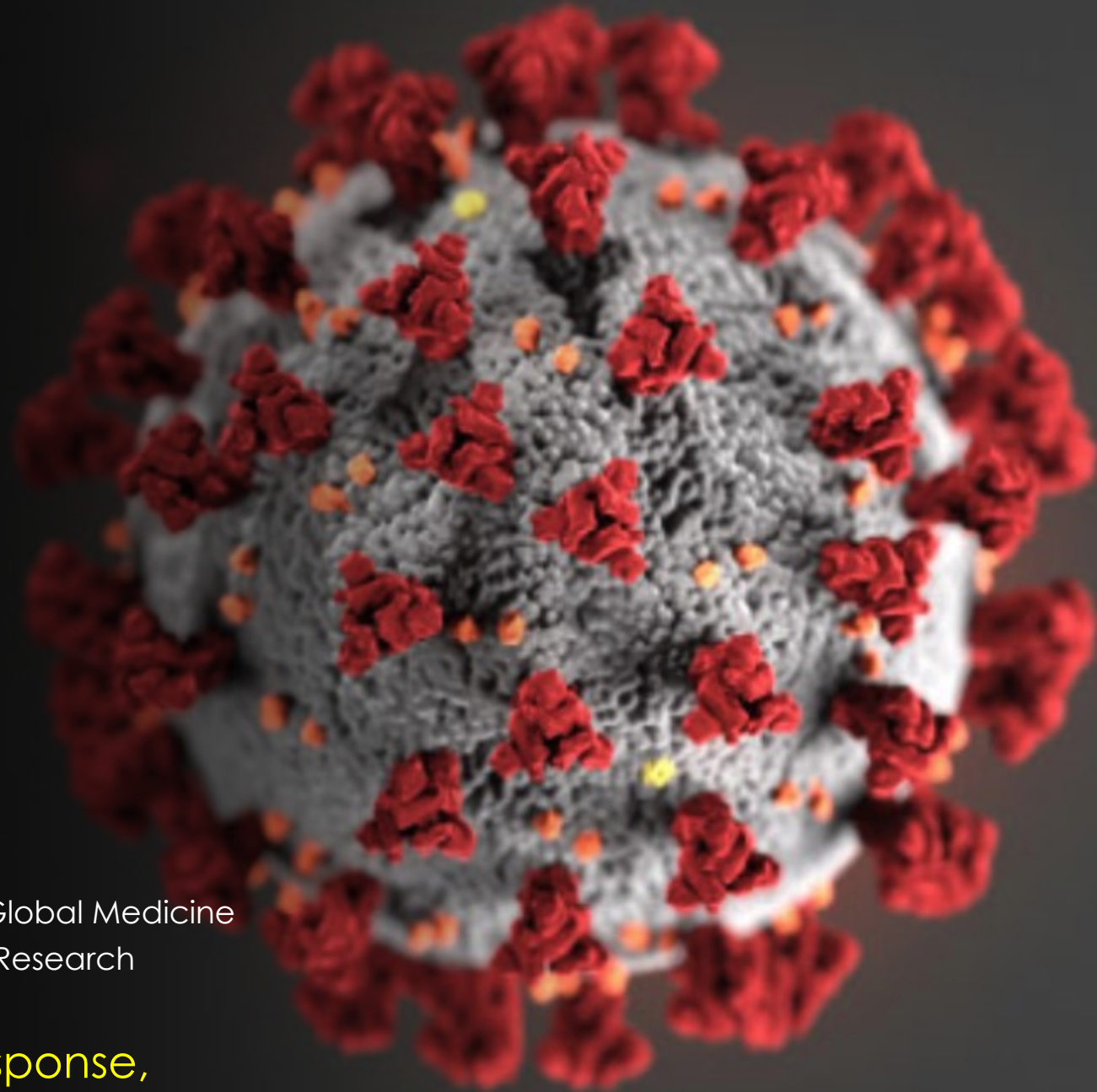


COVID-19, HIV and preparing for pandemics



Monica Gandhi MD, MPH

Professor of Medicine, Division of HIV, Infectious Diseases and Global Medicine
Medical Director, Ward 86 and Director, UCSF Center for AIDS Research

Center for Pandemic Preparedness and Response,
UCSF | April 18, 2023







Objectives of talk

- History of COVID-19 and HIV
- Global COVID vaccines & variants
- Current state of COVID pandemic
- Current state of HIV pandemic
- History of ART and ART access
- Book on COVID (Endemic) and equitable responses



HISTORY OF COVID and HIV

How do new infectious diseases “emerge” or enter human populations?

Activity	Consequence
 Global Warming	<ul style="list-style-type: none"> • Pathogens can go to new niches, have access to new hosts
 Interaction with animals (hunting, eating, pets)	<ul style="list-style-type: none"> • Zoonoses is when a microbe jumps from nonhuman to human hosts
 Changes in agriculture	<p>New crops attract new pests</p>
 Encroachment on animal habitats	<ul style="list-style-type: none"> • Other animals crowded, microbes can mutate, mix • Destruction of rain forests bring humans into contact with unfamiliar microbes
 Urbanization	<ul style="list-style-type: none"> • People more crowded together, contagious diseases
 Other	<ul style="list-style-type: none"> • Jet travel spreads diseases even when asymptomatic • Ships can carry “unintended passengers” • Breakdown of public health measures, poverty, war, famine, intent to harm



SARS 2002-2003 more limited

- In 2002, there was another virus (identified in China) called “SARS” - Severe Acute Respiratory Syndrome (SARS-CoV-1)
- Lasted about 9 months in the world until 2003; 8098 cases, 29 countries, 774 deaths
- 29 cases in U.S. but 0 deaths, more in Canada
- Horseshoe bat, then cat-like mammal called palm civet → human → human to human



Middle East respiratory syndrome coronavirus in 2012 (MERS-CoV)



- First came out in Saudi Arabia in 2012; all cases linked to Middle East
- Went around world from 2012-2019: 27 countries, 2494 cases, 858 deaths
- United States: 2 cases in May 2014 (Indiana, Florida) – both health care workers from Saudi Arabia
- Was originally in camel and then went to humans then human to human



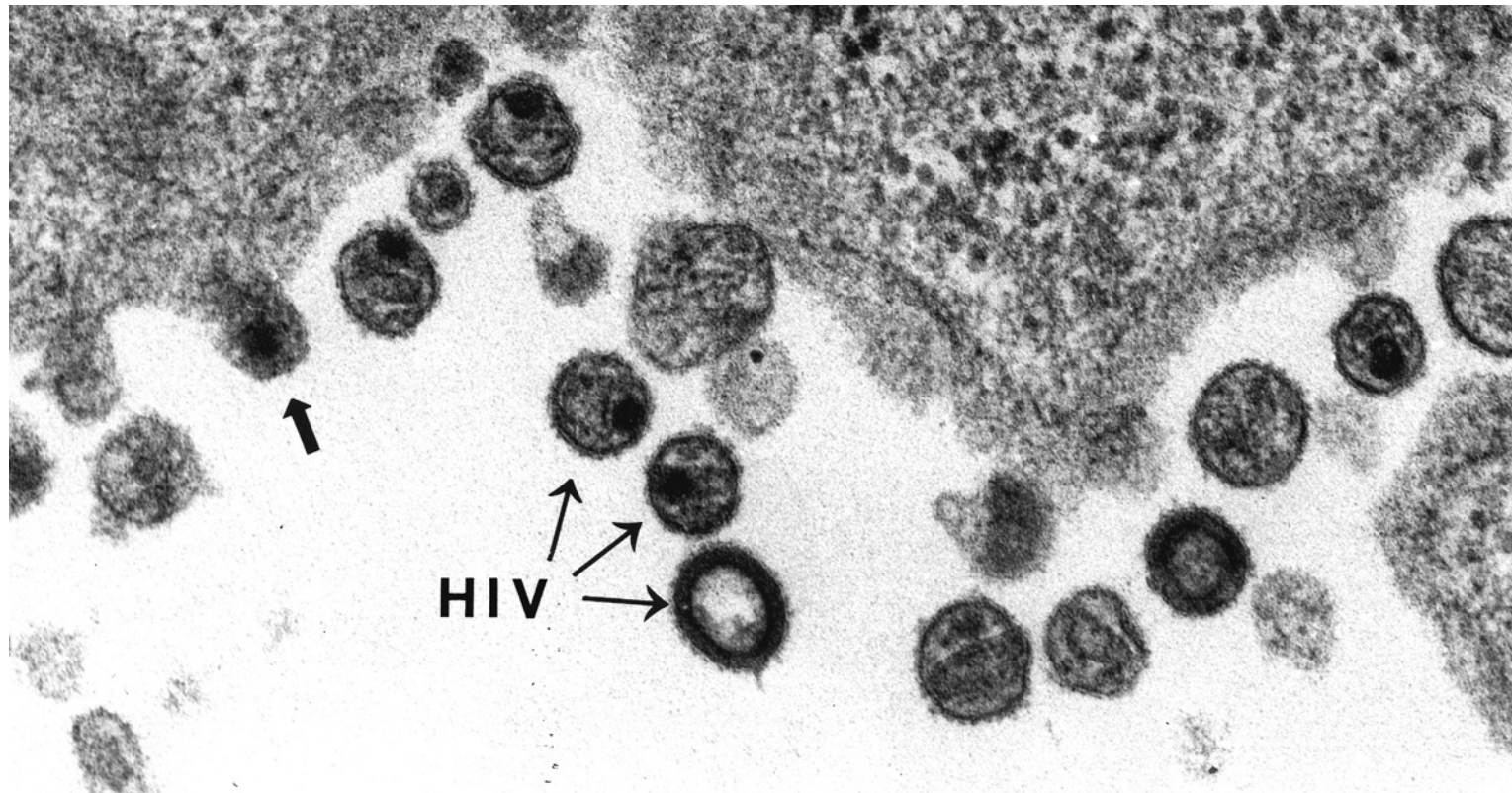
SARS-CoV-2 history

- Illness with fever, cough, pneumonia reported from Wuhan, China on New Years' Eve to WHO (December 31, 2019)
- January 7, 2020: Identified etiology a new coronavirus
- Has been spreading around world since then
- January 30, 2020: WHO - "global health emergency"
- March 11, 2020: WHO – "Pandemic"
- March 26, 2020 – US becomes epicenter of pandemic (not for first time)
- December 11, 2020: First EUA from FDA for COVID-19 vaccine in US (Pfizer)
- 6.84 million deaths
- May 11, 2023: US public health emergency endsnational emergency ended April 10

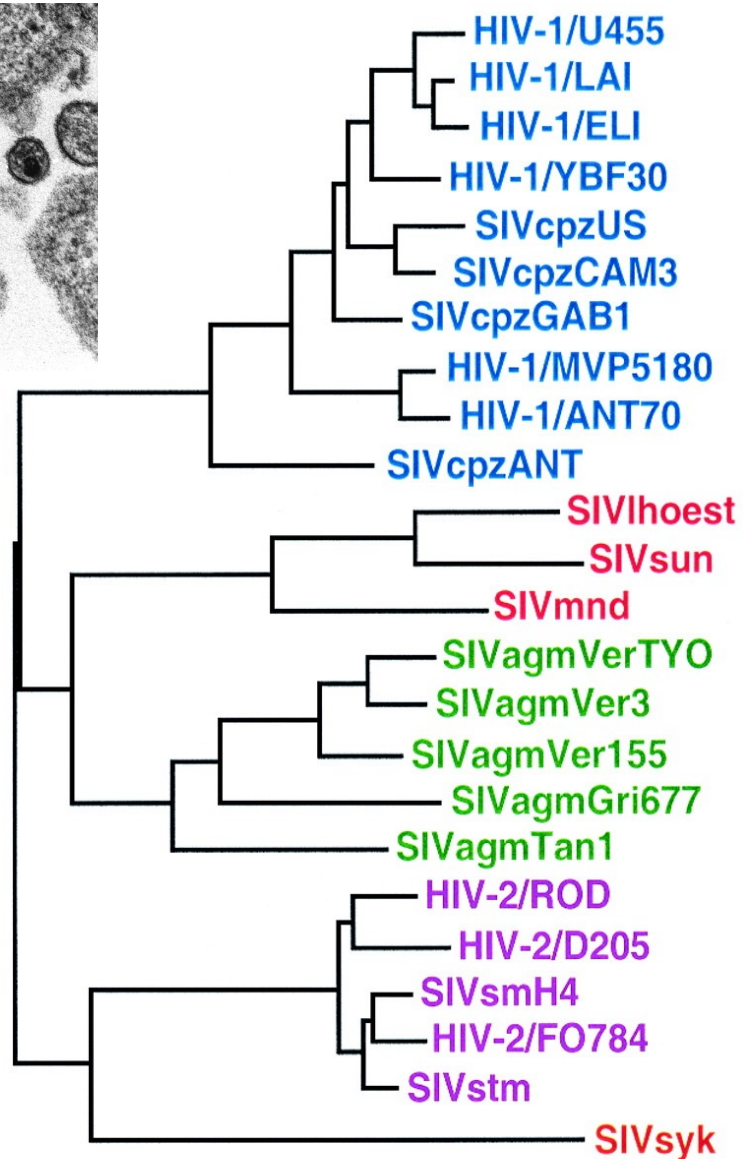
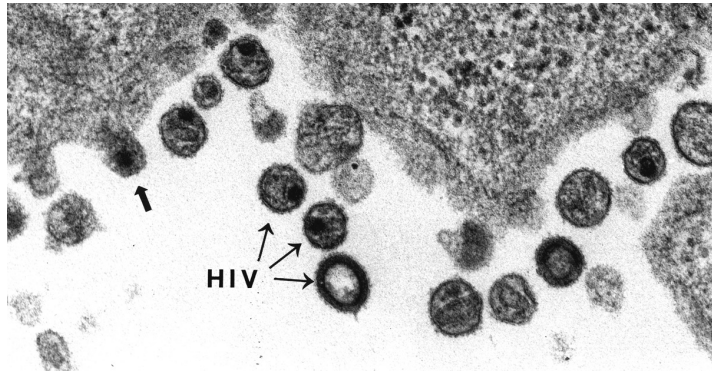


What type of virus is HIV?

