

COVID-19: vulnerabilities, variants and vaccines

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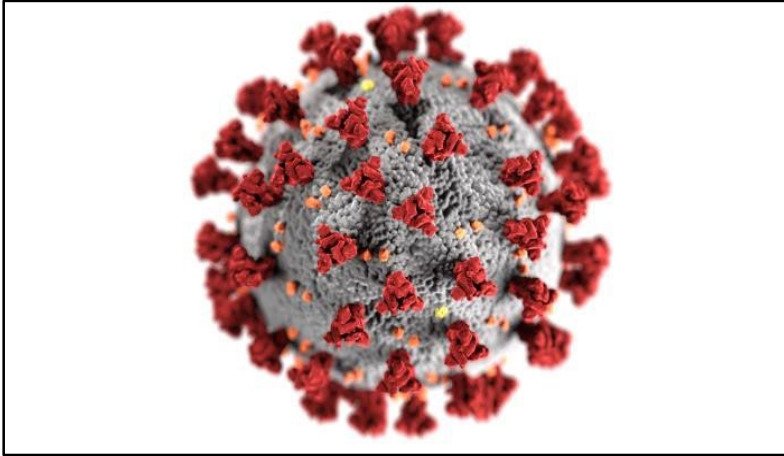


Acknowledgement of Country

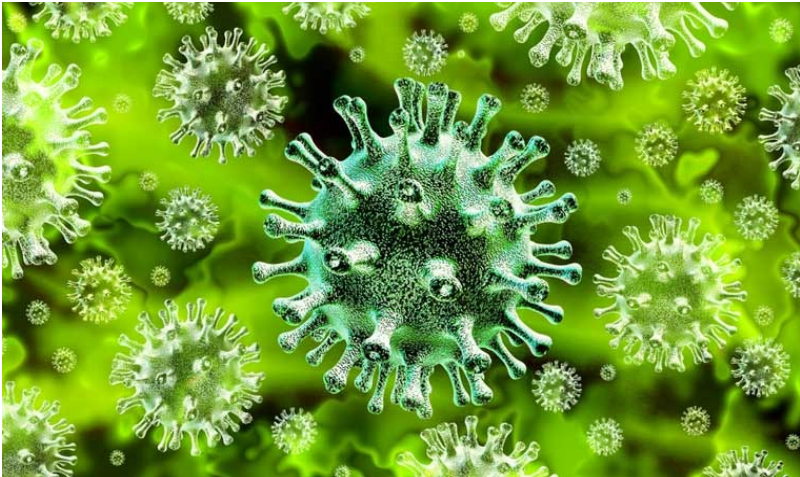
I would like to acknowledge the Wadjuk Noongar Aboriginal people as the traditional custodians of the land on which I present, and would like to pay my respects to their elders past, present and emerging.

A global university - Perth | Kalgoorlie | Dubai | Malaysia | Singapore

2019 – novel CORONA VIRUS emergence







- A pneumonia of unknown cause detected in Wuhan, China on 31 December 2019.
- On 20 Jan 2020, China mentioned human to human transmission.
- The outbreak was declared a Public Health Emergency on 30 January 2020.
- On On 11 February 2020, WHO announced a name for the new coronavirus disease: **COVID-19**.
- 11 March 2020 – COVID-19 was declared a pandemic.
- In the most severe cases, people with the virus can develop difficulty breathing, and may ultimately experience organ failure and death.



WHAT IS THE CORONAVIRUS

Coronavirus Emergence

<p>Severe Acute Respiratory Syndrome (SARS-CoV)</p>  <ul style="list-style-type: none">▪ Identified in 2003, first infected humans in China in 2002▪ Thought to be from bats, spread to civet cats to humans 	<p>Middle East Respiratory Syndrome (MERS-CoV)</p>  <ul style="list-style-type: none">▪ First identified in Saudi Arabia in 2012▪ From dromedary camels to humans 	<ul style="list-style-type: none">• Coronaviruses are a large family of viruses that are known to cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS).• 2019-novel coronavirus (COVID-19) was identified in Wuhan, China. This is a new coronavirus that has not been previously identified in humans.
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Building a Safe, Secure and Resilient World

I Think .∴ IEM.

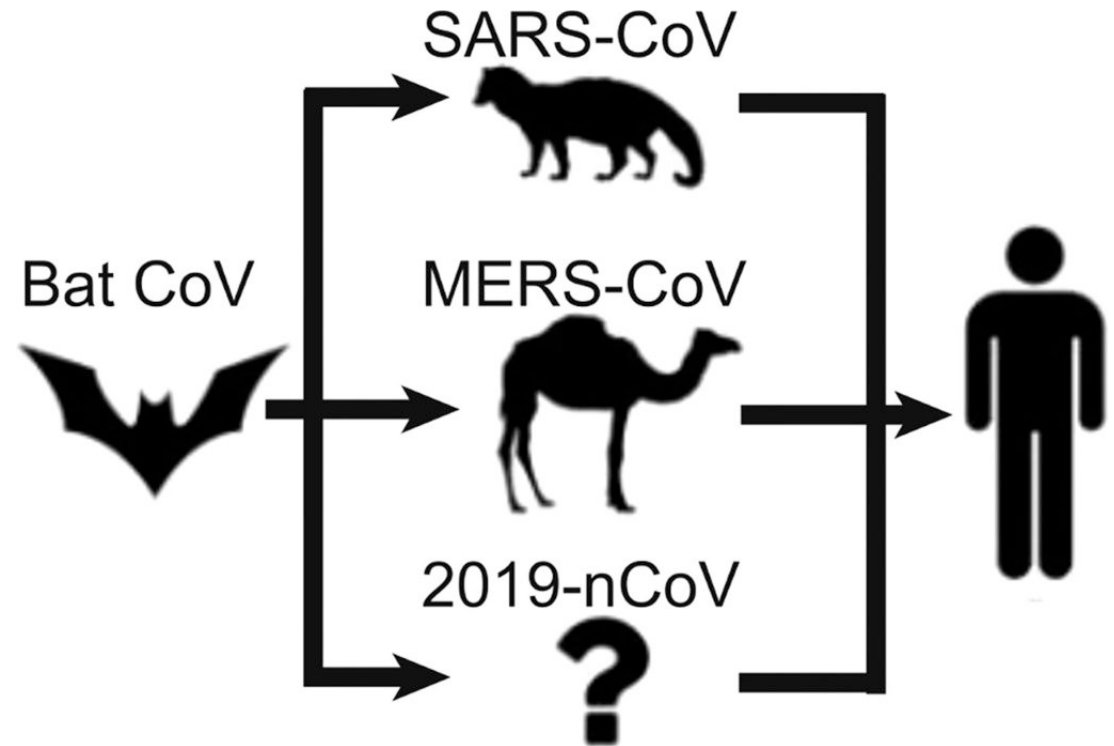
SARS – 8096 cases and 774 deaths case fatality rate = 9.6% & 26 countries
MERS– 2494 cases and 858 deaths, case fatality rate = 34.4% & 27 countries

