



Covid-19: More than an acute infection

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Salim S. Abdool Karim, FRS

Director: CAPRISA

CAPRISA Professor of Global Health, Columbia University

Adjunct Professor in Immunology and Infectious Diseases, Harvard University

Adjunct Professor of Medicine: Cornell University

Pro Vice-Chancellor (Research): University of KwaZulu-Natal

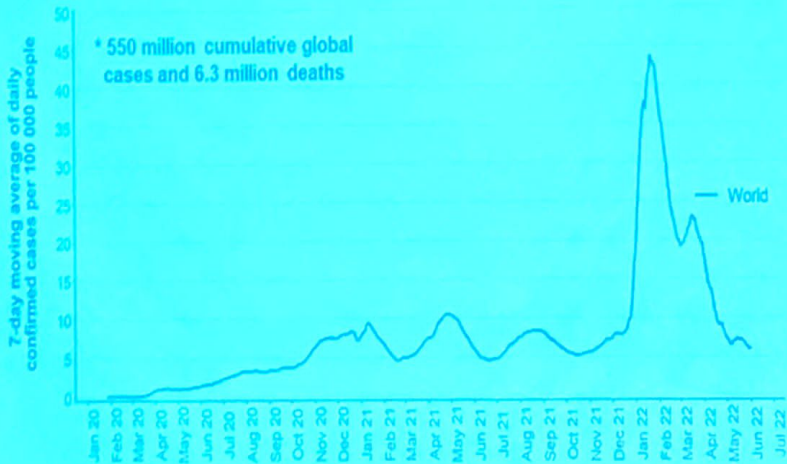
Director: DSI-NRF Centre of Excellence in HIV Prevention

Director: Global Virus Network – CAPRISA Center of Excellence

Vice President: International Science Council

Global COVID-19 pandemic

up to – 05 July 2022



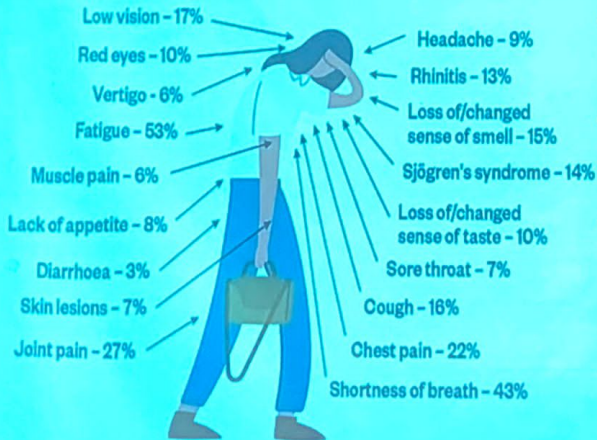
High death toll of Covid-19 – excess & reported deaths

Reported Covid-19 deaths: 6 million

Estimated 20 million (14m – 24m) excess deaths worldwide during the pandemic



Long COVID-19: the burden of “brain fog”



- Study of a cohort of 3762 people in 56 countries
- Time to recovery in >90% exceeded 8 months
- Most frequent symptoms after 6 months:
 - Fatigue
 - post-exertional malaise
 - cognitive dysfunction & memory problems

The Covid-19 illness burden long after infection

nature
medicine

Long-term cardiovascular outcomes of COVID-19

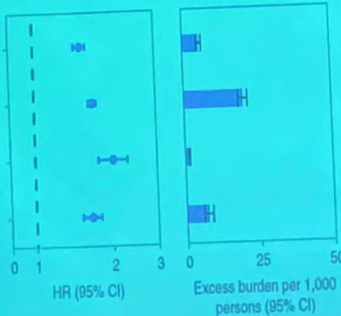
Yan Xie^{1,2,3}, Evan Xu^{1,4}, Benjamin Bowe^{1,2} and Ziyad Al-Aly^{1,2,5,6,7,8}

Cerebrovascular disorders

Dysrhythmia

Inflammatory heart disease

Ischemic heart disease



- >50% ↑ risk of heart disease - from stroke to heart attacks & myocarditis 1 year later
- ↑ risk in asymptomatic, mild & severe Covid-19
- ↑ risk regardless of cardiac risk factors... (age, weight, etc)