- HIV – “lentivirus”, subgroup of retroviruses
 - **Lentivirus** means SLOW virus (long interval between initial infection and onset of serious symptoms)



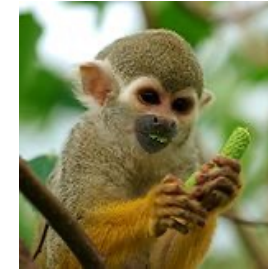
To trace origins, where do we see retroviruses (lentiviruses) in our closest relatives?



1) Chimpanzees; gorillas



2) Monkeys; Mandrills



3) African green monkeys; baboons



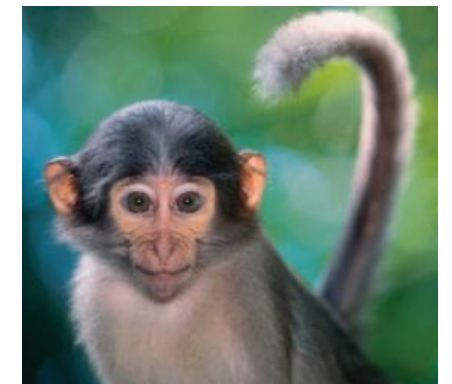
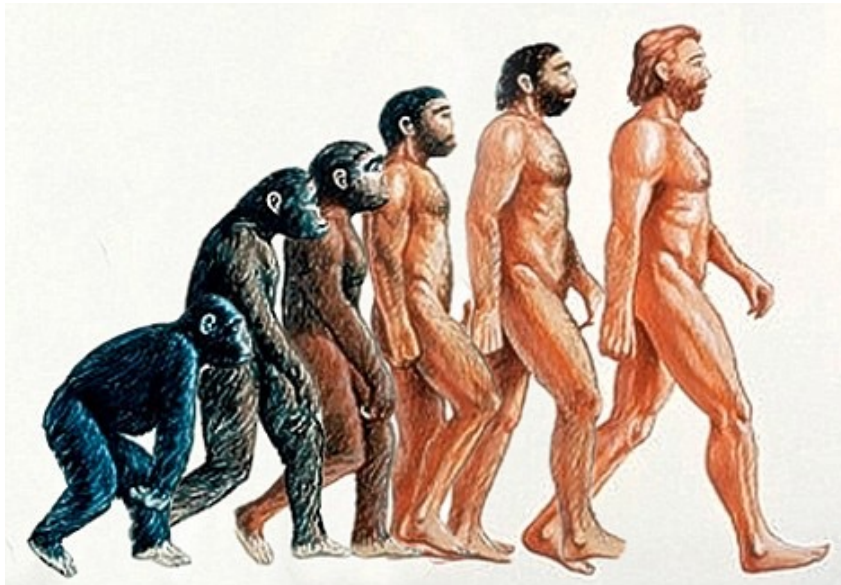
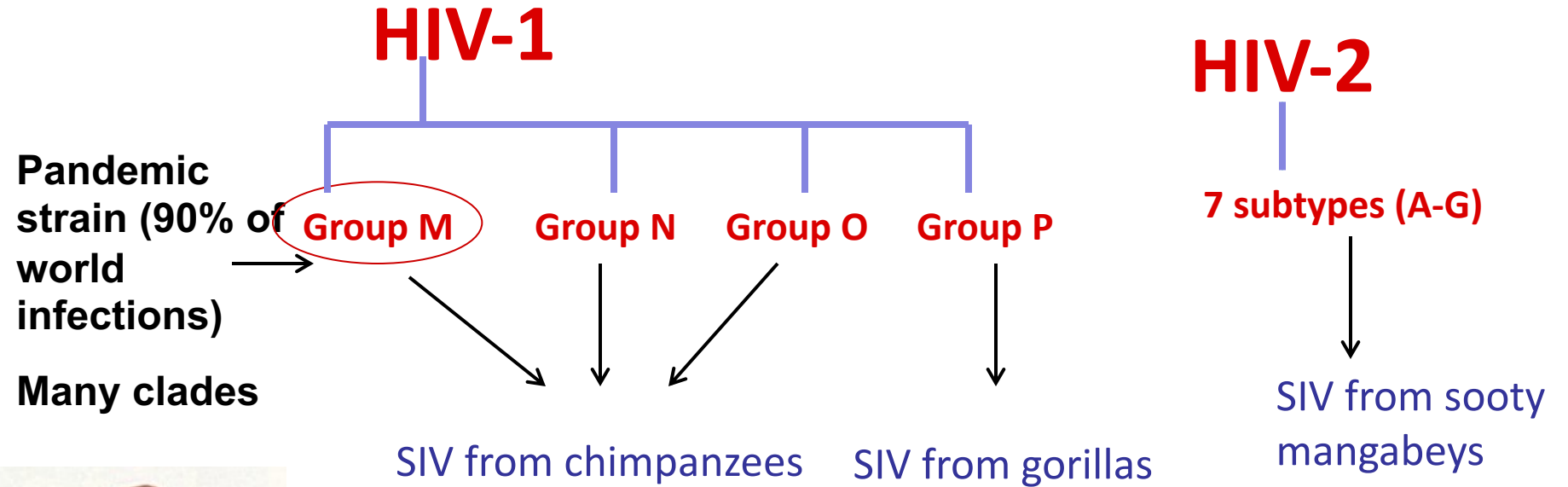
4) Sooty mangabeys



5) Sykes' monkeys

From where?
How?
When?

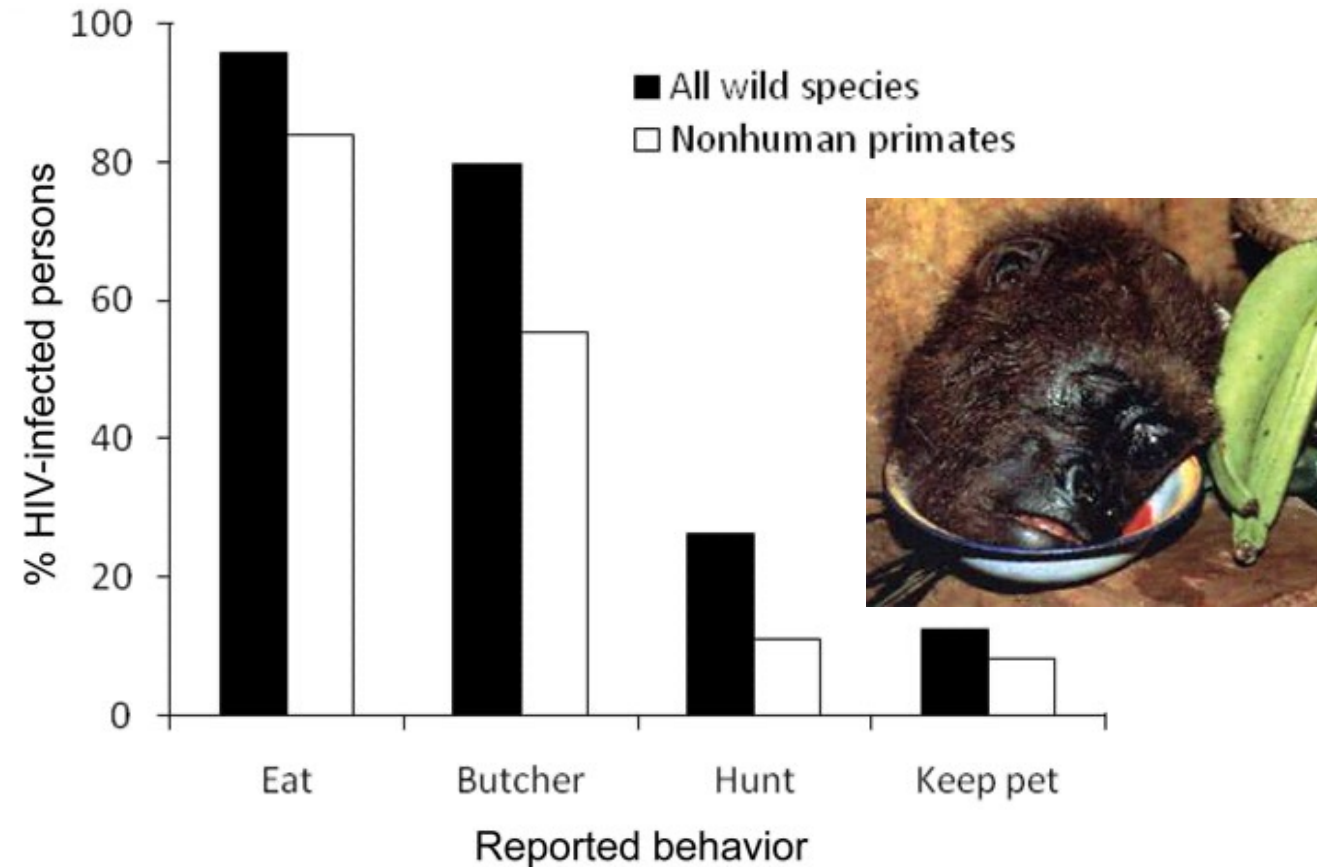
How did HIV-1 and 2 get from primate host to us?



What was the cross over event?

