Prof. Tobias Rinke de Wit
Research Director PharmAccess

What is COVID-19?

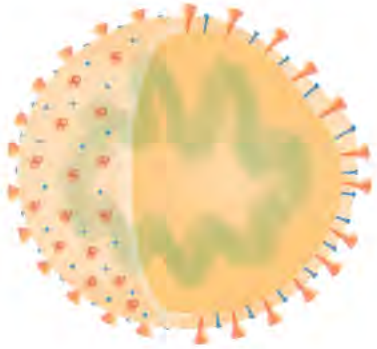
Architectural Association of Kenya, CPD Session

May 5, 2021

Facts or fiction?

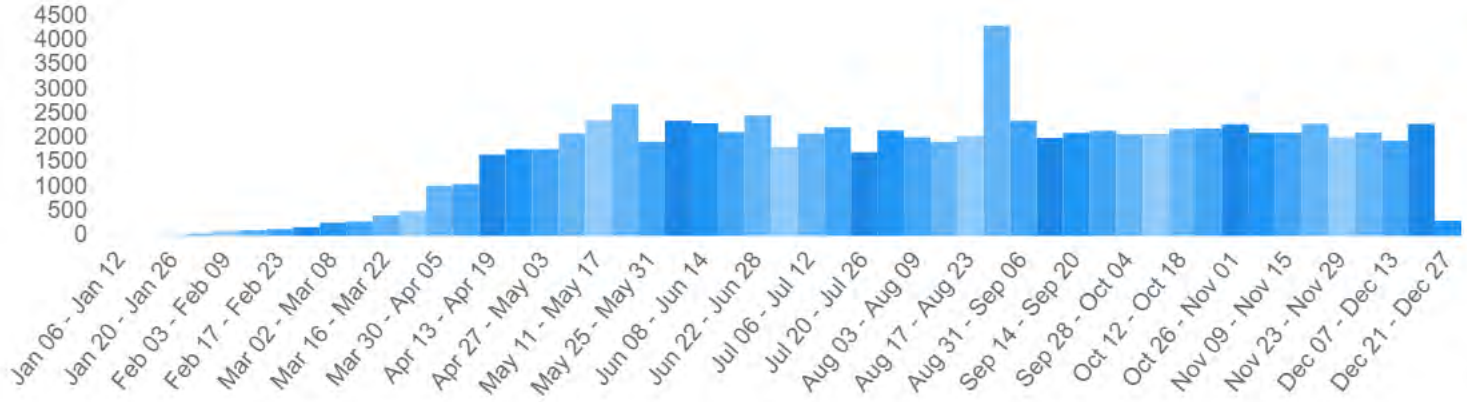
Every day 300 articles…….

GENERAL MECHANISM TRANSMISSION DIAGNOSIS TREATMENT PREVENTION CASE REPORT FORECASTING



LitCovid is a curated literature hub for tracking up-to-date scientific information about the 2019 novel Coronavirus. It is the most comprehensive resource on the subject, providing a central access to 82734 (and growing) relevant articles in PubMed. The articles are updated daily and are further categorized by different research topics and geographic locations for improved access. You can learn more at Chen et al. Nature (2020) or our FAQ, and download our data here.

Weekly Publications



Latest Publications

MECHANISM • TREATMENT

Complications and Pathophysiology of COVID-19 in the Nervous System.

Yu, Haiyang et al. • Front Neurol

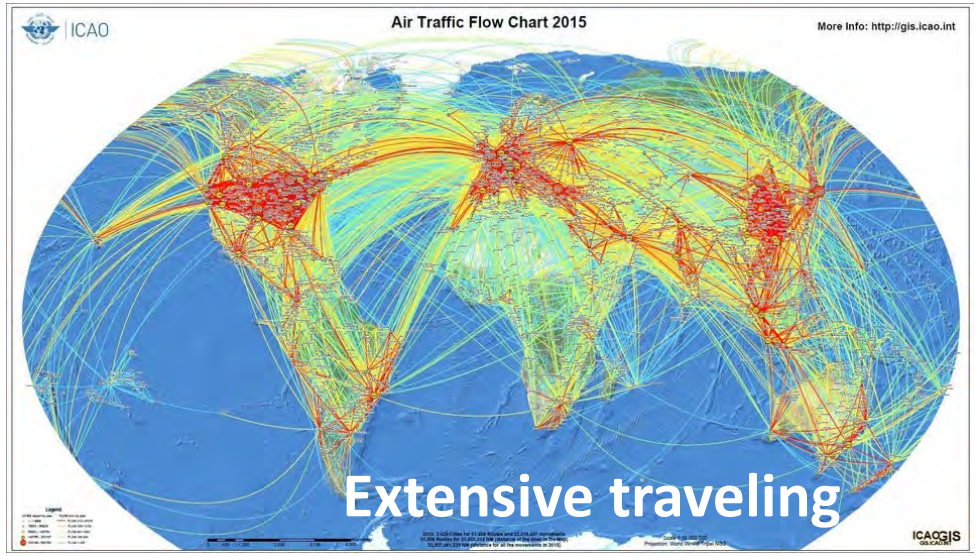
MECHANISM • TREATMENT

Recent Progress in the Drug Development Targeting SARS-CoV-2 Main Protease as Treatment for COVID-19.

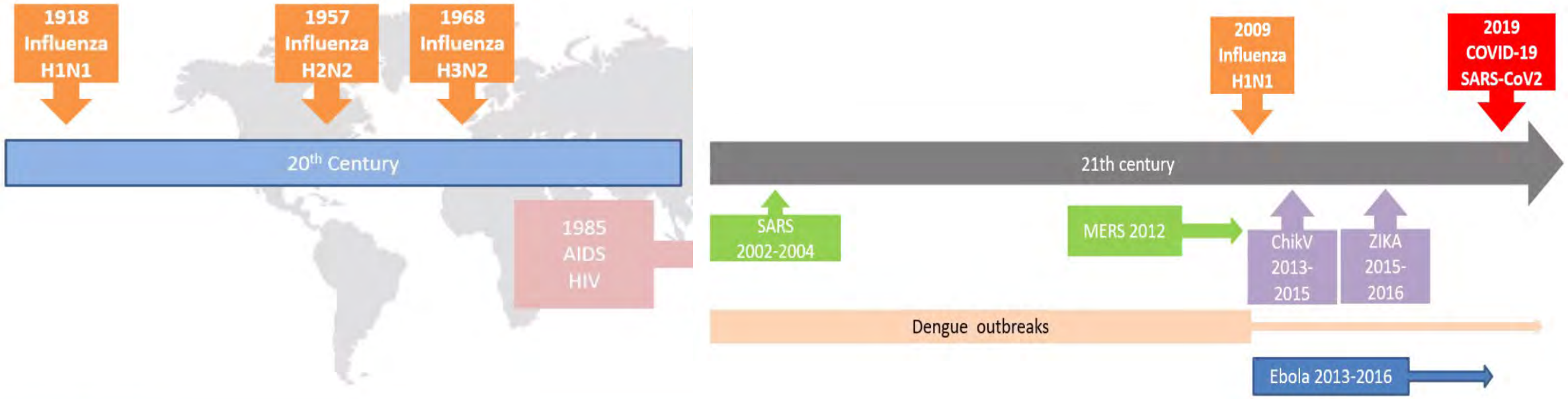
https://www.ncbi.nlm.nih.gov/research/coronavirus/

Epidemics

Human behavior → epidemics



Acceleration epidemic outbreaks



World Health Organization

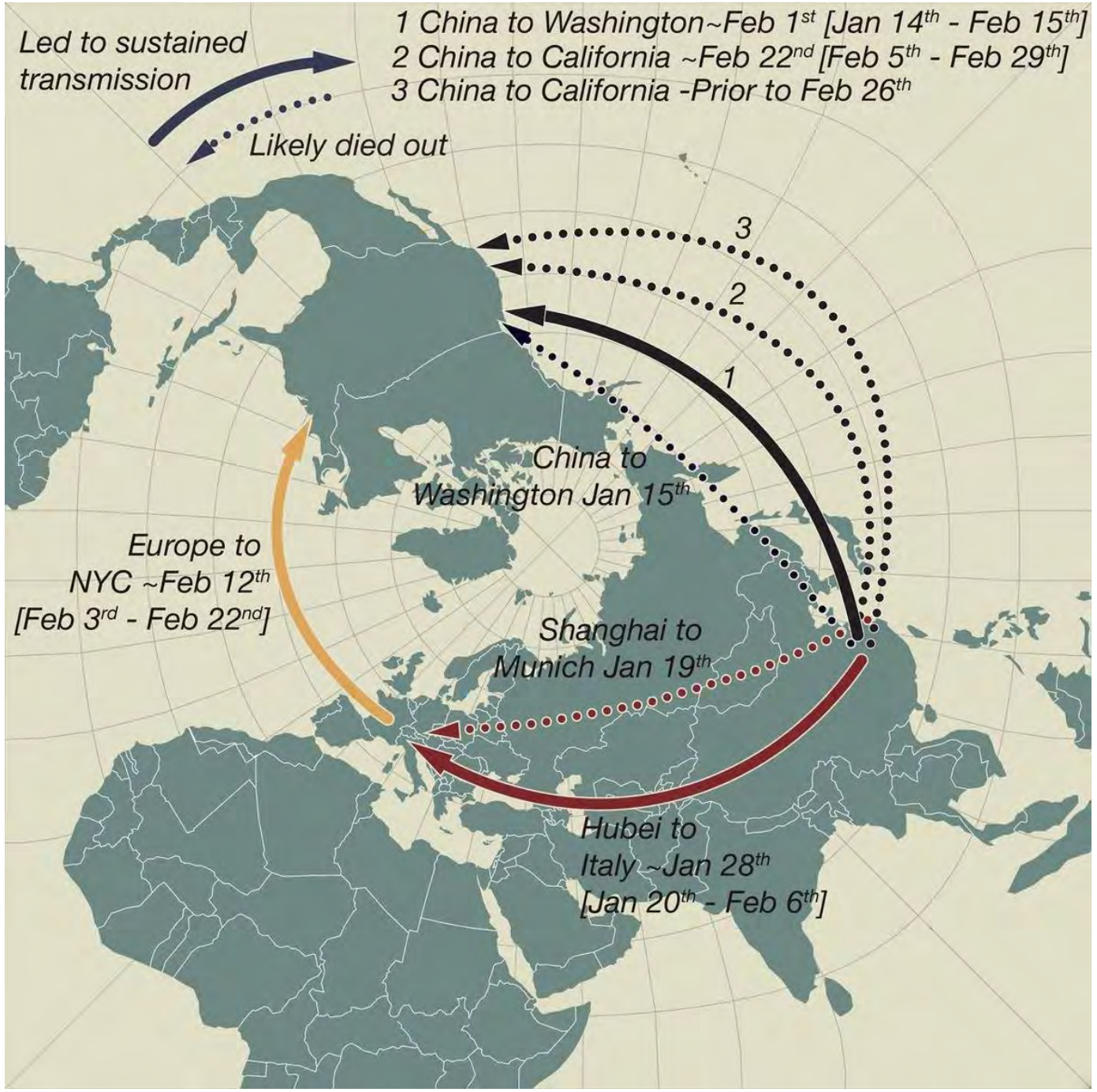
Pardo CA/Johns Hopkins

Corona began in China

'wet market'

19 Jan
Shanghai → Munich

28 Jan Hubei → Italy



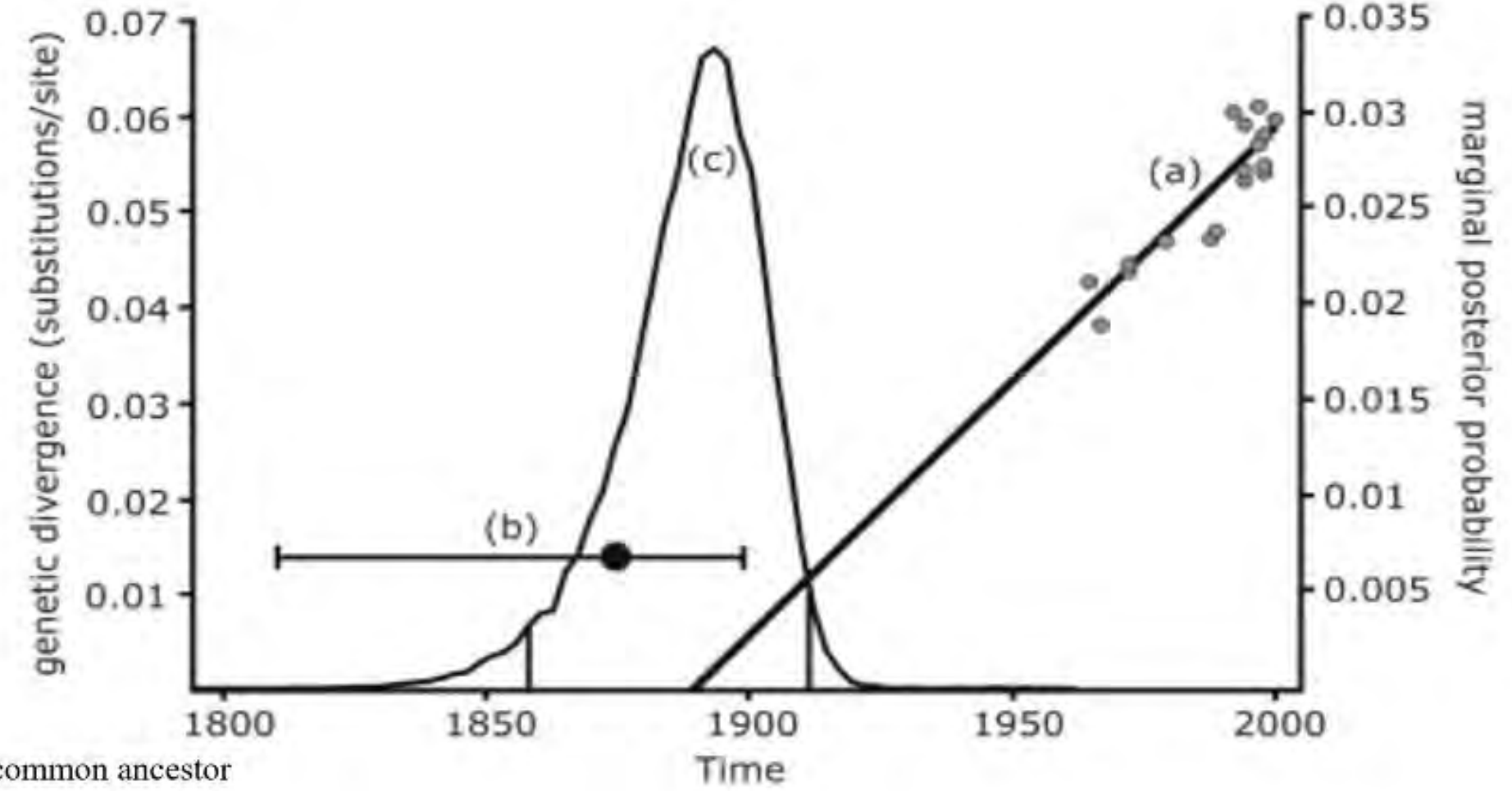
Epidemics with at least 1 million deaths

Rank	Epidemics/pandemics	Death toll	Global population lost	Regional population lost	Date	Location
1	Black Death	75–200 million	[Note 1]	30–60% of European population[8]	1346–1353	Europe, Asia, and North Africa
2	Spanish flu	17–100 million	1–5.4%[9][10]	–	1918–1920	Worldwide
3	Plague of Justinian	15–100 million	[Note 1]	25–60% of European population[11]	541–549	Europe and West Asia
4	**HIV/AIDS pandemic**	**35 million+ (as of 2020)**	[Note 2]	–	**1981–present**	**Worldwide**
5	Third plague pandemic	12–15 million	[Note 2]	–	1855–1960	Worldwide
6	Cocoliztli Epidemic of 1545–1548	5–15 million	[Note 1]	27–80% of Mexican population[12]	1545–1548	Mexico
7	Antonine Plague	5–10 million	3–6%[7]	25–33% of Roman population[13]	165–180 (possibly up to 190)	Roman Empire
8	1520 Mexico smallpox epidemic	5–8 million	[Note 1]	23–37% of Mexican population[12]	1519–1520	Mexico
9	**COVID-19 pandemic**	**2.6 million+ (as of March 2021)**	**0.03%**[6]	–	**2019–present**	**Worldwide**
10	1918–1922 Russia typhus epidemic	2–3 million	0.1–0.16%[14][Note 3]	1–1.6% of Russian population[15]	1918–1922	Russia

https://en.wikipedia.org/wiki/List_of_epidemics

Molecular clock analysis:

OC43 = ?



Time of most recent common ancestor

a) Linear regression
b) Maximum likelihood
c) Bayesian coalescence

Soure: Vijgen L, Keyaerts E, Moës E., et al. Journal of Virology Jan 2005, 79 (3) 1595-1604

Russian Flu

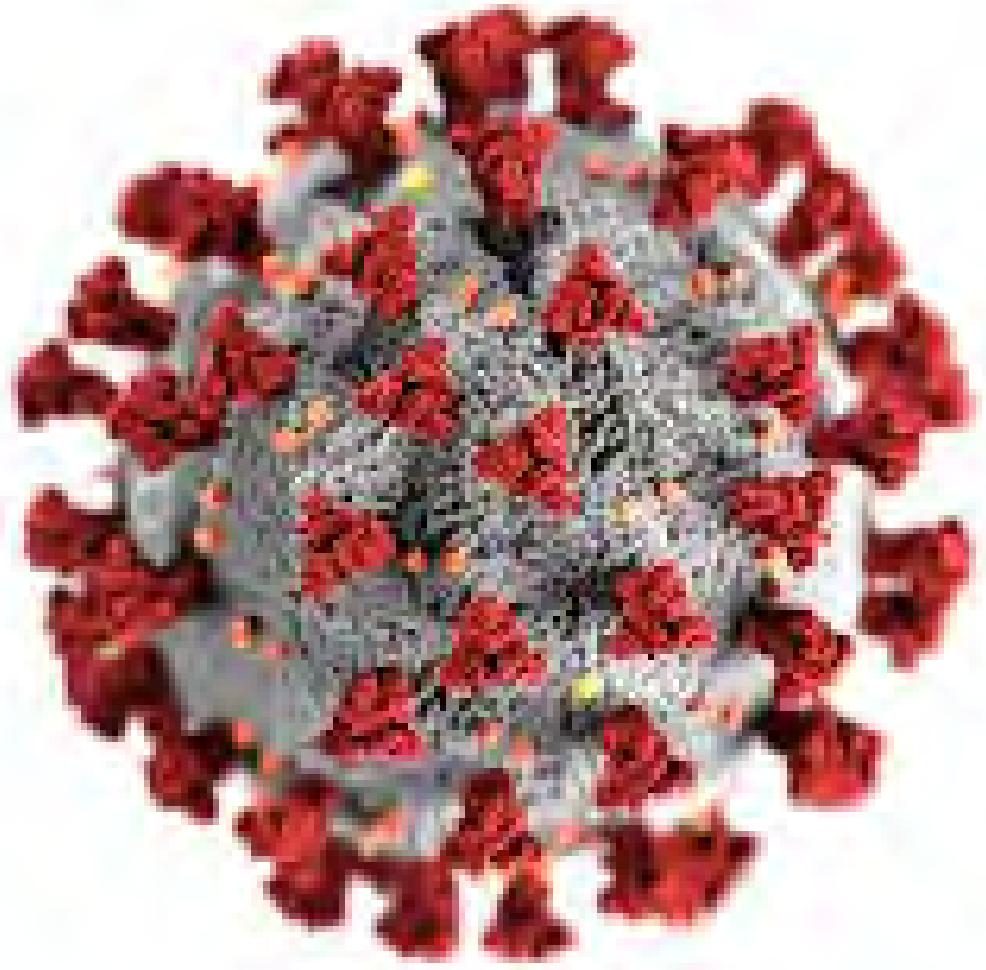
- Among the top-20 deadliest pandemics in history: ‘Russian flu’ killed 1M/1.5B worldwide
- Originally from rodents → cows → humans
- 200,000 km of railroads in 1890
- First outbreak: Oct 1889 - Dec 1890
- Recurrences:
  - Mar - Jun 1891
  - Nov 1891 - Jun 1892
  - Winter of 1893 – 1894
  - Early 1895

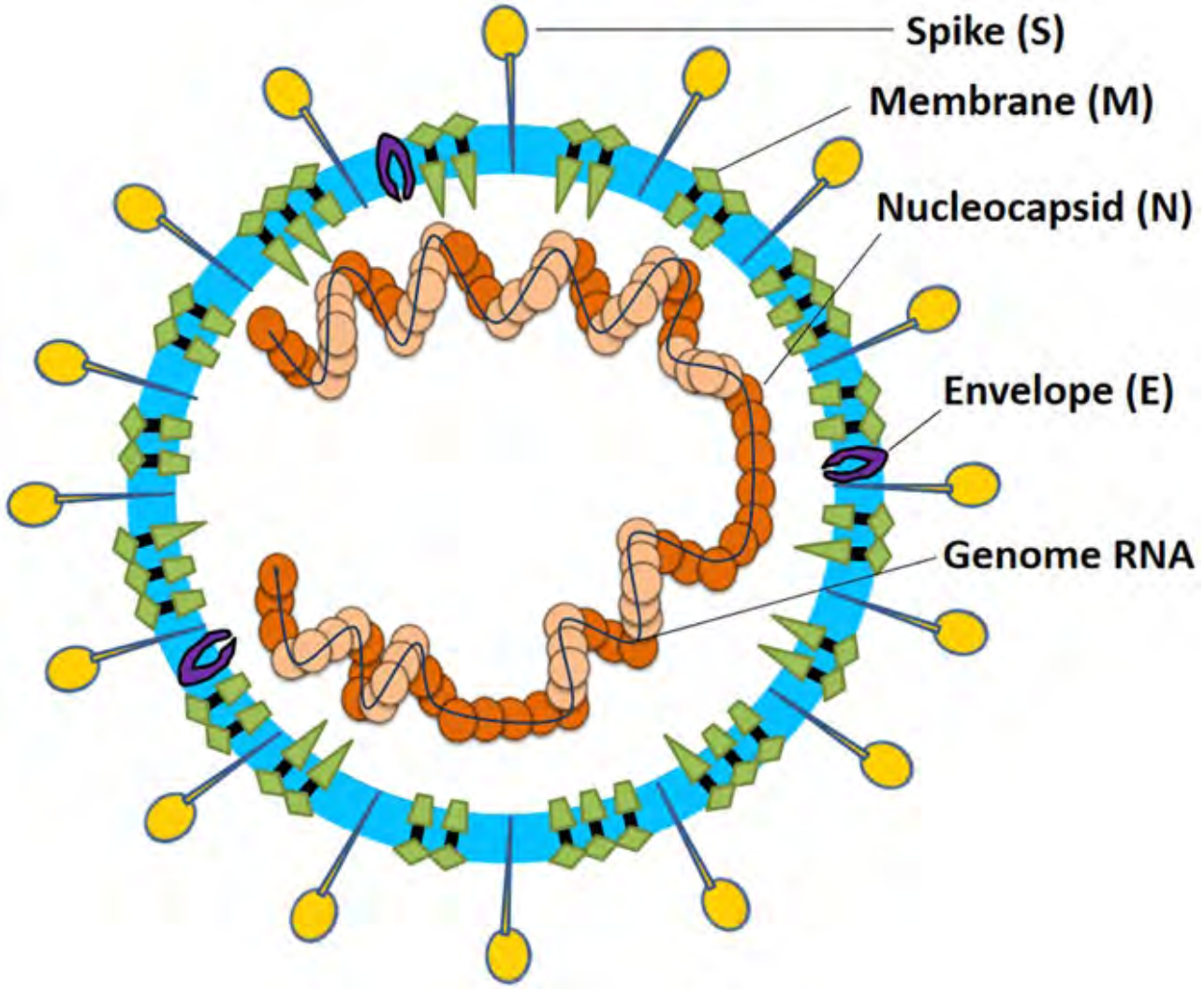
https://en.wikipedia.org/wiki/1889%E2%80%931890_pandemic

The Virus

SARS-CoV-2

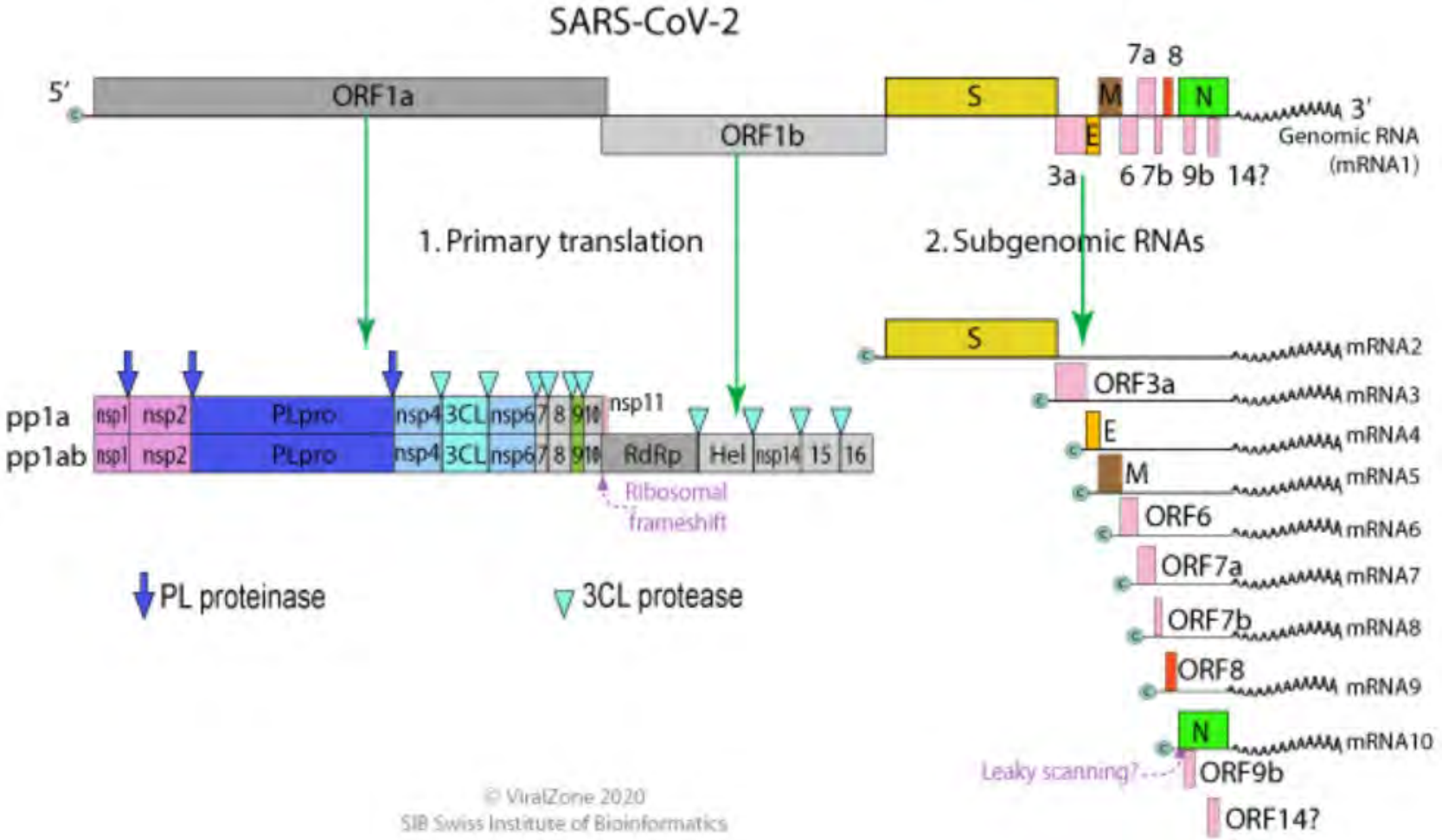
(severe acute respiratory syndrome)

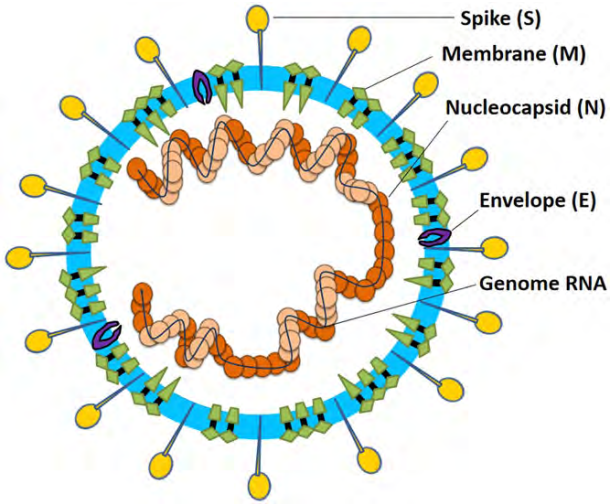


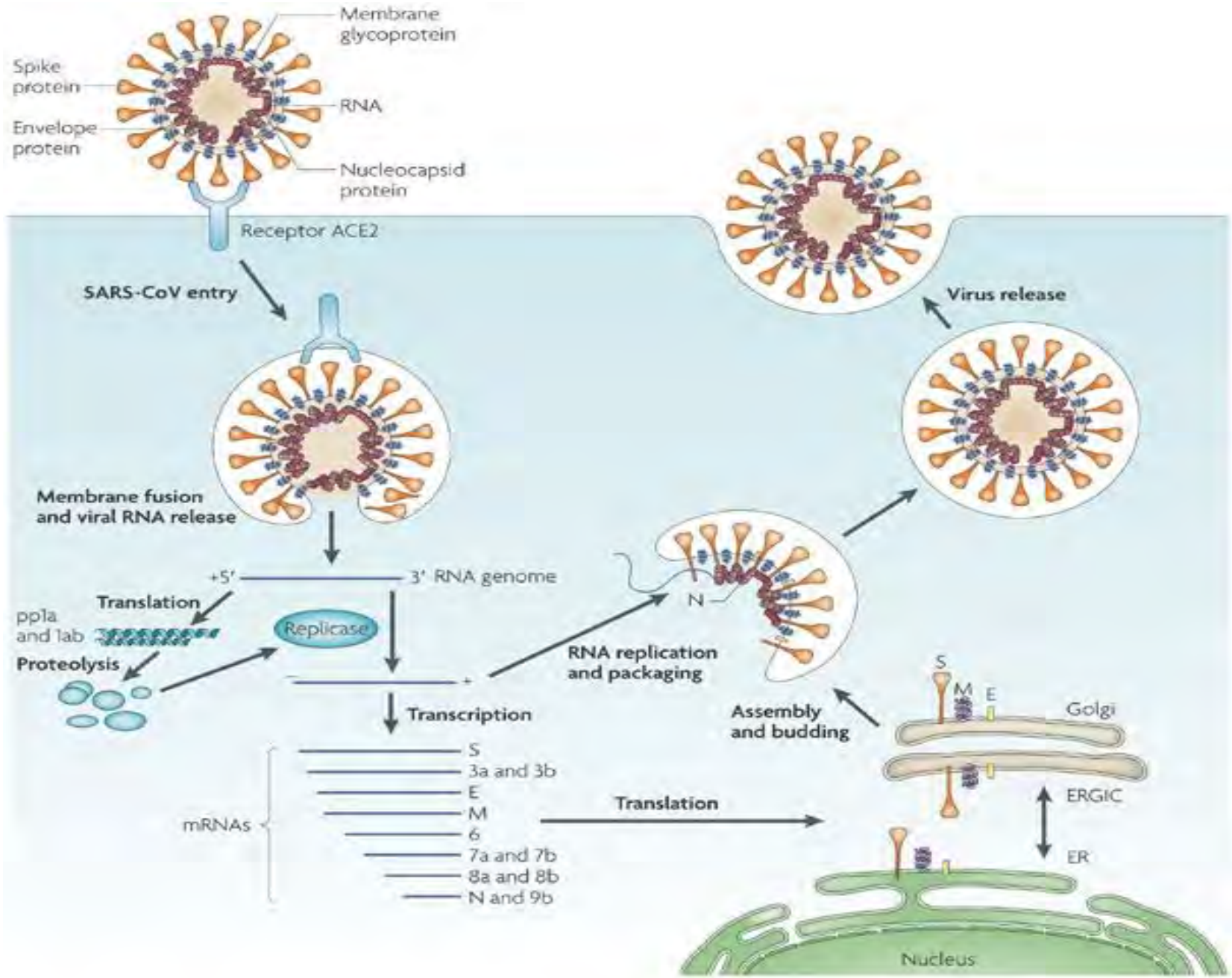


The virus

Large and quite complex RNA virus; 6 open reading frames: ORF1, ORF2 (16 replication proteins), S, E, M and N (structure)