153,760 Covid-19+ vs 5m current & historical controls

CAPRISA

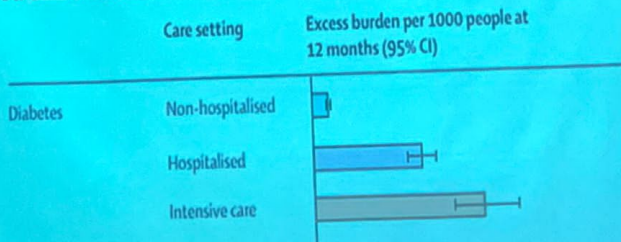
High new diabetes risk months after Covid-19

THE LANCET

Risks and burdens of incident diabetes in long COVID:
a cohort study

Yan Xie, Ziyad Al-Aly

- 181,280 Covid+ participants
- Post-acute Covid-19: ↑ *risk of new diabetes diagnoses & anti-hyperglycaemics*
- Increased diabetes risk worst in those with severe acute Covid-19

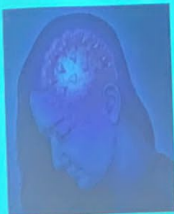


SARS-CoV-2 is associated with changes in brain structure in UK Biobank

Gemma D. Duggan^{1,2}, Scott Lee¹, Fidel Alfaro-Almeida¹, Christopher Athyler¹, Chaojie Wang¹, Paul

Marquardt¹, Steven D. Love¹, James T. B. Amarasena¹, Teodoro Gilman¹, Ewan Duff¹, Sami Baheti¹, Robert

- 401+ and 384- UK brain scans from Biobank – 2 images in 5 mths
- Effects of SARS-CoV-2 infection:



- Smaller brain size
- ↓ in grey matter thickness – up to 2% loss
- Less able to complete complex tasks

The 5 benefits of Covid-19 vaccines

- Individual benefits:

1. ↓ asymptomatic infections
2. ↓ clinically apparent infections
3. ↓ severity / hospitalisations / deaths
4. ↓ progression to long Covid

- Community benefits:

5. ↓ secondary attack rate to close contacts
 - ↓ infectious if infected when vaccinated
 - ↓ period of infectiousness when vaccinated

Level of benefit varies by:

Type of vaccine

Time since vaccine

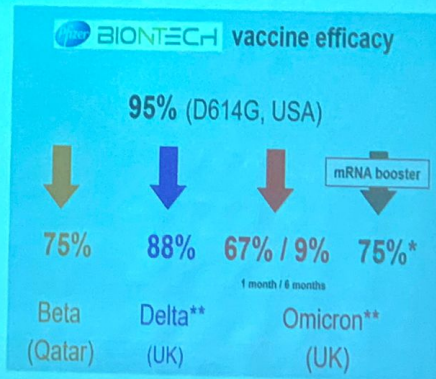
Variant

Immunosuppression

1 & 2. Vaccines prevent silent asymptomatic infections and clinical infection – but impact varies by variant

Two doses of Pfizer vaccine:

1. 66% fewer asymptomatic infections
2. 95% fewer clinically mild infections



Sources: Liu et al., NEJM 2021; 384(15): 1465-8; Abu-Raddad, et al., NEJM 2021; 385:187-189; Bernal et al., NEJM 2021; 385:585-594; Andrews et al., NEJM DOI: 10.1056/NEJMoa2119451

3. Vaccines effective over time for all past variants for severe Covid-19, hospitalization & deaths

New York State (n=8,834,604) ≥ 65 years

(efficacy for severe disease and hospitalization for Alpha or Delta variant infection)

- Pfizer-BioNTech: **95% to 89%** four months later
- Moderna: **97% to 94%**
- J&J: **86% to 83%**

COVID-19 Incidence and Death Rates Among Unvaccinated and Fully Vaccinated Adults with and Without Booster Doses During Periods of Delta and Omicron Variant Emergence — 25 U.S. Jurisdictions, April 6–December 25, 2021

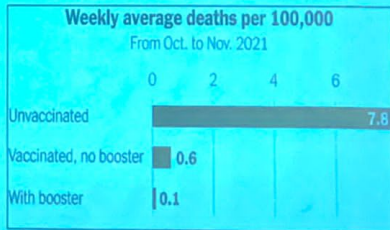
<https://www.cdc.gov/media/releases/2022/s0927-covid19-vaccine-effectiveness.html>

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US data on Covid-19 deaths:

Boosted people have 78 times lower risk of dying of Covid-19



Source: Rosenberg et al. NEJM 2022;386(2): 116-27.