<https://iem.com/what-we-do/iems-coronavirus-resources/>

Human Coronavirus Origins

The most likely ecological reservoirs for coronaviruses are bats, but it is believed that the virus jumped the species barrier to humans from another intermediate animal host.

This intermediate animal host could be a domestic food animal, a wild animal, or a domesticated wild animal which has not yet been identified.



4 Feb 2020, there were only **176 cases worldwide**

22 May 2020: Coronavirus disease (COVID-19) outbreak situation
4,995 996 confirmed cases and **327 821** confirmed deaths

3 June 2020: **6,429 453** confirmed cases and **385873** Confirmed deaths

16 July 2021, **188,925,223** confirmed cases and
4,066,561 confirmed deaths

03 Sept 2021, **219,017,517** confirmed cases and
4,541,048 confirmed deaths

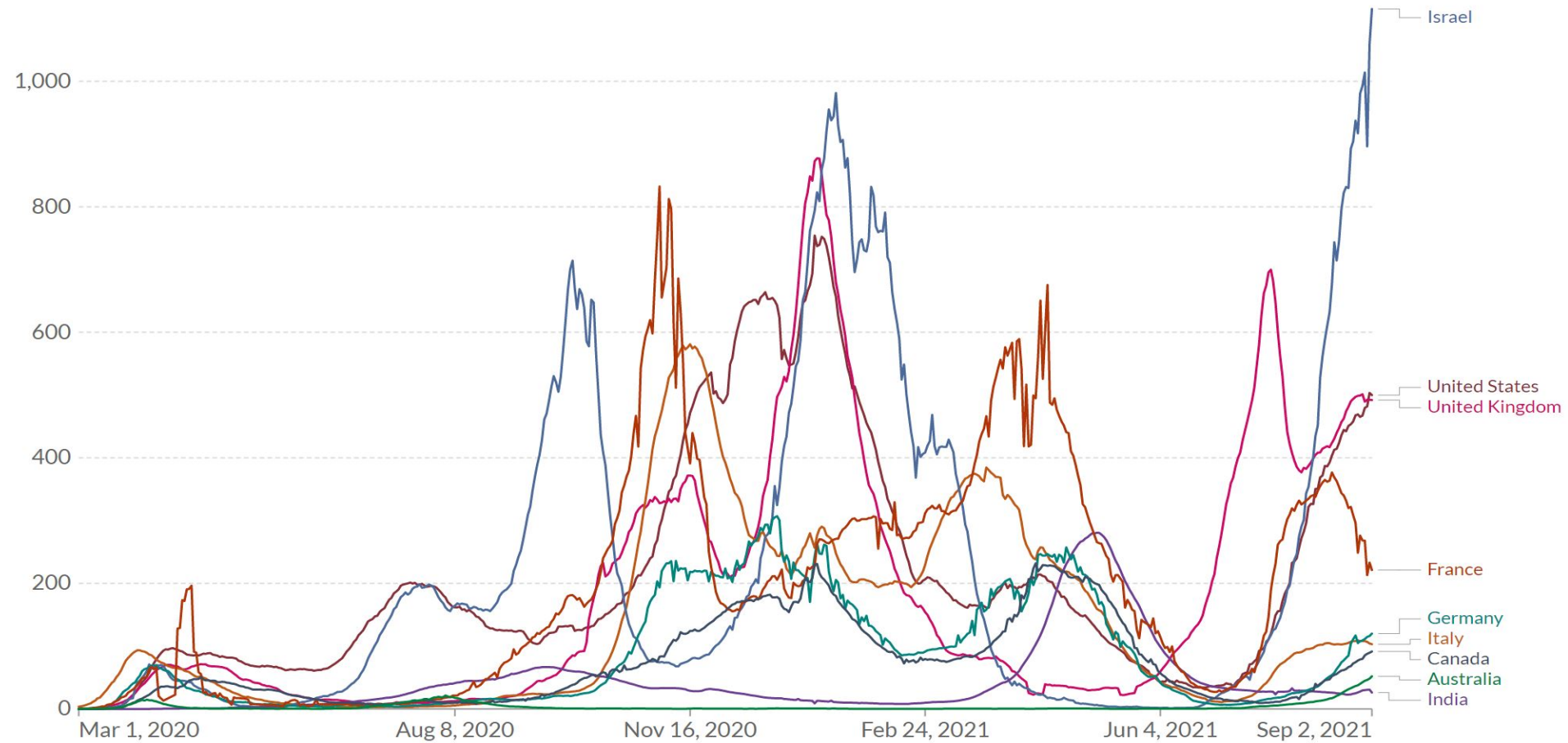
192 countries, areas or territories with cases. **5,370,977,547** doses of the vaccines administered globally

<https://coronavirus.jhu.edu/map.html>

Daily new confirmed COVID-19 cases per million people

Shown is the rolling 7-day average. The number of confirmed cases is lower than the number of actual cases; the main reason for that is limited testing.