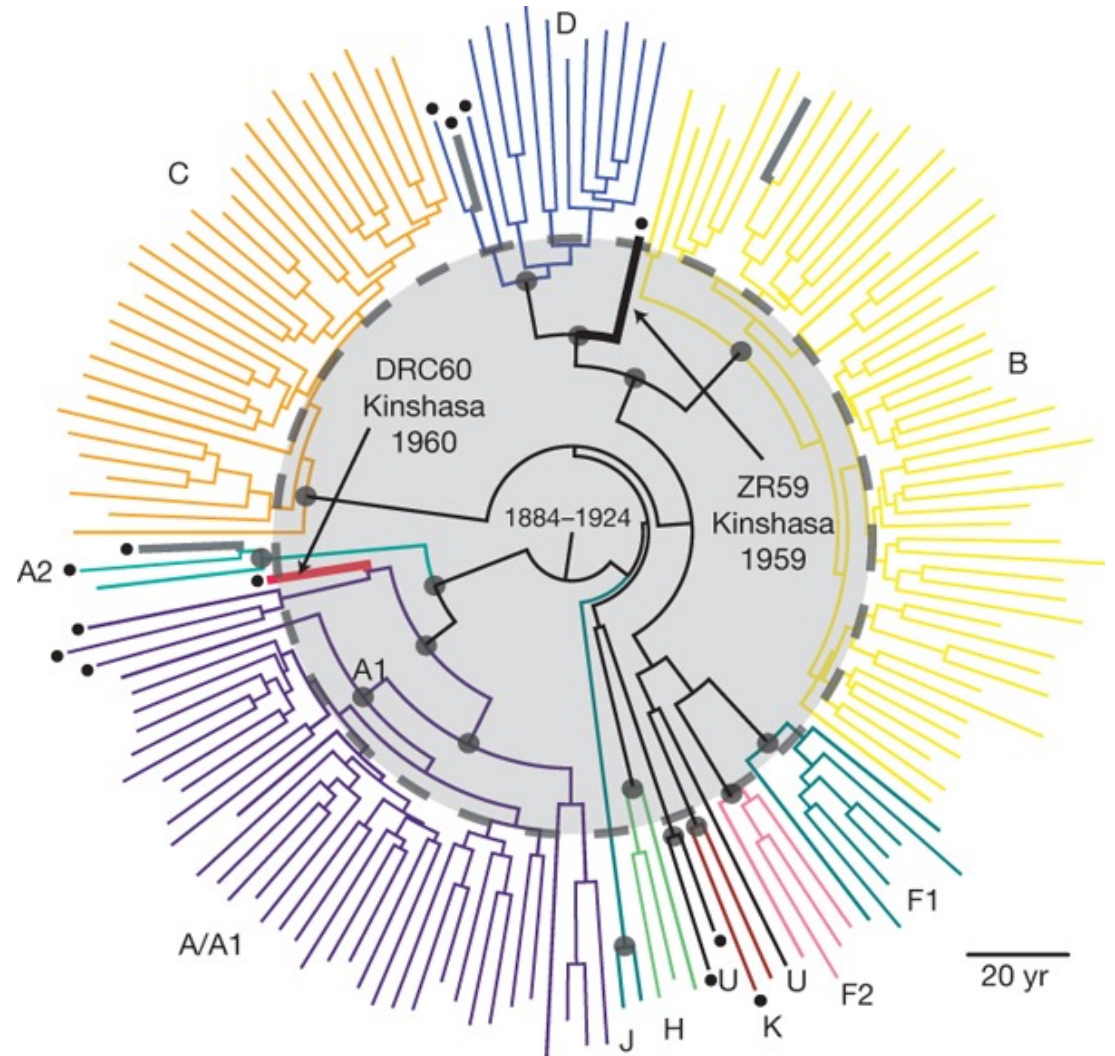
- Likely “bushmeat” trade- hunting primates for food
- Hunters and other highly exposed populations: many SIV strains incorporated
- General human population – one cross over event and SPREAD due to social disruption, colonization with establishment of sex trade, city growth

% HIV-positive persons in 17 rural villages, Cameroon



When came into human populations

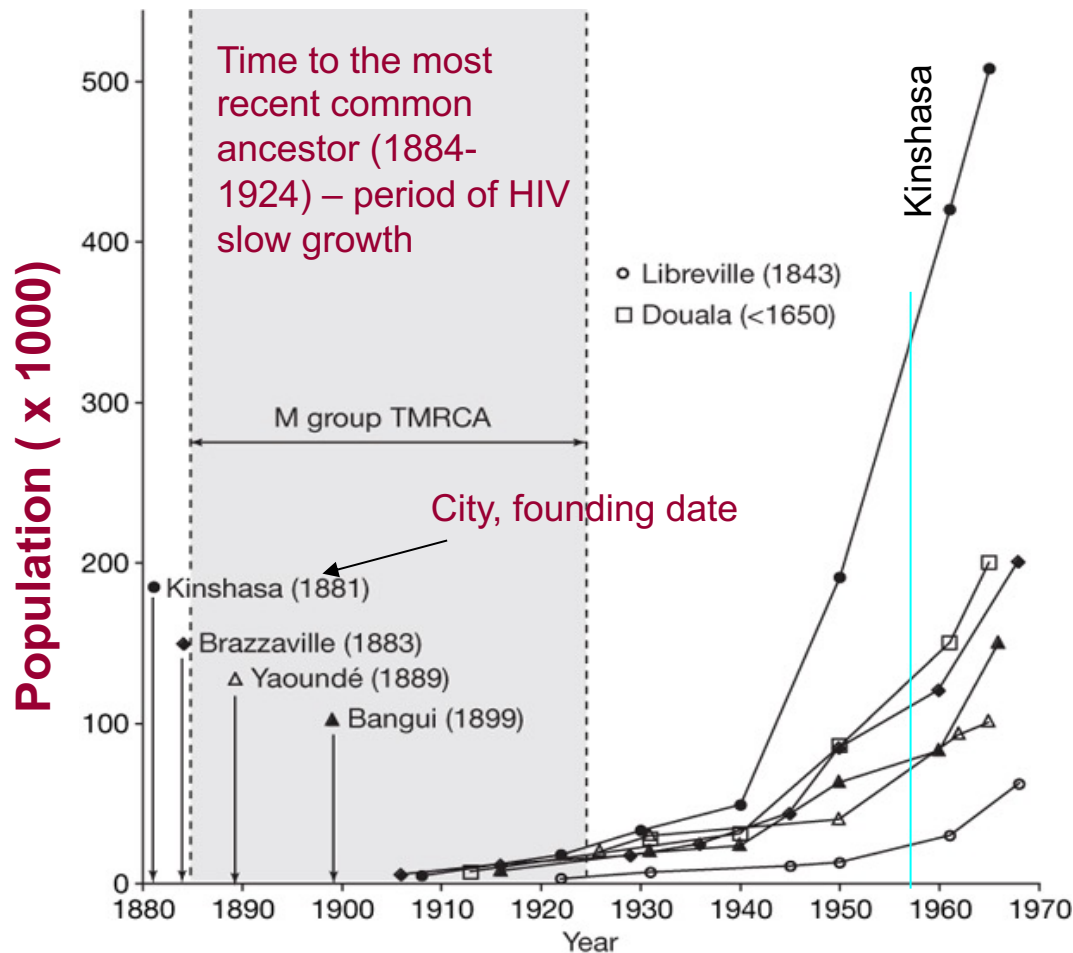
- Lymph node in paraffin found, adult female, Kinshasa, 1960 “DRC60”
- DRC60 very different than ZR59
- Family tree constructed, rate of mutation calculated
- Ancestor of HIV-1 M probably entered humans 1884-1924





The rest is West African history

- No city in region before 1910 had population > 10,000
- Kinshasa (and other) populations ↑ in 2nd half of 20th C. (trade, colonial)
- HIV-1 M from Cameroon brought by traveler down-river to Kinshasa – entered urban sexual network and spread
- By 1960's, ~2000 people infected in Africa
- By 1970s, first probable outbreak in Kinshasa (OIs seen)

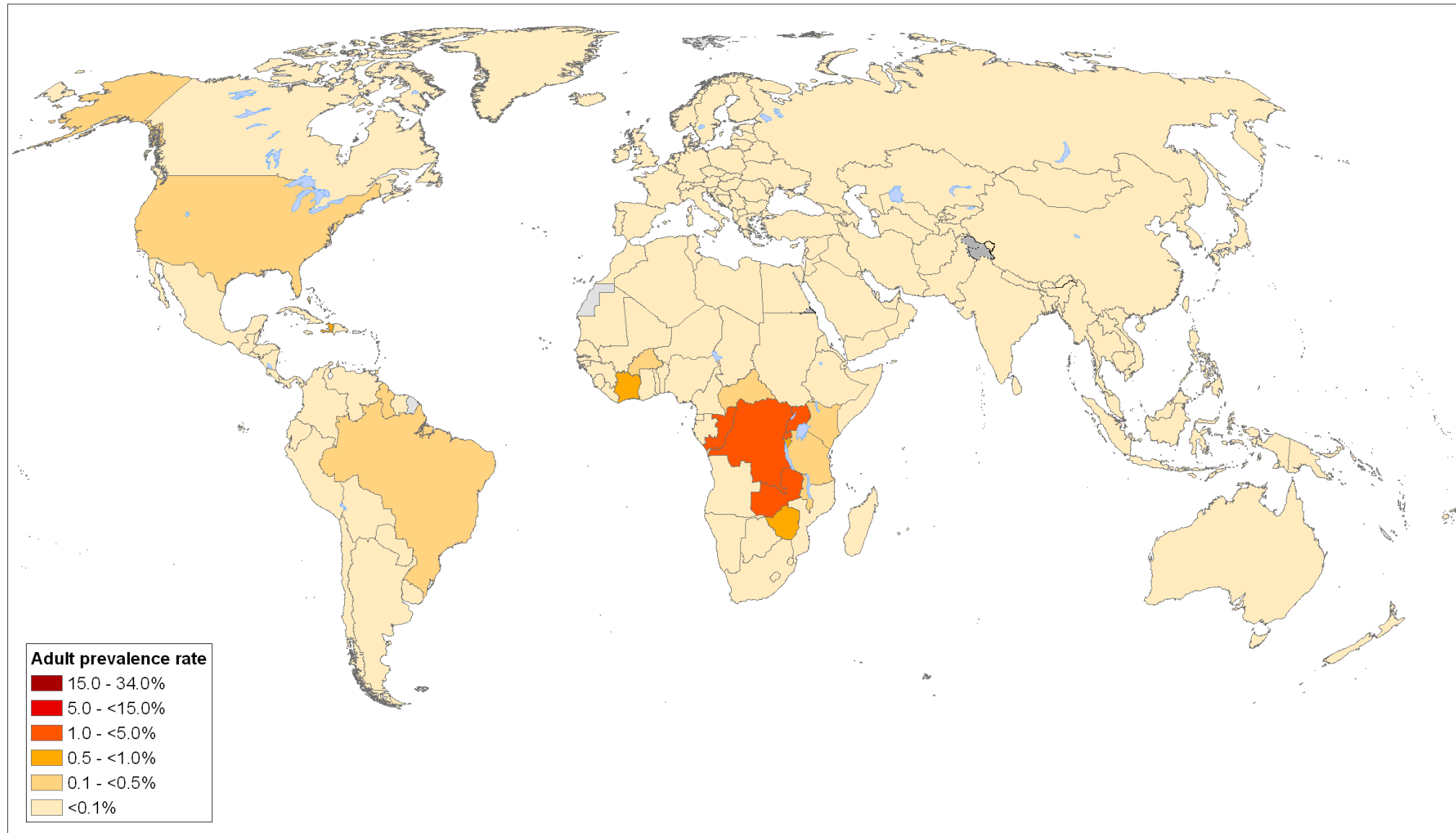


What happened from there?

- Carried from West to Eastern Africa in '70's
- Spread fast in E. Africa, epidemic form in early '80's
 - Labor migration (35% truck drivers positive Uganda '88)
 - High ratio of men urban centers, sex trade, STDs
 - Low status of women, low rates circumcision
 - 85% Nairobi sex workers infected by '86)
- By mid and late '80's, on to sub-Saharan Africa
 - Tanzam road between Tanzania and Zambia