5a. Vaccination reduces SARS-CoV-2 transmission

Science

Indirect protection of children from SARS-CoV-2 infection through parental vaccination

Samah Hayek¹, Galit Shiham¹, Yotir Ben-Shlomo¹, Eldad Kepten¹, Noa Dagan^{1,2,3,4}, Daniel Nevo⁵, Marc Lipsitch⁶, Ben Y. Reis^{1,4,5}, Ran D. Balicer^{1,6}, Noam Barda^{1,2,3,4,6}

Direct Protection Effect

Protection of parents from having been vaccinated

94%



Indirect Protection of Household members

Reduction in Risk of transmission from infected parent to unvaccinated child

72%



- Two-parent homes with at least one vaccine-ineligible child
- Children with vaccinated parents - 72% lower risk of getting infected

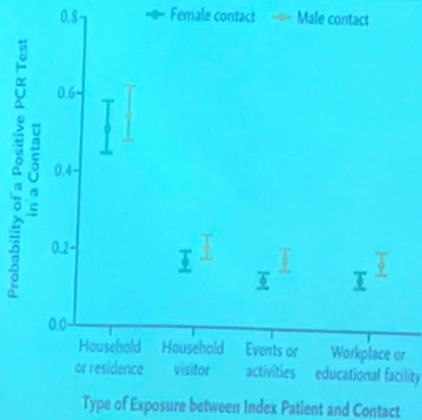
5b. Vaccination reduced SARS-CoV-2 transmission to household & workplace contacts (in two variants)



THE NEW ENGLAND
JOURNAL of MEDICINE

Effect of Covid-19 Vaccination on Transmission of Alpha and Delta Variants

David W. Eyre, B.M., B.Ch., D.Phil., Donald Taylor, M.Math., Mark Purver, Ph.D.,
David Charman, Ph.D., Tom Fradette, Ph.D., Kevin R. Pebody, Ph.D.



- 146,243 contacts of 108,498 index patients tested (37% were PCR+)
- **Pfizer (X2)** reduced infection by **68%** in contacts compared to infections in contacts of unvaccinated
- Vaccine → ↓ viral load - ↓ infectiousness

Reinfection is not harmless!

nature
portfolio
Preprint

Outcomes of SARS-CoV-2 Reinfection

Ziyad Al-Aly, Benjamin Bowe, Yan Xie

- Cohort

- 257,427 people with 1st infection
- 38,926 people with reinfection
- 5,396,855 non-infected people

- Reinfection increases risk of all-cause mortality, hospitalization and adverse health outcomes (pulmonary and extrapulmonary organs)

Figure: Cumulative risk & burden of sequelae in people with 1, 2 and 3 or more SARS-CoV-2 infections compared to non-infected controls

1 infection 2 infections 3 or more infections



COVID-19 vaccination averted 63% of deaths in year 1

THE LANCET
Infectious Diseases

Global impact of the first year of COVID-19 vaccination: a mathematical modelling study

Oliver J Watson, Gregory Barnsley*, Jaspreet Toor, Alexandra B Hogan, Peter Winskill, Azra C Ghani*