LINEAR LOG



Source: Johns Hopkins University CSSE COVID-19 Data

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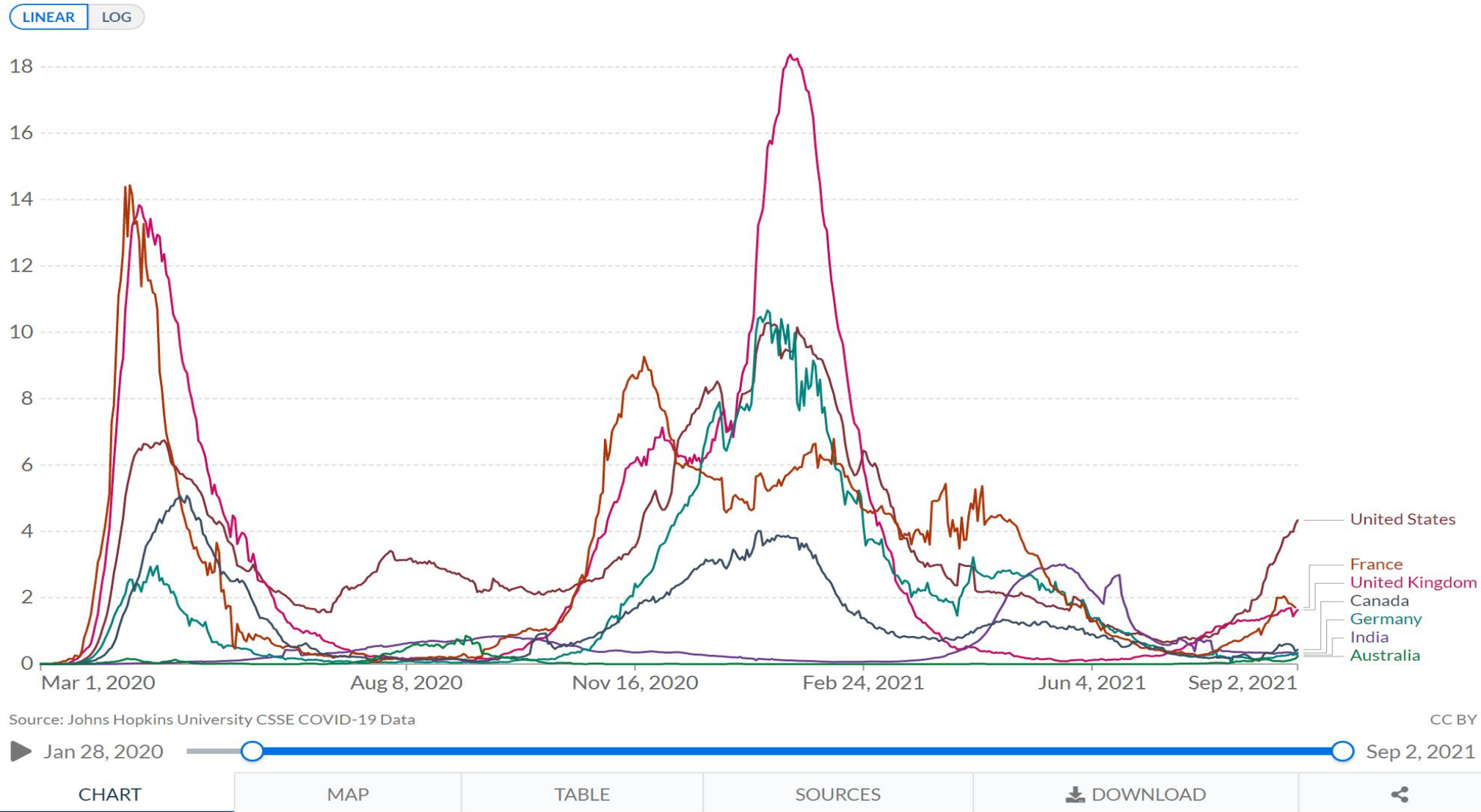
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Daily new confirmed COVID-19 deaths per million people

Shown is the rolling 7-day average. Limited testing and challenges in the attribution of the cause of death means that the number of confirmed deaths may not be an accurate count of the true number of deaths from COVID-19.



Strategies to Control the Pandemic

Strategies to Control the Pandemic

1. Lockdown/Shelter-in-Place
2. Societal Measures:
 - i. Quarantine/Isolation
 - ii. Social Distancing
 - iii. Masking
 - iv. Hand Hygiene
3. The TTT Program
 - i. Testing
 - I. Tracking (surveillance)
 - II. Tracing
4. Therapeutics (drugs – IV, oral, inhalants and Plasma phosphoresis)
5. Vaccines

Australia's Public Health Response to COVID-19

- Establishing a COVID-19 Clinical Council and Clinical Communities of Practices across key clinical specialities;
- Providing advice to GPs, pharmacists, emergency departments, and the health system on the situation as it evolves so cases are rapidly identified, diagnosed and managed;
- Developing diagnostic tests through public health laboratories to rapidly diagnose cases & testing at public COVID-19 clinics ;
- Managing any cases with appropriate infection prevention and control and public health measures to minimise the risk to health care workers and the community;
- Providing regular updates to the community, through media briefings, media releases and social media including in community languages;

THE GENDERED IMPACTS



In every country, women have been hit harder by the impacts of COVID-19. Women are caregivers and educators for children, students, the sick, the elderly and the most vulnerable in our communities.

UNWomen reports that 70% of health, education and social sector workers around the world are women and do three times more unpaid care work than men.



Women constitute **70%** of frontline health workers



Adaptions to site operations are **most effective** if they are **gender inclusive**.



Gender-inclusive measures to protect safety and wellbeing is **essential to minimize disruption and profit losses**.

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THE GENDERED IMPACTS

- This is a particularly worrying time for pregnant women who need access to information and care.
- UNFPA notes that during COVID-19, infection control measures need to be enhanced to protect women during antenatal, neonatal and post natal care.
- It is also a time of greater care and support for older women over 70 years who live on their own especially those.
- Many women in developing and developed countries, work in low paid, casual and insecure jobs, so the pandemic has disrupted their ability to support their families.
- Many women are not safe in their own homes as the threat of domestic violence increases due to quarantine and lockdown measures.