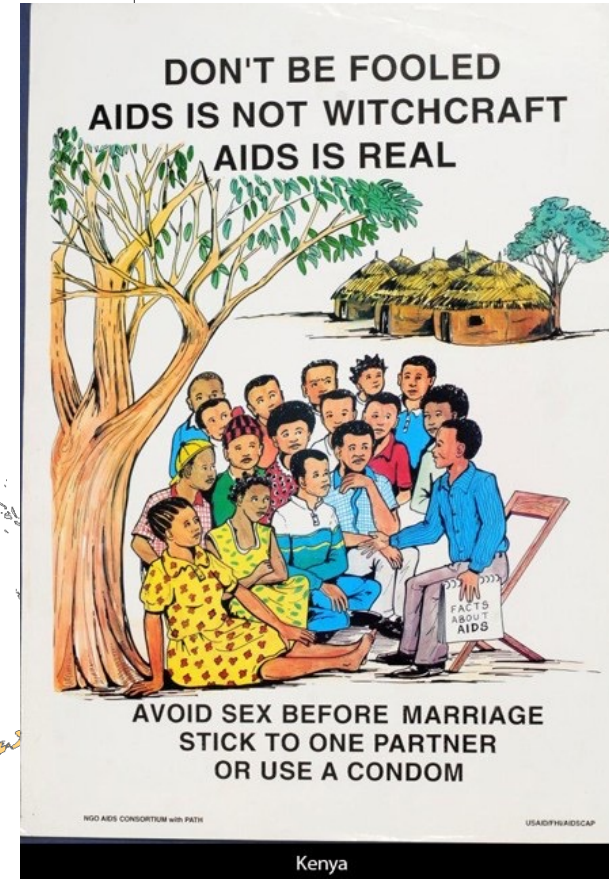
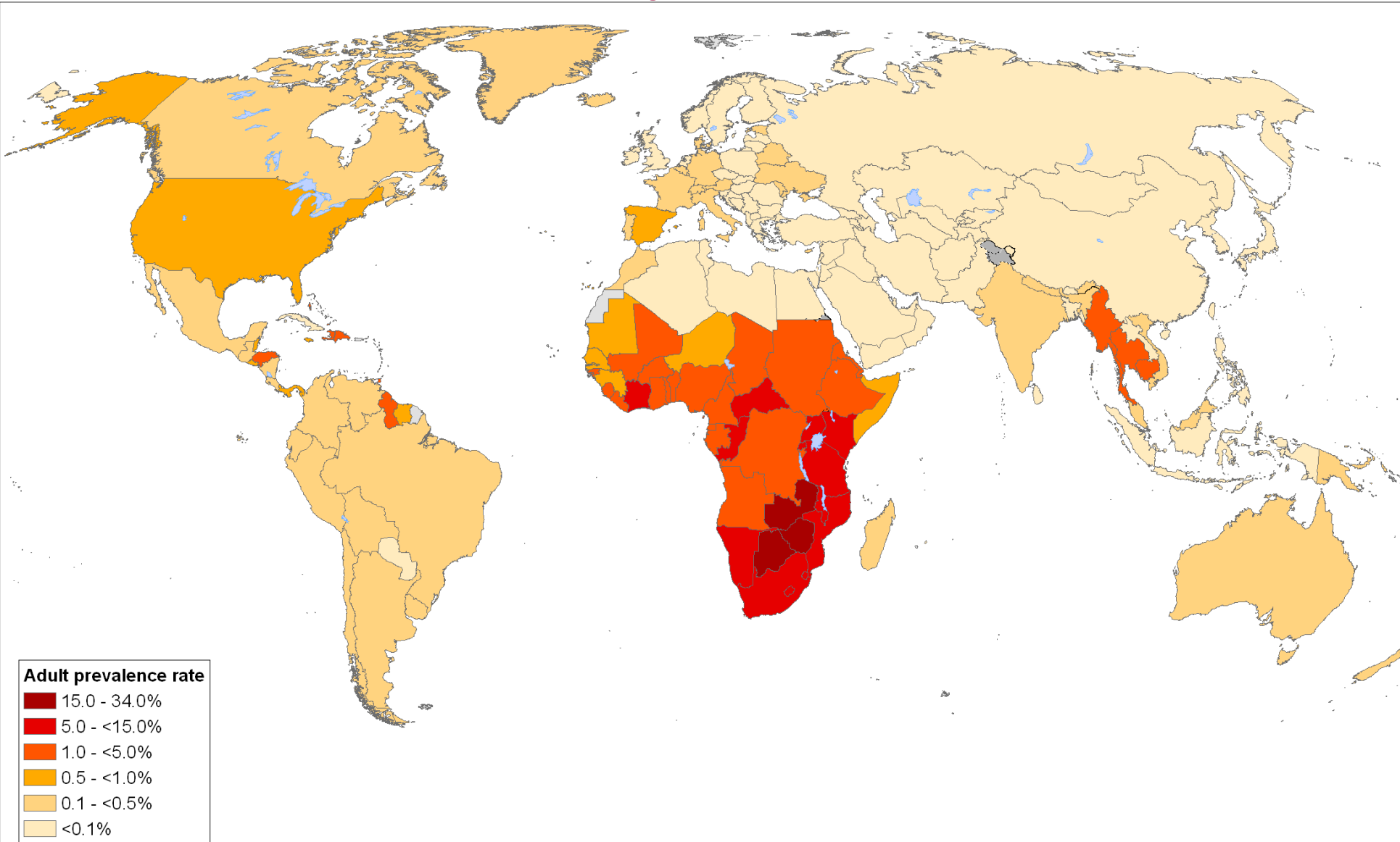
Global HIV prevalence in adults, 1985



UNAIDS/WHO 1985



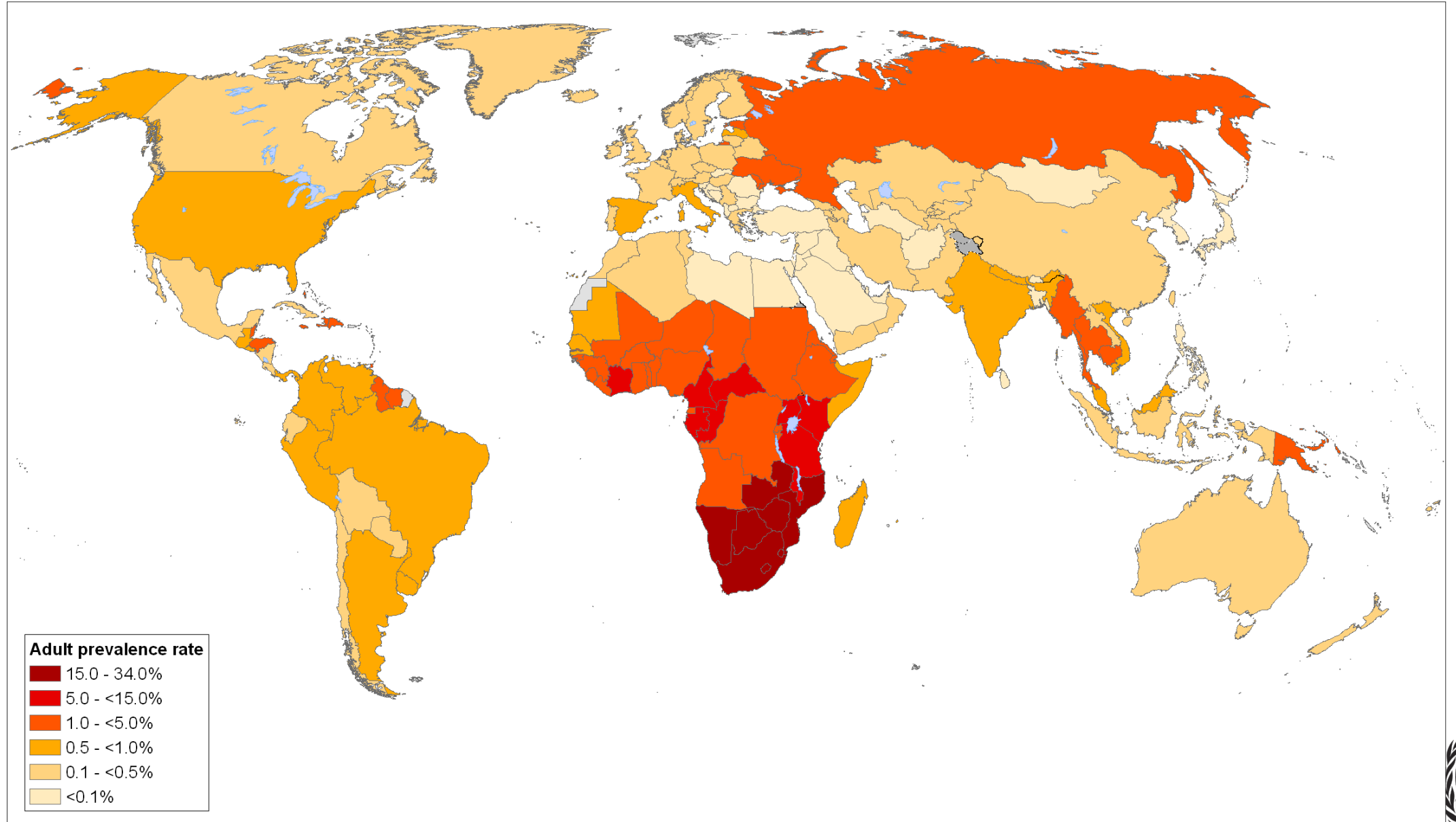
Global HIV prevalence in adults, 1995



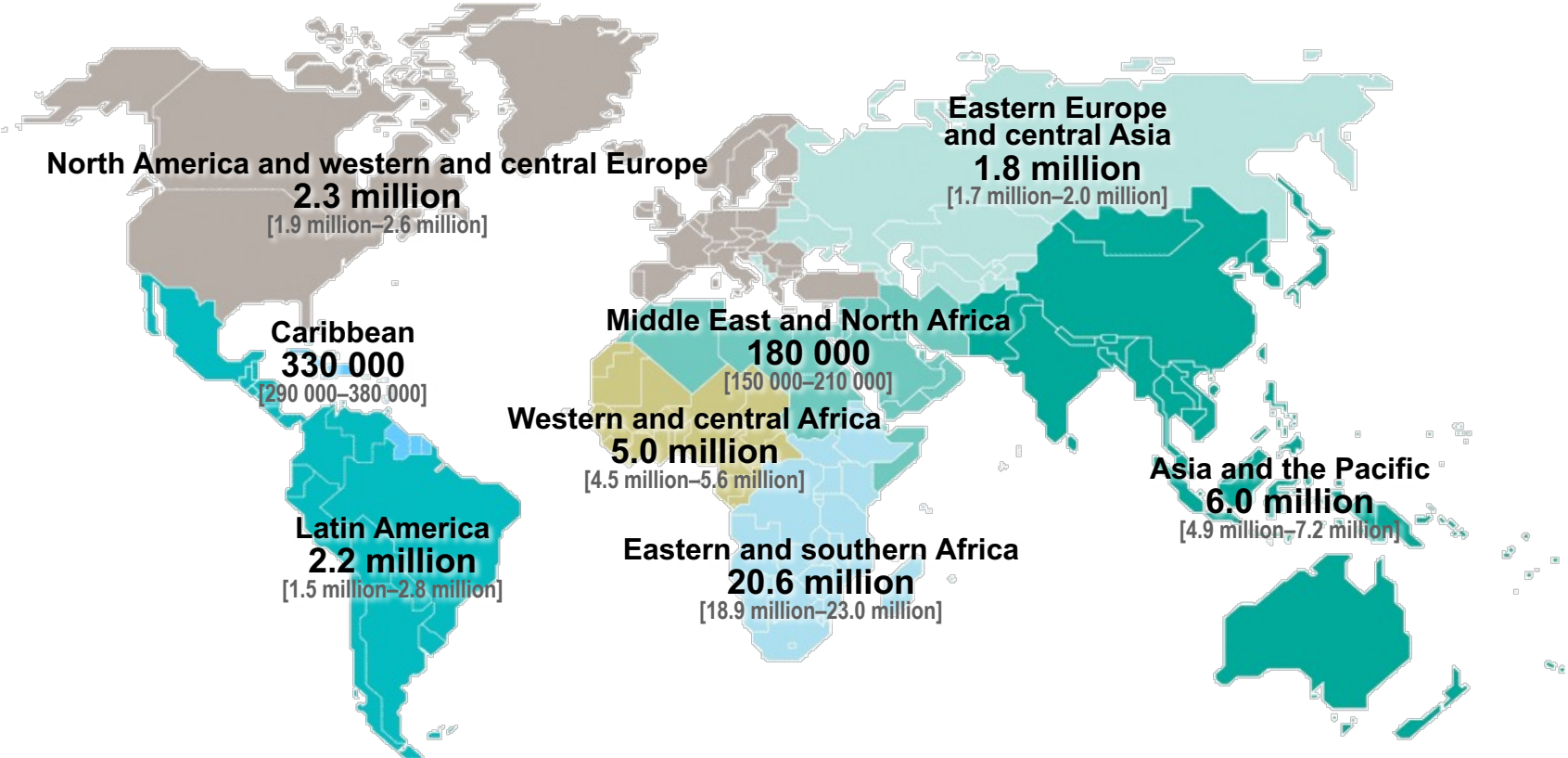
UNAIDS/WHO 1995



Global HIV prevalence in adults, 2005










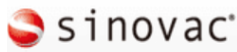

Adults and children estimated to be living with HIV | 2021



Total: 38.4 million [33.9 million–43.8 million]