Nature Reviews | Microbiology

Zoonoses

Seven coronas

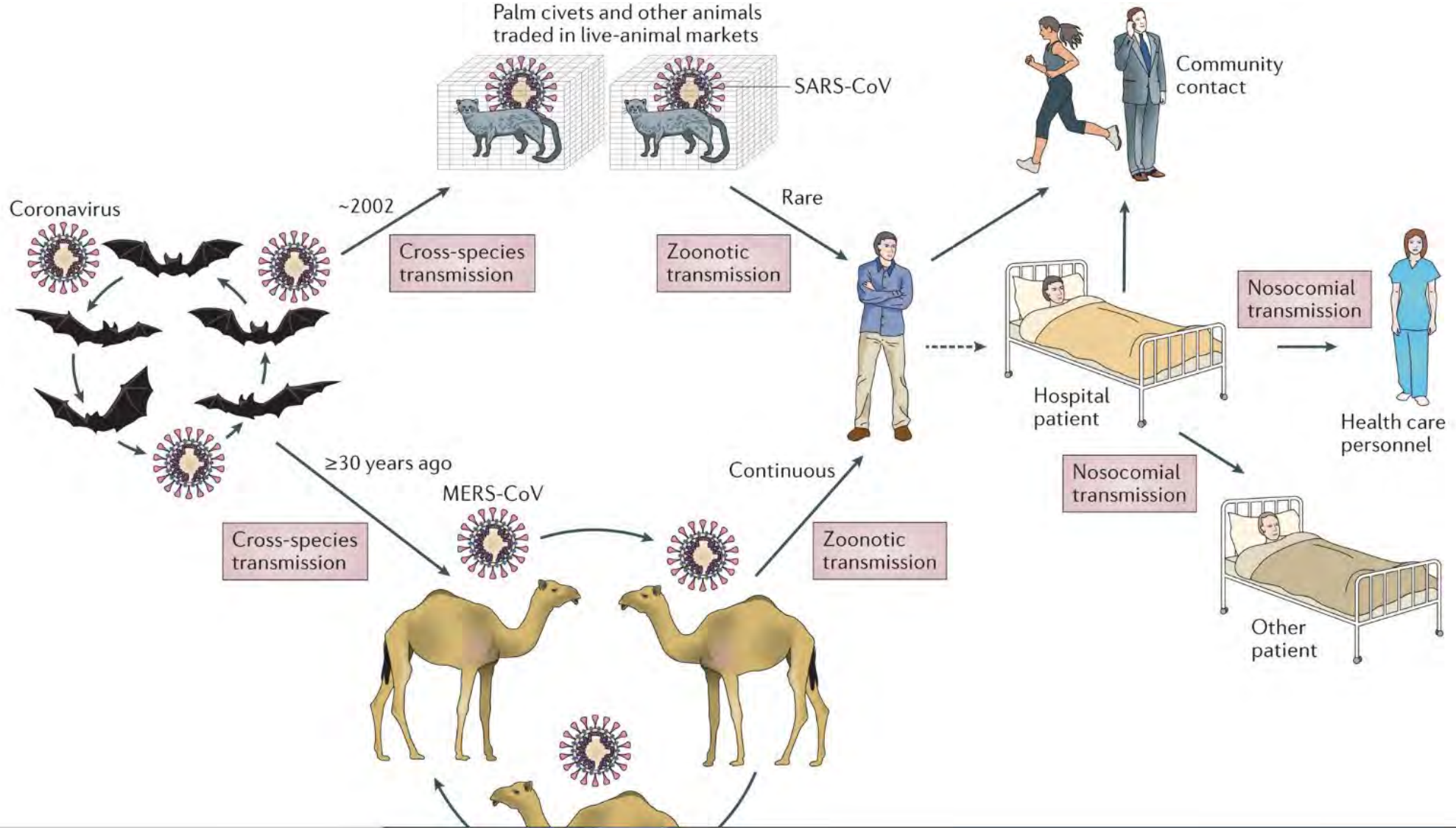
- HCoV-229E (alpha)
- HCoV-NL63 (alpha)
- HCoV-OC43 (beta)
- HCoV-HKU1 (beta)

'Old' viruses → URTI, not dangerous

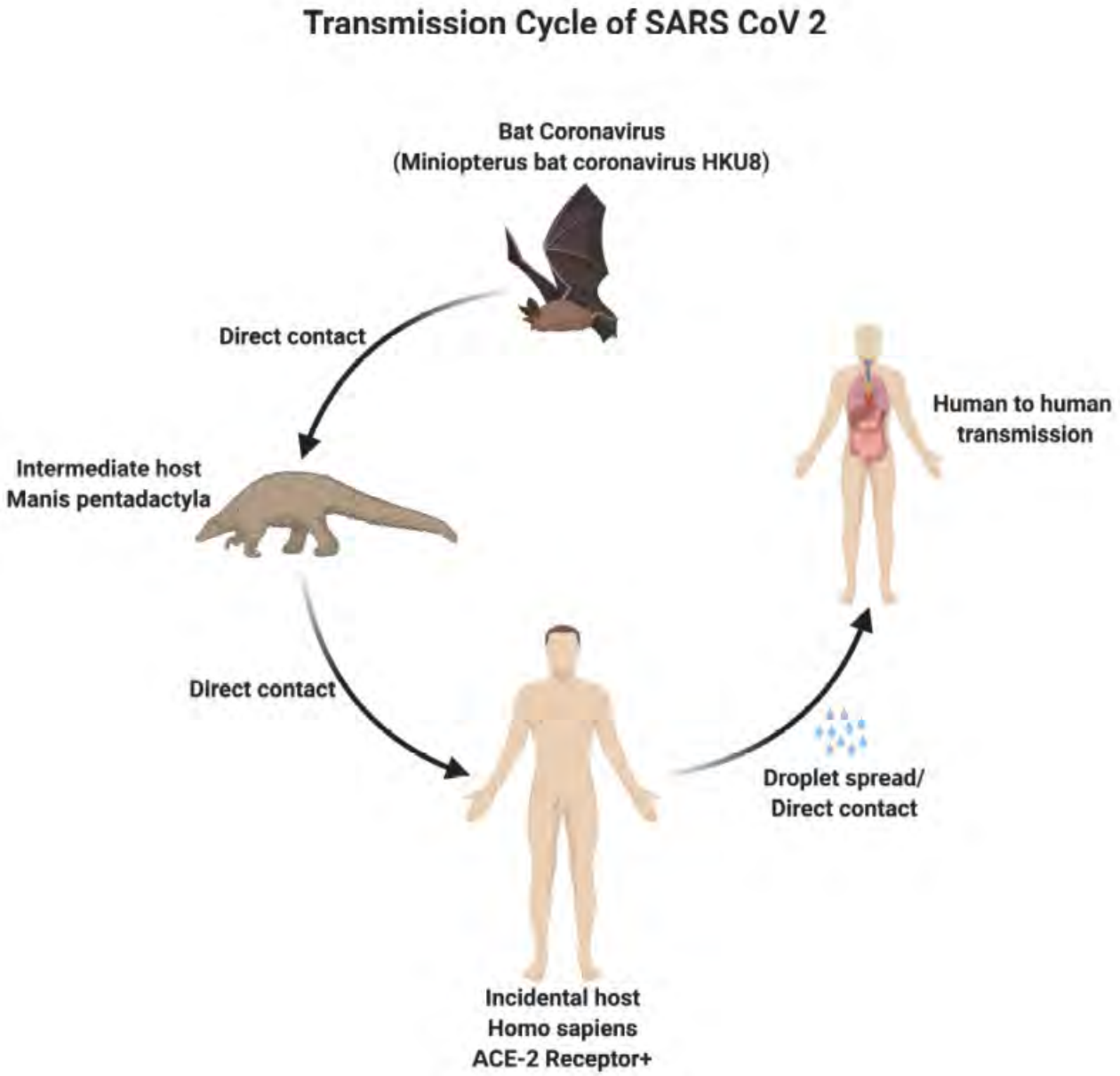
- SARS-CoV (beta) 2003
- MERS-CoV (beta) 2012
- SARS-CoV-2 (beta) 2019

New viruses → URTI + LRTI, more dangerous

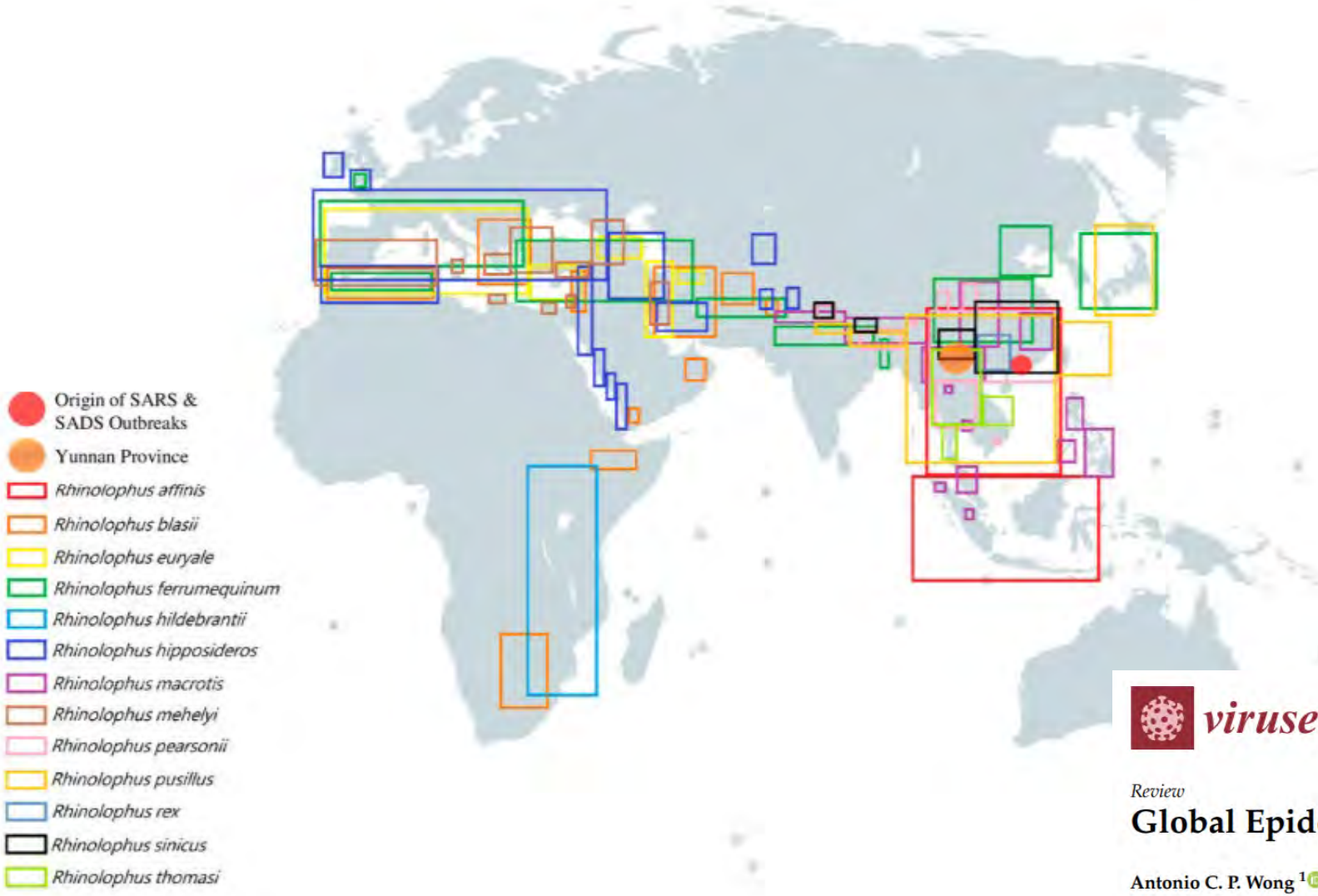
Coronavirus transmission routes



Pangolin


Transmission Cycle of SARS CoV 2
Bat Coronavirus
(Miniopterus bat coronavirus HKU8)
Direct contact
Intermediate host
Manis pentadactyla
Direct contact
Incidental host
Homo sapiens
ACE-2 Receptor+
Droplet spread/
Direct contact
Human to human
transmission

Worldwide horseshoe bats



- Bats are highly diversified
- Bats have global distribution
- Mammals with 2nd largest # of species
- Capable of sustained flight → large action radius, enhance zoonosis possibilities
- Bats host >30 different coronaviruses
- Bats only have α and β coronaviruses

viruses

MDPI

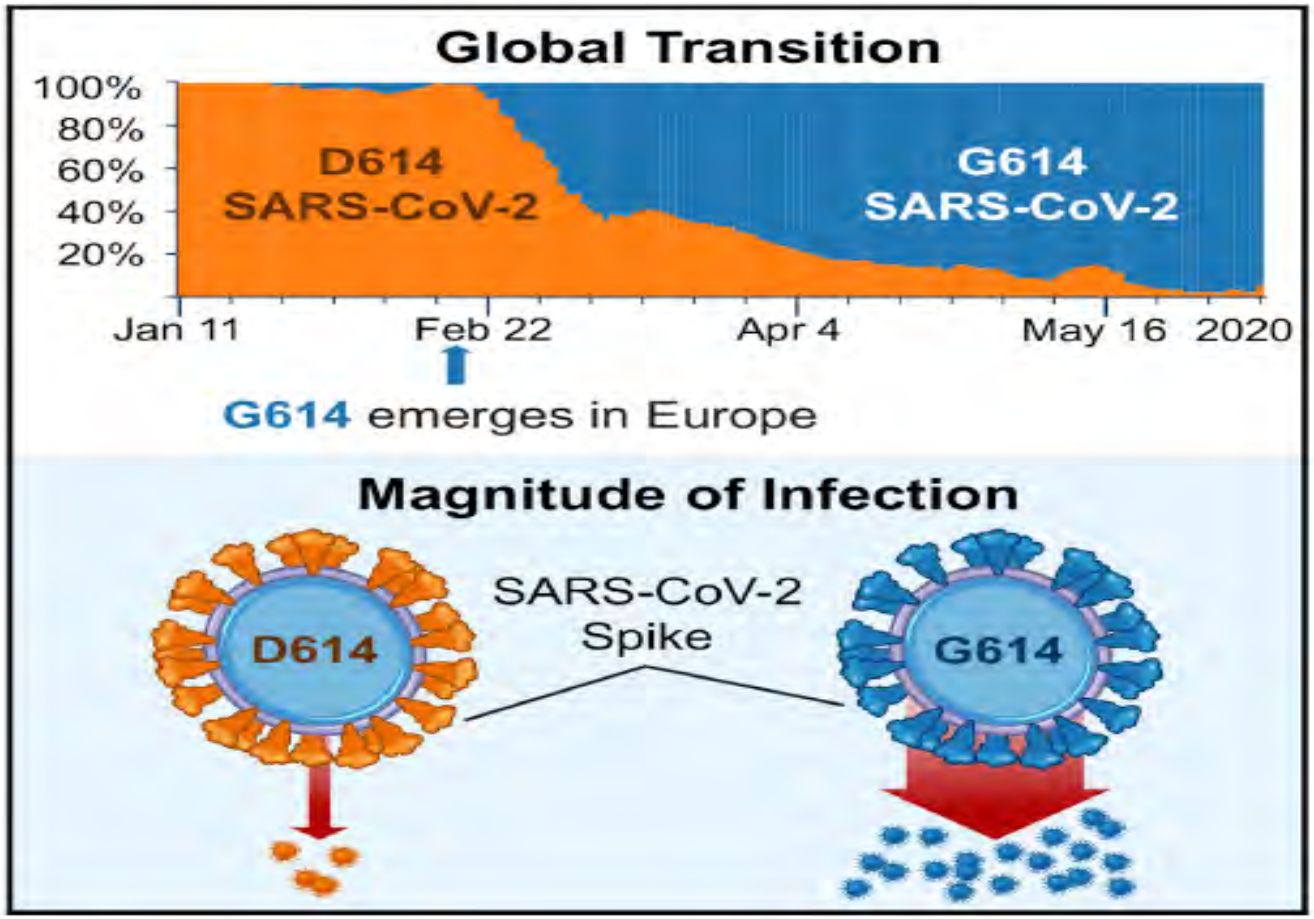
Review

Global Epidemiology of Bat Coronaviruses

Antonio C. P. Wong [1], Xin Li [1], Susanna K. P. Lau [1,2,3,4,5,*] and Patrick C. Y. Woo [1,2,3,4,5,*]

Mutants

SARS-CoV-2 mutates



Cell

Volume 182, Issue 4, 20 August 2020, Pages 812-827.e19

CellPress

Article

Tracking Changes in SARS-CoV-2 Spike: Evidence that D614G Increases Infectivity of the COVID-19 Virus

Bette Korber [1, 2, 10], Will M. Fischer [1], Sandrasegaram Gnanakaran [1], Hyejin Yoon [1], James Theiler [1], Werner Abfalterer [1], Nick Hengartner [1], Elena E. Giorgi [1], Tanmoy Bhattacharya [1], Brian Foley [1], Kathryn M. Hastie [3], Matthew D. Parker [4], David G. Partridge [5], Cariad M. Evans [5], Timothy M. Freeman [4], Thushan I. de Silva [5, 6]

ACE2 mutates too

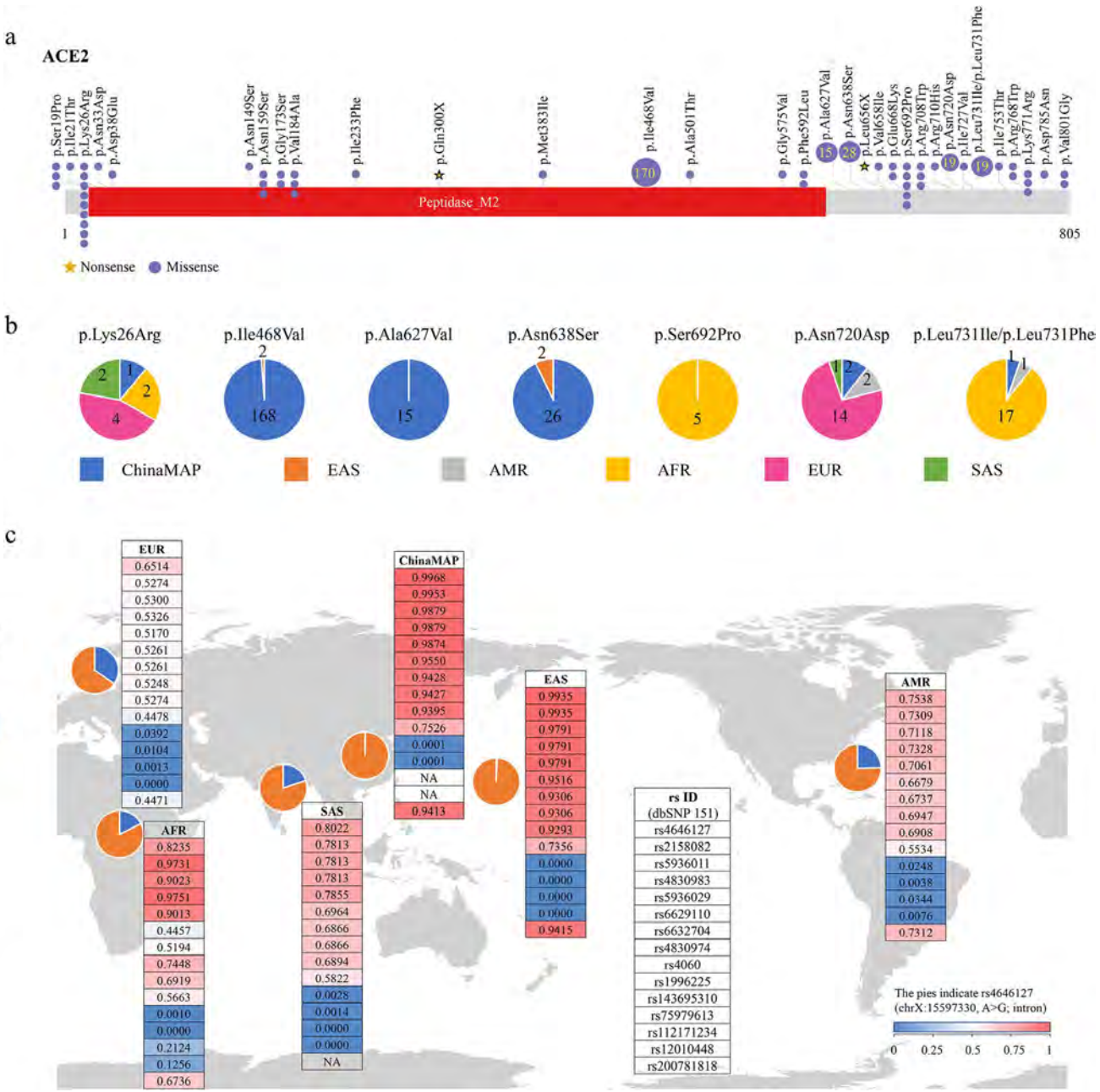
Cao et al. *Cell Discovery* (2020)6:11
https://doi.org/10.1038/s41421-020-0147-1

Cell Discovery
www.nature.com/celldisc

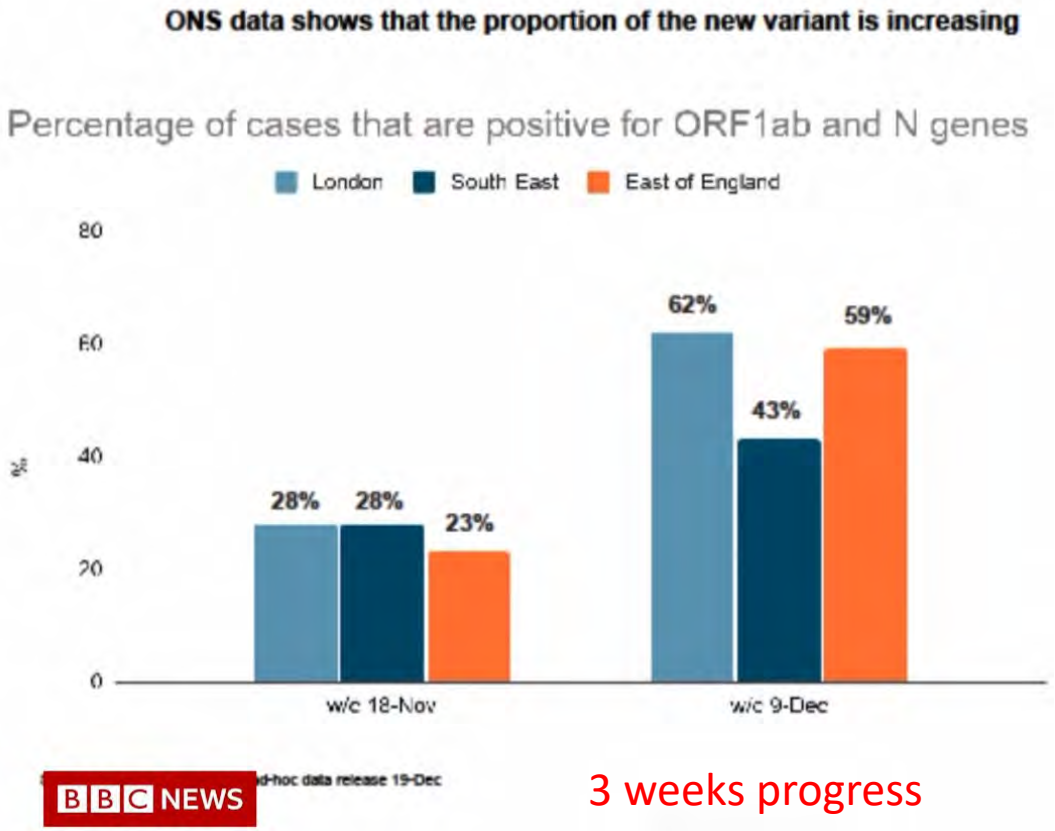
CORRESPONDENCE Open Access

Comparative genetic analysis of the novel coronavirus (2019-nCoV/SARS-CoV-2) receptor ACE2 in different populations

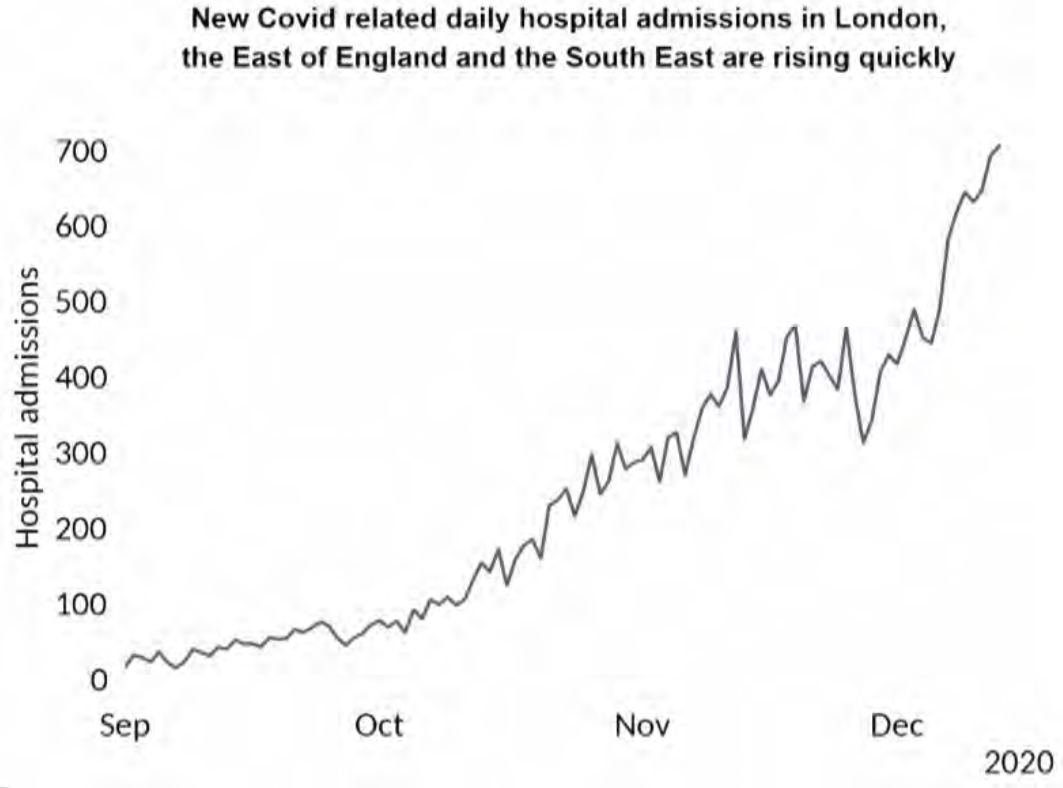
Yanan Cao[1], Lin Li[1], Zhimin Feng[1], Shengqing Wan[1], Peide Huang[1], Xiaohui Sun[1], Fang Wen[1], Xuanlin Huang[1], Guang Ning[1] and Weiqing Wang[1]



UK mutants
BBC – Boris Johnson
December 19, 2020



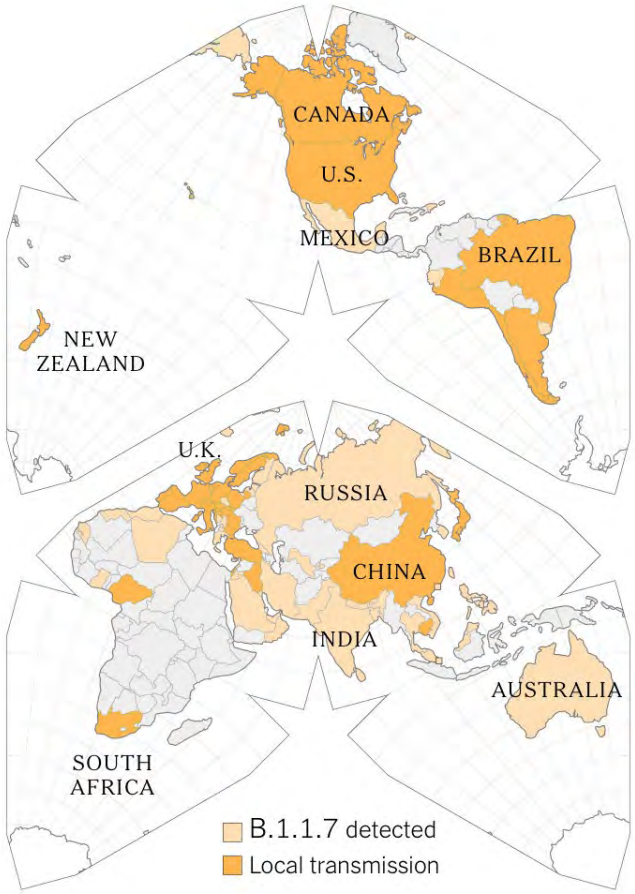
3 weeks progress



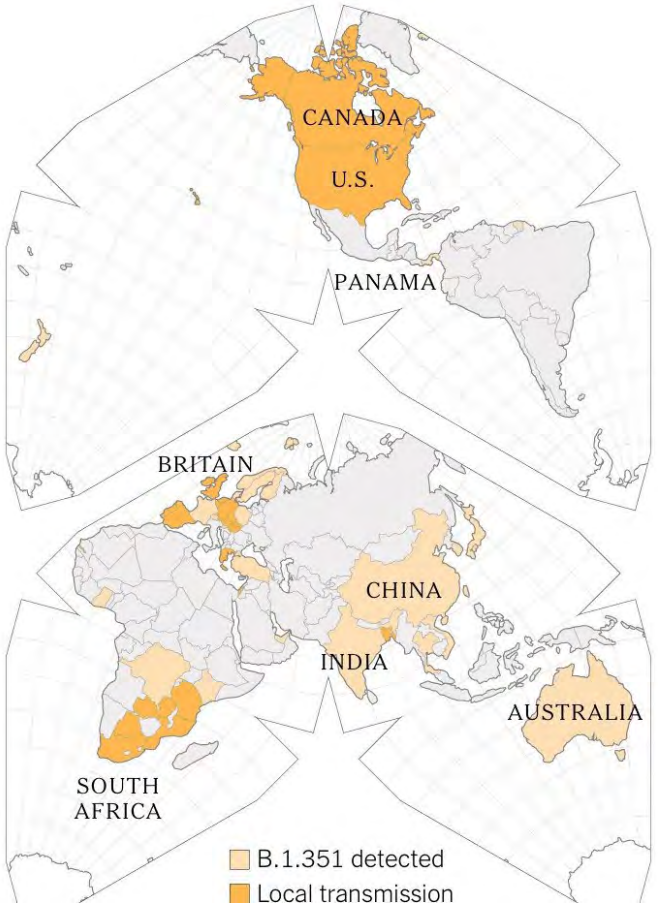
Why concern over variants?