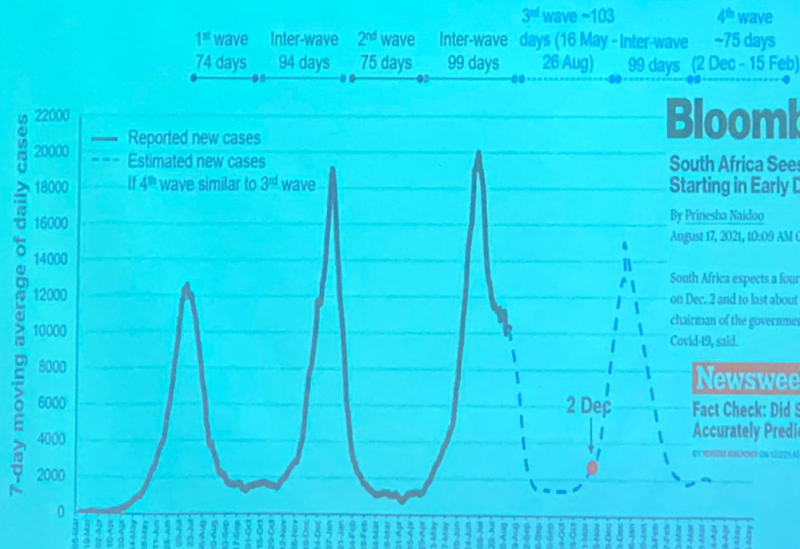
- **Vaccination → ↓19.8 million COVID-19 deaths** (based on excess mortality)
- **63% fewer Covid-19 deaths than expected in year 1 of vaccination**
- Could have had additional 45% deaths averted in low-income countries if COVAX 20% target had been met
- Could have averted additional 111% deaths in low-income countries had the 40% target set by WHO been met



Figure. Median deaths averted by vaccinations per 10 000 people by country in the first year of COVID-19 vaccination

In August 2021, I asked what may happen next....

(estimated case numbers assuming 4th wave has similar pattern & new variant)



Bloomberg

South Africa Sees Covid-19 Fourth Wave Starting in Early December

By Prinesha Naidoo

August 17, 2021, 10:09 AM GMT+2

South Africa expects a fourth wave of coronavirus infections to start on Dec. 2 and to last about 75 days, Salim Abdool Karim, former chairman of the government's ministerial advisory committee on Covid-19, said.

Newsweek

Fact Check: Did South African Epidemiologist Accurately Predict Nation's COVID Surge?

BY MICHELLE KROCHONSKI ON 12/02/21 AT 1:00PM EST

Note: New variant and other factors may change epidemic trajectory. These estimations are based on several assumptions and not on mathematical modelling

Outline

- The global Covid-19 pandemic
- Covid-19: more than an acute infection
- Effect of evolving variants on vaccines
- What's next in Covid-19?
- Lessons from Covid-19
 - *Living smartly with the virus*

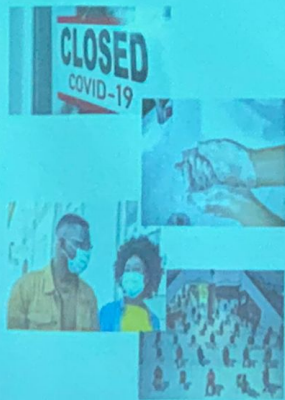
What does “*Living smartly with the virus*” entail?

1. Be fully vaccinated
2. Know level of community transmission – e.g. are cases rising?
- adjust your risk appetite accordingly
3. Know the potential risky situations you may be entering
- know what you can do to mitigate that risk
4. Avoid distant travel to places where you are not confident about the health care services available in the event of illness
5. Do what you can to protect others (not just yourself)!

The 3 Eras of the Covid-19 response: Adding “Test & Treat to [Vaccines + Public health measures]”

Era 1 - 2020

Public health measures



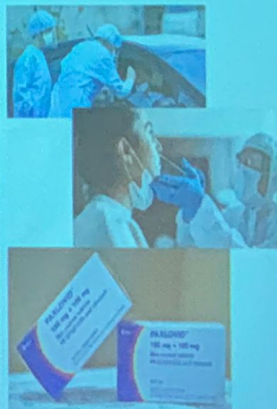
Era 2 - 2021

Vaccines & Variants



Era 3- 2022

Test & Treat



A key lesson from HIV for Covid-19: Importance of mutual interdependence & shared responsibility



"The AIDS movement demonstrates that with a shared vision, shared responsibility and through global solidarity... ..we can change the course of history."

– UNAIDS 2015

- **Global solidarity** – essential for access to life-saving medication, e.g. Global Fund & PEPFAR
- **Shared responsibility:** Countries where individuals see caring for fellow citizens as important do better than those where individuals focus on themselves first
- **No-one is safe until everyone is safe!**