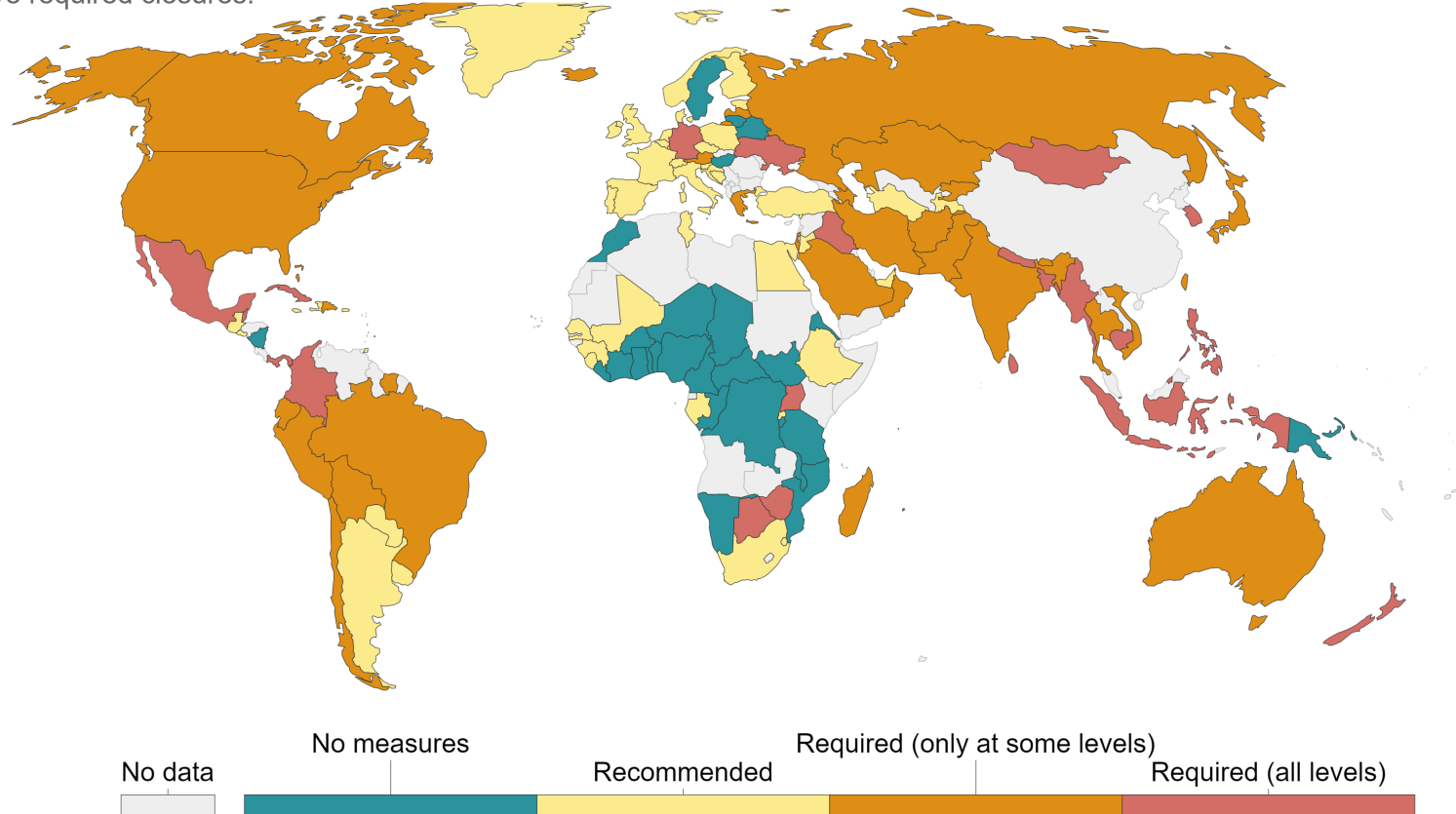
The Women Heads of Government in Germany (**Angela Merkel**), Taiwan (**Tsai Ing-Weng**), New Zealand (**Jacinda Ardern**), Iceland (**Katrin Jacobsdottir**), Finland (**Sanna Marin**), Norway (**Erna Solberg**), Denmark (**Mette Frederiksen**), have been widely recognized for the rapidity, decisiveness and effectiveness of their national response to COVID-19, as well as the compassionate communication of fact-based public health information.

Increase of people living in extreme poverty

	Female	Male	F/M
2019 (before COVID-19)	8.9	8.5	104.4
2020 (during COVID-19)	9.8	9.4	103.8
2021 (COVID-19)	9.5	9.1	104.2

School closures during the COVID-19 pandemic, Sep 1, 2021

There may be sub-national or regional differences in policies on school closures. The policy categories shown may not apply at all sub-national levels. A country is coded as 'required closures' if at least some sub-national regions have required closures.



Source: Hale, Angrist, Goldszmidt, Kira, Petherick, Phillips, Webster, Cameron-Blake, Hallas, Majumdar, and Tatlow. (2021). "A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker)." *Nature Human Behaviour* – Last updated 22 March, 15:00 (London time)
OurWorldInData.org/coronavirus • CC BY

What should be done

1. **First**, contain the pandemic. This is the first step to mitigating not only the health impacts but also the economic impacts.
2. **Second**, strengthen the safety net. Low-wage workers are often those most likely to lose their jobs if they miss work due to an extended illness. They are often the least able to work remotely. And they are the least likely to have savings to survive.
3. **Third**: Making sure there are cash transfers, and sick leave helps the most vulnerable survive and provides support to populations.
4. **Fourth**, measure the impact. Systematic data on which populations are experiencing the greatest hardships and which industries are failing is essential to providing assistance.

During the Ebola epidemic of 2014-2015, [researchers used phone surveys in Sierra Leone and Liberia](#) –to gather information on the impacts of both ill health and aversion behaviour on households across the countries.

AUSTRALIA's COVID-19 summary statistics

COVID-19 summary statistics



The above tiles show the:

- number of locally acquired, overseas acquired and under investigation cases in the last 24 hours
- current number of active cases, hospitalised cases and tests conducted in the last 24 hours. Note: the number of active cases is an estimate as states and territories differ in how they collect this data
- total number of cases, deaths and tests.

- Our most vulnerable have been:
- The aged living in care home,
 - Front line workers in aged care, quarantine workers, clinicians – all have an occupational hazard.
 - Workers mostly immigrant in Abattoirs, and factories
 - Migrants living in high density accommodation.