- May transmit more easily – increased infectivity
- May be more pathogenic – virulent
- May evade immune response
  - May make vaccines less effective
  - May enable re-infection
- Diagnostic tests may fail

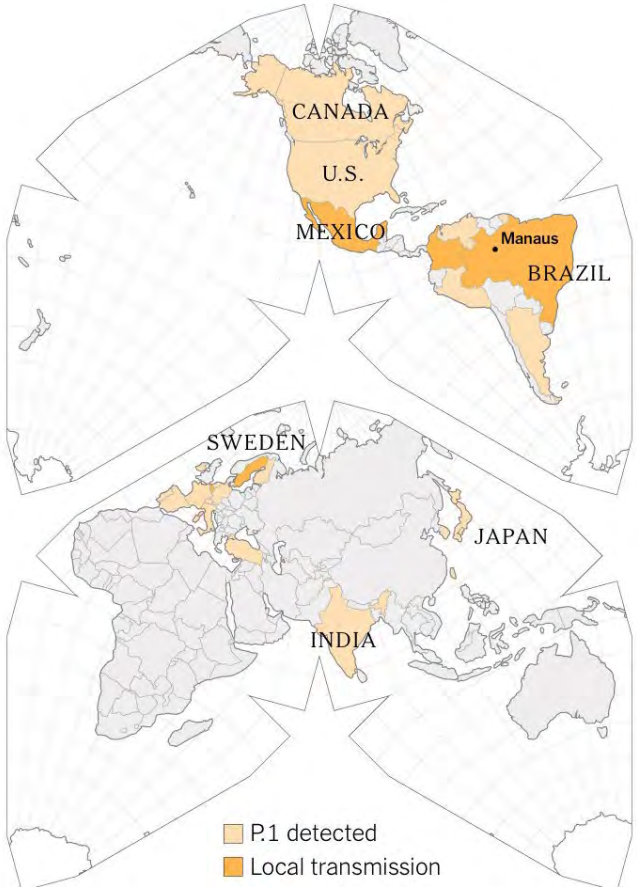
Geographic spread variants



UK Variant



South Africa Variant



Brazil Variant

Transmission

COVID is unique in its pre-symptomatic transmission

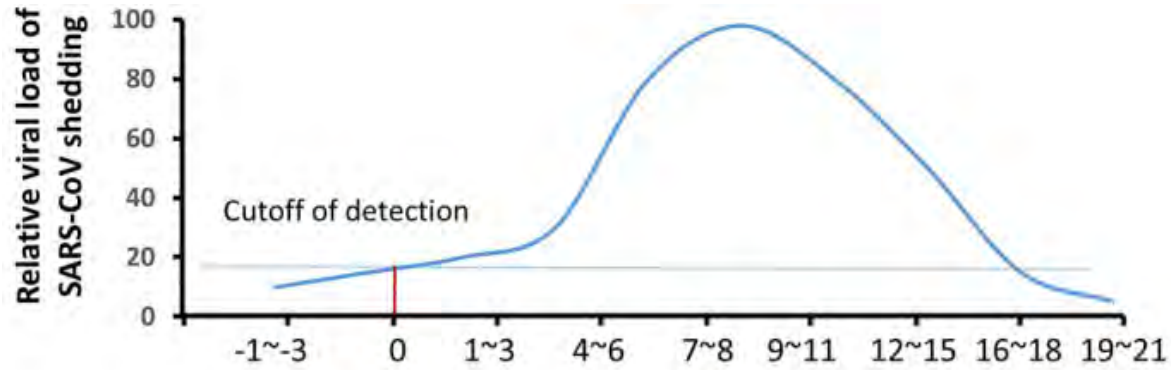
SARS & MERS

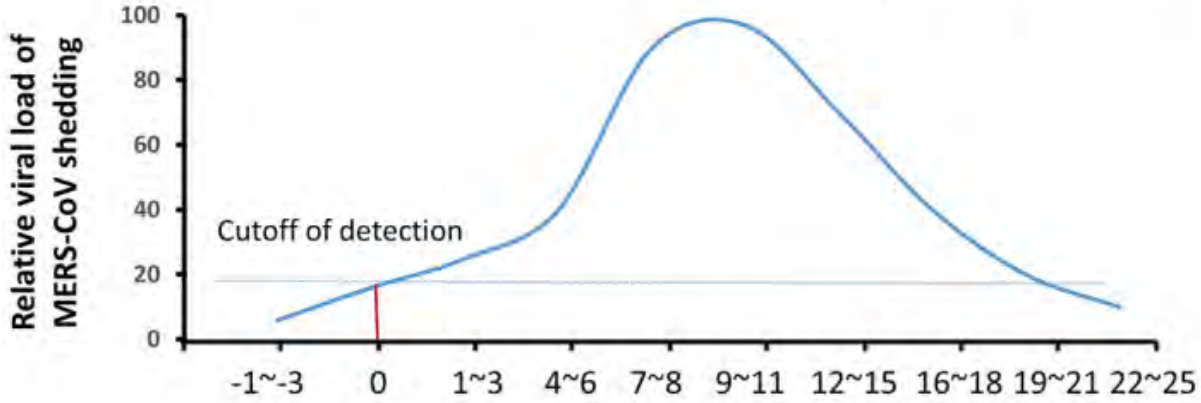
- Low viral shedding, high symptomatic cases in early infection
- Lack of transmission by pre- and asymptomatics enables syndromic surveillance, isolation and quarantine

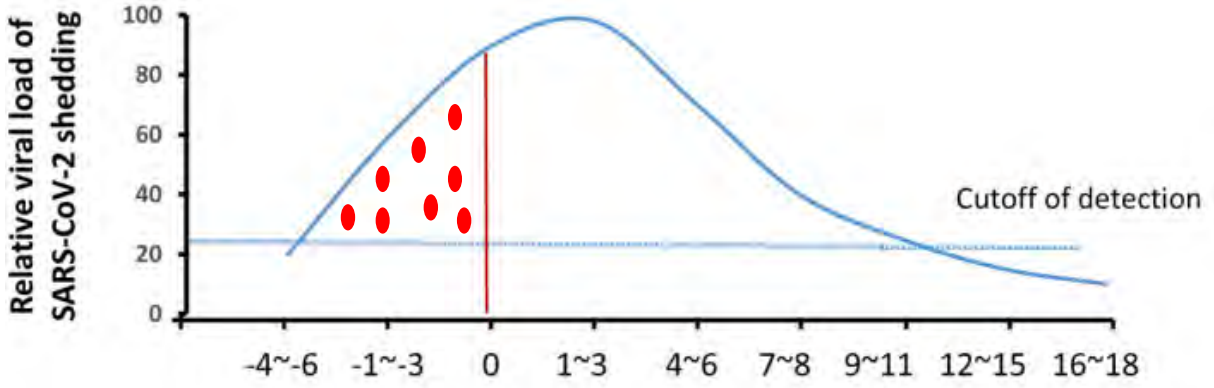
SARS-CoV-2

- Viral shedding peaks much earlier in pre and asymptomatic phase
- Syndromic surveillance far less effective.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7537046/

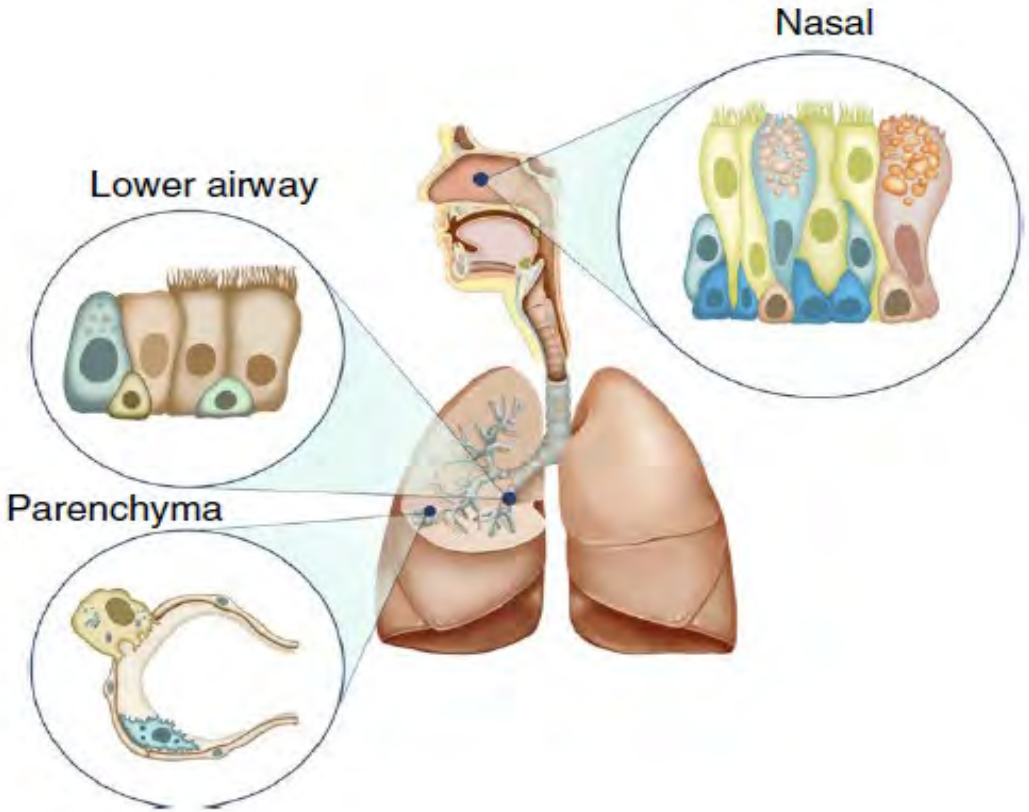






Two-stage rocket

- nasal secretory cells (mucus producing goblets)
- ciliated cells (moving particles)



List of epithelial cells

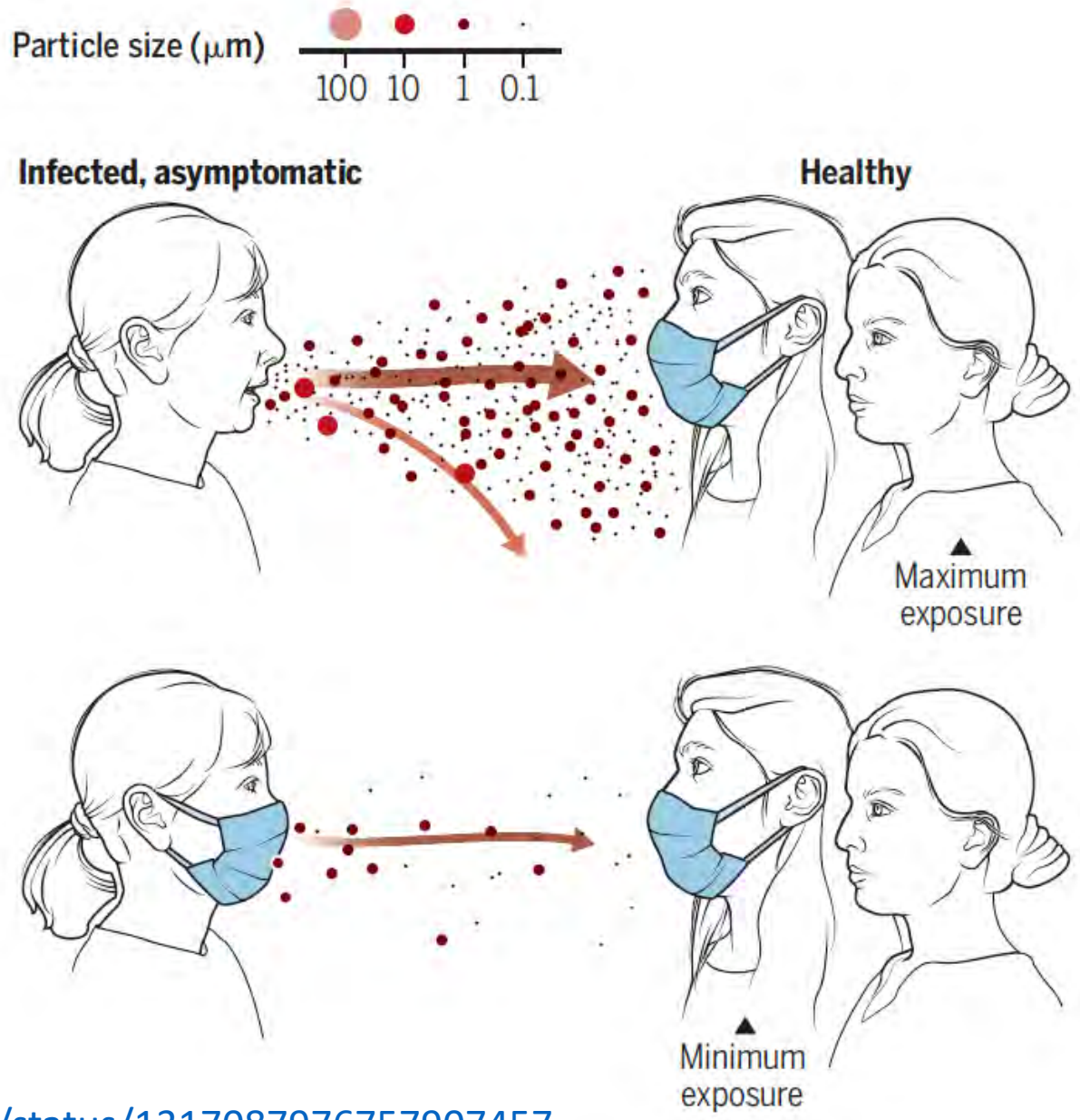
Nasal	Lower airway	Parenchyma
Goblet 1	Basal 1	Alveolar type I
Goblet 2	Basal 2	Alveolar type II
Ciliated 2	Ciliated 1	
	Club	

Sungnak et al., Nature Medicine, 2020
https://doi.org/10.1038/s41591-020-0868-6

Transmission pathways

- Larger (100 µm) droplots → 1,5-2,5 m distance; 5 seconds → infected surfaces

- Aerosols (1 µm)→ remain air borne 10 min - 12 hours (depending on ventilation)

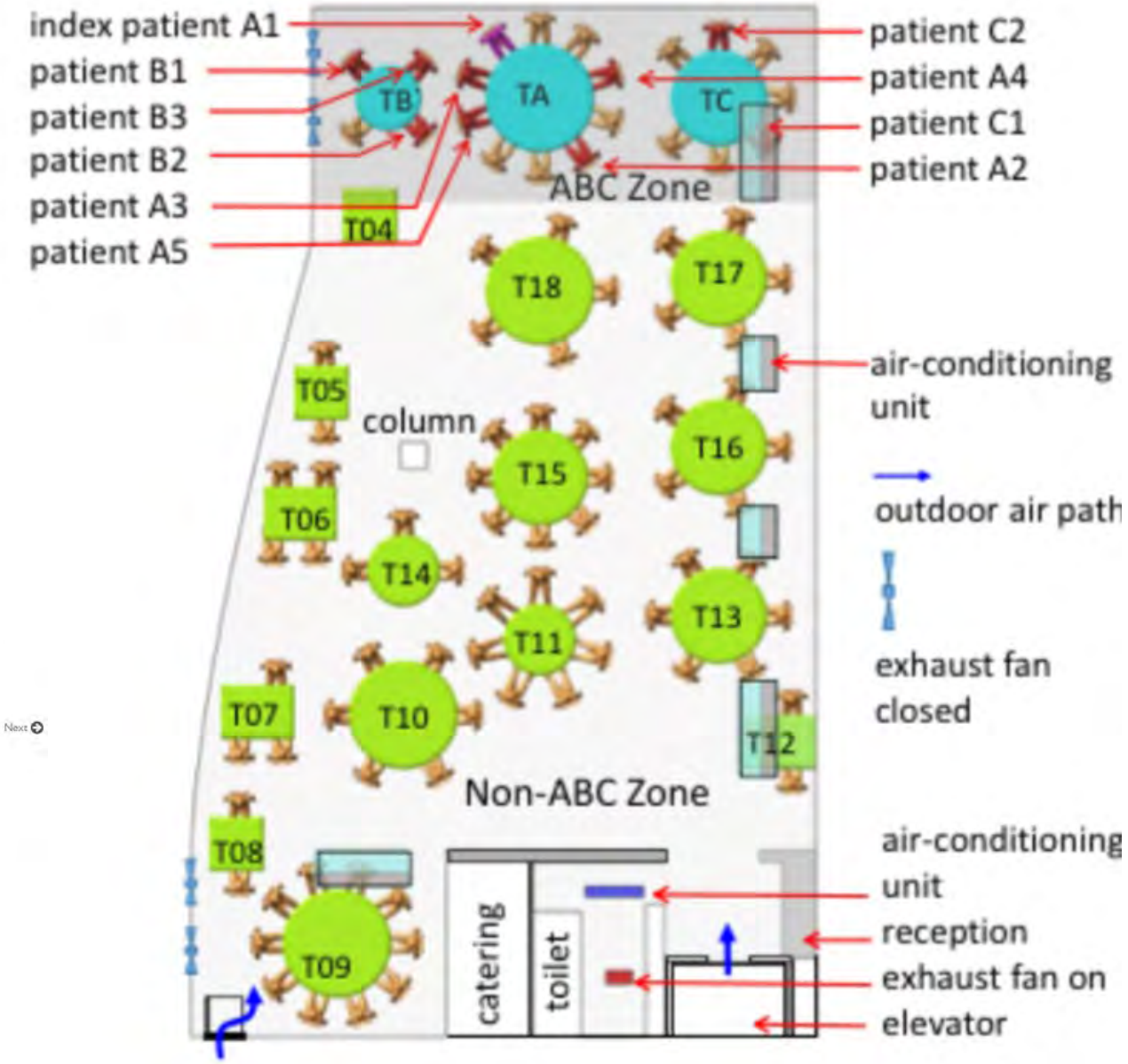


Prather et al. Science 368, 1422-1424, June 2020.

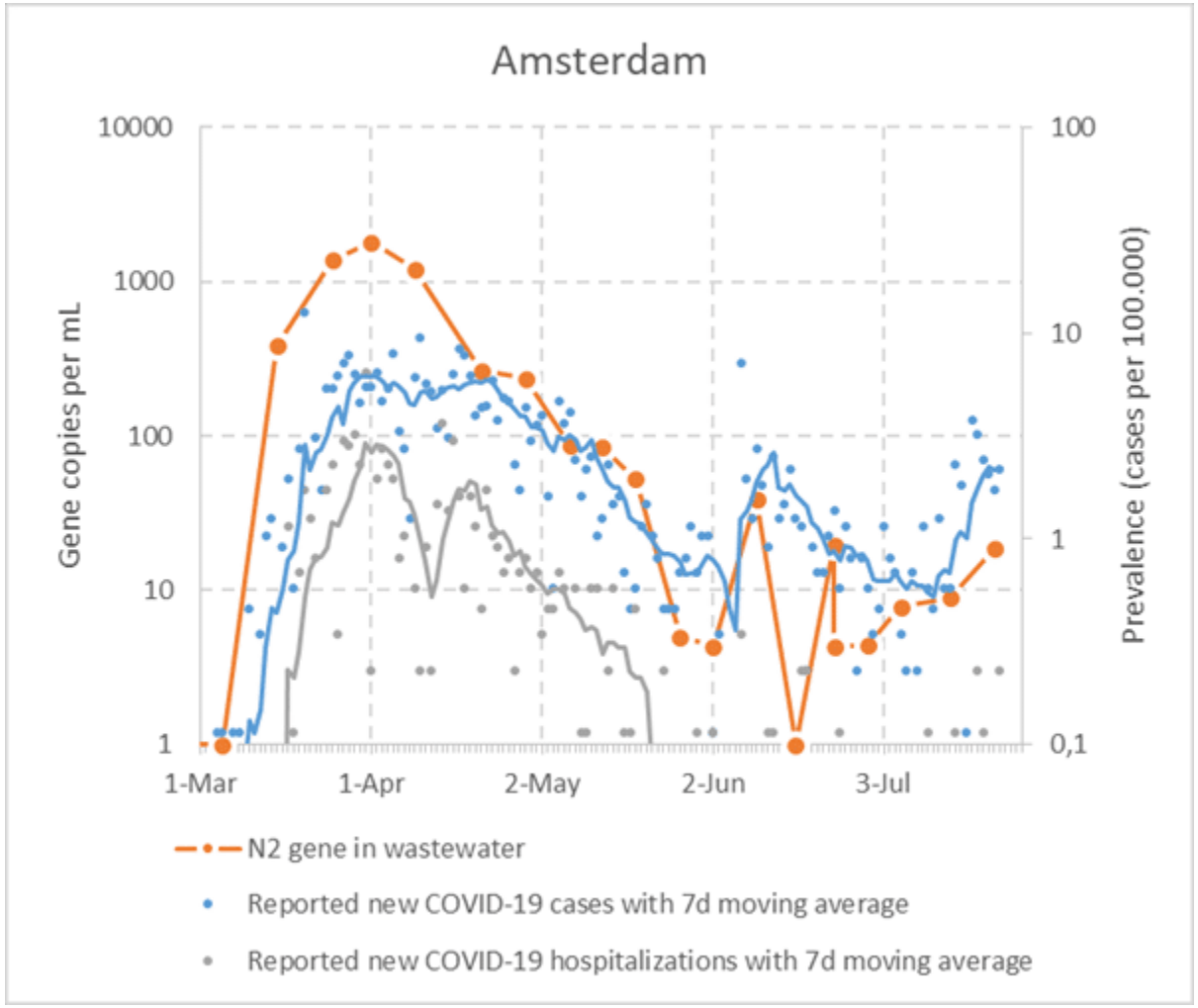
https://twitter.com/i/status/1317087976757907457

Transmission

poorly ventilated area
in Chinese Restaurant



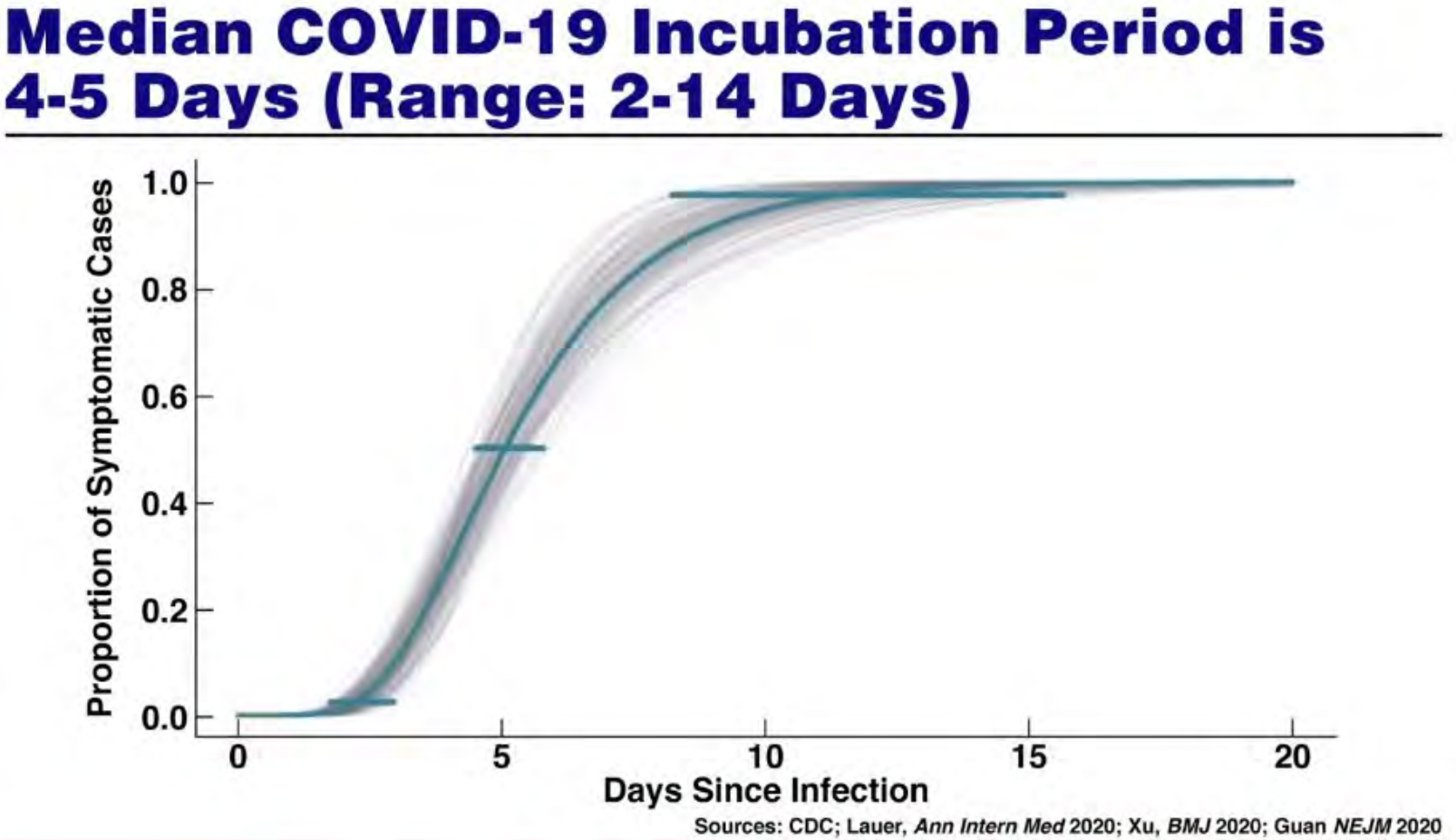
Sewage water monitoring



COVID-19 clinical

SARS-CoV-2

Incubation period



COVID-19 Clinical Presentation

Fever	83–99%
Cough	59–82
Fatigue	44–70
Anorexia	40–84
Shortness of breath	31–40
Myalgias	11–35

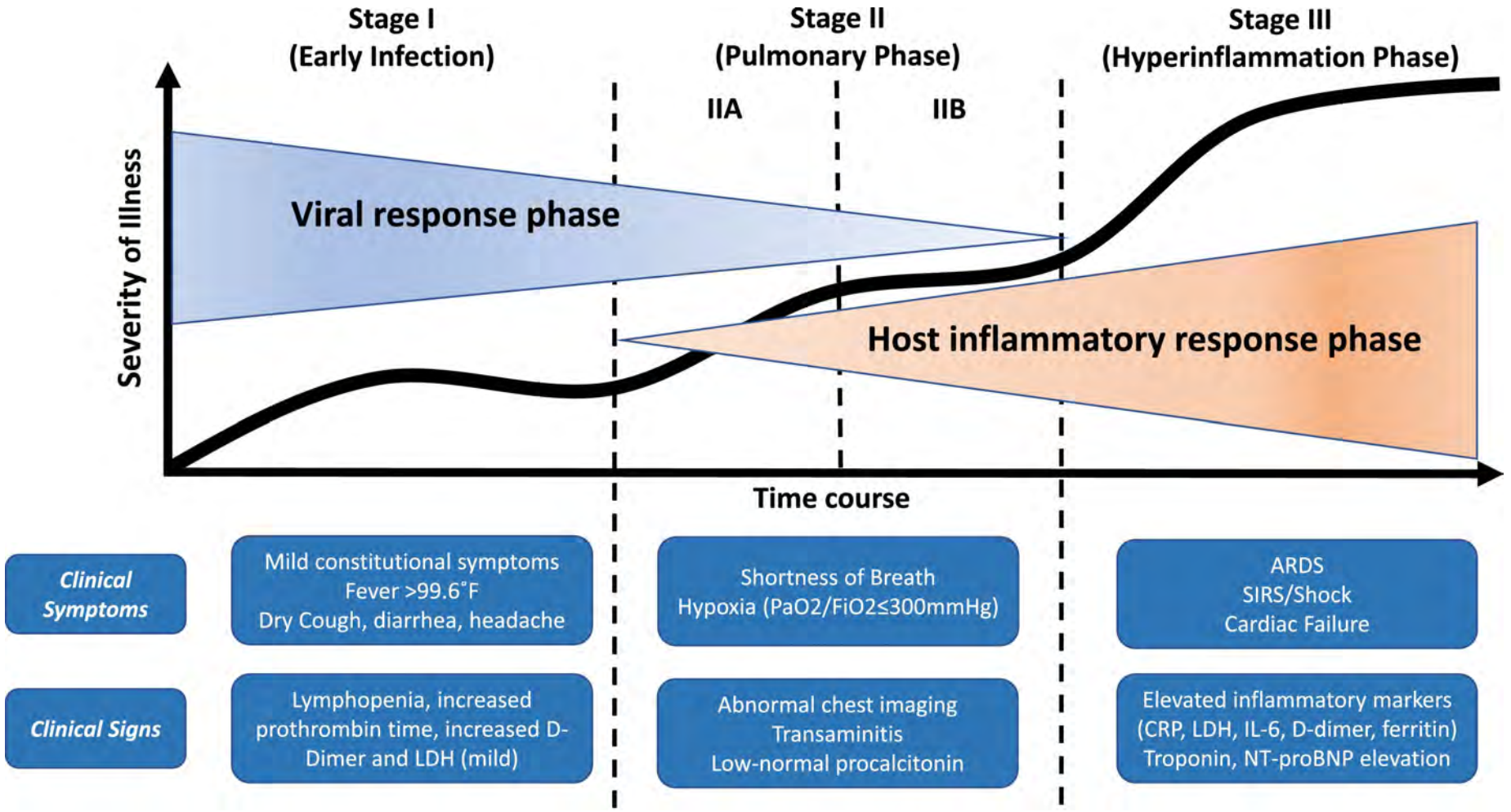
Other non-specific symptoms reported

- Sore throat, nasal congestion, headache, diarrhea, nausea, vomiting. Loss of smell/taste preceding the onset of respiratory symptoms.

