://hdl.handle.net/20.500.11911/195>

<http://hdl.handle.net/20.500.11911/195>

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