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The Phases of Vaccine Development



www.cdc.gov/vaccines/basics/test-approve.html

MPH@GW

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The Development of the COVID Vaccine

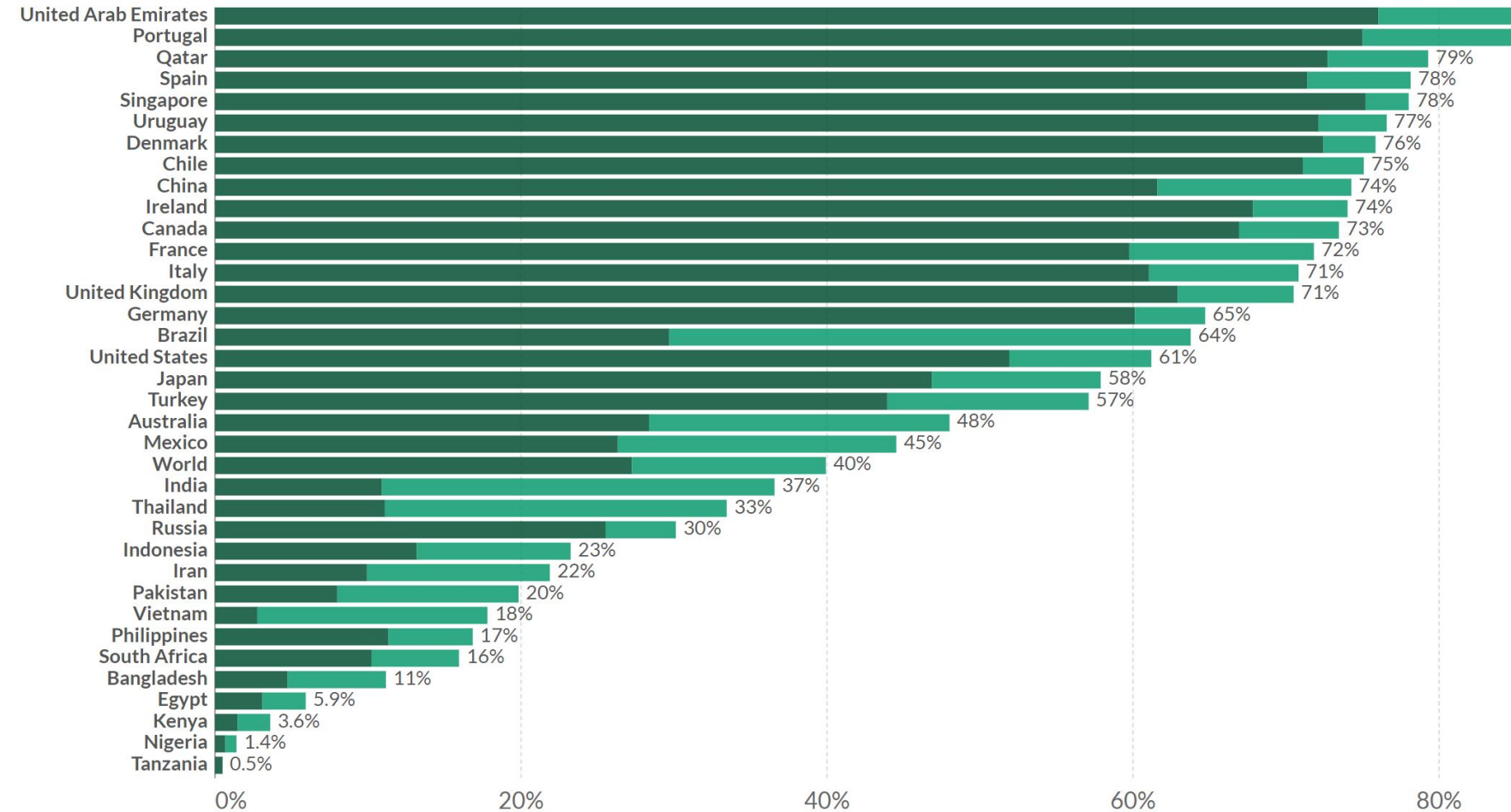
Date	Milestone
Dec 1	Covid-19 illness documented (unpublicized Nov 17 th)
Jan 10	SARS-CoV-2 virus sequenced
Jan 15	NIH designs mRNA vaccine in collaboration with Moderna
Mar 16	Moderna Phase 1/2 trial begins
May 2	Pfizer/BioNTech Phase 1/2 trial begins
July 14	Moderna Phase 1/2 trial published in NEJM
July 27, 28	Moderna and Pfizer/BioNTech Phase 3 trial begins
Aug 12	Pfizer/BioNTech Phase 1/2 published in Nature
October 22,27	Enrollment in both Phase 3 trials complete; >74,000 participants
Nov 9	Pfizer/BioNTech announces interim analysis efficacy > 90%
Nov 16	Moderna announces interim analysis efficacy 94.5%
Nov 18	Pfizer/BioNTech announces 95% efficacy as final result
Nov 20	1 st EUA submitted by Pfizer/BioNTech
Nov 27	Distribution of vaccine by UAL charter flights throughout US
Dec 10	FDA External review of Pfizer/BioNTech EUA
Dec 11	Phase 1a Vaccination begins for health care professionals*

*Provisional on positive external review

Share of people vaccinated against COVID-19, Sep 1, 2021

Alternative definitions of a full vaccination, e.g. having been infected with SARS-CoV-2 and having 1 dose of a 2-dose protocol, are ignored to maximize comparability between countries.

■ Share of people fully vaccinated against COVID-19 ■ Share of people only partly vaccinated against COVID-19



Source: Official data collated by Our World in Data. This data is only available for countries which report the breakdown of doses administered by first and second doses in absolute numbers. CC BY

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The Variants of Concern

- 1) Alpha:** This variant emerged in England in [September](#) 2020 and drove a winter surge in cases that sent the U.K. back into [lockdown](#) in January. Other countries, particularly in [Europe](#), followed the U.K. in reimposing movement restrictions. Alpha was previously the [dominant strain](#) in the U.S., and has been reported in at least **173 countries**, according to the WHO.
- 2) Beta:** This one, which appeared in South Africa in August 2020, led to a [resurgence](#) in Covid cases that overwhelmed southern Africa. It's been reported in at least **122 countries**.
- 3) Gamma:** This variant, first spotted in the [Amazon](#) city of Manaus in December 2020, has contributed to a [surge](#) in cases that [strained](#) Brazil's health system and led to oxygen shortages. It's been reported in at least **74 countries**.

4) **The Delta Strain**: This fast-spreading variant stoked a dramatic wave of Covid cases in India that overwhelmed hospitals and crematoriums and has since been found in at **104 countries**. It's estimated to be 55% more transmissible than alpha and almost twice as infectious as the original strain that began spreading worldwide in early 2020.

Early data from Scotland found Covid patients infected by delta were 1.8 times more likely to hospitalized than those with an alpha infection.