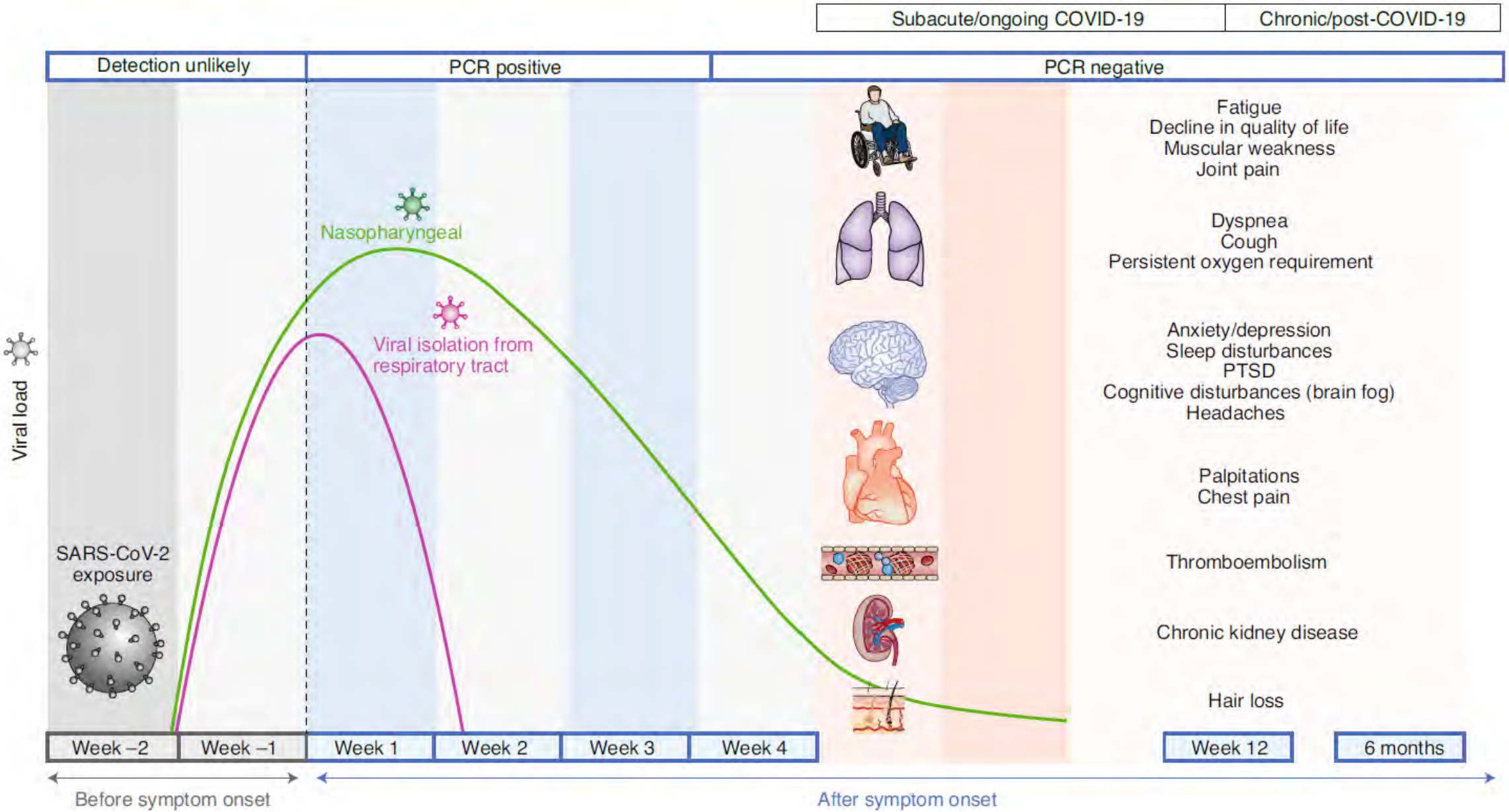
Source: WHO, 5/2020

IAS COVID-19 CONFERENCE

COVID-19: a disease in stages

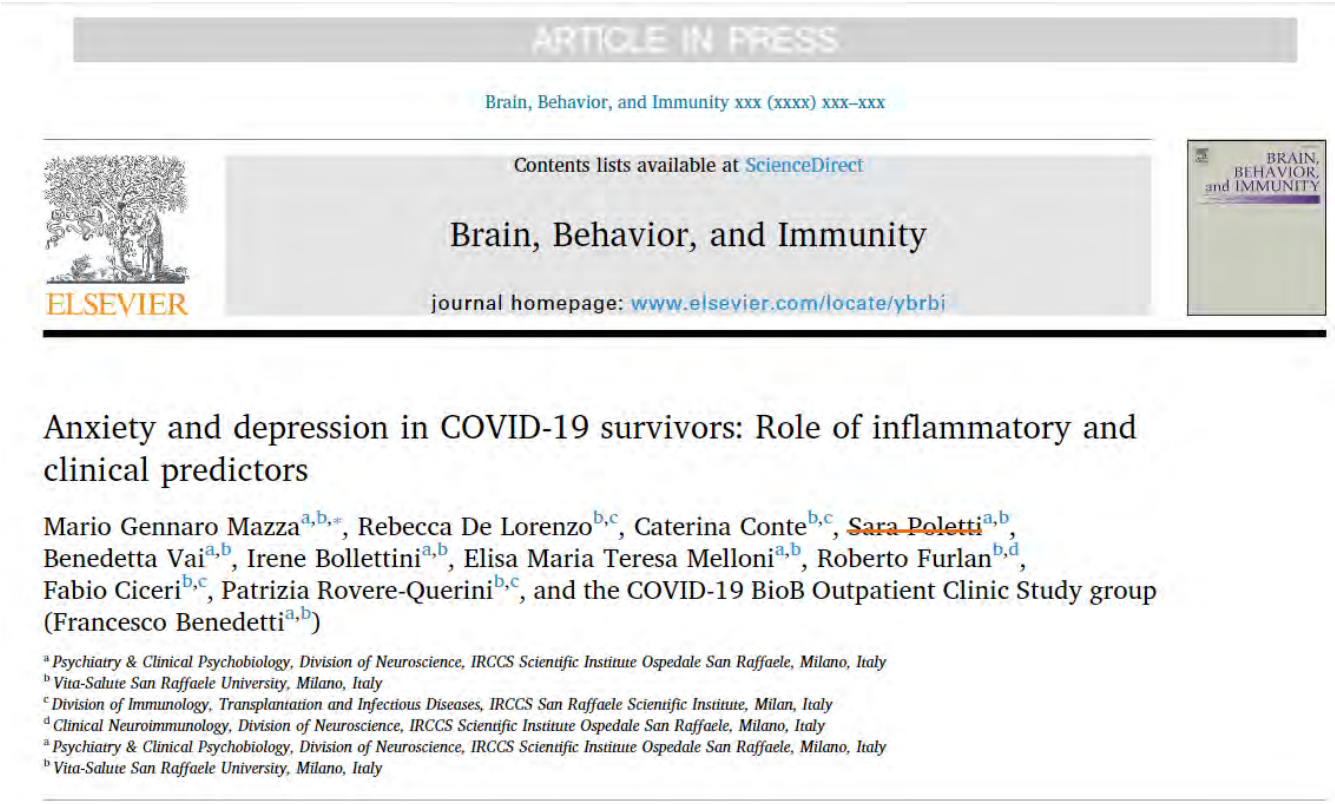


If untreated: ~70% death by ARDS, 30% by cytokine storm organ damage/sepsis



https://www.nature.com/articles/s41591-021-01283-z

- COVID-19, is associated with **psychiatric** implication
- 56% of the sample (n=402) presented a clinical score for at least one mental disorder
  - 28% PTSD
  - 31% depression
  - 42% anxiety
  - 40% insomnia
- **Psychiatric history**, setting, and length of hospitalization influenced psychopathology
- **Females** suffered more than males, scoring higher in all the measures
- There is the need to diagnose and treat psychiatric events in COVID-19 survivors



ARTICLE IN PRESS

Brain, Behavior, and Immunity xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Brain, Behavior, and Immunity

journal homepage: www.elsevier.com/locate/ybrbi

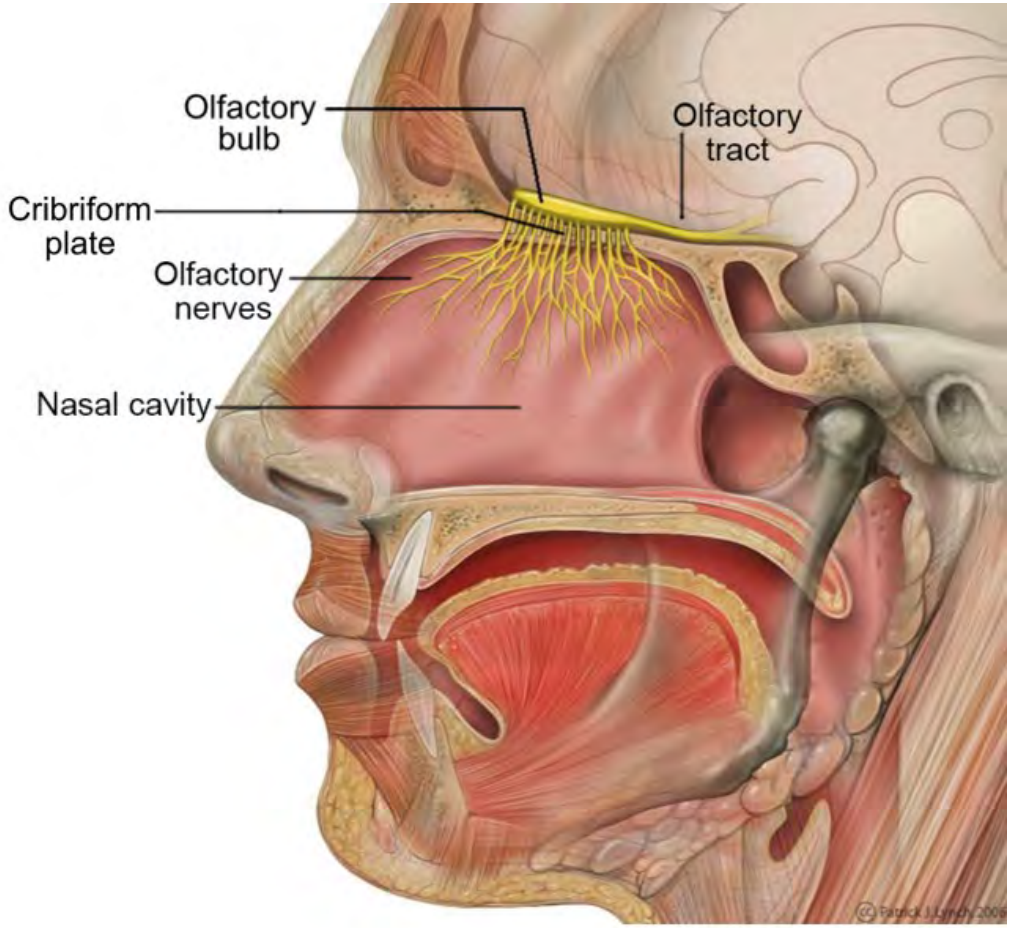
Anxiety and depression in COVID-19 survivors: Role of inflammatory and clinical predictors

Mario Gennaro Mazza[a,b,*], Rebecca De Lorenzo[b,c], Caterina Conte[b,c], Sara Poletti[a,b], Benedetta Vai[a,b], Irene Bollettini[a,b], Elisa Maria Teresa Melloni[a,b], Roberto Furlan[b,d], Fabio Ciceri[b,c], Patrizia Rovere-Querini[b,c], and the COVID-19 BioB Outpatient Clinic Study group (Francesco Benedetti[a,b])

[a] Psychiatry & Clinical Psychobiology, Division of Neuroscience, IRCCS Scientific Institute Ospedale San Raffaele, Milano, Italy
[b] Vita-Salute San Raffaele University, Milano, Italy
[c] Division of Immunology, Transplantation and Infectious Diseases, IRCCS San Raffaele Scientific Institute, Milan, Italy
[d] Clinical Neuroimmunology, Division of Neuroscience, IRCCS Scientific Institute Ospedale San Raffaele, Milano, Italy
[a] Psychiatry & Clinical Psychobiology, Division of Neuroscience, IRCCS Scientific Institute Ospedale San Raffaele, Milano, Italy
[b] Vita-Salute San Raffaele University, Milano, Italy

Neuro-invasion of the brain

- Olfactory neurons are crossing blood-brain barrier and are in direct contact with open air
- Explains neural COVID-19 symptoms (headache, nausea, vomiting, confusion)?
- SARS-CoV-2 can replicate in neural cell lines
- Transgenic mice: SARS & MERS can infect the brain through olfactory bulb
- Role in respiratory failure of patients?



Relation anosmia – depression

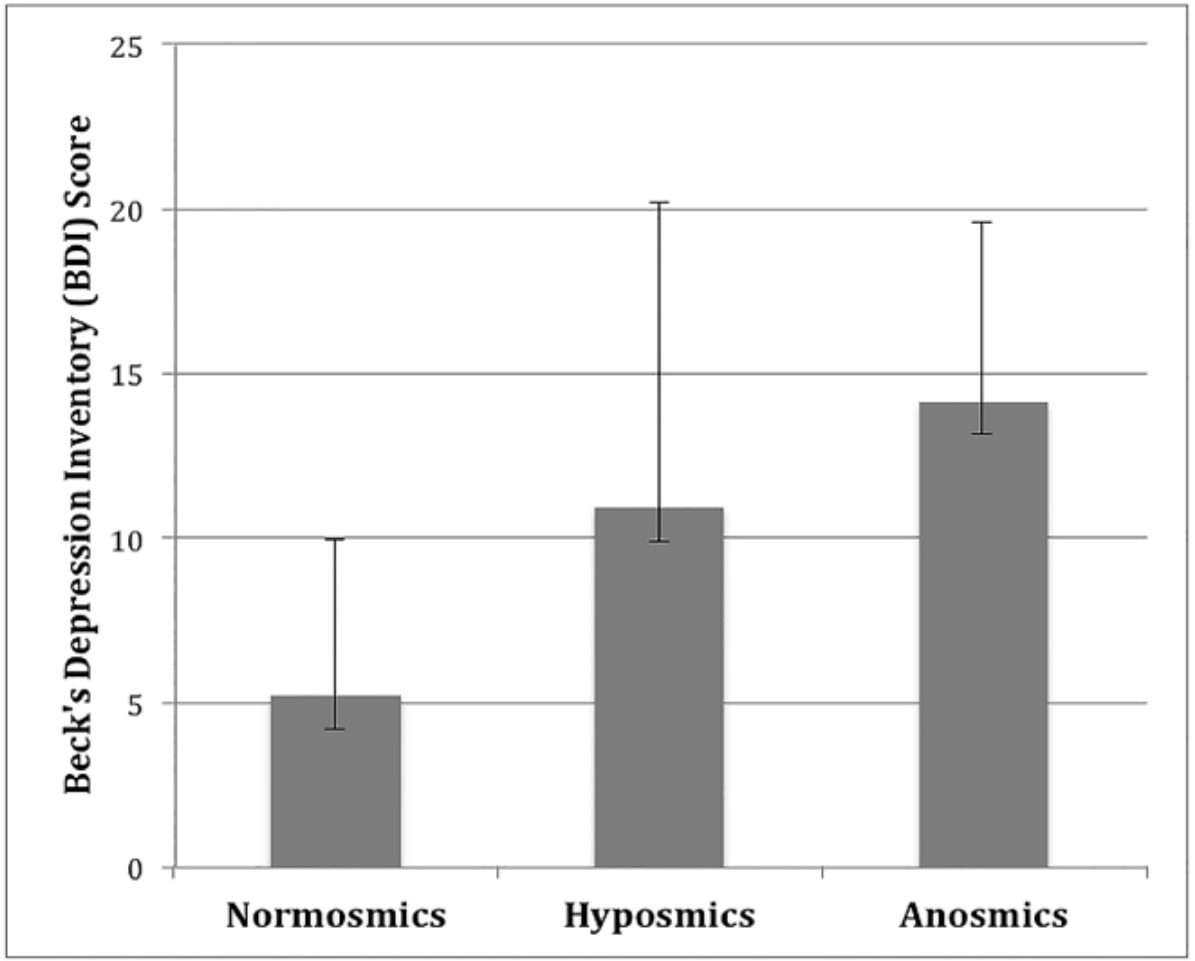
Chemical Senses, 2016, Vol 41, 479–486
doi:10.1093/chemse/bjw061
Review Article
Advance Access publication May 11, 2016

OXFORD

Review Article

The Association Between Olfaction and Depression: A Systematic Review

Preeti Kohli[1], Zachary M. Soler[1], Shaun A. Nguyen[1], John S. Muus[1] and Rodney J. Schlosser[1,2]



Normosmics vs hyposmics: p<0.0001
Normosmics vs anosmics: p<0.0001
Hyposmics vs anosmics: p=0.0274
BDI: Beck's Depression Inventory

Post-COVID syndrome

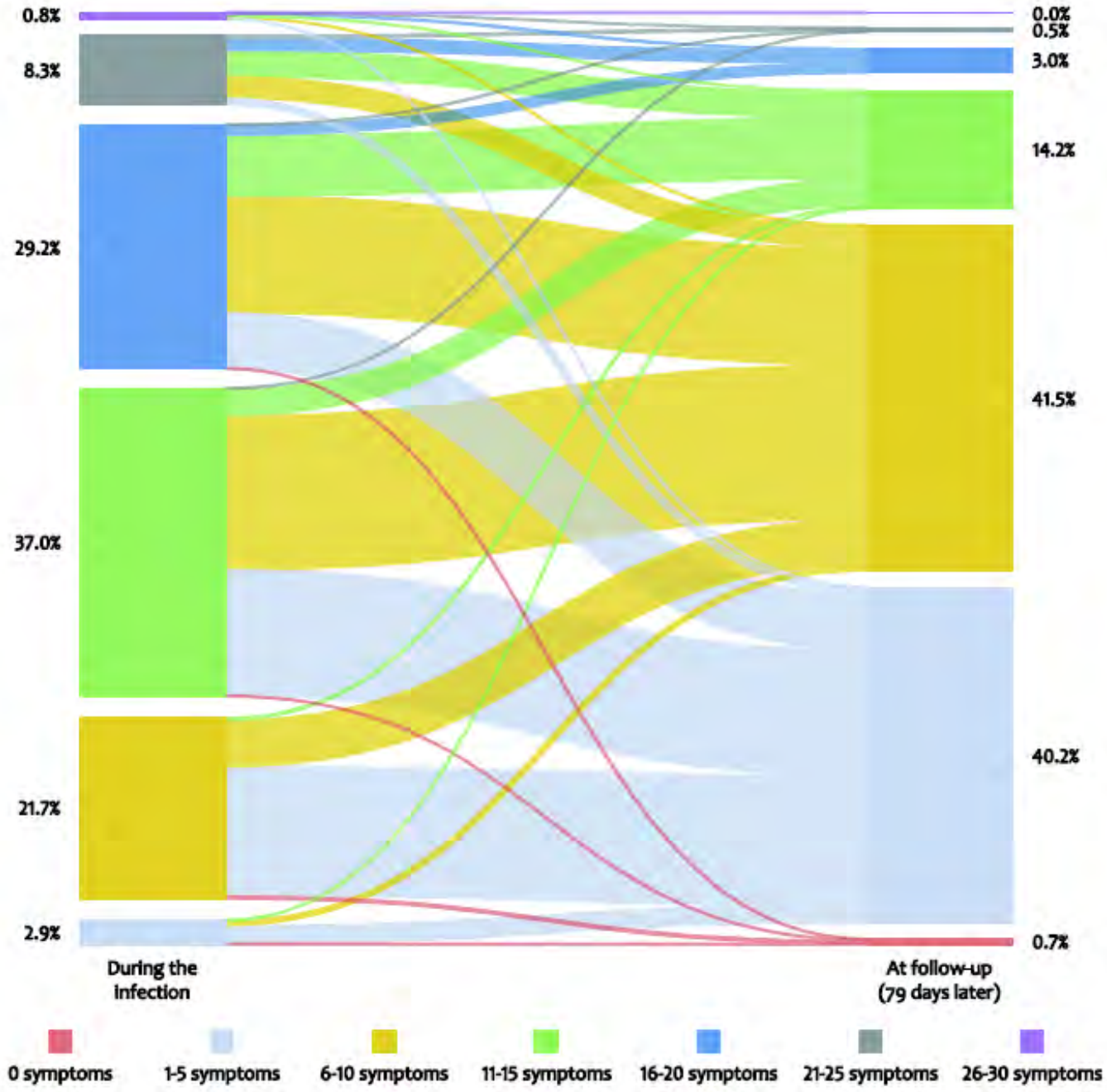
ERJ open research
THE BEST IN OPEN ACCESS BASIC, TRANSLATIONAL & CLINICAL RESPIRATORY RESEARCH

Early View

Original article

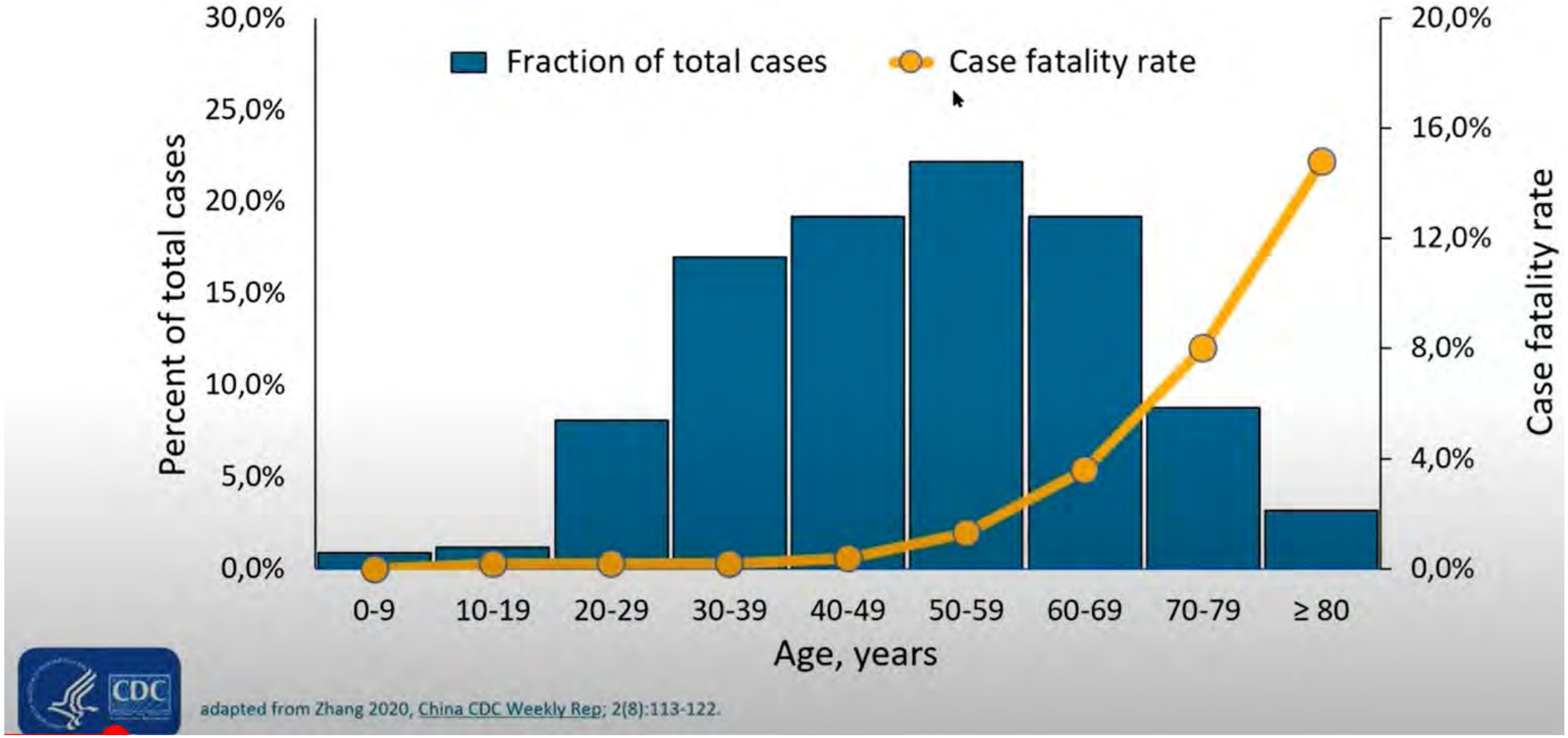
Persistent symptoms 3 months after a SARS-CoV-2 infection: the post-COVID-19 syndrome?