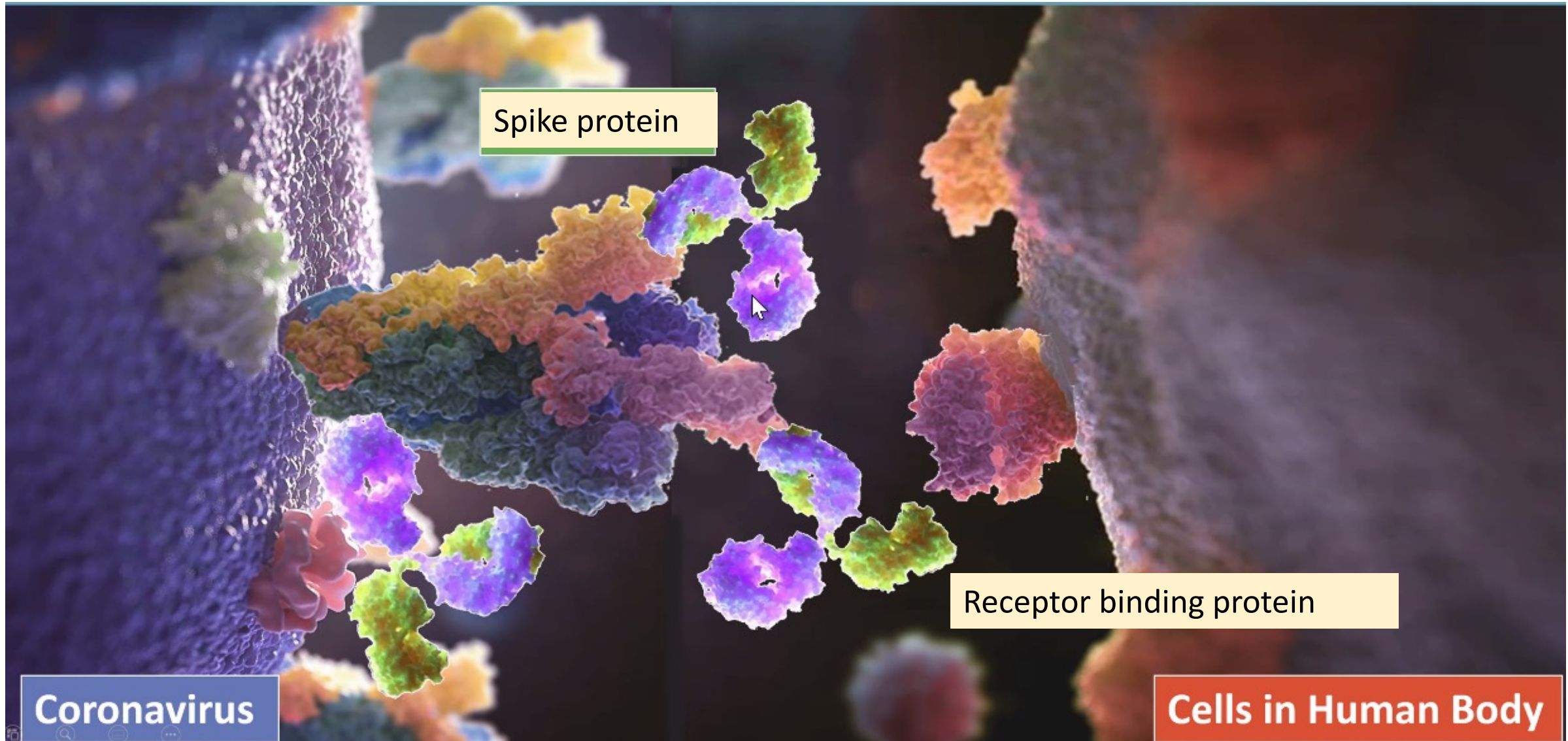


GLOBAL COVID VACCINES AND VARIANTS

Company or name	Type of vaccine	Reference
	mRNA vaccine	Baden NEJM , Feb 4, 2021
	mRNA vaccine	Polack NEJM , December 31, 2020
	Adenovirus + DNA vaccine	J&J press release January 29, 2021; FDA document Feb 24
 AstraZeneca	Adenovirus + DNA vaccine	Voysey Lancet December 8, 2020; Preprint Feb 1, 2021
 NOVAVAX Creating Tomorrow's Vaccines Today	Spike protein + an adjuvant	Novavax press release June 14; Novavax NEJM June 30, 2021
	Adenovirus + DNA vaccine	Logunov Lancet , February 2, 2021
	Whole inactivated virion	Sinopharm , JAMA, May 28, 2021
	Whole inactivated virion	Sinovac , JAMA May 28, 2021
	Whole inactivated virion	Bharat Covaxin , April 21, 2021

There are actually 8 unique vaccines approved by WHO for COVID-19 (Sputnik V pending), four authorized in U.S.

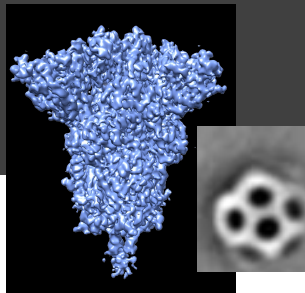
6 vaccine candidates to date involve spike protein and receptor binding domain of SARS-CoV-2 - either mRNA or adenoviral-vector DNA vaccines or protein adjuvant itself; 3 inactivated virus



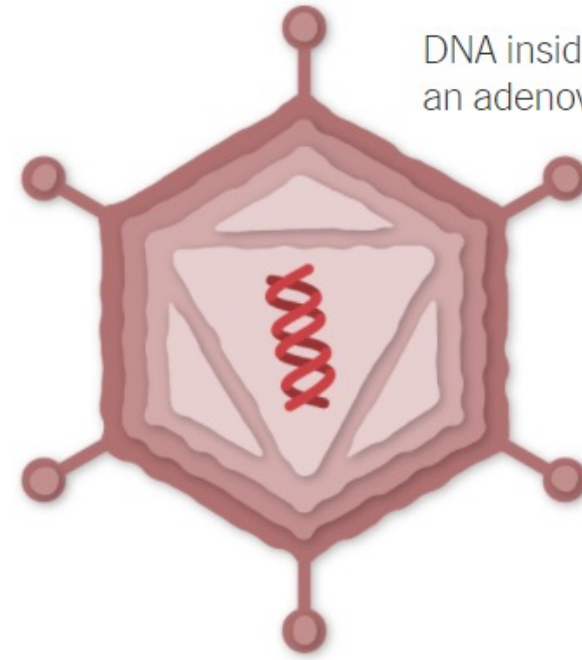
Three types of vaccines involving spike protein

- mRNA vaccines (2)
- Adenoviral vector DNA vaccines (3)
- Spike protein + M-adjuvant vaccine (1)

Three vaccines whole inactivated virions



NOVAVAX
Creating Tomorrow's Vaccines Today



DNA inside an adenovirus

Johnson & Johnson



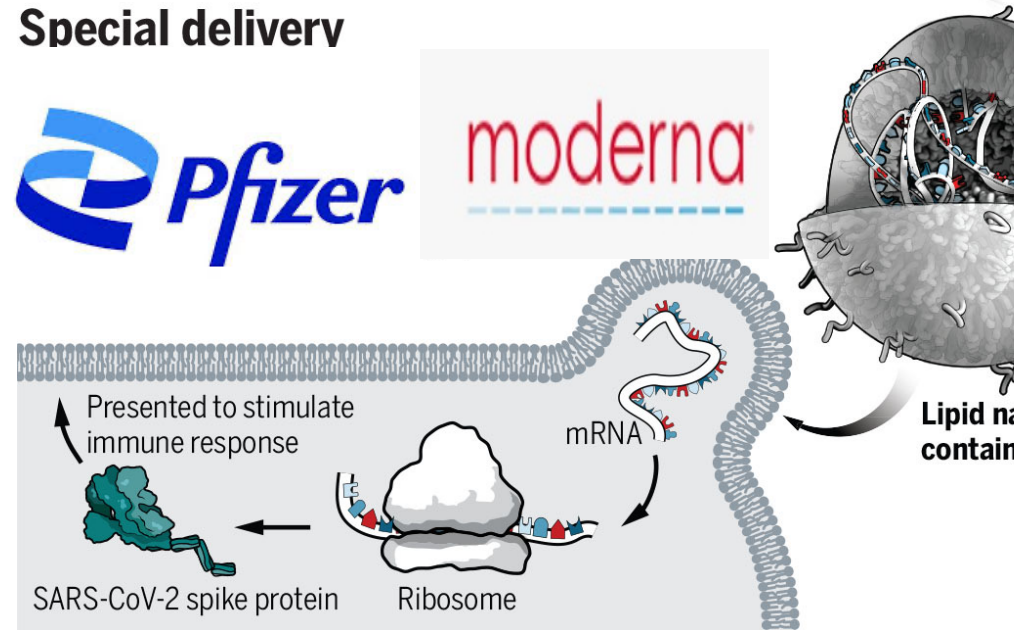
AstraZeneca

Sputnik V

Special delivery



moderna



Presented to stimulate immune response

SARS-CoV-2 spike protein

Ribosome

mRNA

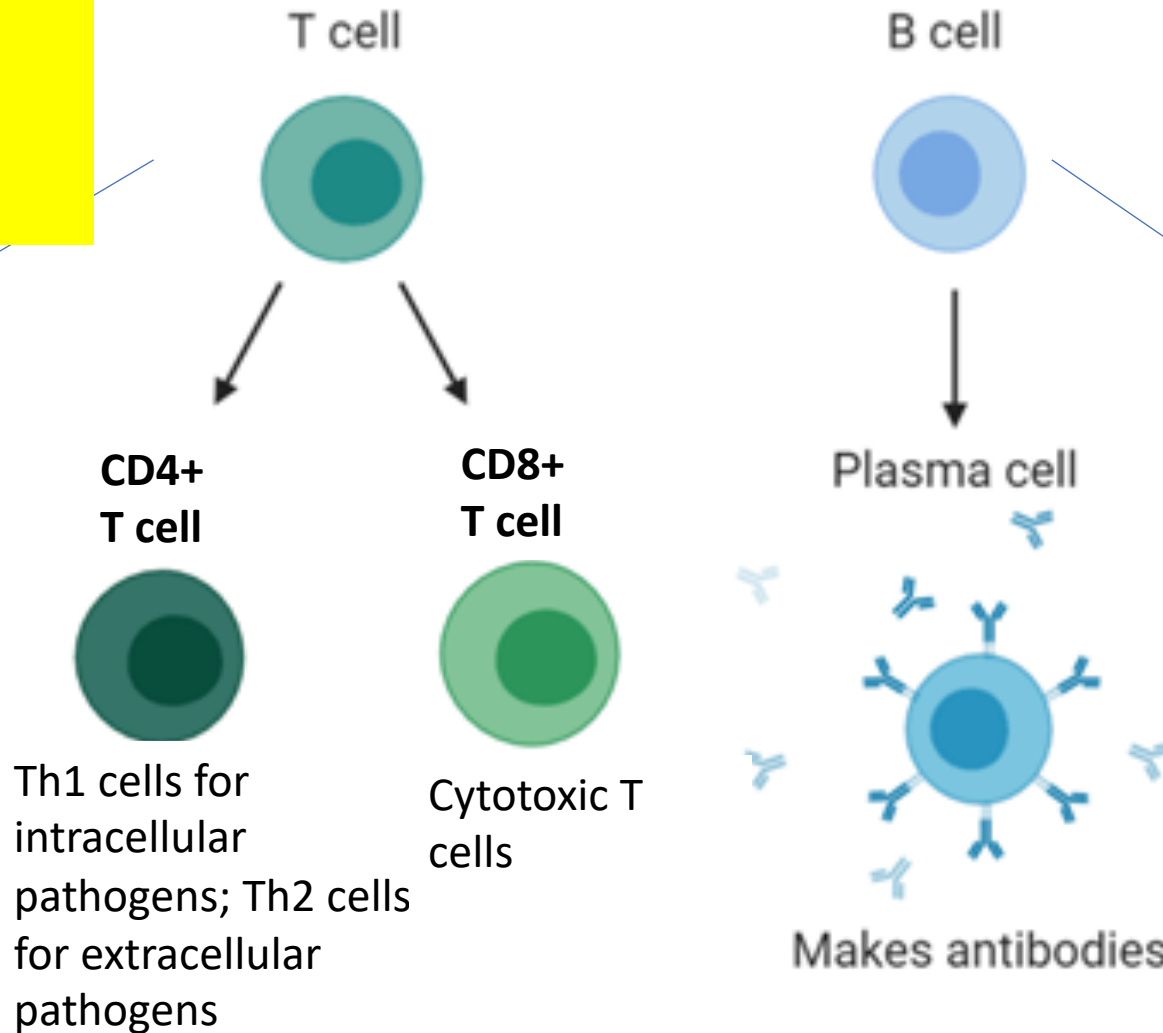
Lipid bilayer contains

Remember immunity -antibodies and cell-mediated

T cells are the major immune defense against viruses; preserved







Memory T cells




Of note, want Th1:Th2 ratio $\gg 1$ for viruses; Th2 CD4s block antiviral Th1-CD4s and CD8s



Memory B cells produce antibodies (remember antibodies will wane with time, but memory B cells are blueprint to make more)