Other evidence found delta had some propensity to evade antibody-based treatments and that it potentially increased the risk of reinfection in people who have recovered from Covid caused by another strain.

Currently designated Variants of Concern:

WHO label	Pango lineages	GISAID clade	Nextstrain clade	Additional amino acid changes monitored*	Earliest documented samples	Date of designation
Alpha	B.1.1.7	GRY	20I (V1)	+S:484K +S:452R	United Kingdom, Sep-2020	18-Dec-2020
Beta	B.1.351 B.1.351.2 B.1.351.3	GH/501Y.V2	20H (V2)	+S:L18F	South Africa, May-2020	18-Dec-2020
Gamma	P.1 P.1.1 P.1.2	GR/501Y.V3	20J (V3)	+S:681H	Brazil, Nov-2020	11-Jan-2021
Delta	B.1.617.2 AY.1 AY.2	G/478K.V1	21A	+S:417N	India, Oct-2020	VOI: 4-Apr-2021 VOC: 11-May-2021




























**Notable spike (S) amino acid changes under monitoring, which are currently reported in a minority of sequenced samples.*

Currently designated Variants of Interest:

WHO label	Pango lineage*	GISAID clade	Nextstrain clade	Earliest documented samples	Date of designation
Eta	B.1.525	G/484K.V3	21D	Multiple countries, Dec-2020	17-Mar-2021
Iota	B.1.526	GH/253G.V1	21F	United States of America, Nov-2020	24-Mar-2021
Kappa	B.1.617.1	G/452R.V3	21B	India, Oct-2020	4-Apr-2021
Lambda	C.37	GR/452Q.V1	21G	Peru, Dec-2020	14-Jun-2021
Mu	B.1.621	GH	21H	Colombia, Jan-2021	30-Aug-2021

*includes all descendent lineages. The full list of Pango lineages can be found here: https://cov-lineages.org/lineage_list.html; for FAQ, visit: <https://www.pango.network/faqs/>

How some of the Covid-19 vaccines compare

Company	Doses	Storage
RNA		
 Pfizer (BioNTech)		 -80 to -60°C (6 months) and 2 to 8°C (for up to 5 days)
 Moderna		 -25 to -15°C (6 months) and 2 to 8°C (for 30 days)
Viral vector		
 Oxford-AstraZeneca		 2 to 8°C (6 months)
 Sputnik V (Gamaleya)		 -18.5°C (liquid form) 2 to 8°C (dry form)
 Johnson & Johnson (Janssen)		 2 to 8°C (3 months)
Inactivated virus		
 CoronaVac (Sinovac)		 2 to 8°C
 Sinopharm		 2 to 8°C
 Covaxin (Bharat Biotech)		 2 to 8°C
Protein-based		
 Novavax		 2 to 8°C