Yvonne M.J. Goërtz, Maarten Van Herck, Jeannet M. Delbressine, Anouk W. Vaes, Roy Meys, Felipe V.C. Machado, Sarah Houben-Wilke, Chris Burtin, Rein Posthuma, Frits M.E. Franssen, Nicole van Loon, Bita Hajian, Yvonne Spies, Herman Vijlbrief, Alex J. van 't Hul, Daisy J.A. Janssen, Martijn A. Spruit



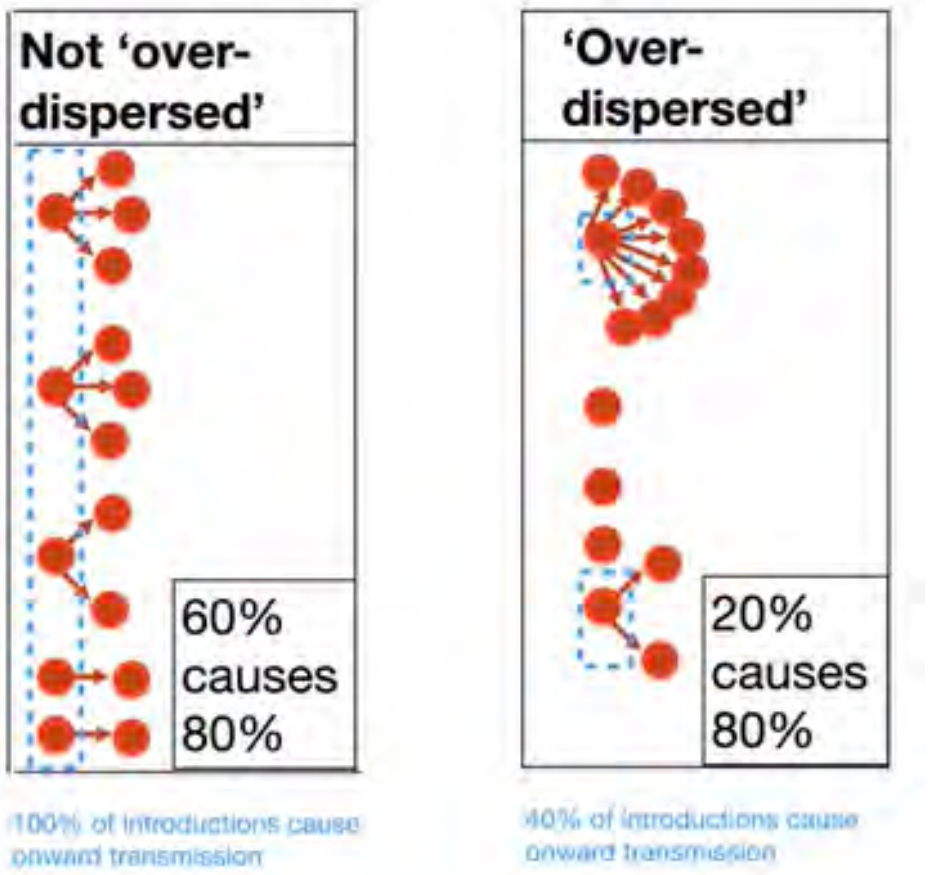
COVID-19 epidemiology

COVID-19 fatality rates



Superspreading

- Average R0 of SARS-CoV-2 ~2.5
- But: R0 is heterogeneous



20% of patients cause 80% of infections

- 1,000 → 2,500 (R0=2.5)
  - 200 → 2,000
  - 200 → 500
  - 600 → 0

nature medicine
LETTERS
https://doi.org/10.1038/s41591-020-1092-0
Check for updates

Clustering and superspreading potential of SARS-CoV-2 infections in Hong Kong

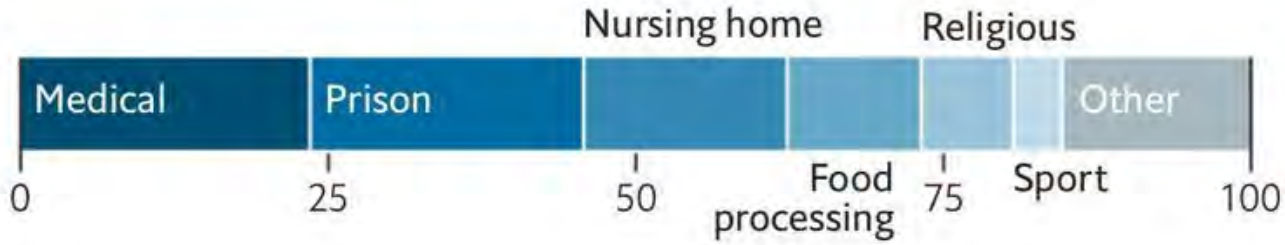
Superspreading is not rare

RESEARCH

CORONAVIRUS

Epidemiology and transmission dynamics of COVID-19 in two Indian states

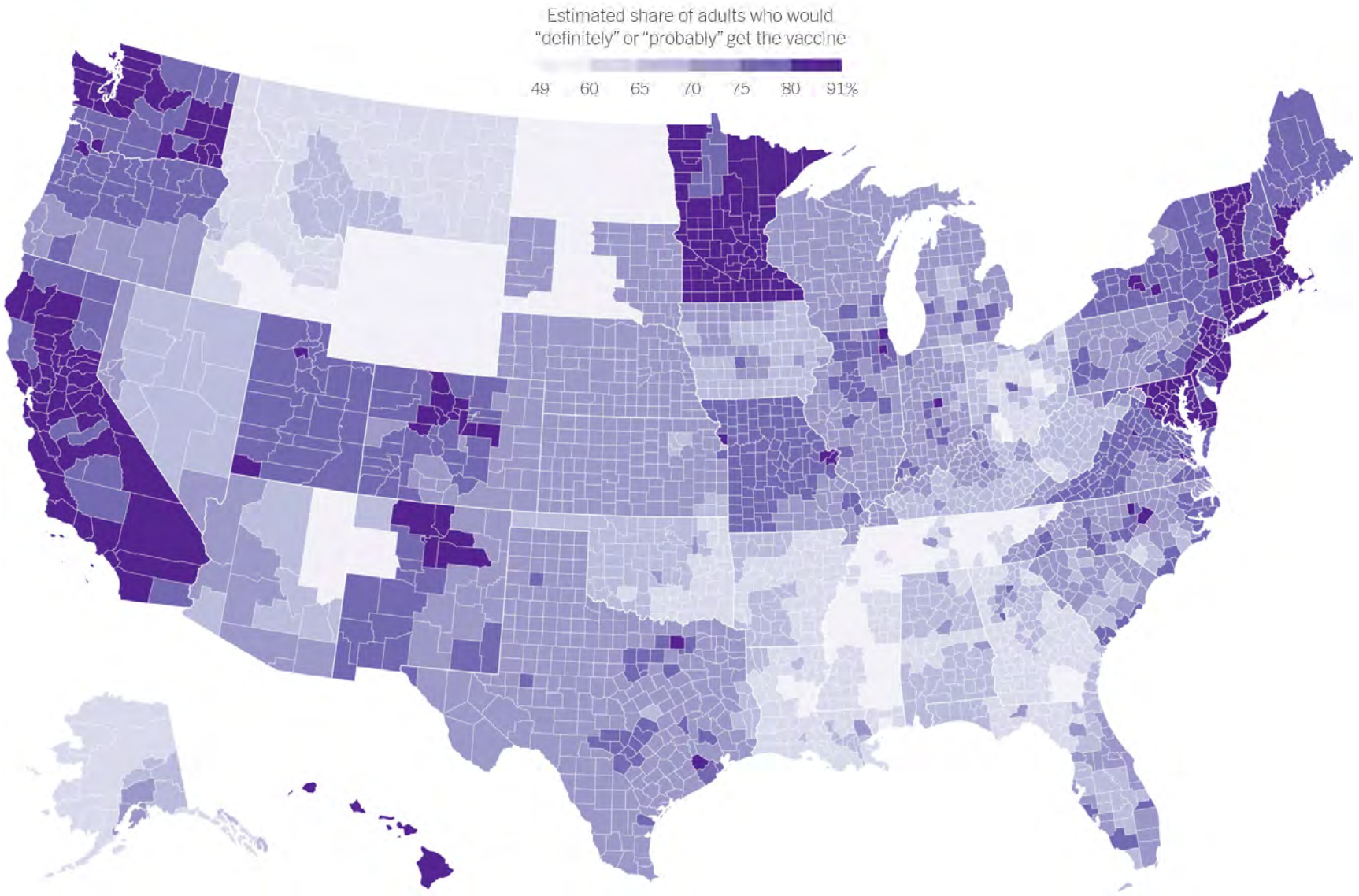
Ramanan Laxminarayan[1,2,3], Brian Wahl[3,4], Shankar Reddy Dudala[5], K. Gopal[6], Chandra Mohan B[7], S. Neelima[8], K. S. Jawahar Reddy[9], J. Radhakrishnan[10], Joseph A. Lewnard[11,12]*



https://science.sciencemag.org/content/370/6517/691

Herd immunity possible?

- There is uneven willingness in the world to get vaccinated
- Today mutants have R0=5 → heard immunity only at 80% coverage



https://www.nytimes.com/2021/05/03/health/covid-herd-immunity-vaccine.html?campaign_id=154&emc=edit_cb_20210503&instance_id=30160&nl=coronavirus-briefing&regi_id=159673391&segment_id=57134&te=1&user_id=3dee7e9dca784a37060233df65d96b61

World Statistics

July 6, 2020

World Health Organization

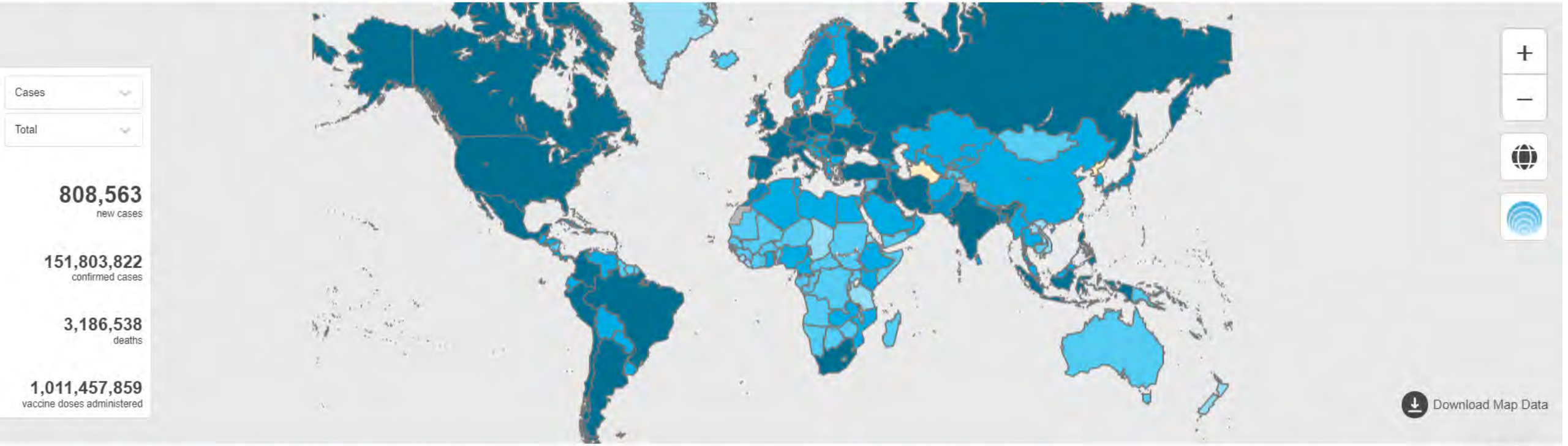
Search by Country, Territory, or Area

Covid-19 Response Fund

Donate

WHO Coronavirus (COVID-19) Dashboard

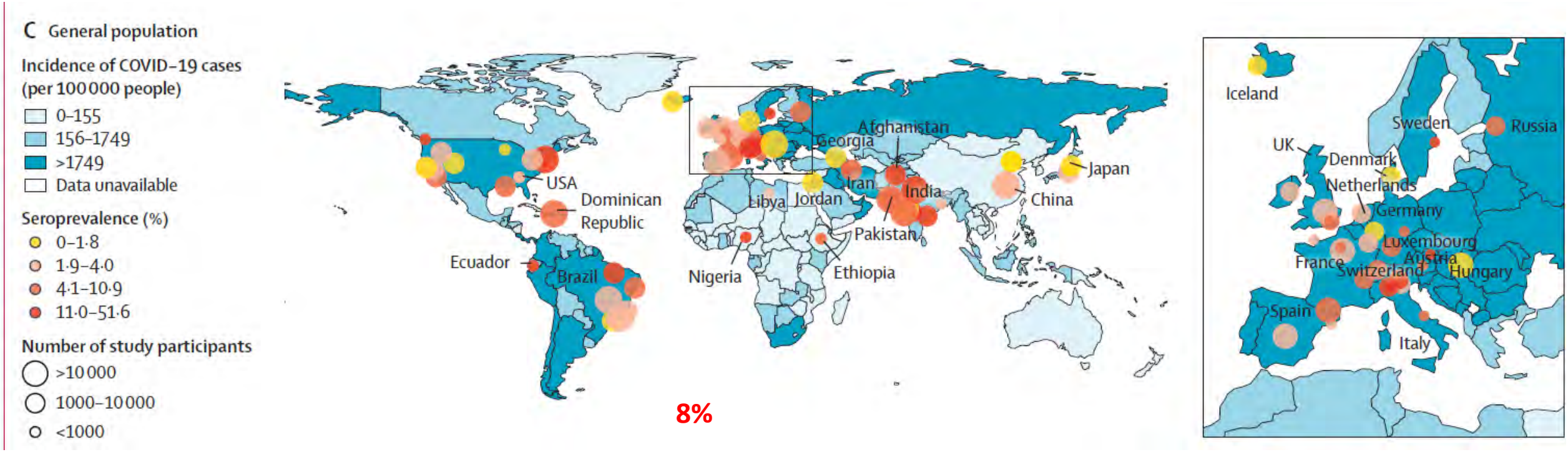
Overview | Data Table | Explore



Globally, as of **3:09pm CEST, 2 May 2021**, there have been **151.803.822 confirmed cases** of COVID-19, including **3.186.538 deaths**, reported to WHO. As of **29 April 2021**, a total of **1.011.457.859 vaccine doses** have been administered

Over 150 million…. how accurate?

Worldwide COVID antibody prevalence



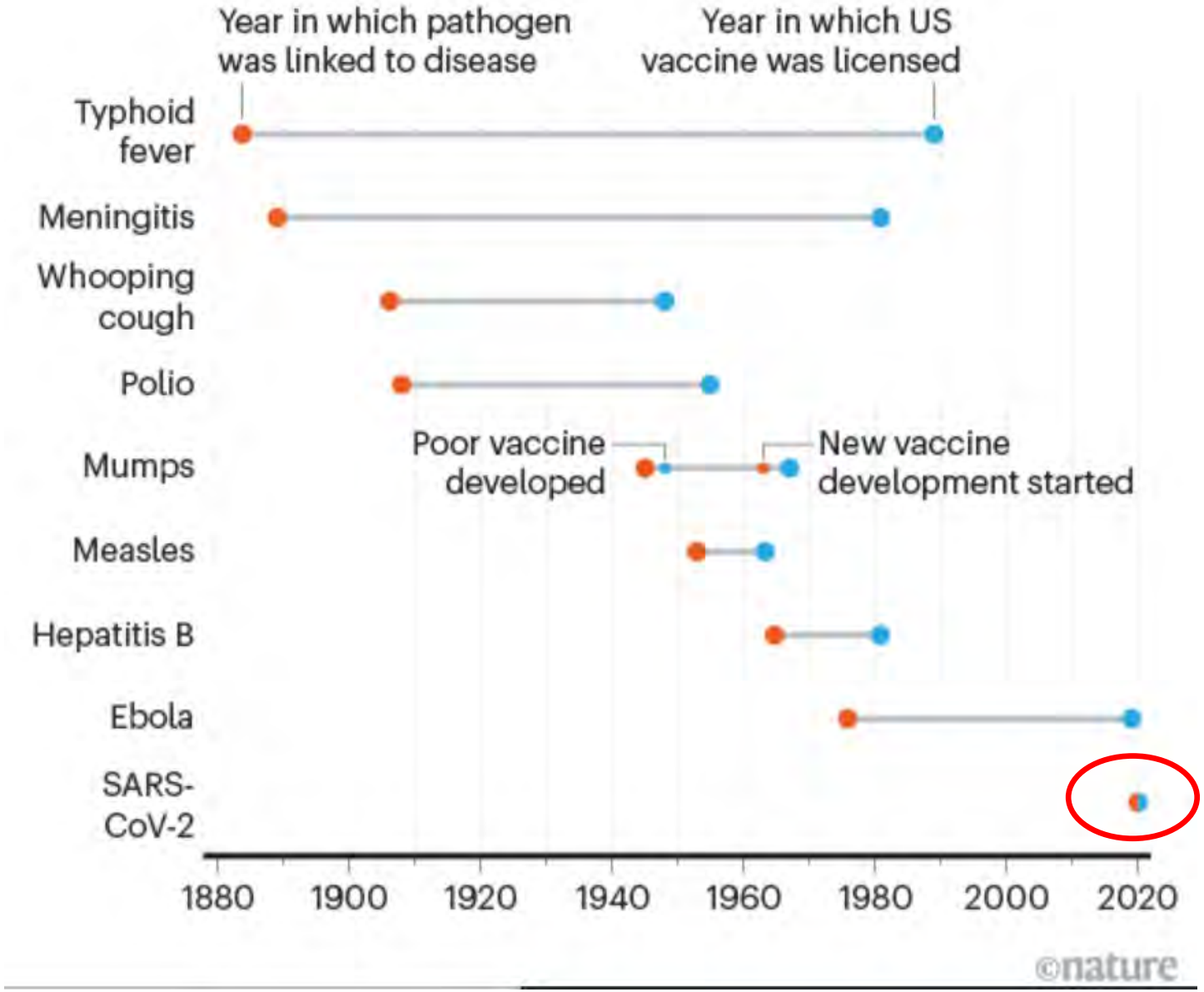
8% of 7.8 billion people = 624 million COVID infections (5x)

https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(21)00026-7/fulltext

Vaccines

Vaccine speed record

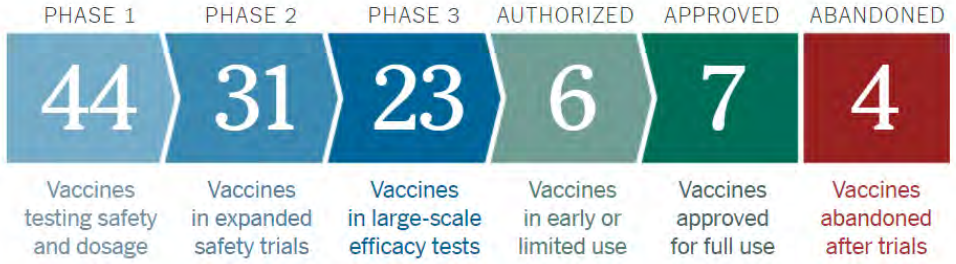
- years of **previous research** on related viruses and faster ways to manufacture vaccines
- **enormous funding** that allowed firms to run multiple trials in parallel
- **regulators moving more quickly** than normal



New York Times

Coronavirus Vaccine Tracker

By Carl Zimmer, Jonathan Corum and Sui-Lee Wee Updated March 20, 2021



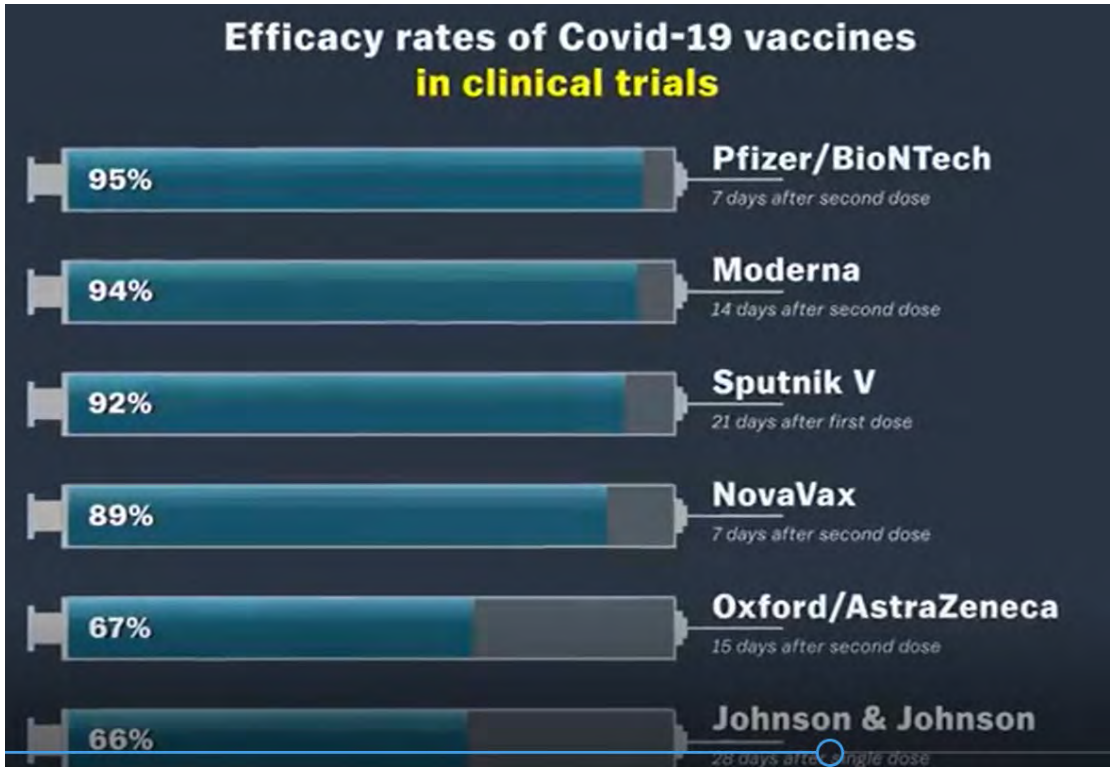
Leading vaccines

Developer	Type	Phase	Status
Pfizer-BioNTech	mRNA	2 3	Approved in Canada and other countries. Emergency use in U.S. and other countries.
Moderna	mRNA	3	Approved in Canada. Emergency use in U.S.
Gamaleya	Adenovirus	3	Early use in Russia. Emergency use in Belarus, Argentina.
CanSino	Adenovirus	3	Limited use in China.
Johnson & Johnson	Adenovirus	3	
Oxford-AstraZeneca	Adenovirus	2 3	
Vector Institute	Protein	3	Early use in Russia.
Novavax	Protein	3	
Sinovac	Inactivated	3	Limited use in China.
Sinopharm-Beijing	Inactivated	3	Approved in U.A.E., Bahrain. Limited use in China.
Sinopharm-Wuhan	Inactivated	3	Limited use in China, U.A.E.

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

Vaccine efficacy

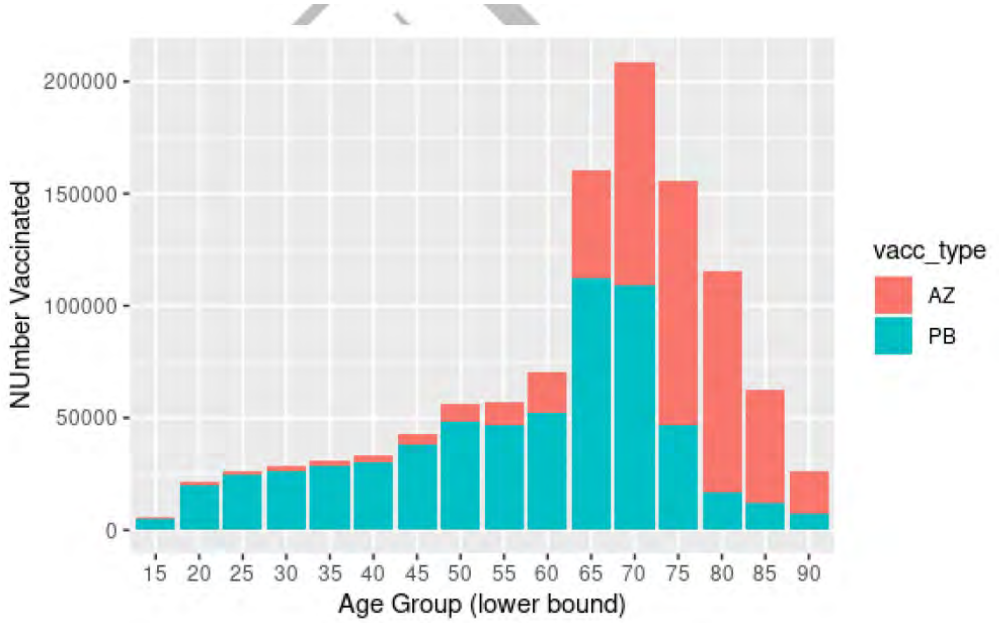
clinical trials versus real-life



https://www.youtube.com/watch?v=K3odScka55A

First real-life effectiveness studies: Scotland

- Effectiveness of first dose of COVID-19 vaccines against hospital admissions in Scotland: national prospective cohort study of 5.4 million people
- Pfizer (BNT162b2) → 85% prevention of COVID-19 related hospitalization at 28-34 days post-vaccination
- AstraZeneca (ChAdOx1) → 94%
- For ≥80 years: combined vaccine effect for prevention of COVID-19 related hospitalization: 81% at 28-34 days post-vaccination



https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3789264

Risk of blood clots AstraZeneca

6 months of full protection Pfizer

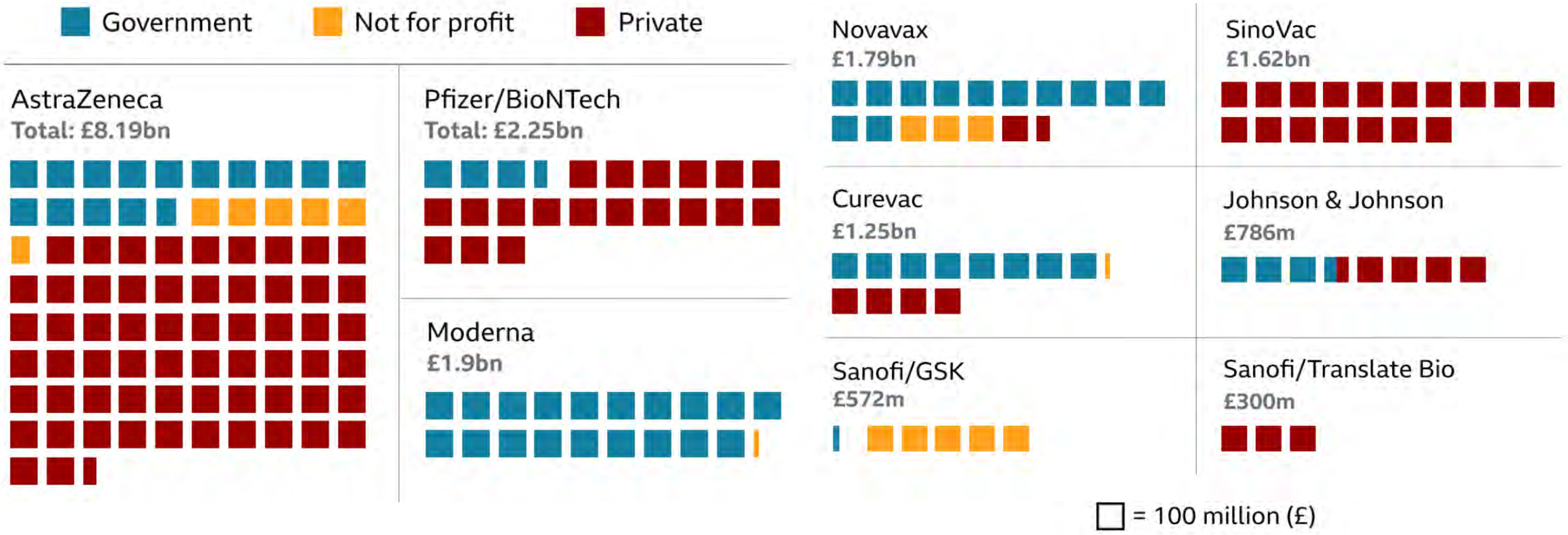
(to be submitted for publication)

SLASHGEAR TECH CARS GAMING ENTERTAINMENT SCIENCE

Pfizer: COVID-19 vaccine still effective six months after shots

Chris Davies - Apr 1, 2021, 11:27am CDT

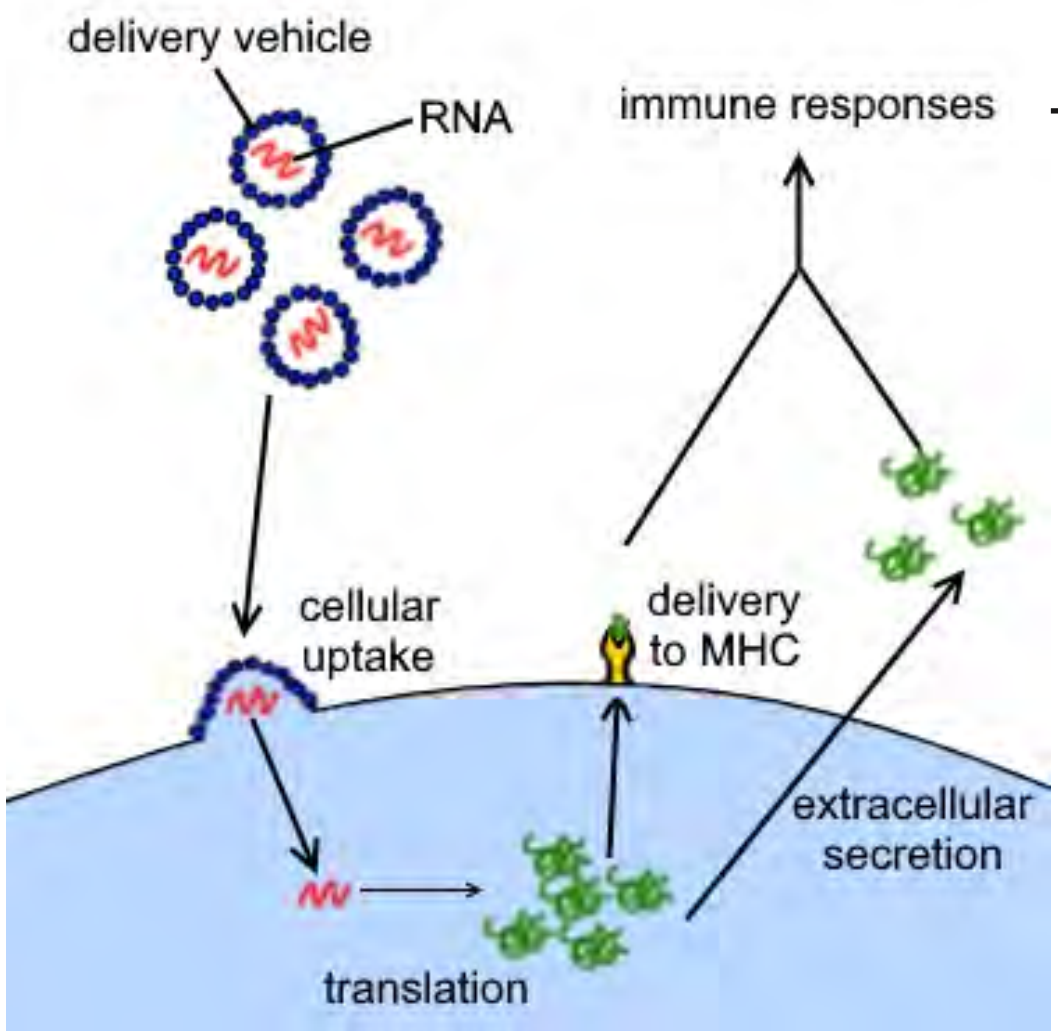
Funding COVID vaccine development

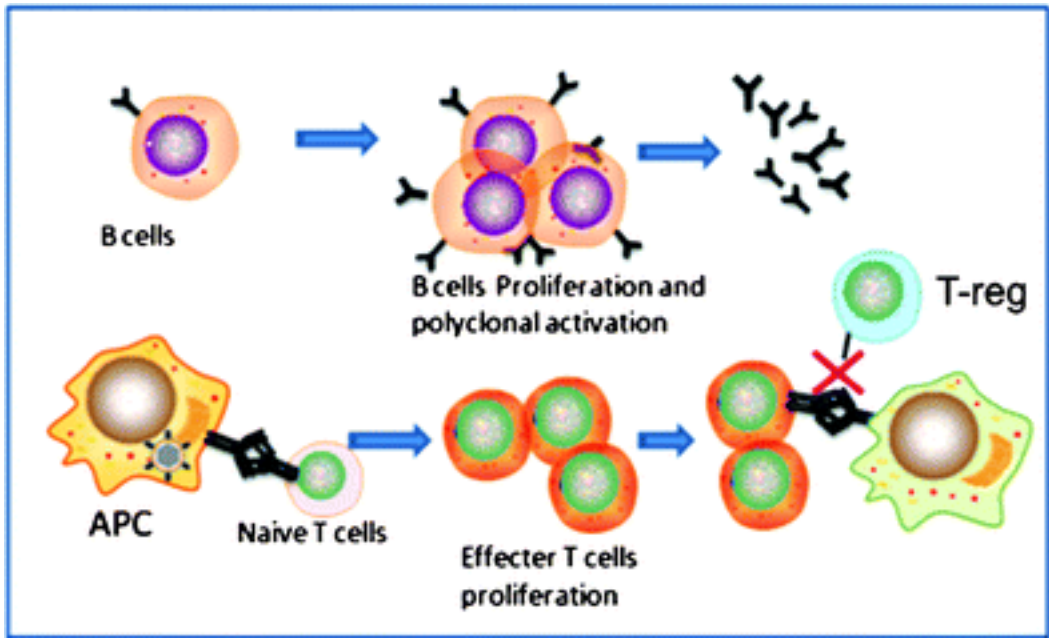


https://www.bbc.com/news/business-55170756

Private: Gates Foundation, Alibaba founder Jack Ma, etc.

How do RNA vaccines work?