Most vaccine trials measured antibodies and T cell responses

Company	Platform	Doses	Non-clinical results	# with vaccine (same placebo)	Protection from COVID-19 hospitalization	Protection from COVID severe dz (some at home)	Efficacy against milder COVID
	mRNA-1273 mRNA in lipid nanoparticle	2	Neutralizing Abs; Strong Th1 CD4+ protection from challenge (macaques)	~15,000	90% (1 in vaccine arm after 2nd dose hospitalized)	97% (30 cases in placebo arm; 0 in vaccine reported but 1 severe per FDA)	94.1%
	BNT162b2 mRNA in lipid nanoparticle	2	Neutralizing Abs; Strong Th1 CD4+, CD8+; protection from challenge (macaques)	~18,600	100%	100% (9 cases in placebo arm; 0 in vaccine- 1 initially severe but not)	95%
	JNJ-78436725 Non-replicating human adenovirus/DNA	1	Neutralizing Abs; Strong Th1 CD4+ > Th2; CD8+; challenge protection (macaque)	~22,000 US, Latin America, S. Africa	100%	85.4% across 3 sites (7 deaths, 16 hospitalizations, all in placebo arm)	72% US; 61% Latin America; 64% S. Africa (95% B1.351)
	AZD 1222 Non-replicating Chimp Adenovirus-DNA	2	Neutralizing Abs; Strong Th1 CD4+ > Th2; CD8+; protection from challenge (macaques)	~28,588 (UK, SA, US/Peru/Chili)	100%	100% (UK, 15 placebo arm hospitalized, 0 in vaccine; US, 8 severe in placebo, 0 vaccine)	76% US (85% in >65 yrs); 70% UK; S. Africa halted for mild
	NVX-CoV2373 Spike protein/RBD + Matrix M adjuvant	2	Neutralizing Abs; Strong Th1 CD4 > Th2; macaque challenge protection	8833 (Phase 3 UK; 2b SA); 12.5K (Φ 3)	100%	100% (24 severe placebo in UK/SA/US/MX; 0 vaccine)	90.4% US/MX; 100% severe; 93.2% variants
	Ad26 and Ad5 adenovirus/DNA	2	NAbs; IFN-γ secretion PMBCs, cellular response	~14964	100%	100% (20 in placebo; 0 vaccine)	91.6%

Company	Platform	Doses	Non-clinical results	# with vaccine (same placebo)	Protection from COVID-19 hospitalization	Efficacy against milder COVID
 BHARAT	Inactivated whole virus	2	Neutralizing Abs; Strong Th1 CD4 responses in phase II trial (Lancet)	11,000 (press release 4/21)	100%	78%
 sinovac	Whole inactivated virion	2	Neutralizing Abs; IFN-gamma assays T cell responses	13,068	100%	72.8%
 SINOPHARM	Whole inactivated virion	2	Neutralizing Abs; IFN-gamma assays T cell responses	13,068	100%	78.1%

T cells have held up against variants

Negligible impact of SARS-CoV-2 variants on CD4+ and CD8+ T cell reactivity in COVID-19 exposed donors and vaccinees.

Alison Tarke, John Sidney, Nils Methot,  Yun Zhang,  Jennifer M Dan, Benjamin Goodwir 

- T cell reactivity against variants remain intact if you had natural infection or mRNA vaccination from alpha to Omicron

Fig. 2

n = 0.0830

n = 0.3008

Cell

Article

SARS-CoV-2 vaccination induces immunological T cell memory able to cross-recognize variants from Alpha to Omicron

Graphical abstract

Authors

Alison Tarke, Camila H. Coelho,

Article | Published: 05 April 2022

SARS-CoV-2 antigen exposure history shapes phenotypes and specificity of memory CD8⁺ T cells

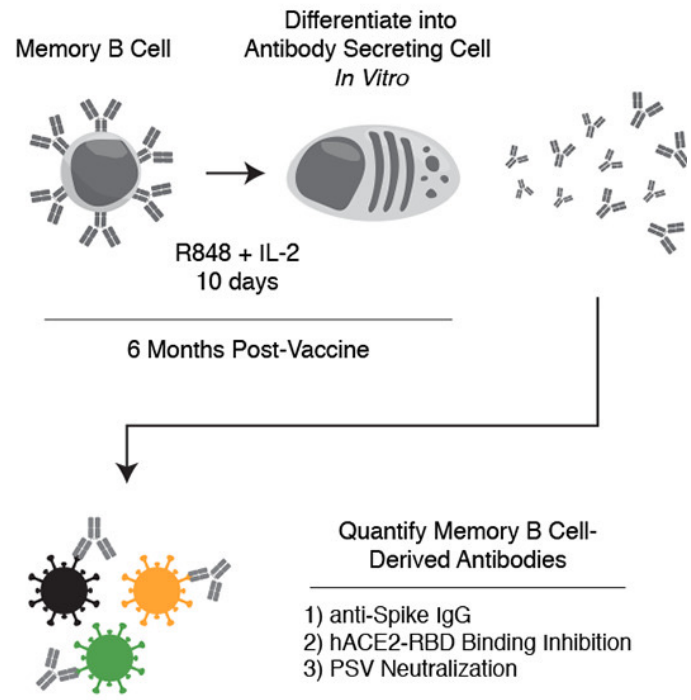
COVID-19

Cross reactive T cells hold up against Omicron

[Anastasia A. Minervina](#), [Mikhail V. Pogorelyy](#), [Allison M. Kirk](#), [Jeremy Chase Crawford](#), [E. Kaitlynn Allen](#),

¹Madhi. NEJM. March 16, 2021; Ma. Biorxiv April 29, 2021; deMarco. bioRxiv 2021.12.30.474453.

Memory B cells from vax or infection adapt to whatever variant they see



The Journal of Infectious Diseases

MAJOR ARTICLE



Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)-Specific Memory B Cells From Individuals With Diverse Disease Severities Recognize SARS-CoV-2 Variants of Concern

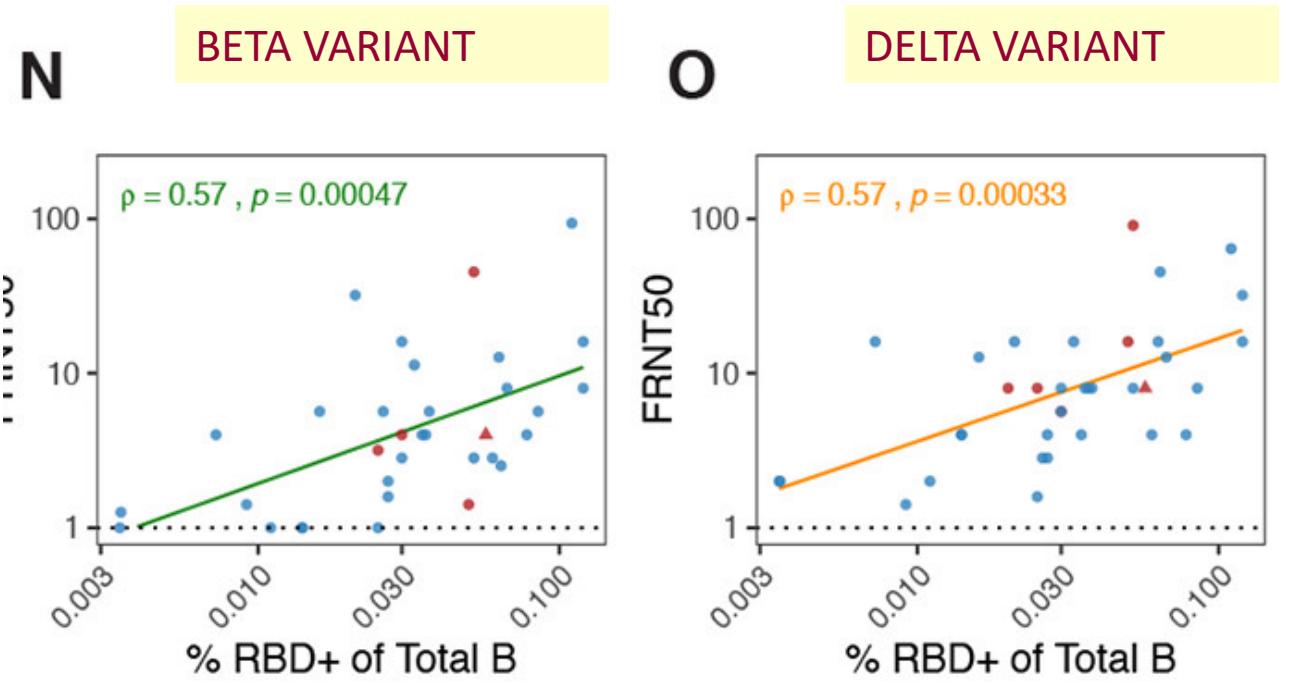
Science

RESEARCH ARTICLES

Cite as: R. R. Goel et al., *Science* 10.1126/science.abm0829 (2021).





mRNA vaccines induce durable immune memory to SARS-CoV-2 and variants of concern

Rishi R. Goel^{1,2+}, Mark M. Painter^{1,2+}, Sokratis A. Anostolidis^{1,2,3+}, Divii Mathew^{1,2+}, Wenzhao Meng^{1,4}, Aaron M.



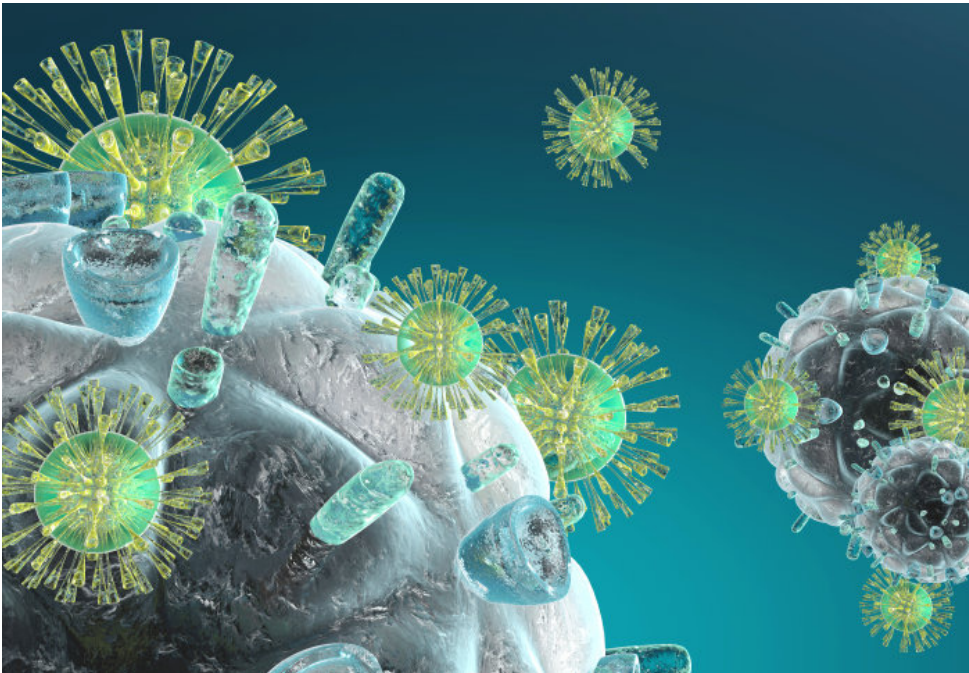


**World Health
Organization**

Country/region	Scientific name	WHO name
 Kent, UK	B.1.1.7	Alpha
 South Africa	B.1.351	Beta
 Brazil	P.1	Gamma
 India	B.1.617.2	Delta

Omicron's feeble attack on the lungs could make it less dangerous

Mounting evidence from animal studies suggests that Omicron does not multiply readily in lung tissue, which can be badly damaged in people infected with other variants.



Omicron- similarities to end of 1918 influenza pandemic?