Source: Wellcome Trust, BBC research

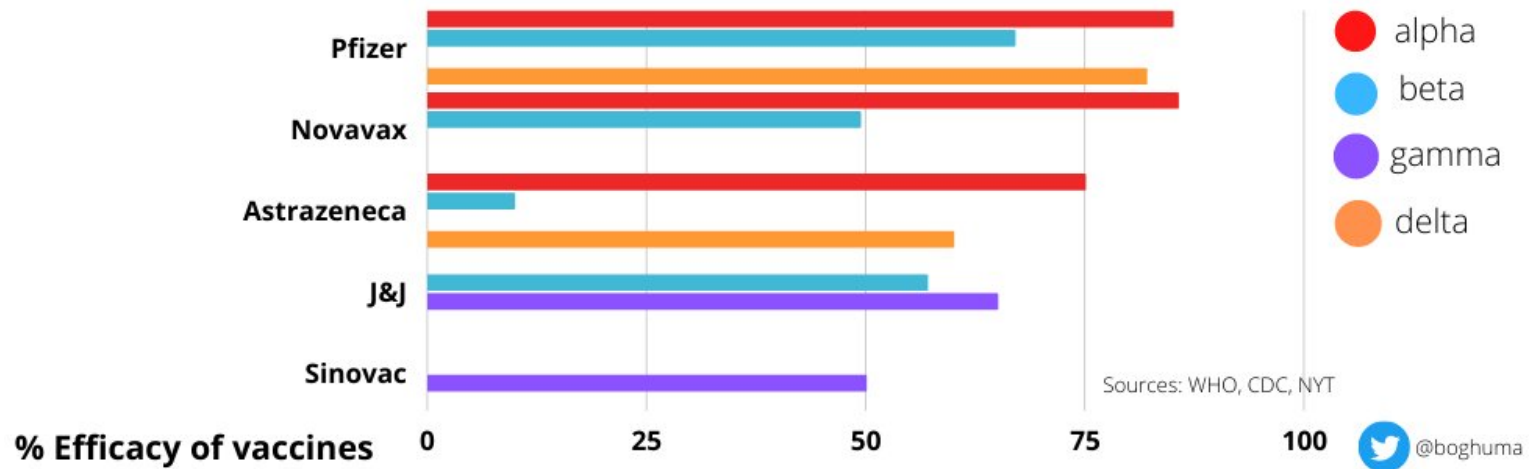


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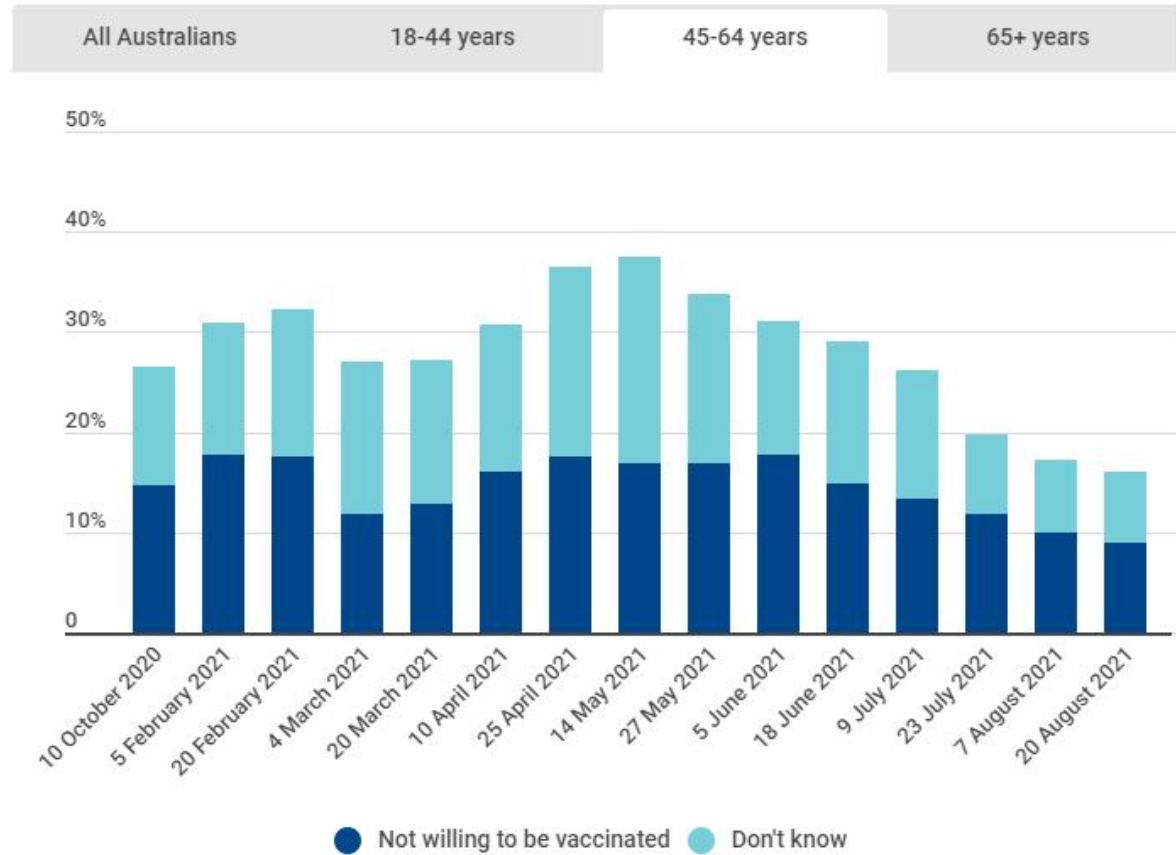
KEY SARS-COV-2 VARIANTS OF CONCERN AND VACCINES

				
	B.1.1.7	B.1.351	P1	B.1.617.2
Transmissibility	↑ +++	↑ +	↑ ++	↑ +++++
Disease severity	↑  	↔	↔	↑  
Country where first identified	 UK	 S.Africa	 Brazil	 India



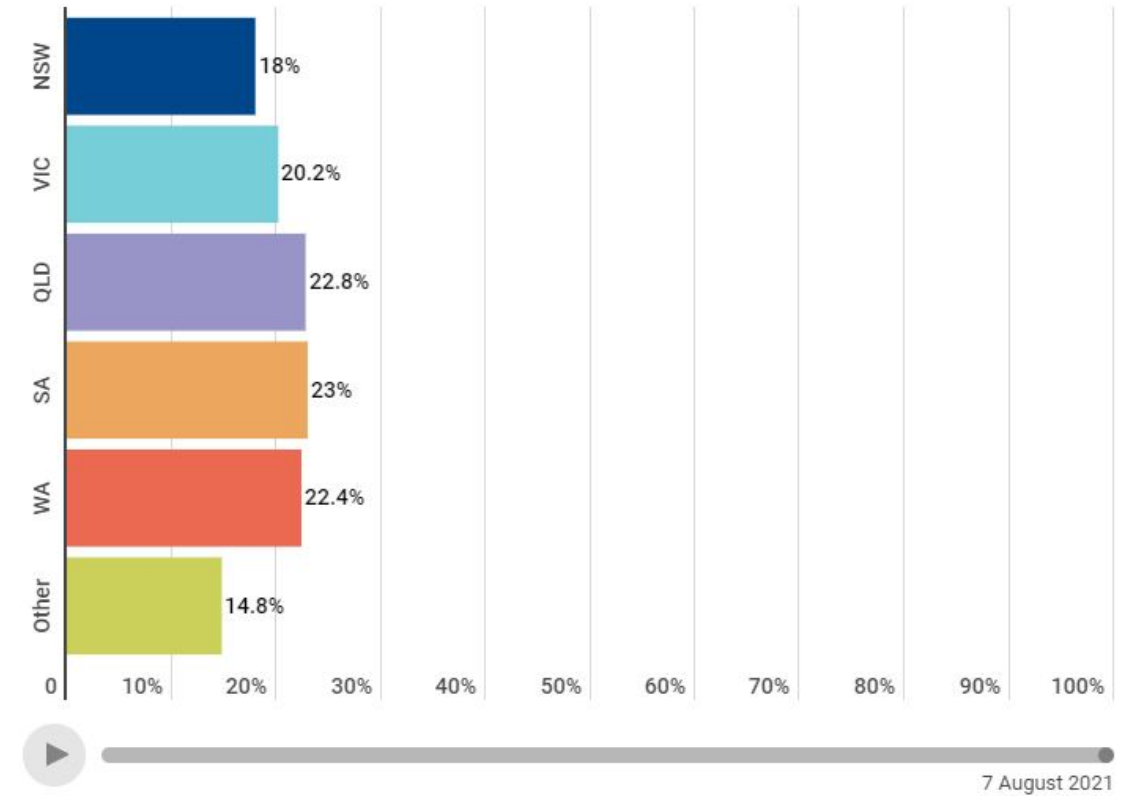
Vaccine Hesitancy, by Age Group

Proportion of adult population who are hesitant.



Vaccine Hesitancy, by State

Proportion of adult population who are hesitant.



<https://melbourneinstitute.unimelb.edu.au/publications/research-insights/ttpn/vaccination-report>

The Delta variant spreads easily in indoor spaces when people are unmasked and unvaccinated

Occasionally unmasked adult infected with Delta variant worked for 2 days



12 of 24 kids infected



bit.ly/MMWR82721b

Schools can help stop spread by ensuring everyone:



Wears masks correctly in indoor spaces



Gets vaccinated, if eligible



Stays home if having symptoms



Tests routinely

MMWR



The COVID-19 situation globally is very dangerous with high levels of transmission driven by 4 major factors:

Dr Maria Van Kerkhove from WHO.