Pfizer Vaccine ingredients

1. mRNA → specifically codes for SARS-CoV-2 S-protein
2. ((4-hydroxybutyl)azaandiyl)bis(hexaan-6,1-diyl)bis(2-hexyldecanoaat) (ALC-0315)
3. 2-[(polyethyleenglycol)-2000]-N,N-ditetradecylacetamide (ALC-0159)
4. 1,2-distearoyl-sn-glycero-3-fosfocholine (DSPC)
5. Cholesterol

Lipid nanoparticle

6. Potassium chloride
7. Potassium dihydrogen phosphate
8. Sodium chloride
9. Di sodium phosphate hydrate

Salts to prevent lipid nanoparticle from disintegrating

10. Sucrose → antifreeze
11. Water → dissolve

WHO working group

Health Topics | Countries | Newsroom | Emergencies | Data | About Us

Smart Yellow Card Working Group

A consortium focussed on establishing standards for a common architecture for a digital smart yellow card to support the anticipated vaccine(s) against COVID-19 and other immunizations."

A multi-sectoral consortium focused on supporting a governance model, joint learning, and key standards for a digital smart yellow card and trusted architecture to support roll out of the anticipated COVAX, and application to other routine immunisation systems.

Goals

1. Achieve consensus on common standards and governance for security, authentication, privacy, and data exchange;
2. Strategically align efforts and collaboration to manage lessons learned and commonalities; and
3. Establish guidance for member states to facilitate informed adoption.

Contact

smartyellowcard@who.int

https://www.who.int/groups/smart-yellow-card-working-group

COVID-19 TRAVEL PASS

PATHOLOGISTS
LANCET
KENYA (PLK)
Key to diagnostic excellence
Maabara ya Kisasa

Trusted Travel Certificate

- A person intending to travel out of Kenya is expected to take a COVID -19 test and is expected to present a Trusted Travel (TT) Certificate at the exit border points
- Once the test is done, our lab uploads the results to Panaboios' System
- The traveler will receive an SMS from Panaboios' with a Trusted Travel Code to access a link to their Trusted Travel Certificate

'Panabios is a travel documentation system that is a
Smart, secure, standardized
Transcontinental COVID-19 Travel documentaion partner

This is an Initiative by African Union · AFRICA CDC · KAA · Trusted Travel

0703 061 000 · info@lancet.co.ke · www.lancet.co.ke

KENYA ACCREDITATION SERVICE KENAS — Our COVID-19 PCR test is KENAS ACCREDITATED

Pathologist Lancet Kenya was the first private lab in Africa and the only one in the region to attain ISO15189 accreditation specific for COVID-19 PCR test and also the first private lab in Kenya to be approved to offer the Trusted Travel Certificate

To book a test online visit www.lancet.co.ke/covid-19-tests/

sanas Medical Laboratory
M0462
ISO15189
Accredited since 2010 to Date

Africa

CDC Africa dashboard

https://africacdc.org/covid-

- Africa hosts **1/6th** of the world population: 1.2B out of 8B
- Africa hosts only **1/30th** of the COVID cases: 3.5M out of 100M

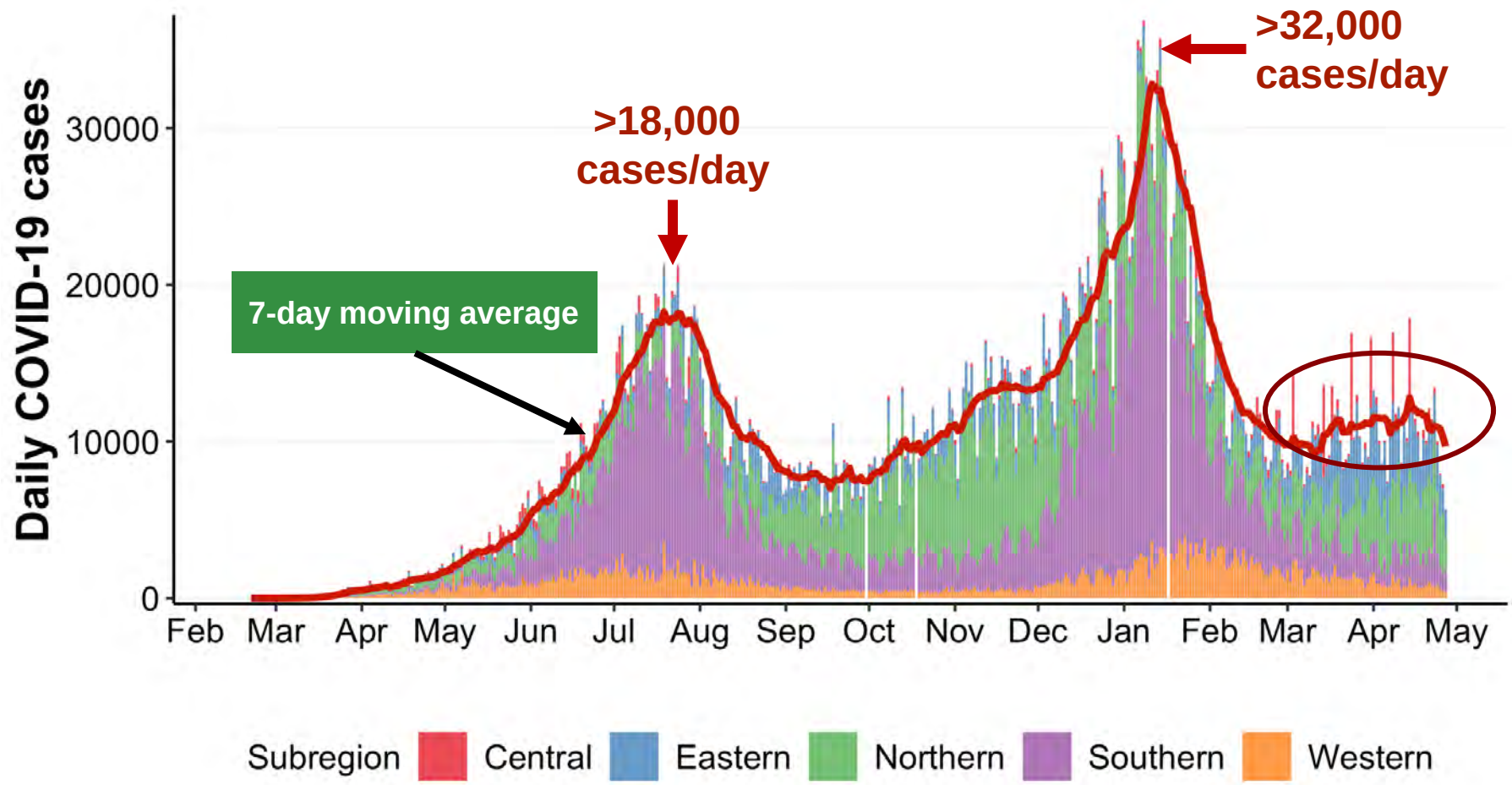
COVID-19 CASES IN AFRICA | TRENDS

15 February 2020 – 28 April 2021

>4.3M
cases

>3.9M
recoveries
(90%)

>116K
deaths
CFR: 2.7%



African Union

AFRICA CDC
Centres for Disease Control and Prevention
Safeguarding Africa's Health

NEW COVID-19 CASES* REPORTED / 1 MILLION POPULATION PER DAY BY AU MEMBER STATE

12 – 18 April 2021

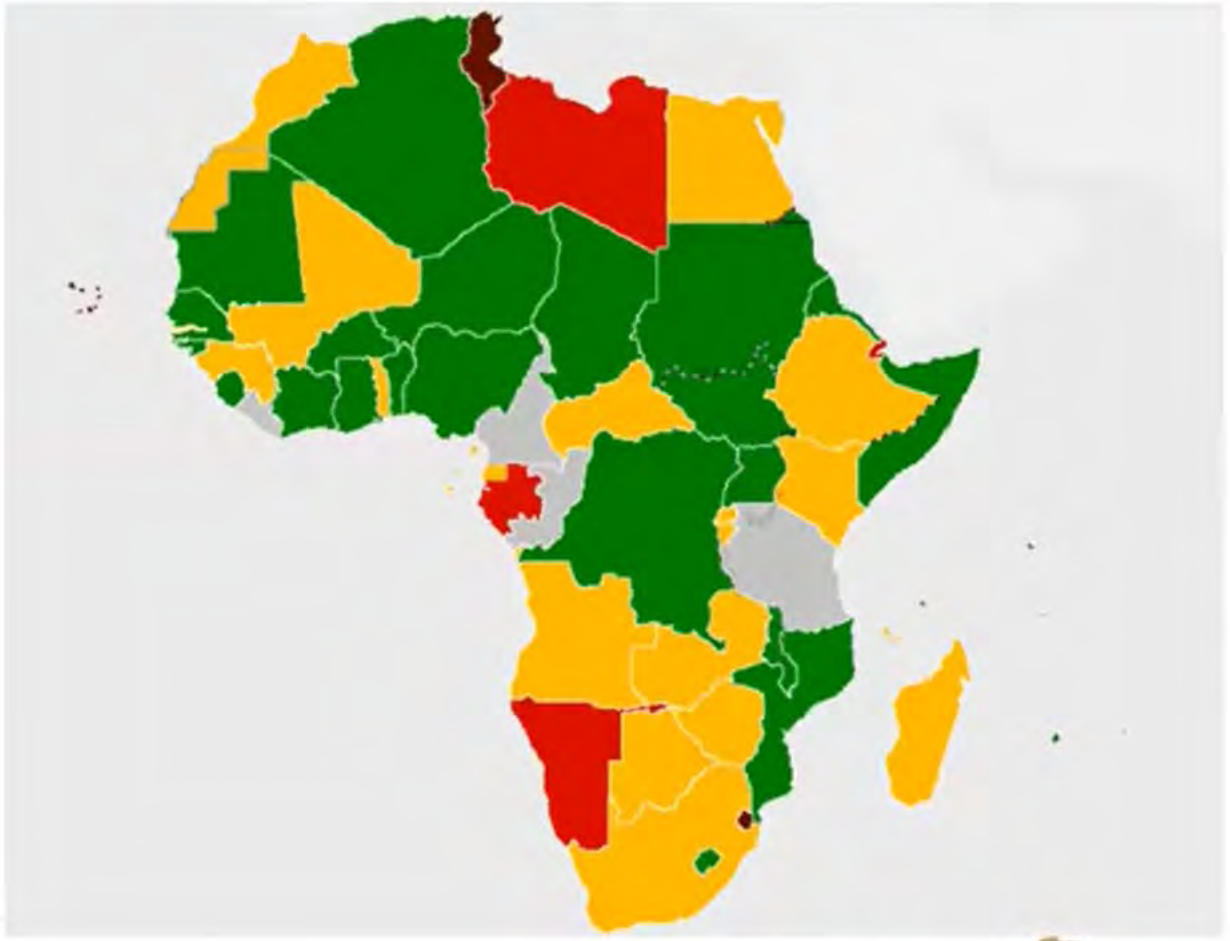
4
countries
No information

27
countries
<5 cases/1M/day

16
countries
5-50 cases /1M/day

4
countries
>50-100 cases /1M/day

4
countries
>100 cases /1M/day



*Cases / 1,000,000 population as reported from official RCC and Member State reports.

African Union

AFRICA CDC
Safeguarding Africa's Health | www.africacdc.org

CASE FATALITY RATE* (CFR) BY AU MEMBER STATE

12 – 18 April 2021

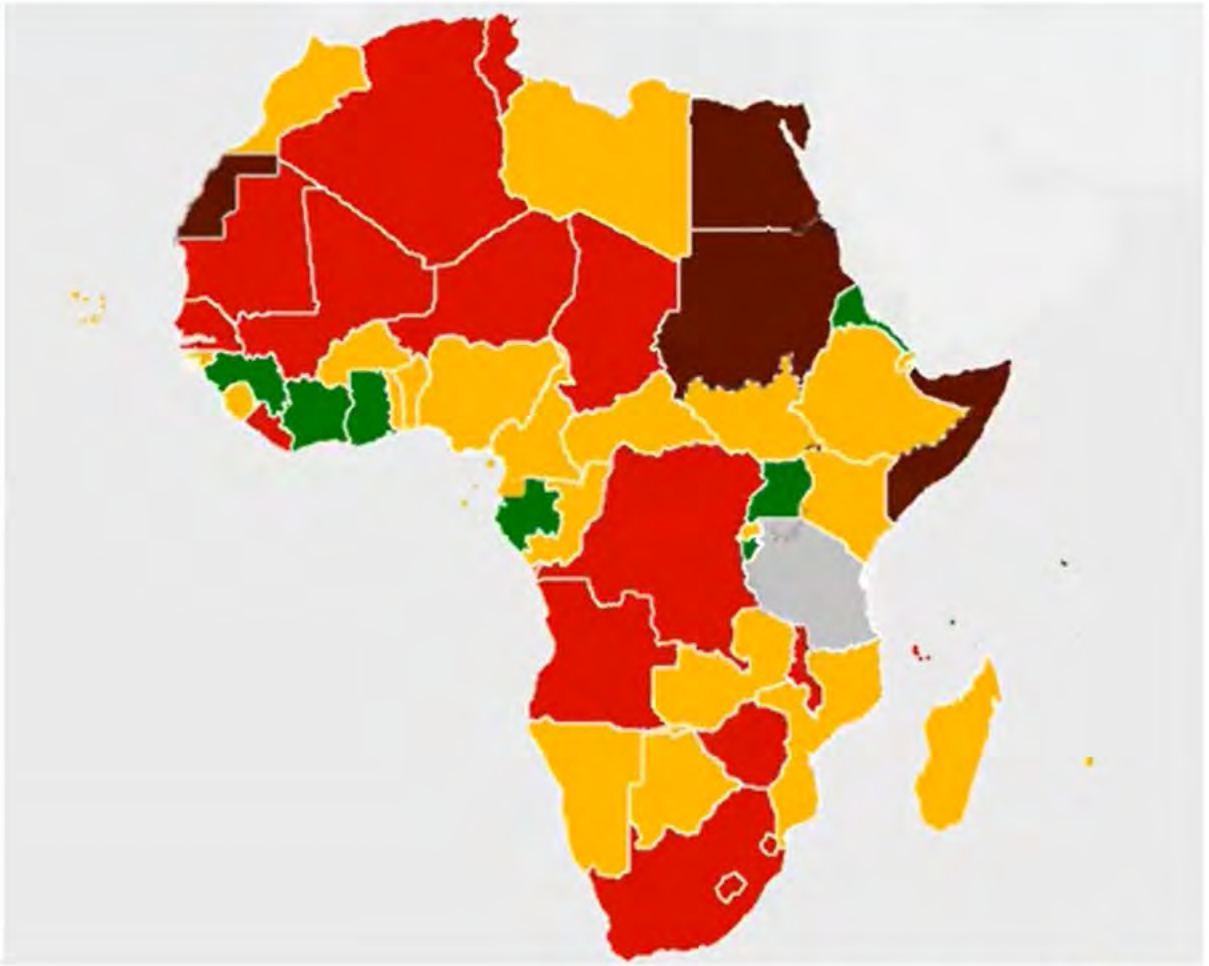
1
country
No information

10
MS reporting <1%

23
MS reporting 1-2.2%

18
MS reporting >2.2-5%

4
MS reporting >5%



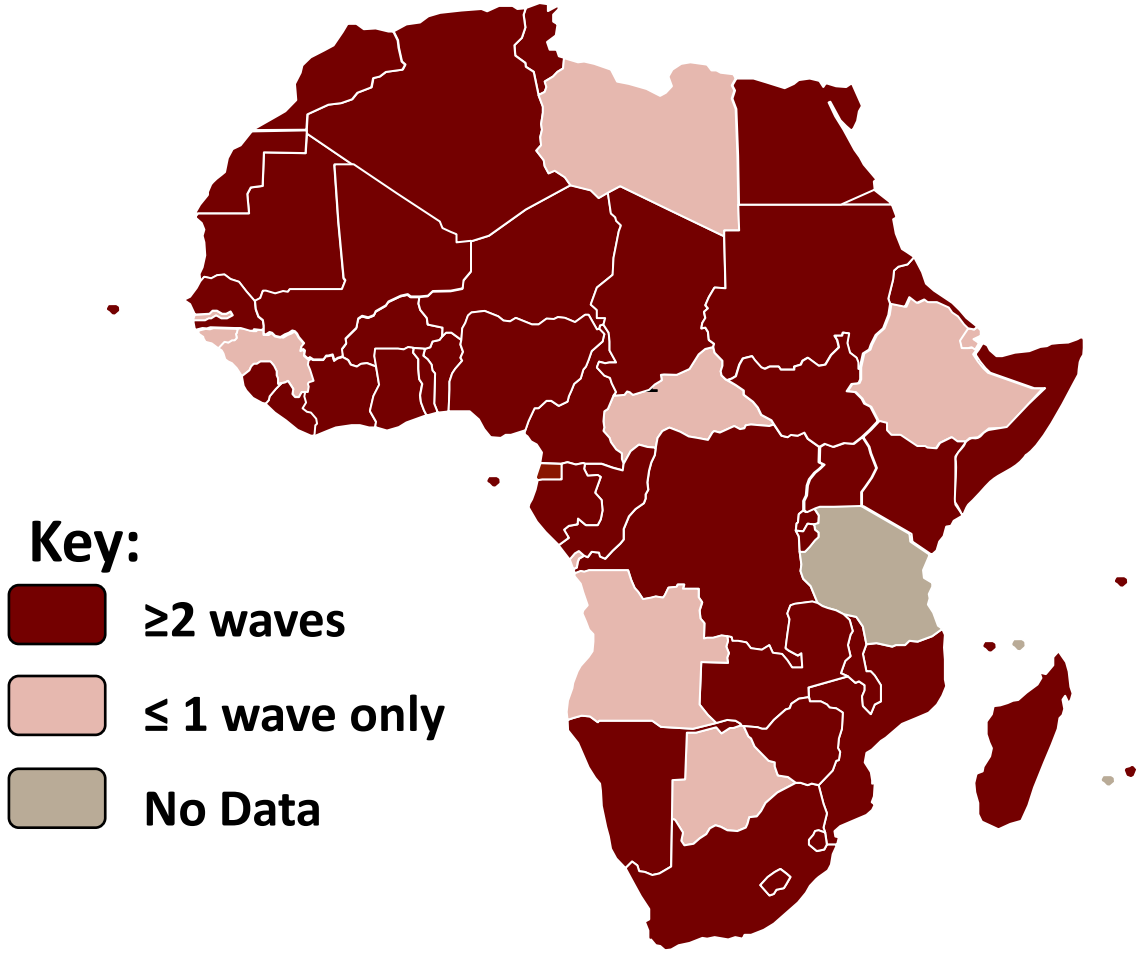
*Africa numbers are taken from official RCC and Member State reports.

African Union

AFRICA CDC
Safeguarding Africa's Health | www.africacdc.org

MOST COUNTRIES ARE NOW EXPERIENCING THE SECOND WAVE OF COVID-19

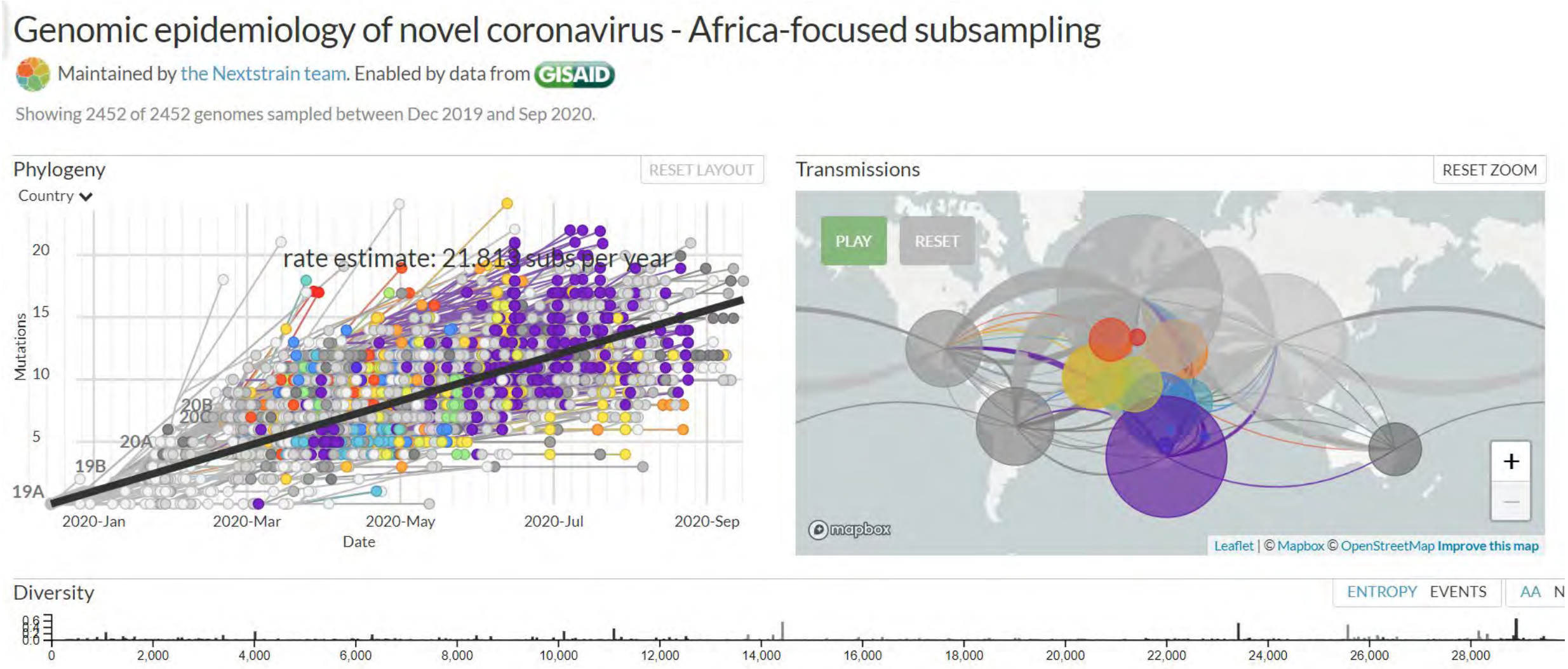
- **44 (80%) Member States** have experienced or are experiencing a **2nd wave of cases**



African Union

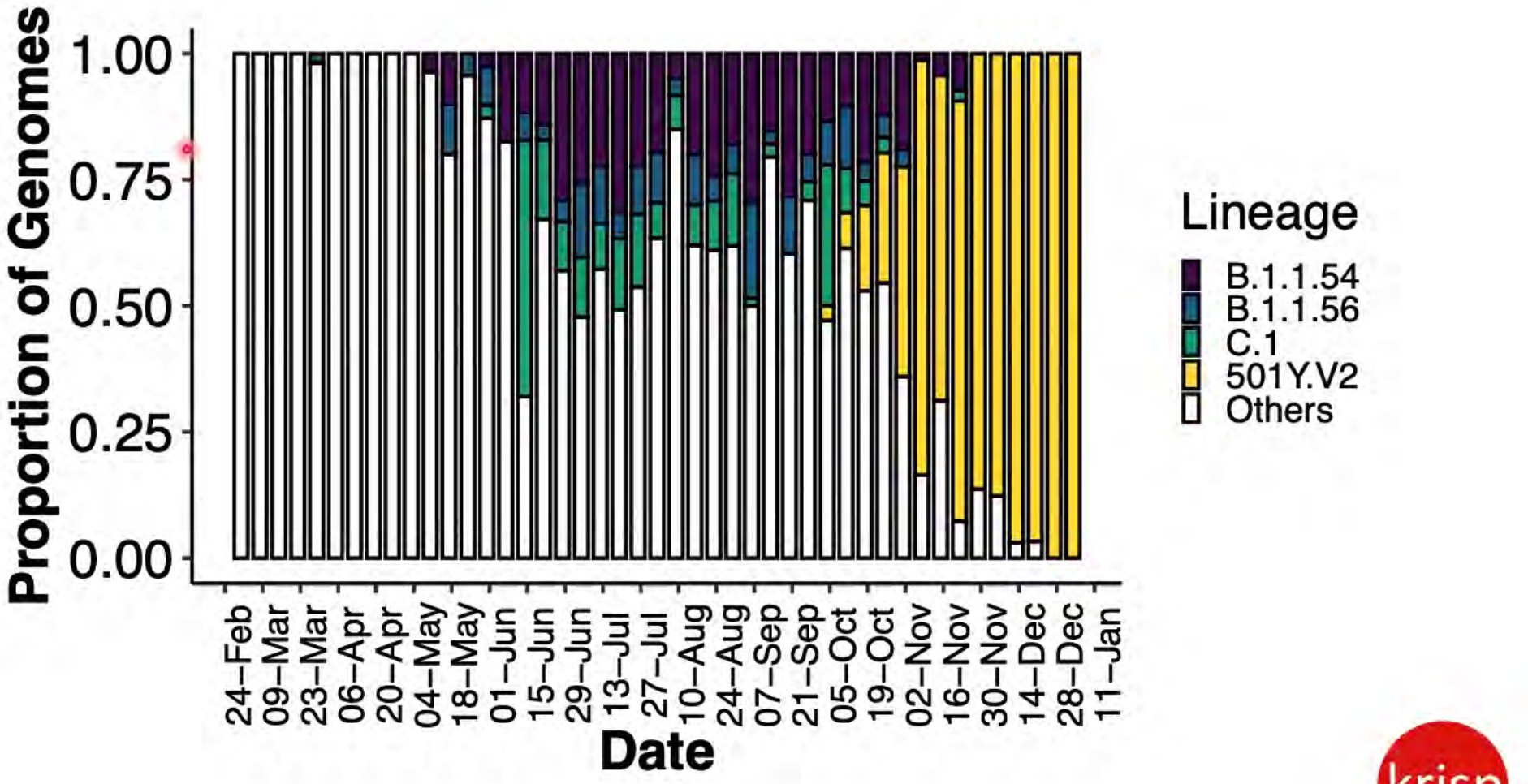
AFRICA CDC
Centres for Disease Control and Prevention
Safeguarding Africa's Health

Most African COVID from Europe

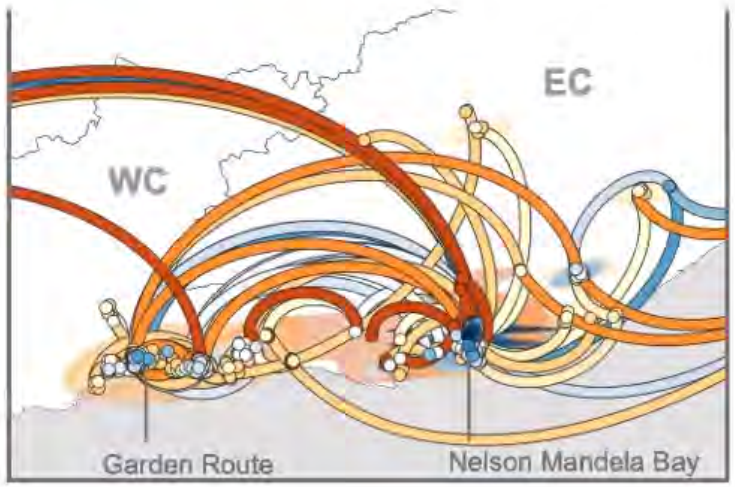


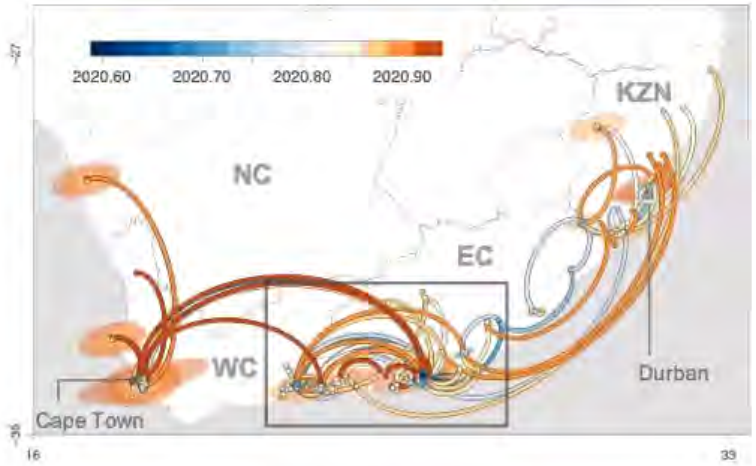
https://nextstrain.org/ncov/africa?l=clock&p=grid

Emergence of South African variant 501Y.V2



Emergence of South Africa variant





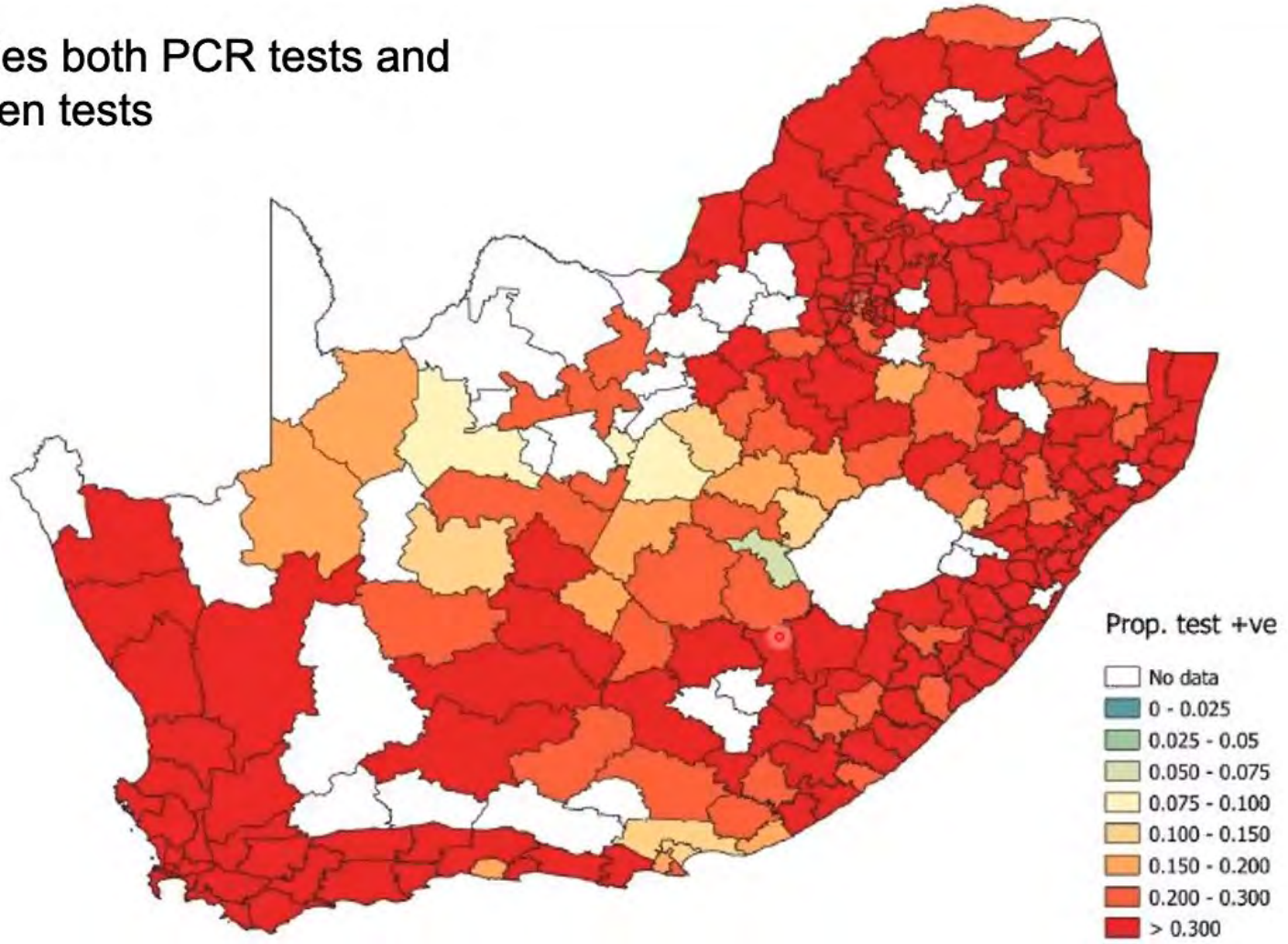
Our analysis suggests that this lineage emerged in Nelson Mandela Bay then spread to other districts in EC, to Western Cape and to multiple locations in KZN