- More and more immunity in the population – IHME estimates at least 80% of the planet exposed to SARS-CoV-2 by now
- **UK data January 13, 2023: 99.99% anti-spike antibody (vaccine or natural); 82.5% anti-nucleocapsid antibody (natural)- US NIH serohub same**
- A less virulent influenza variant in 1918? (3rd wave)
- If you see Omicron, you get immunity across whole virus
- If not, a booster will help; older patients should get booster if infected prior- hybrid immunity
- In the future **we may need whole inactivated virus vaccine as a booster (Covaxin, etc.)- to get immunity across whole virus to combat variants**

<https://covid19serohub.nih.gov/>

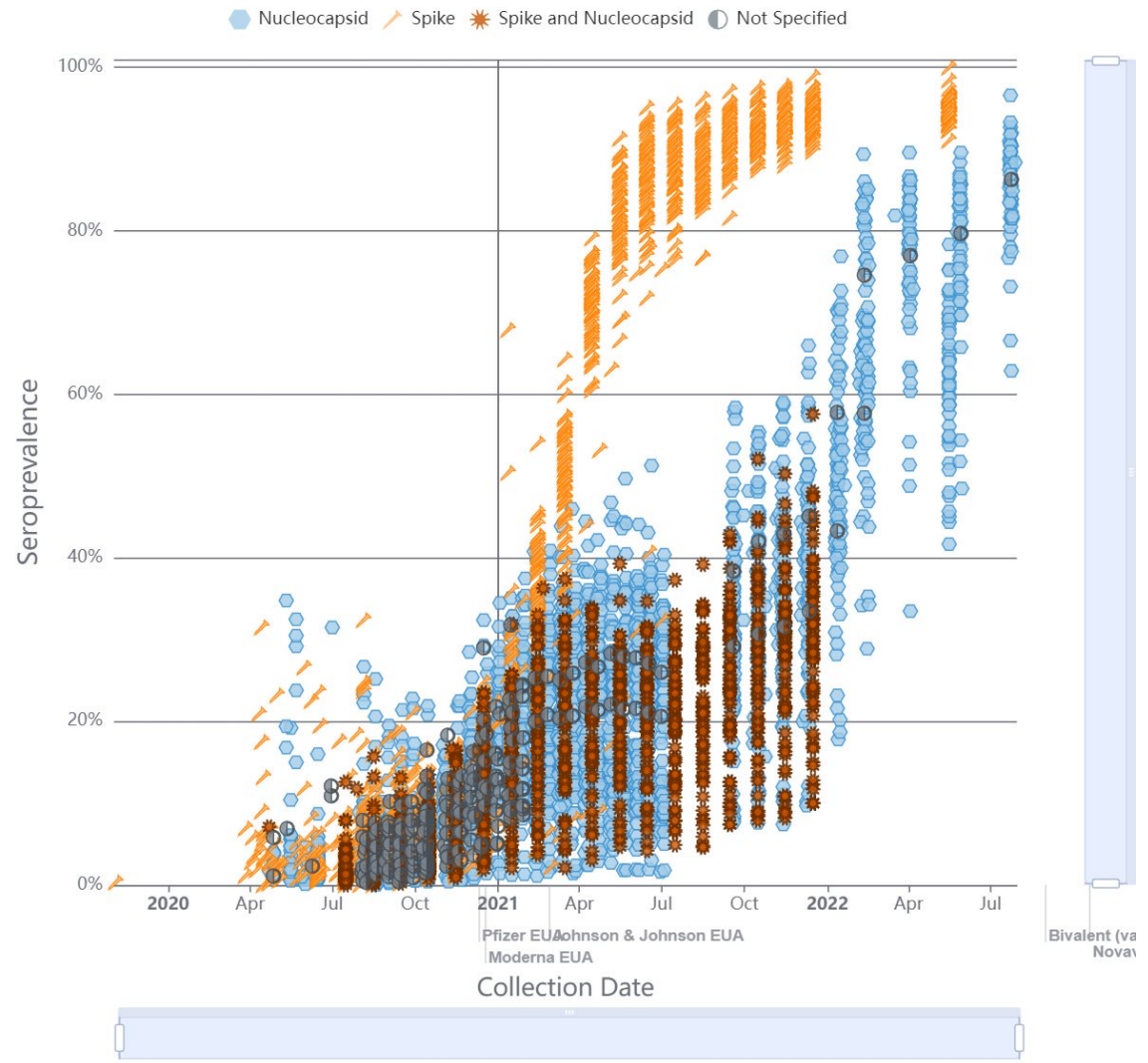
US data April 18, 2023

99.99% anti-spike antibody
(vaccine or natural); 89.4% anti-nucleocapsid antibody (natural)

FDA NEWS RELEASE

Coronavirus (COVID-19) Update: FDA Authorizes Changes to Simplify Use of Bivalent mRNA COVID-19 Vaccines

Share Tweet LinkedIn Email Print



Who remains at risk after 2 doses?

Severe COVID-19 outcomes after full vaccination of primary schedule and initial boosters: pooled analysis of national prospective cohort studies of 30 million individuals in England, Northern Ireland, Scotland, and Wales



Utkarsh Agrawal*, Stuart Bedston*, Colin McCowan*, Jason Oke*, Lynsey Patterson*, Chris Robertson*, Ashley Akbari, Amaya Azcoaga-Lorenzo, Declan T Bradley, Adeniyi Francis Fagbamigbe, Zoe Grange, Elliott C R Hall, Mark Joy, Srinivasa Vittal Katikireddi, Steven Kerr, Sir Lewis Ritchie,



THE LANCET

THE LANCET Infectious Diseases

New boosters are here! Who should receive them and when?

Shira Doron • [Monica Gandhi](#) ✉

PDF [118 K]

- 30 million individuals across UK after 2 doses – published October 18, 2022
- With 2 doses, risk of COVID-19 hospitalization 0.4% (0.004)
- Risk factors for severe breakthrough: >80, 5 or more comorbidities, on immunosuppressants, chronic renal disease
- These groups most in need of booster doses; Paxlovid if infected
- We wrote piece in October 2022 in Lancet ID **stressing the need for boosters for those still at risk** (immunocompromised, older)

HIV in the United States

First Clinical Descriptions of AIDS, MMWR

-1-

1981 June 5;30:250-2

MMWR

Pneumocystis Pneumonia – Los Angeles

In the period October 1980-May 1981, 5 young men, all active homosexuals, were treated for biopsy-confirmed *Pneumocystis carinii* pneumonia at 3 different hospitals in Los Angeles, California. Two of the patients died. All 5 patients had laboratory-confirmed previous or current cytomegalovirus (CMV) infection and candidal mucosal infection. Case reports of these patients follow:

1981 July 4;30:305-8

Kaposi's Sarcoma and *Pneumocystis* Pneumonia Among Homosexual Men – New York City and California

During the past 30 months, Kaposi's sarcoma (KS), an uncommonly reported malignancy in the United States, has been diagnosed in 26 homosexual men (20 in New York City [NYC]; 6 in California). The 26 patients range in age from 26-51 years (mean 39 years). Eight of these patients died (7 in NYC, 1 in California)—all 8 within 24 months after KS was diagnosed. The diagnoses in all 26 cases were based on histopathological examination of skin lesions, lymph nodes, or tumor in other organs. Twenty-five of the 26 patients were white, 1 was black. Presenting complaints from 20 of these patients are

Let's go
to San
Francisco,
early 80's

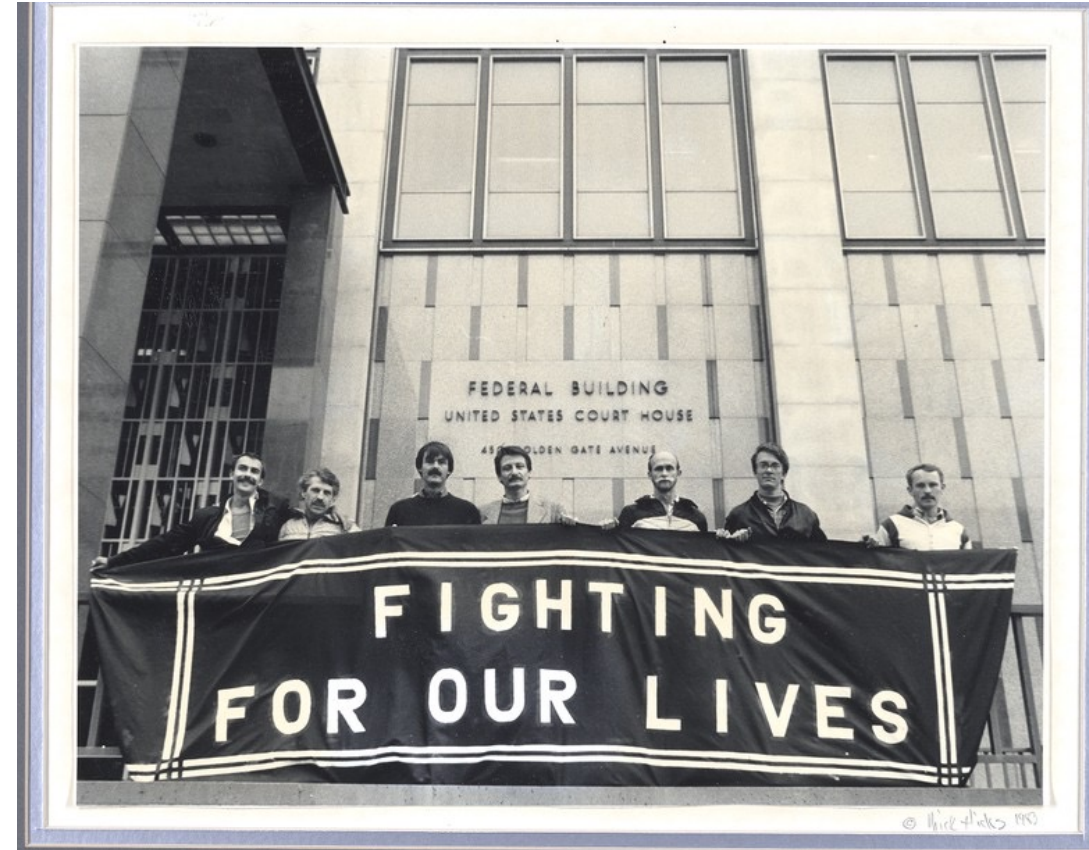
AIDS

"A plague is a formidable enemy,
and is armed with terrors that
every man is not sufficiently fortified
to resist or prepared to stand the
shock against."

"A JOURNAL OF THE PLAGUE YEAR"
LONDON, 1665
BY DANIEL DEFOE

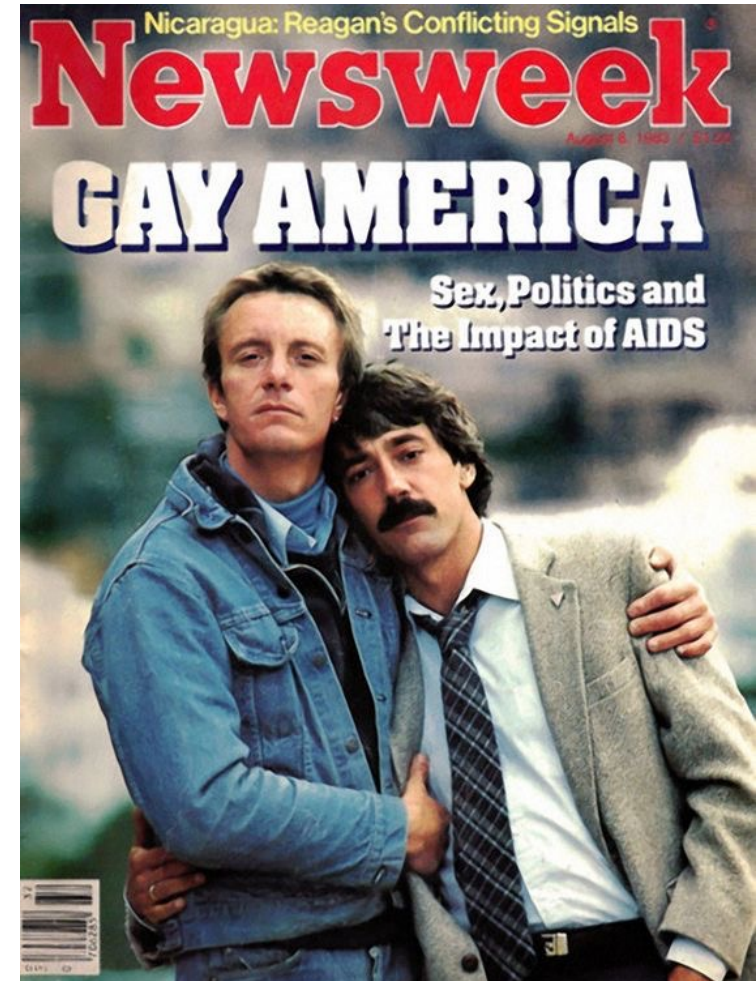
1984 THE YEAR OF THE PLAGUE

SELECTED COVERAGE FROM THE
San Francisco Chronicle



Timeline

- **1981** – MMWR reported 270 of rare immunodeficiency in men, 121 died
- **1982**- GRID labeled AIDS by CDC
- **1983**- Bobbi Campbell AIDS activist appears with his partner (Bobby Hilliard) on cover of *Newsweek*
- **1983** – Virus isolated, antibody test developed
- **1983** –Ward 86 opened doors in San Francisco
- **1984** – Bobbi Campbell died
- **1984** – Bath houses in San Francisco and New York closed
- **1985** – First commercial ELISA approved



DISCOVER

DECEMBER 1985 \$2.50

Special Report
AIDS
 THE LATEST
 SCIENTIFIC FACTS

Contrary to what you've heard, AIDS isn't a threat to the vast majority of heterosexuals or a peril to humanity. It is — and is likely to remain — largely the fatal price one can pay for anal intercourse.