16.7% increase in Africa

16.4% in Eastern Mediterranean

8.6% increase in South East Asia

33% in Europe

10% increase in Western Pacific

1) virus variants

2) increased social mixing and mobility of people

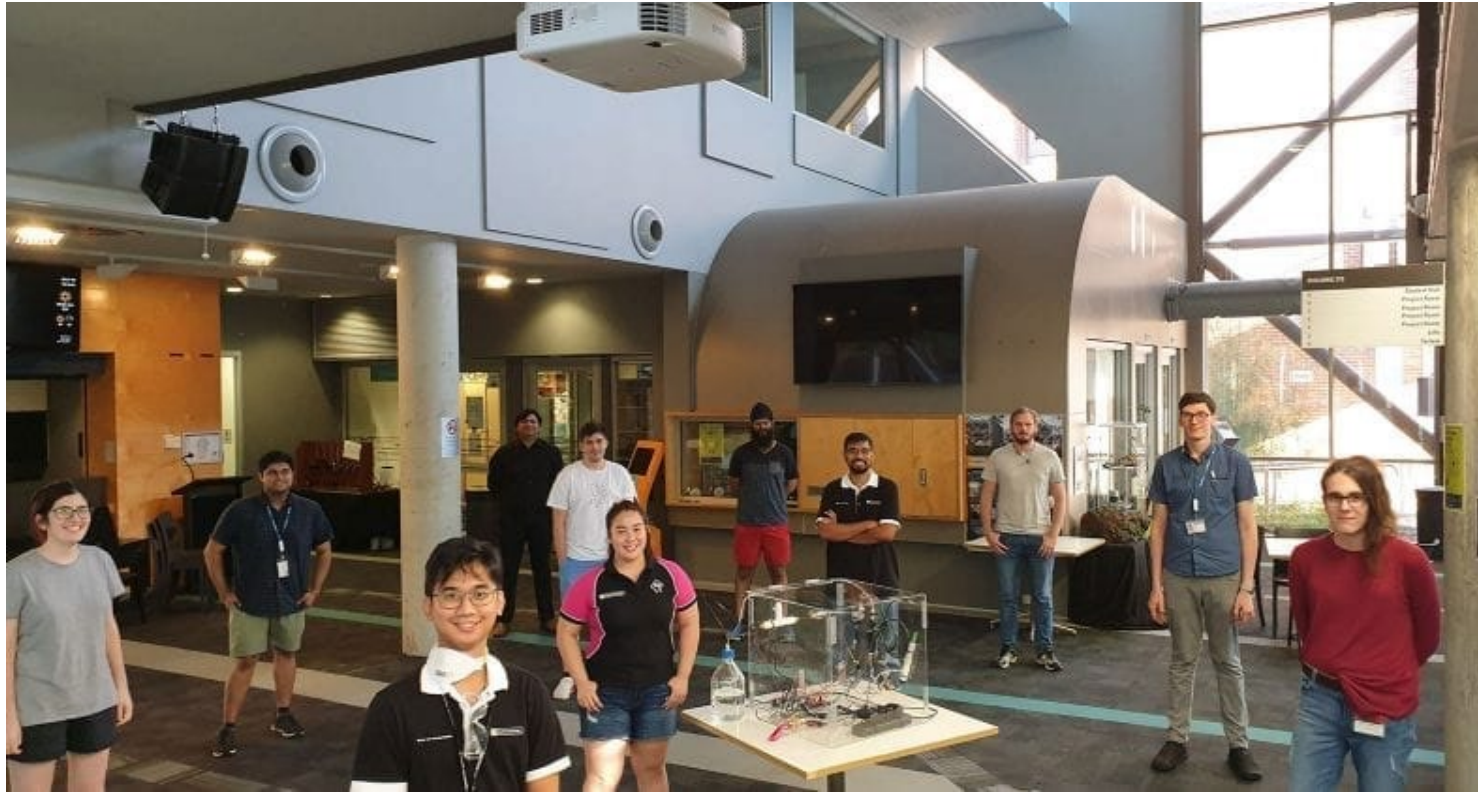
3) appropriate use of public health & social measures

4) vaccine inequity

2 dozen countries with vertical epidemic curves in July 2021

Instead of achieving population-level (herd) immunity, whereby >70% vaccinated wind up protecting those w/o immunity, the very high contagiousness of Delta has flipped the model— "un-herd" immunity—the unvaccinated are infecting each other and the vaccinated.

Curtin students and researchers build ventilators in response to COVID-19



A team of students and researchers from Curtin University has worked quickly to design and develop ventilator prototypes that could be used to help treat people affected by COVID-19 led by Curtin University School of Mines

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Around 70 percent of adults in the European Union have been fully vaccinated against the coronavirus, which puts the bloc among the world's leaders in vaccinations despite a sluggish start.

Taking children and teenagers into account, more than 55 percent of the overall E.U. population has been fully vaccinated, compared with 52 percent in the United States, 61 percent in Israel and 64 percent in Britain.

More than 80 percent of adults have been fully inoculated in Belgium, Denmark and Portugal, and more than 75 percent in Spain and the Netherlands, the figure falls to 45 percent in Latvia, 31 percent in Romania and 20 percent in Bulgaria.

- You trust us giving you your chemotherapy and helping you manage the uncomfortable side effects.
- You trust us helping bring your new baby into this world.
- You trust us providing comfort to your loved ones when they are dying.
- You trust telling us when you are mistreated.
- Trust us when we say get vaccinated, it can save your life.”

Dorene Boydston, Nurse Practitioner, Idaho

We have an opportunity to ensure that one of the legacies of this pandemic is an explicit and steadfast commitment to promoting health equity, health in all policies, and investment in the social and cultural determinants of health.

Croakey – 3 Sept 2021

Acknowledgements:

<https://coronavirus.jhu.edu/map.html>

<http://www.pitt.edu/~super1/lecture/lec56551/015.htm>

<https://ourworldindata.org/policy-responses-covid#stay-at-home-restrictions>

<https://ourworldindata.org/covid-mobility-trends>

<https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/coronavirus-covid-19-current-situation-and-case-numbers>



.. "Now more than ever, we need a healthier world.

Now more than ever, we need a safer world.

Now more than ever, we need a fairer world.

And now more than ever, we need a stronger global agencies.

There is no other way forward but together

[@DrTedros](#) [#WHA73](#)

Dr Tedros Adhanom Ghebreyesus
WHO Director Genral



Thank you

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