We have detected this lineage in **>450 genomes** collected **8 Oct – 15 Jan 21** originating from:

- >30 different health facilities in 3 districts of Western Cape
- >30 different health facilities in 3 districts of Eastern Cape
- >30 different health facilities in 7 districts of KwaZulu-Natal
- 5 different health facilities in 2 districts of Northern Cape

COVID test positivity

week 53 (27 Dec – 2 Jan)



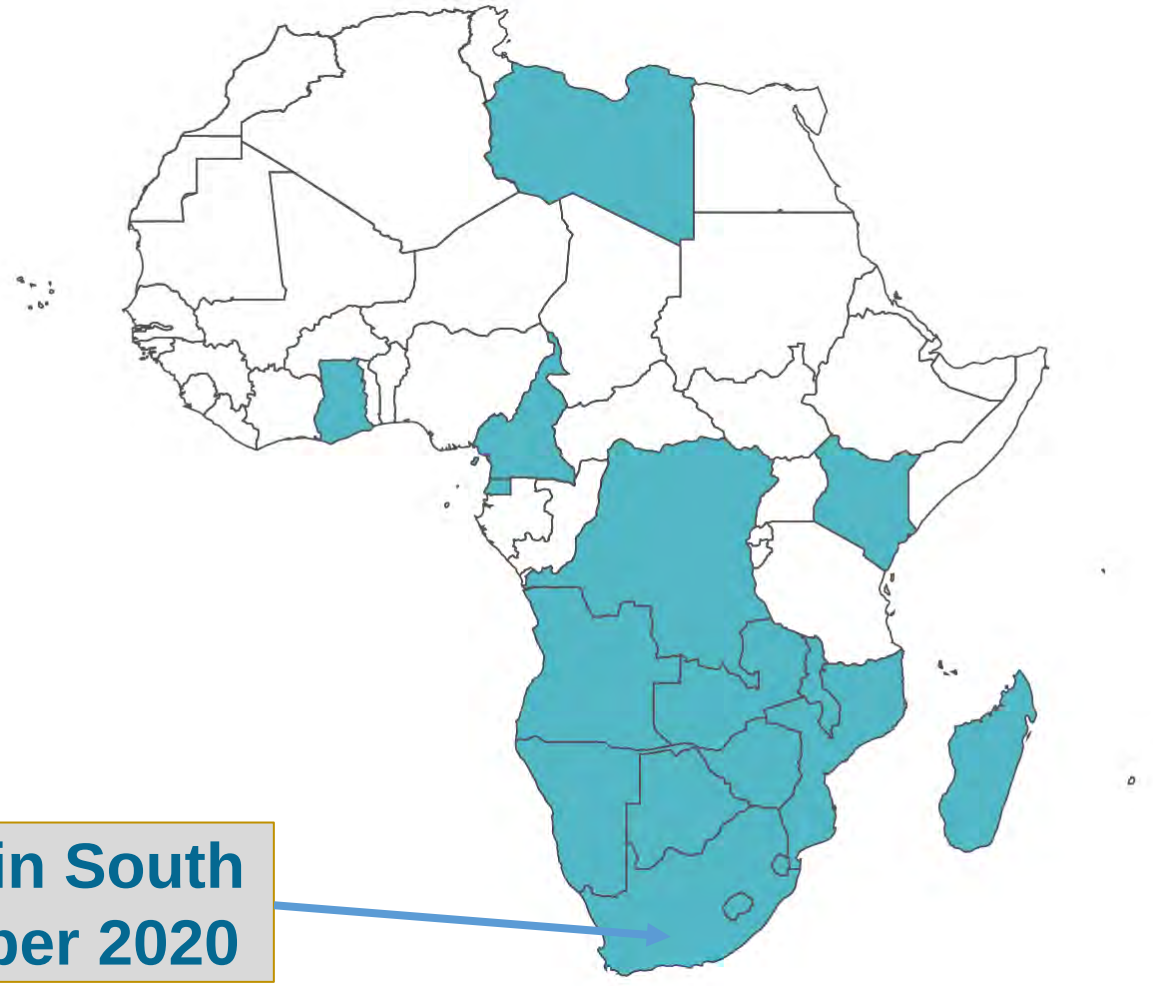
T. De Oliveira, Jan 2021

South African variant

As of 28 April 2021:

21

Countries reported **B.1.351**



First reported in South Africa in October 2020

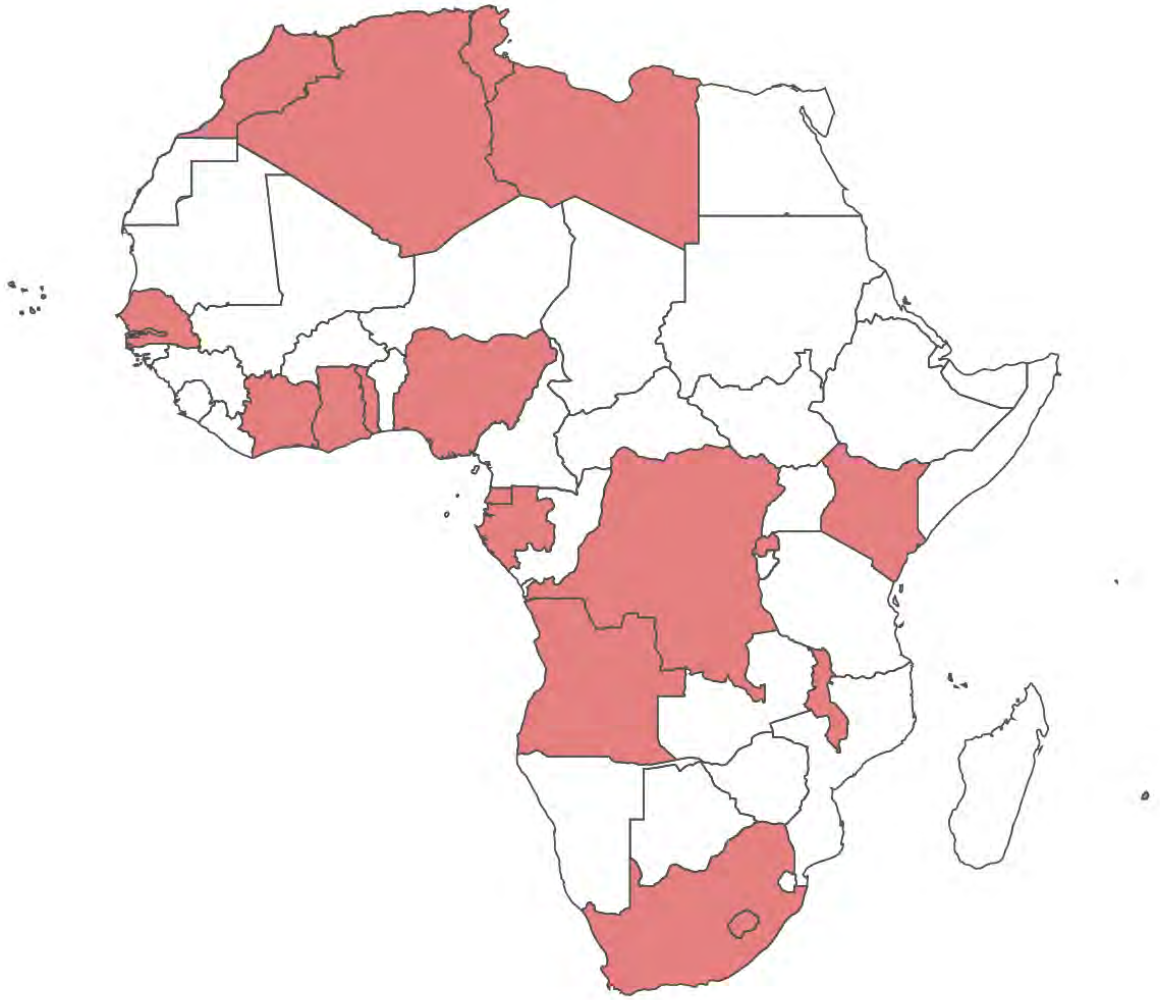
British variant

As of 28 April 2021:

20

Countries reported **B.1.1.7**

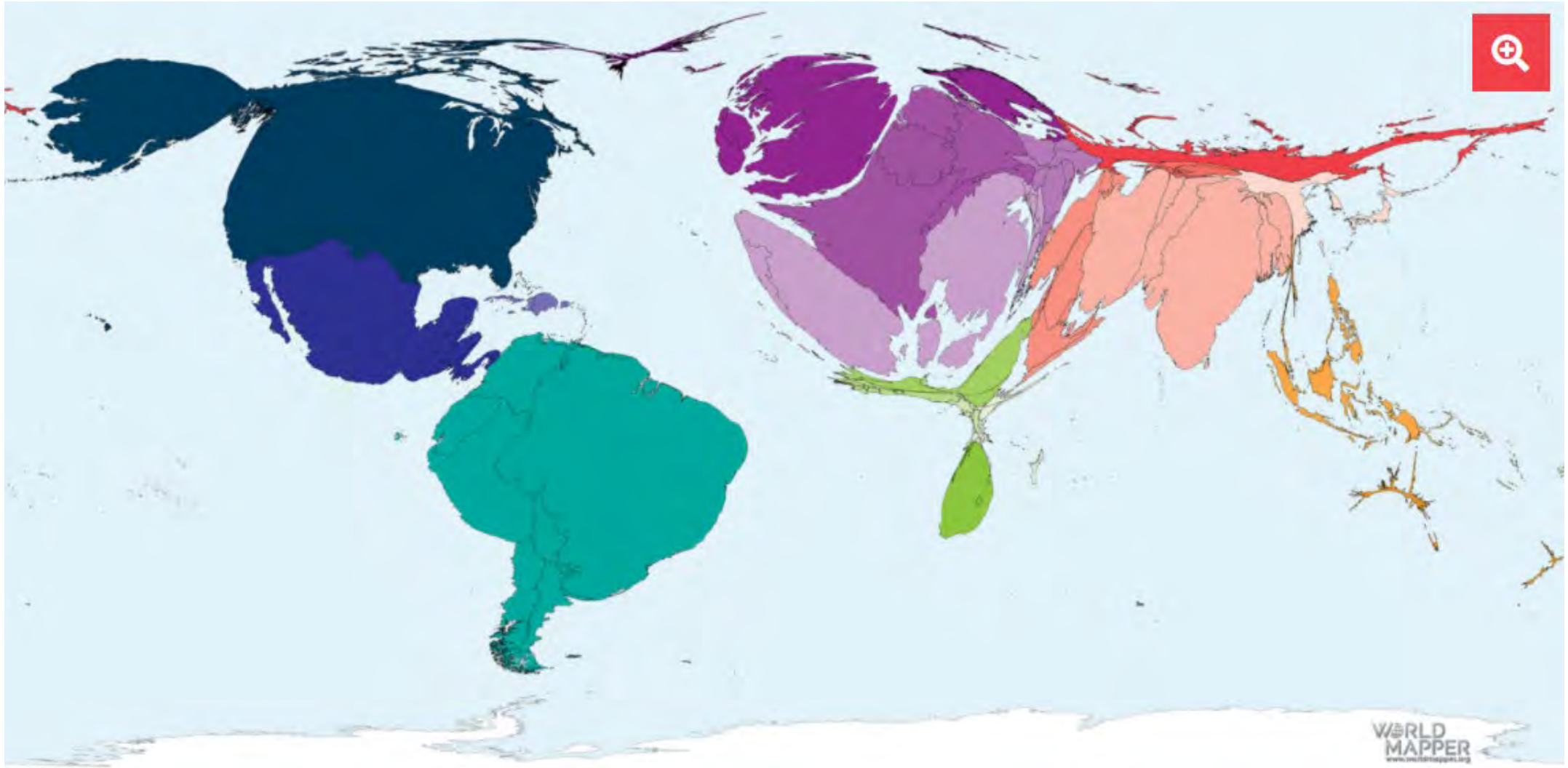
First reported from the UK in September 2020



African Union

AFRICA CDC
Centres for Disease Control and Prevention
Safeguarding Africa's Health

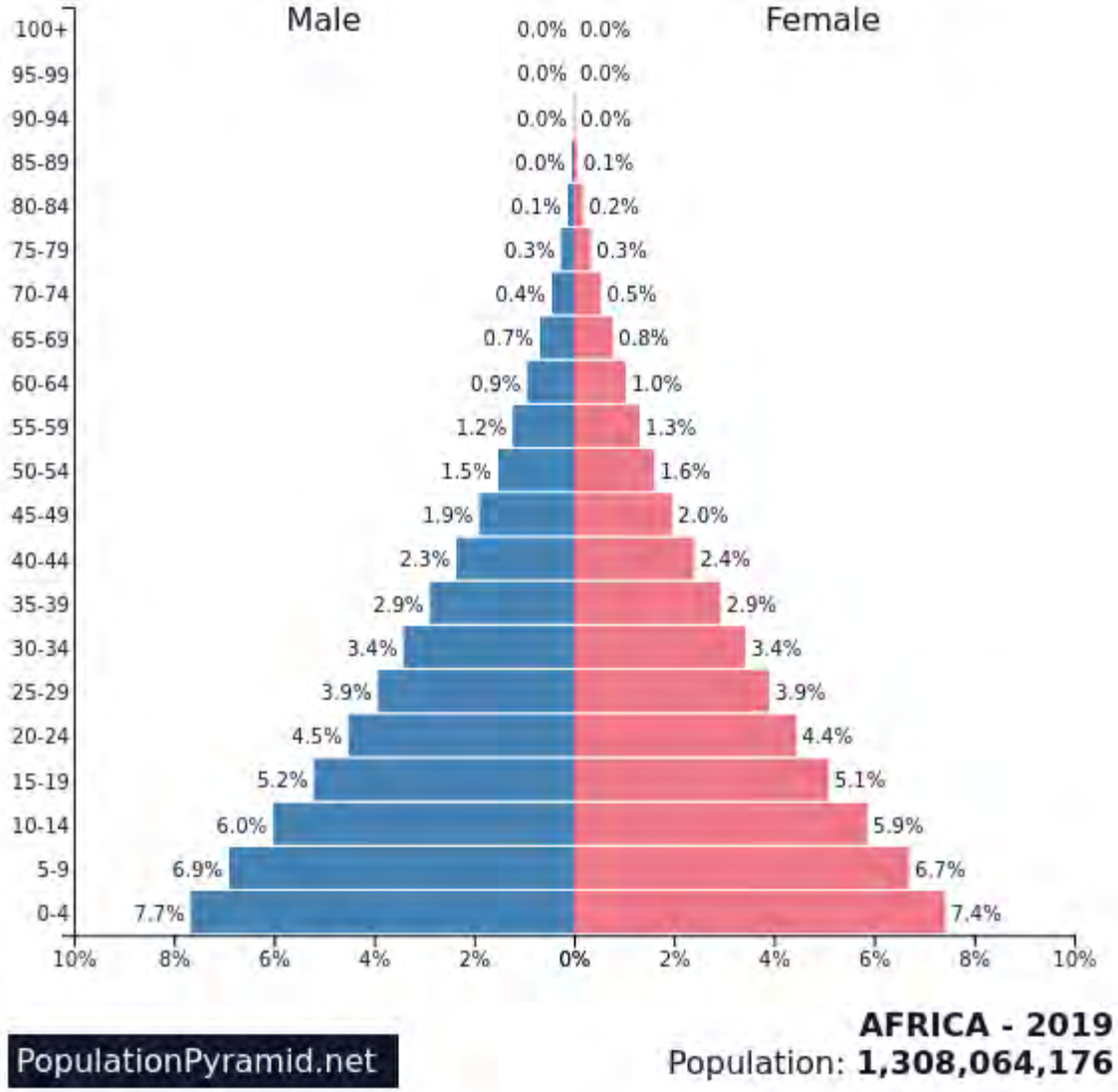
Low fatality in Africa

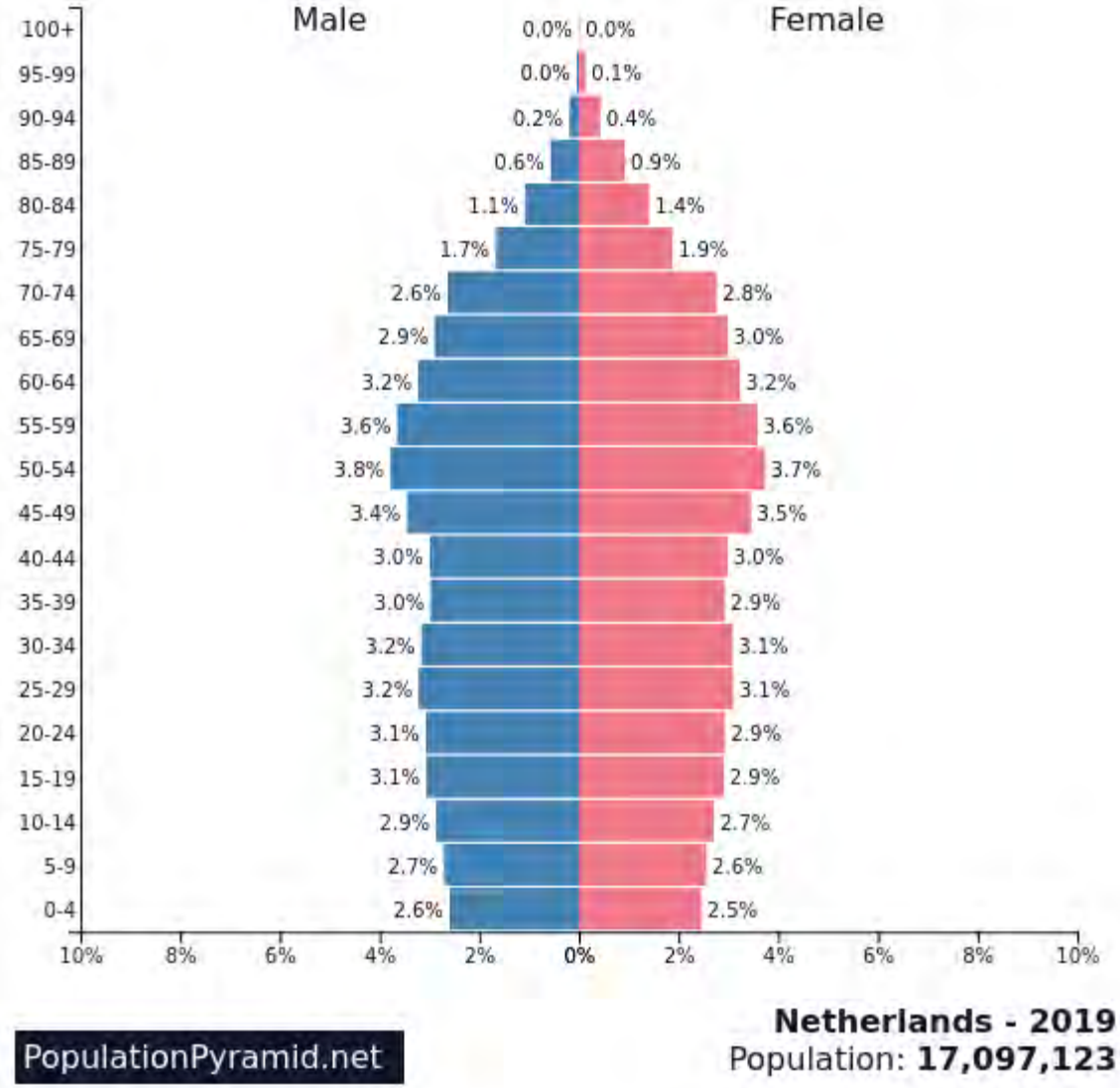


https://worldmapper.org/covid-19-coronavirus/

Early and strict lockdowns?

Younger age distribution?





Mortality underreporting?

Flaws in the collection of African population statistics block COVID-19 insights

August 3, 2020 3.59pm BST

Authors

Emmanuel Olamijuwon
Lecturer, University of Eswatini

Fidelia A. A. Dake
Lecturer, Regional Institute for Population Studies, University of Ghana

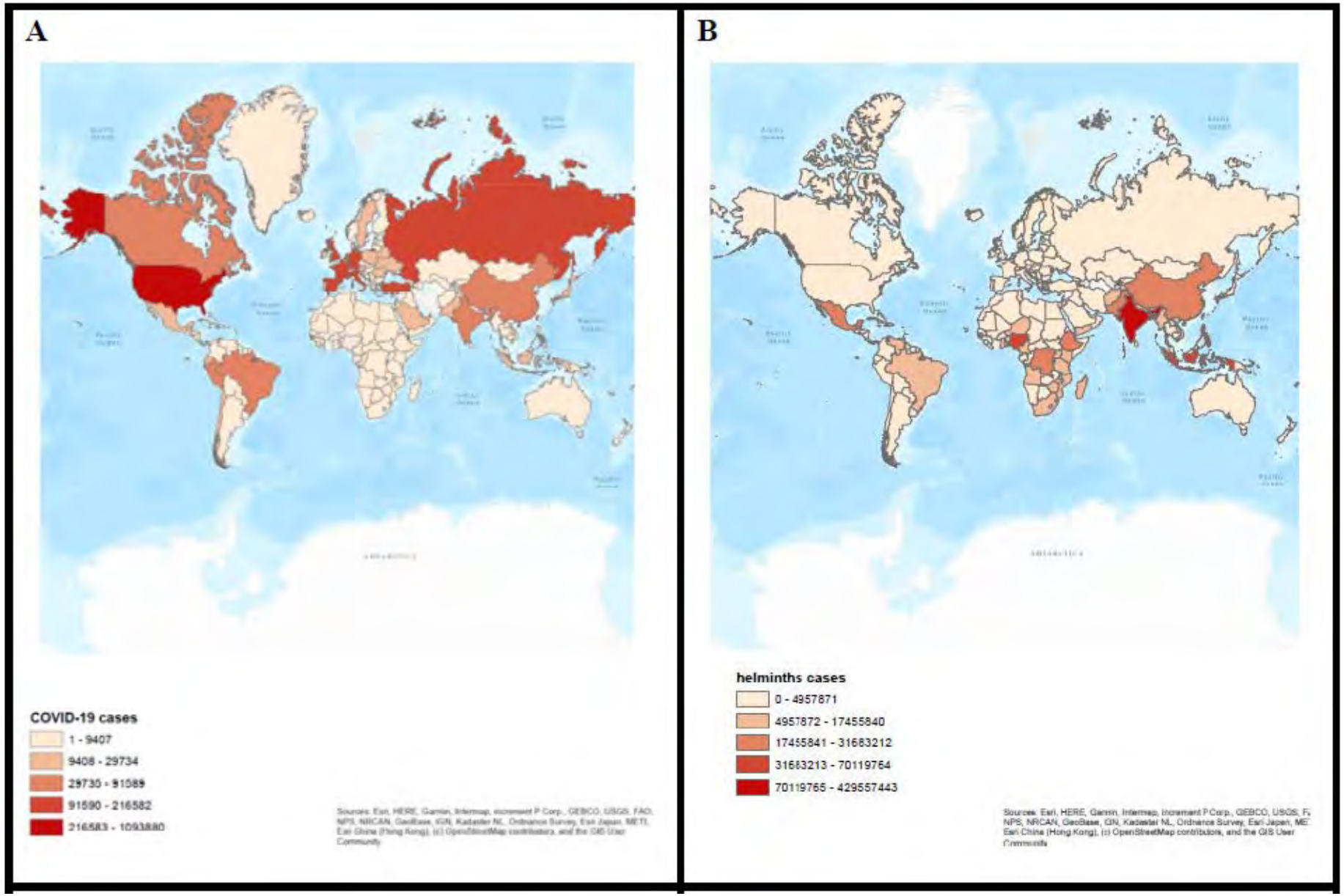
Oluwaseyi Dolapo Somefun
Postdoctoral fellow, University of the Western Cape

Disclosure statement

The authors do not work for, consult, own shares in or receive funding from any company or organisation that would benefit

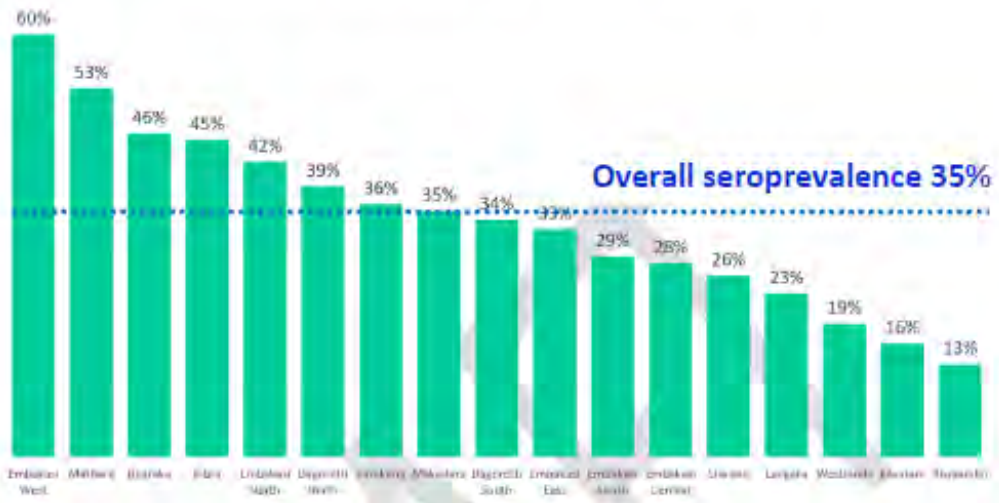
https://theconversation.com/flaws-in-the-collection-of-african-population-statistics-block-covid-19-insights-142669

Helminths protect?



Herd immunity in (parts of) Nairobi

Figure 2: COVID-19 seroprevalence by sub-county, Nairobi, November 2020



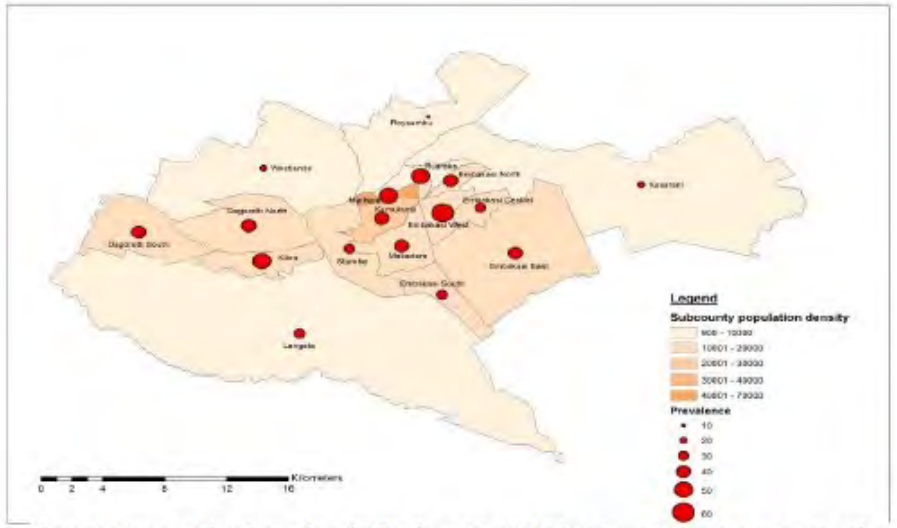


Figure 1: Map of Nairobi showing distribution of the COVID-19 seroprevalence and population density.

RECOMMENDATIONS

1. The basic COVID-19 mitigation measures should continue because nearly two thirds of Nairobi's population, and perhaps more in the rest of the counties, remain at risk.
2. Vaccination should prioritize individuals over 60 years and those with co-morbid conditions who are at the highest risk of severe disease.
3. Although children had lower infection levels in our study, healthy children have lower risk of severe disease and may not be prioritized for vaccination.
4. Surveillance should be enhanced, particularly in rural counties that likely have higher population of people still at risk than Nairobi County.
5. Future seroprevalence studies should be conducted in both rural and urban counties to guide policy.

HOW WAS THE STUDY CONDUCTED?

- Between 2nd-23rd November 2020, 1164 individuals from 527 households spread across the 17 sub-counties in Nairobi were enrolled in the survey.
- The households were selected using randomly generated geocodes.
- Written informed consent was obtained before blood samples were collected.
- Samples were tested for COVID-19 antibodies using the Wantai IgG/IgM ELISA kits at the Kenya Medical Research Institute (KEMRI) laboratory. Validation of the test was conducted jointly by the University of Nairobi, KEMRI and Washington State University.
- Ethical and administrative approvals were obtained from MOH, KEMRI, NMS and NACOSTI.

Acknowledgements: Ministry of Health, Nairobi Metropolitan Services, Kenya Medical Research Institute, Washington State University-Kenya

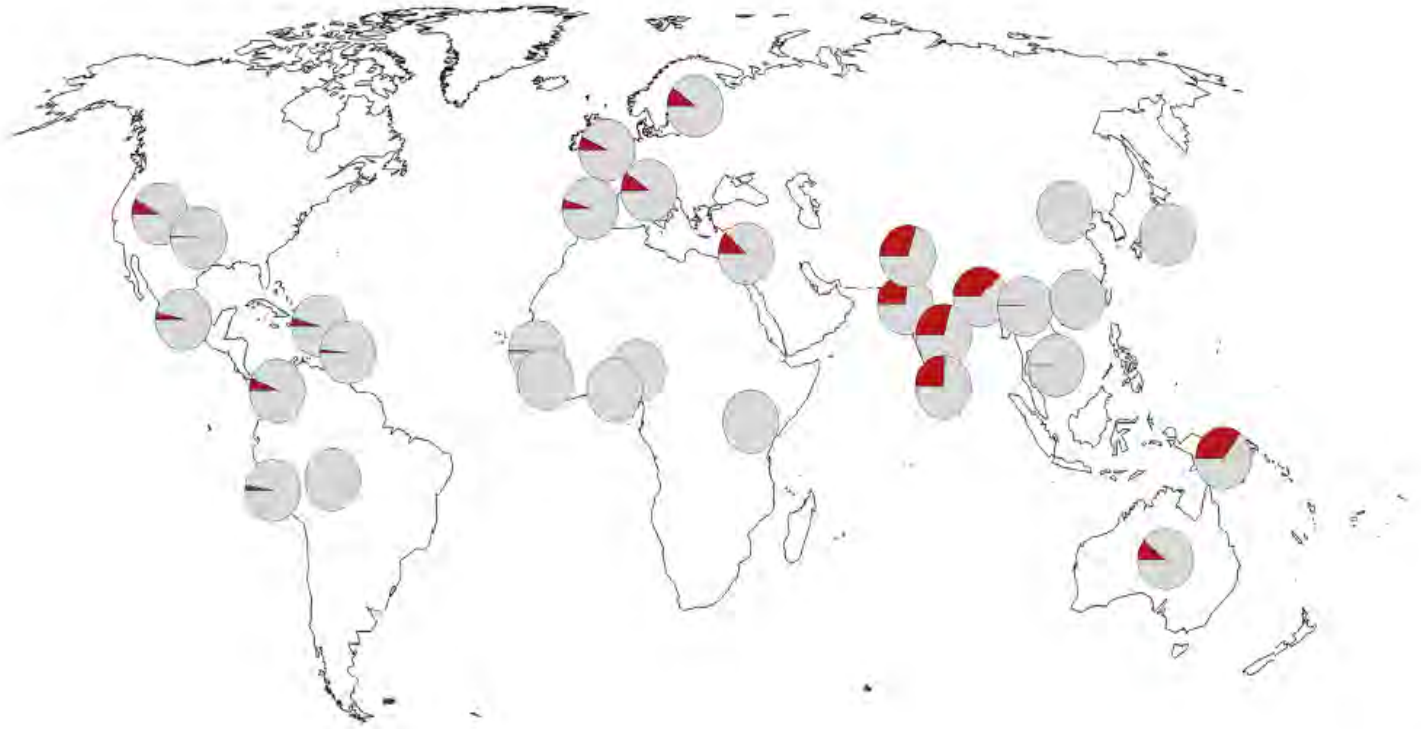
Funding: US National Institutes of Health's Centers for Research in Emerging Infectious Diseases Program, WSU-Kenya

For more information contact:

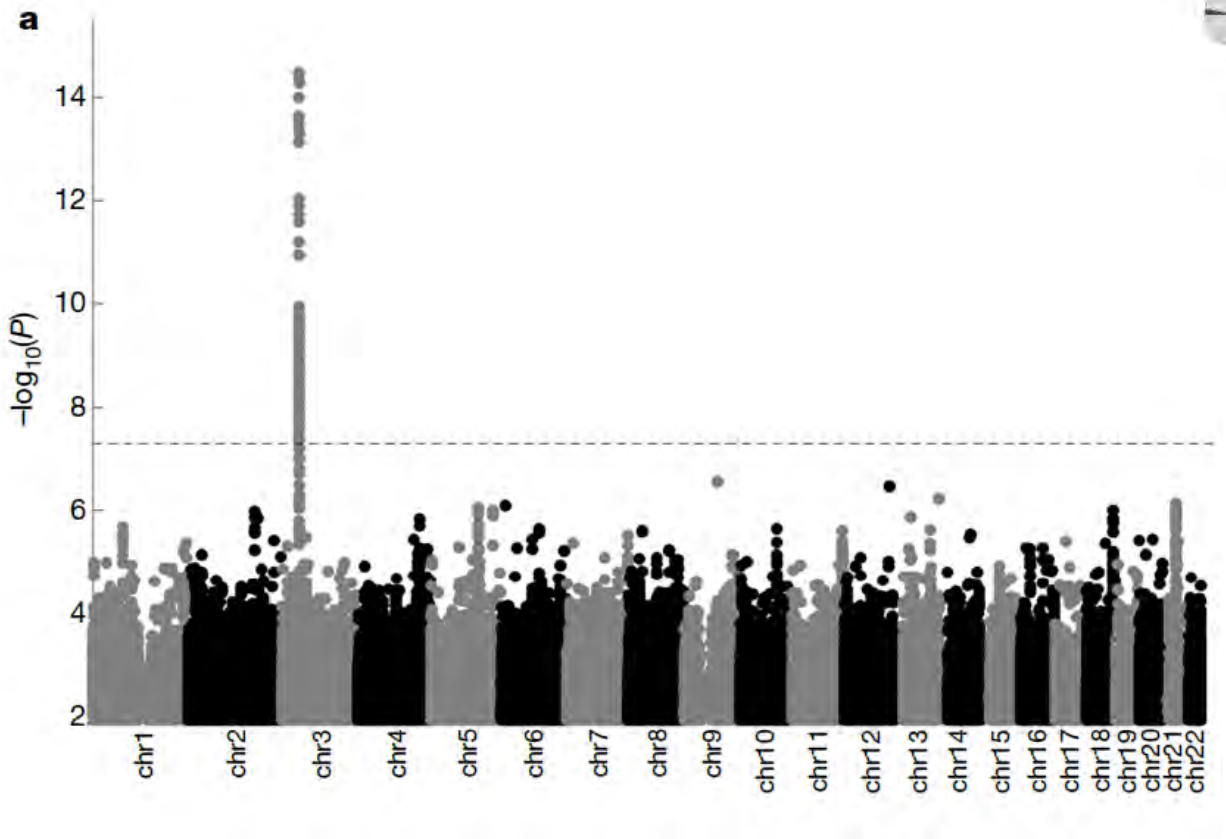
Dr. Lyndah Makayotto (MOH) makayotto@gmail.com 0720257691
Dr. Ouma Oluga (NMS) fredrickoluga@gmail.com 0710969275
Dr. Eric Osoro (WSU) eric.osoro@wsu.edu 0722216391

WASHINGTON STATE UNIVERSITY

Genetics?

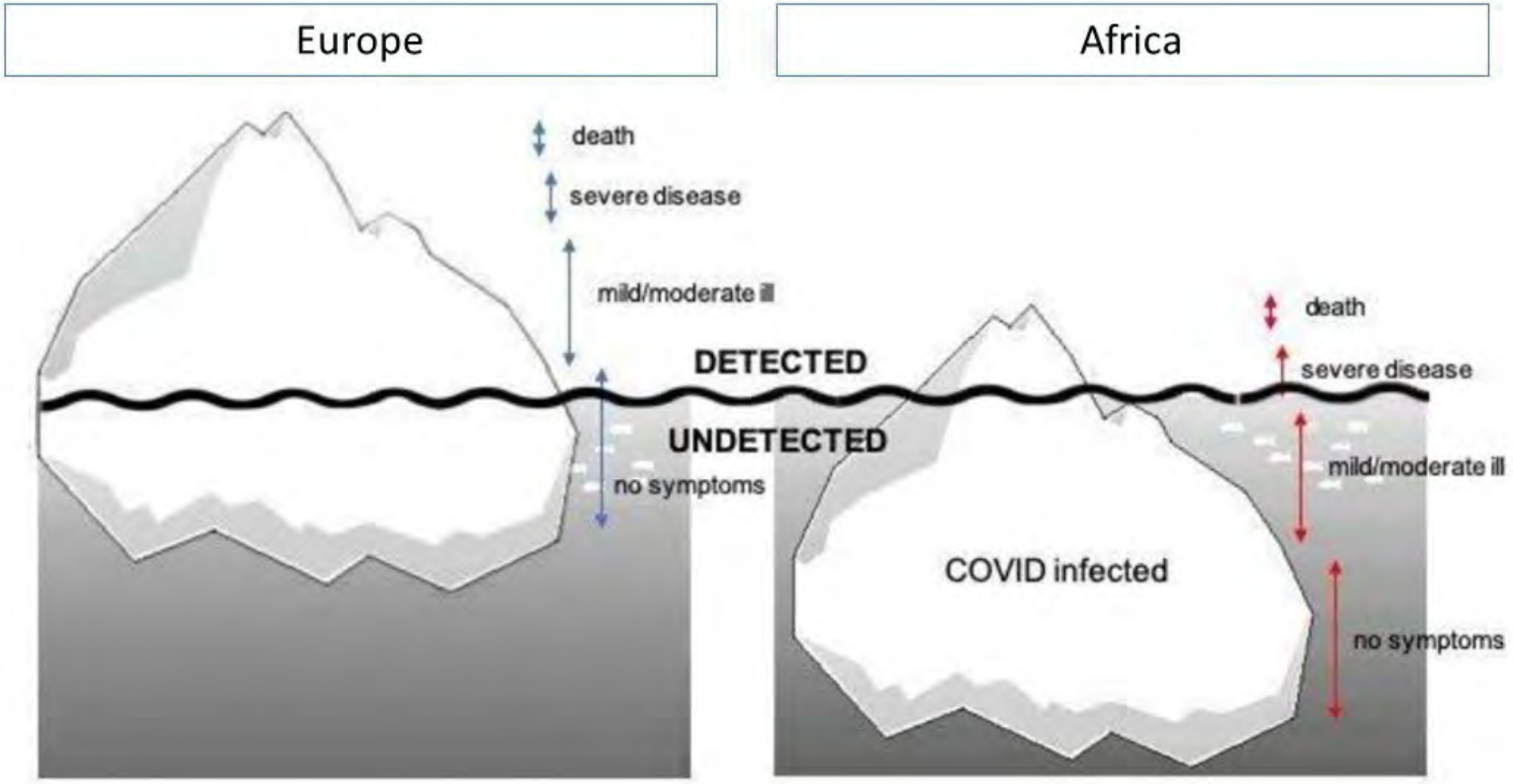


Geographic distribution Neanderthal risk genes



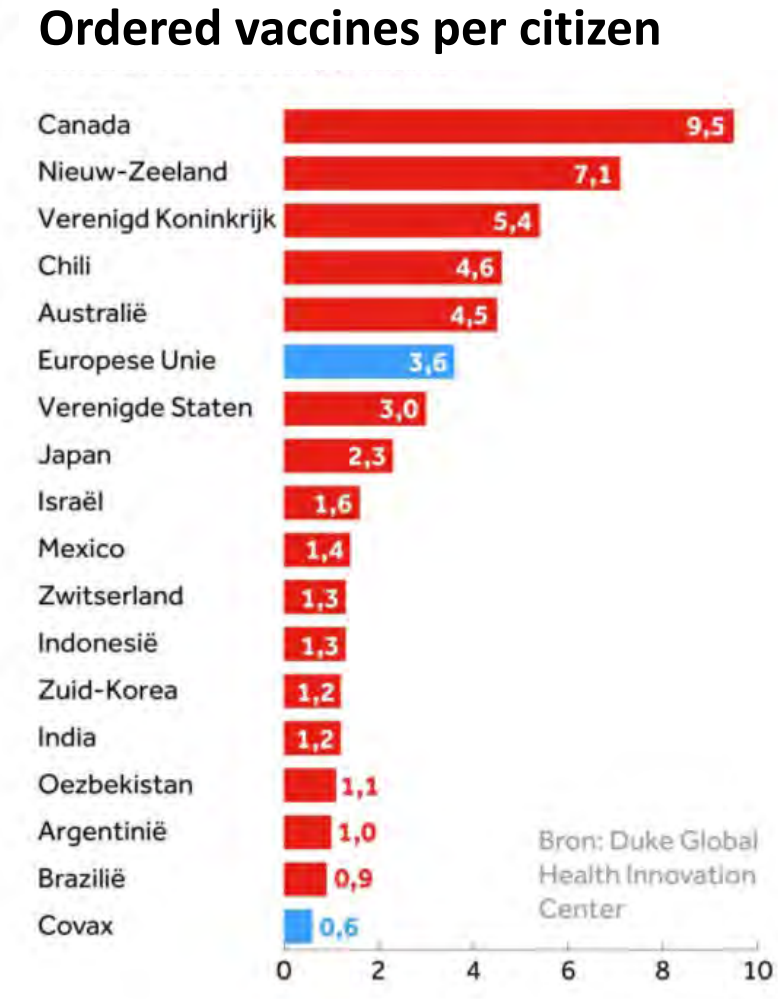
Zeberg H, Paabo S. Nature, Sept 2020
https://doi.org/10.1038/s41586-020-2818-3

Limited diagnostic testing?



Vaccine challenges for Africa

- RNA vaccines (dependent on -70°C cold chain) are very difficult to implement
- Oxford AstraZeneca vaccine does not need such cold-chain, like Sputnik
- African immune systems are different due to persistent immune activation
- How to compete with other countries in the world with more purchase power? → COVAX



Canada ordered 360 million doses for 38 million citizens: 9.5 doses per person = 5x overdosis

Global Times

West opts to turn a blind eye to China's vaccine support to Africa

By Li Qingqing

Published: Jan 11, 2021 10:28 PM

Sputnik in Africa

وكالة الأنباء الجزائرية
ALGÉRIE PRESSE SERVICE

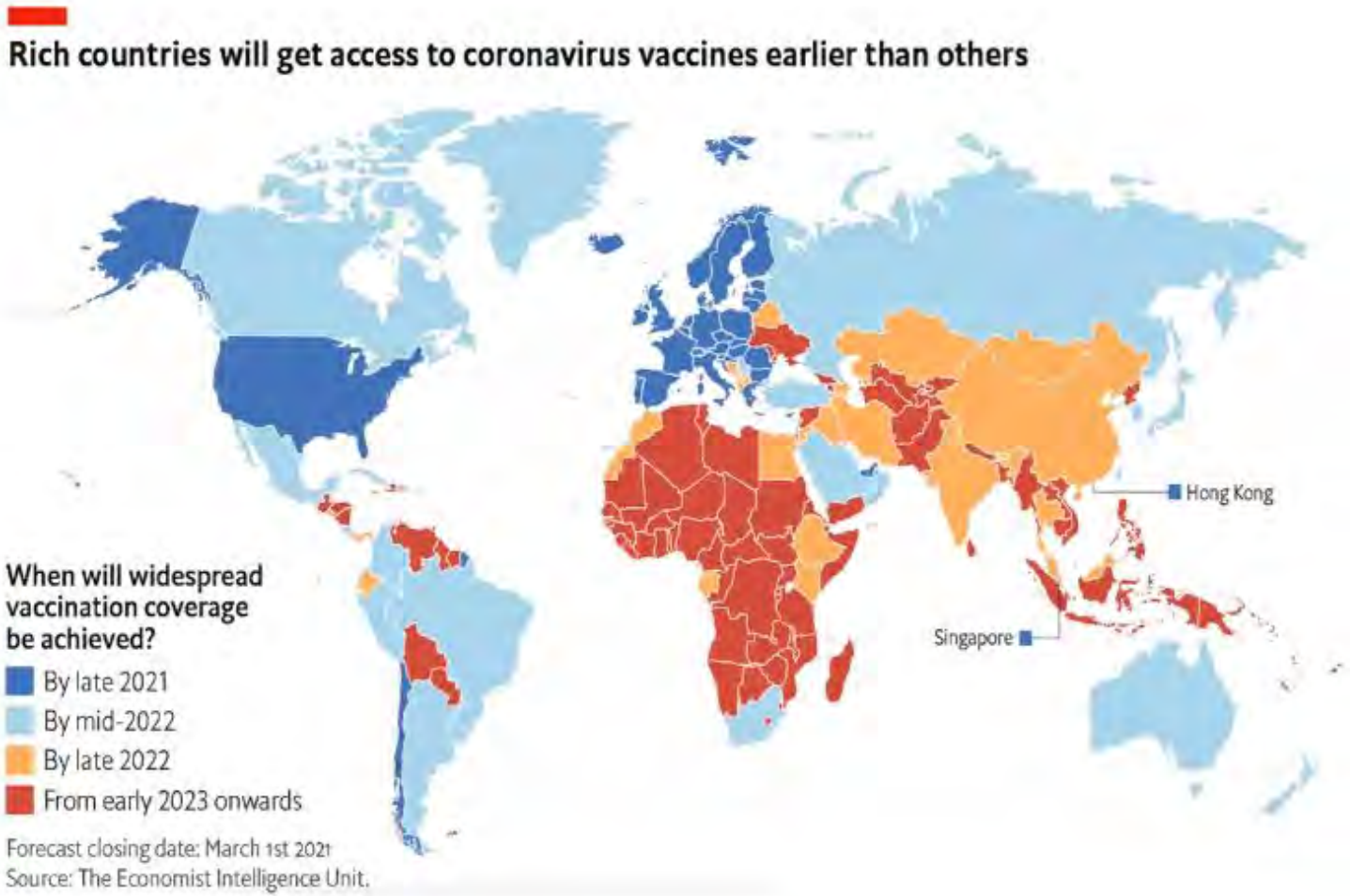
The anti-Covid vaccine "Sputnik V" will be produced in Algeria from September

Posted On: Wednesday, 07 April 2021 13:25

African Union

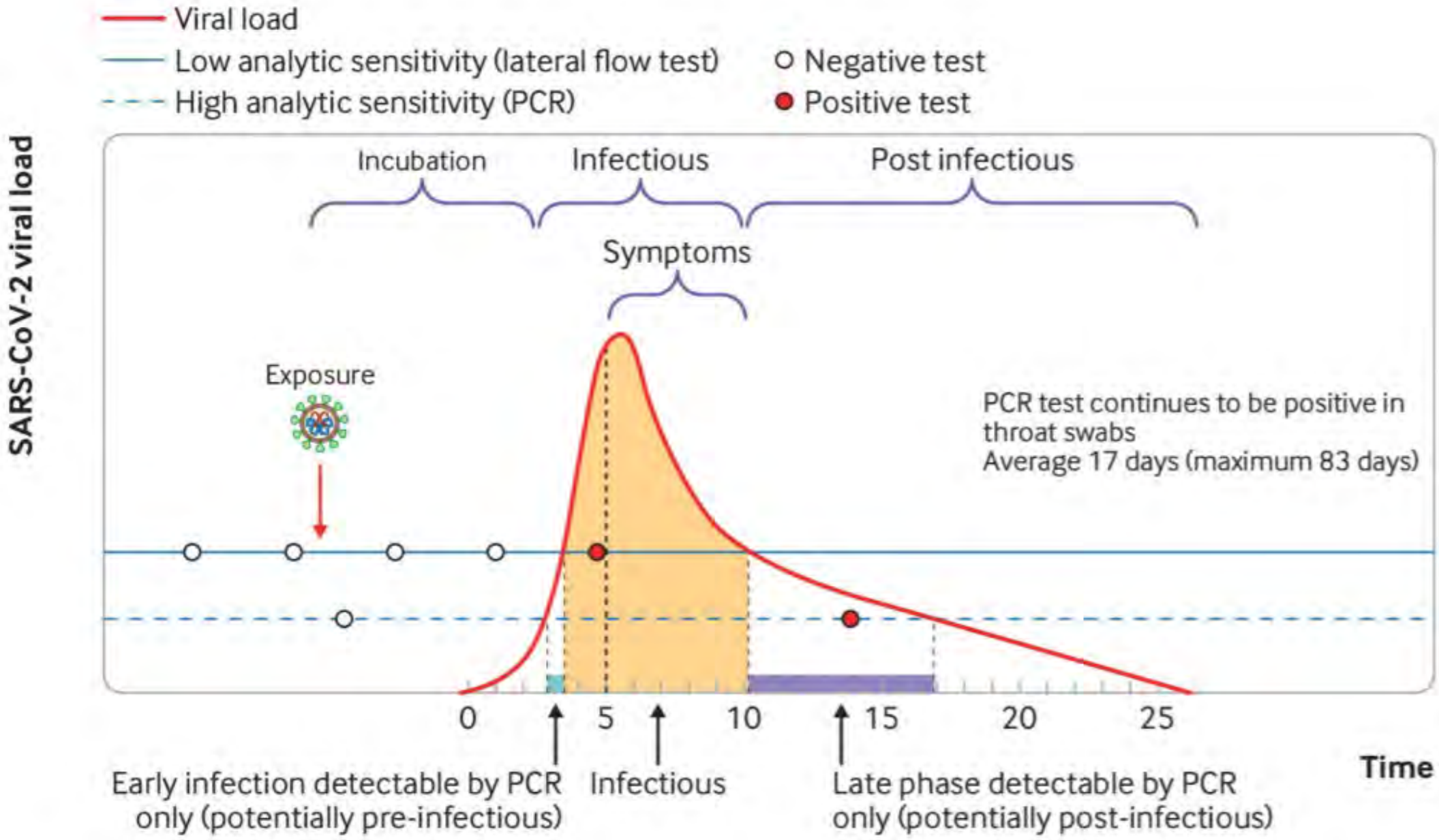
AFRICA CDC
Centres for Disease Control and Prevention
Safeguarding Africa's Health

The world in 3 years ….



- **Production is main bottleneck:**
  - 15% of world's population…
  - … has pre-booked 50+% of vaccines.
- **Other constraining factors:**
  - Supply deals.
  - Logistics.
  - Availability of healthcare personnel.
  - Financing.
  - Vaccine hesitancy.
  - Local factors.
- **Long timelines weigh on recovery:**
  - Advanced economies recover from Q3 2021.
  - Bleaker prospects for emerging countries.
  - Risks, in addition to timelines slipping further:
    - Emerging countries losing motivation?
    - Emergence of new variants.

Diagnostics



https://www.bmj.com/content/372/bmj.n208

RDTs are ~100x less sensitive than PCR ……

but

RDT detect up to 90% of infectiousness

http://modmedmicro.nsms.ox.ac.uk/wp-content/uploads/2021/01/infectivity_manuscript_20210119_merged.pdf

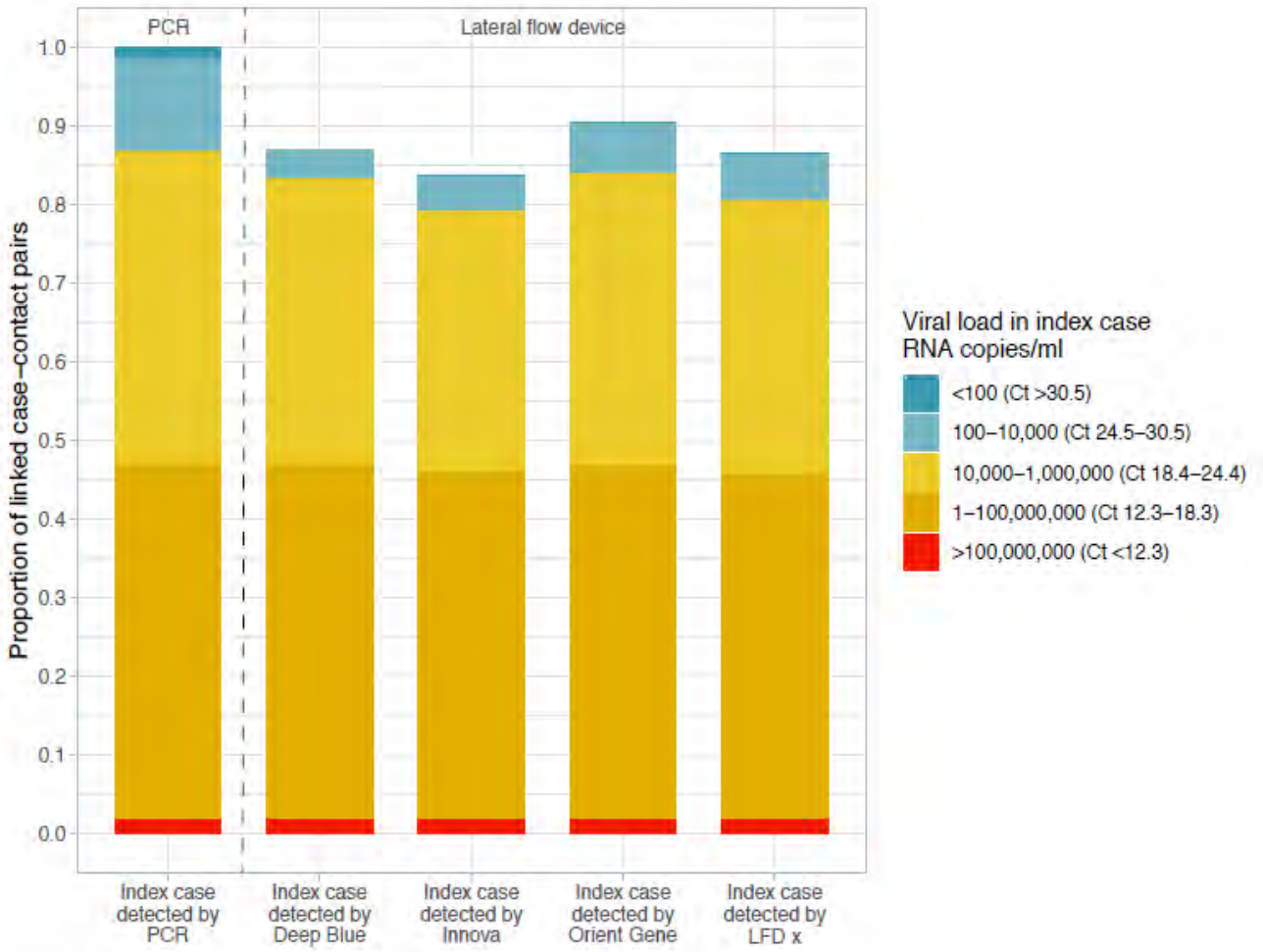
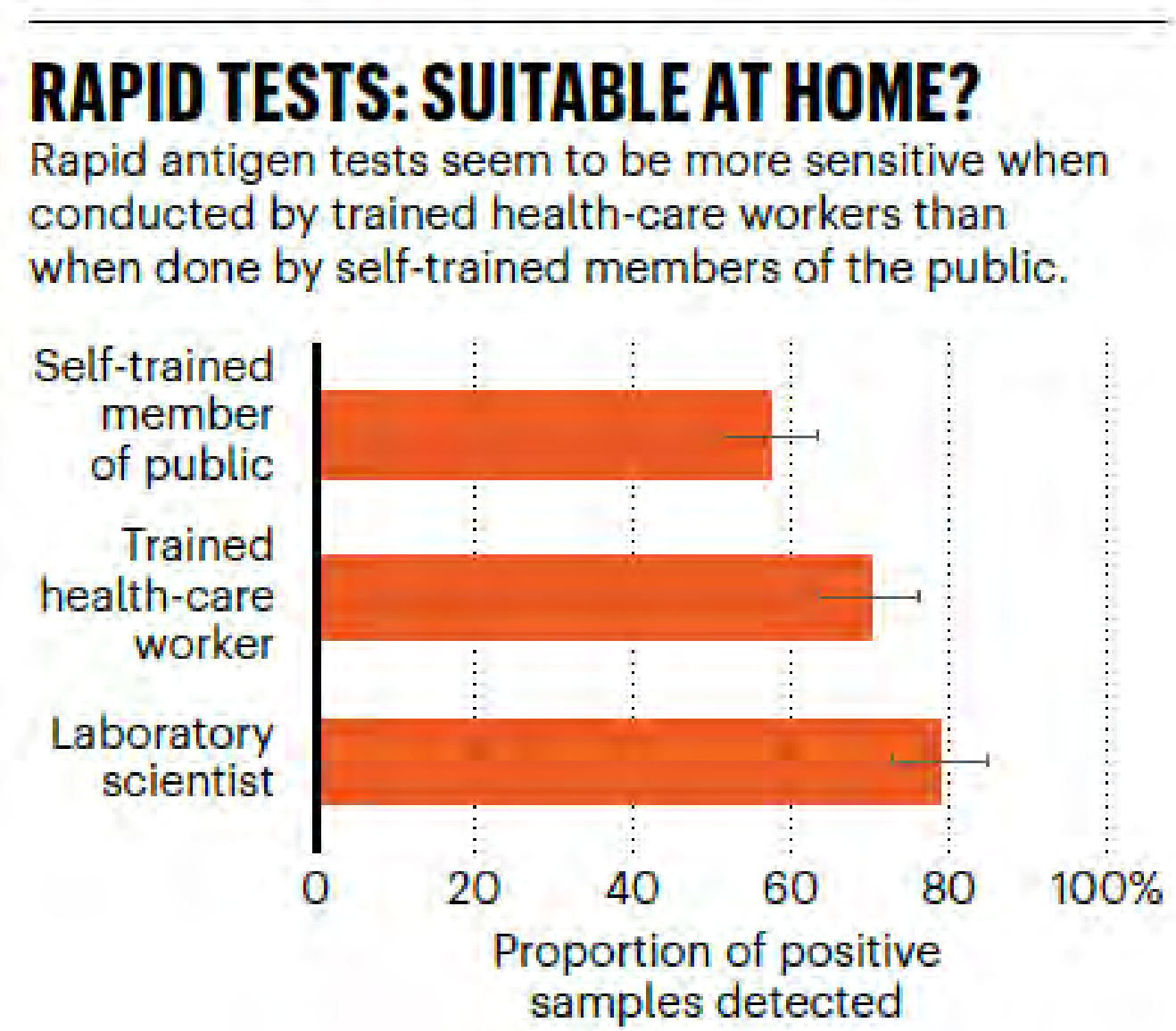


Figure 4. Simulated proportion of cases with a PCR-positive contact detected using four lateral flow devices (LFD). The proportion of cases detected by PCR viral load group is shown in the PCR

Self-testing?



https://www.nature.com/articles/d41586-021-00332-4