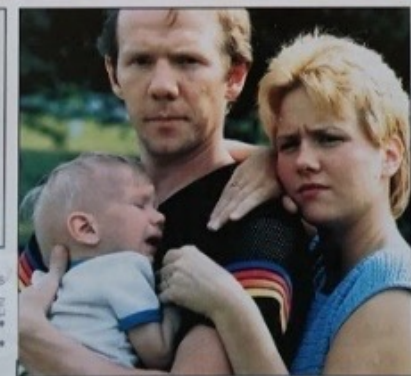
LIFE

July 1985

NOW NO ONE IS SAFE FROM AIDS



SUN CTV CM 92581
 26281 BIRKDALE RD
 *PSEBRZBIE96#0 L592X81 JN86
 *155B*****CNR-RT-508T**CROS
 74442



School bars door to youth with AIDS

By Christopher M. MacNeil
 Tribune staff writer

RUSSIAVILLE, Ind. — The mother of a local 13-year-old AIDS patient who has been barred from attending classes at Western Middle School today accused the school administration of "running around a problem they thought they wouldn't have to deal with."

Jeanne E. White, whose son, Ryan, was diagnosed with the usually fatal virus in December, said she thinks Western administrators "hoped Ryan would be sicker than he is now so that they wouldn't have to deal with him at school."

Tuesday, Western Superintendent James O. Smith announced that Ryan, an incoming seventh-grader, would not be allowed in school because he has acquired immune deficiency syndrome, the lethal virus that renders the body's disease-fighting ability powerless.

However, an interim set of guidelines released Tuesday by the state Board of Health recommended that school-age AIDS patients who feel well enough should be in school.



Los Angeles Times

43 Sunday Wednesday, October 2, 1985 L8/94 Pages Copyright 1985 The Times Mirror Company Daily 25c

AL STOCKS

Hospital Issues

let was mostly lower at the ing his hospital-management.

ndustrials closed down 7.25 at June was about 147.85 million on shares Tuesday.

Tables in Business Section

ouncil Friday

ation, Councilman Arthur K. e will resign from office to Snyder, a controversial and named Los Angeles' Supt. in Richard Alatorre (D-Los

d appoint Alatorre. It is more on, which can take place no Snyder resigns.

jan 'Hypocrisy'

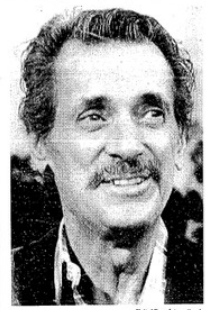
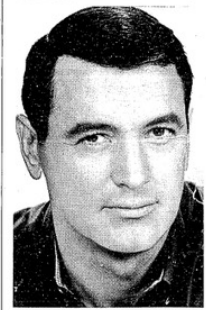
ica (UPI)—President Pater not repeal the Group Areas states where blacks can live, of hypocrisy for condemning

National Party's regional a said. "In the United States, has much to say in his id, is shoving Indians into affairs affecting their lives

bs. of Cocaine

unks of cocaine from a "tash

Rock Hudson Is Dead at 59; His AIDS Moved the World



One of First to Go Public With Illness

By RUTH A. POLKART,
 Times Staff Writer

Rock Hudson lost a months-long struggle with AIDS early today, dying of the incurable disease he personally chose to bring to the attention of a concerned and puzzled world.

The once archetypically rugged and handsome actor, whose film triumphs carried him into a successful television career, died peacefully in his Beverly Hills home. He was 59.

His publicist, Dale Olson, said only members of his staff were present when he died at 9 a.m.

Hudson was a veteran of such motion pictures as "Giant" and "A Farewell to Arms" who in recent weeks had become a symbol of acquired immune deficiency syndrome—a little understood and always fatal ailment that strikes

1985

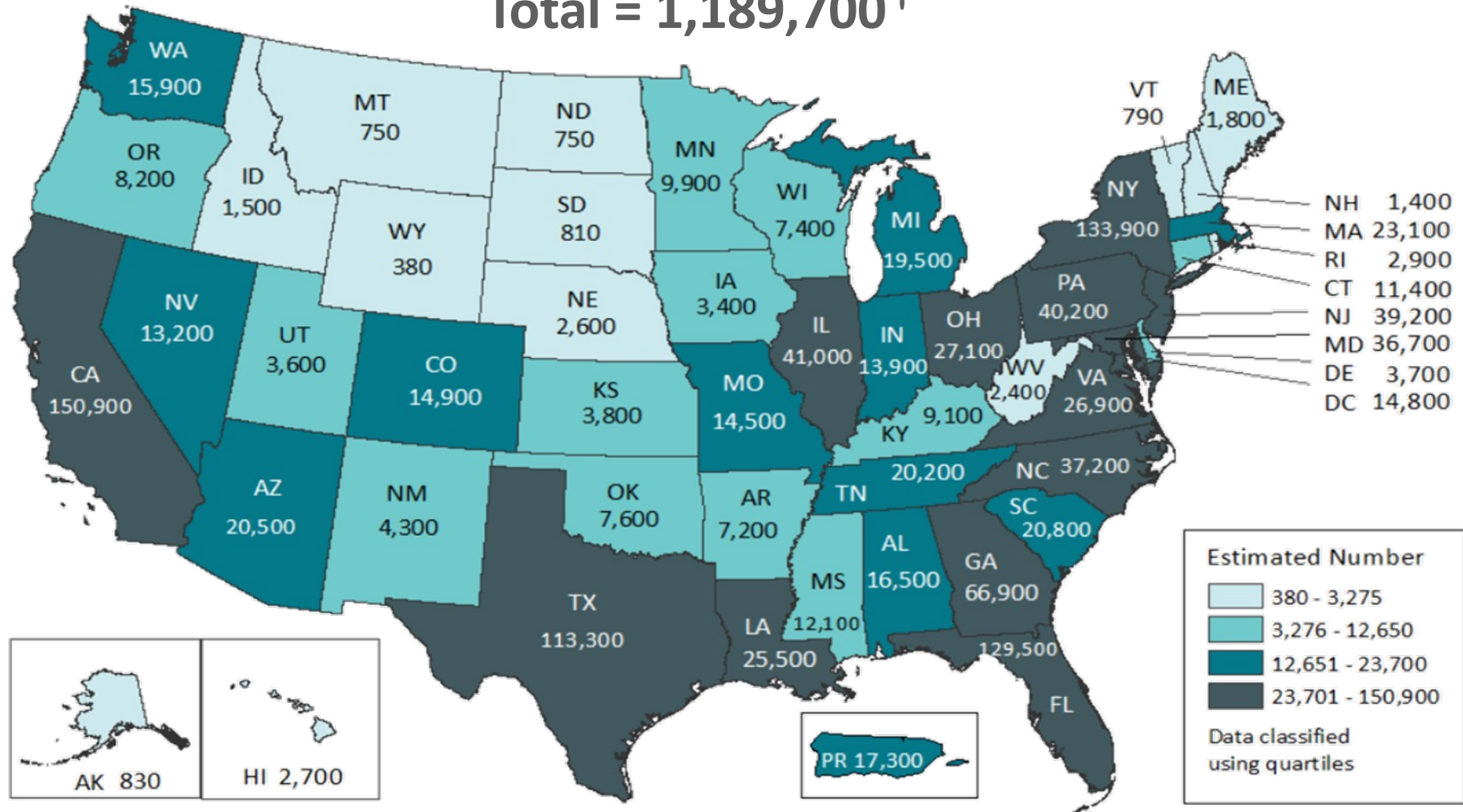
Ryan White Care Program

- **April 8, 1990** – Ryan White, activist, dies at 18
- **August 1990**- Bipartisan Ryan White Care act passed (150,000 cases, 100,000 deaths in U.S. to date), Eric Goosby MD founding director (1991-5)
 - Few disease specific health programs in the country, charged with serving PLWHA who are low income, un-or underinsured or otherwise lack resources to access services on their own – “wrap-around care”
- **1992** – AIDS leading cause of death U.S. men ages 22-44
- **1995** →500,000 AIDS cases in U.S.
- **2010** –National HIV/AIDS Strategy
- **2019**–End the HIV Epidemic initiative



Estimated HIV Prevalence among Persons Aged ≥13 years, by Area of Residence 2019—United States and Puerto Rico

Total = 1,189,700[†]

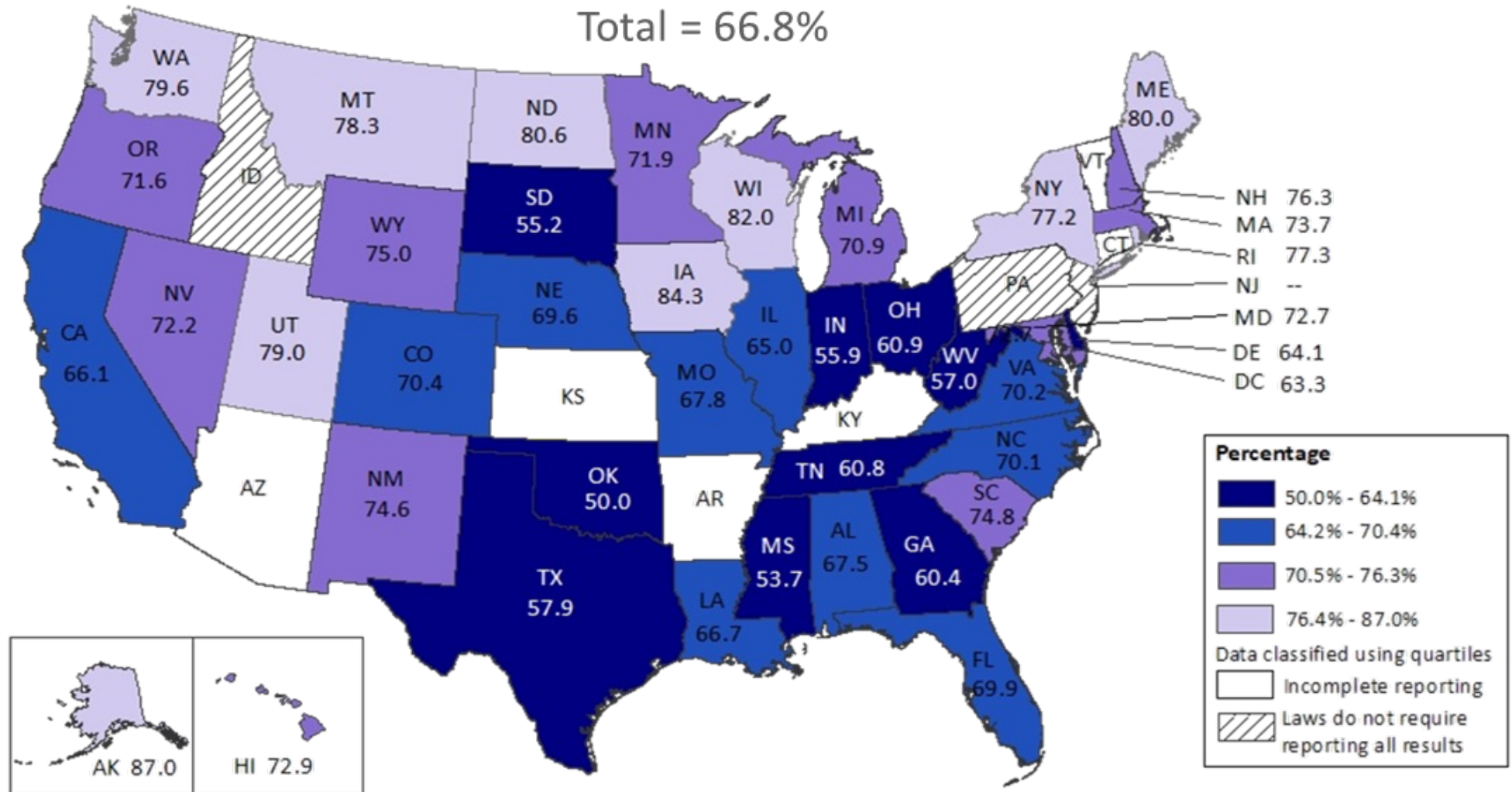


Note. Estimates were derived from a CD4 depletion model using HIV surveillance data. Estimates rounded to the nearest 100 for estimates >1,000 and to the nearest 10 for estimates ≤1,000 to reflect model uncertainty. Estimates for the year 2019 are preliminary and based on deaths reported to CDC through December 2020. Estimates should be interpreted with caution due to incomplete death ascertainment for Kansas, Massachusetts, Mississippi, Nevada, North Dakota, and Vermont.

[†]Total estimate for the United States does not include data for Puerto Rico.



Viral Suppression within 6 months of Diagnosis among Persons Aged ≥13 Years, 2018—41 States and the District of Columbia

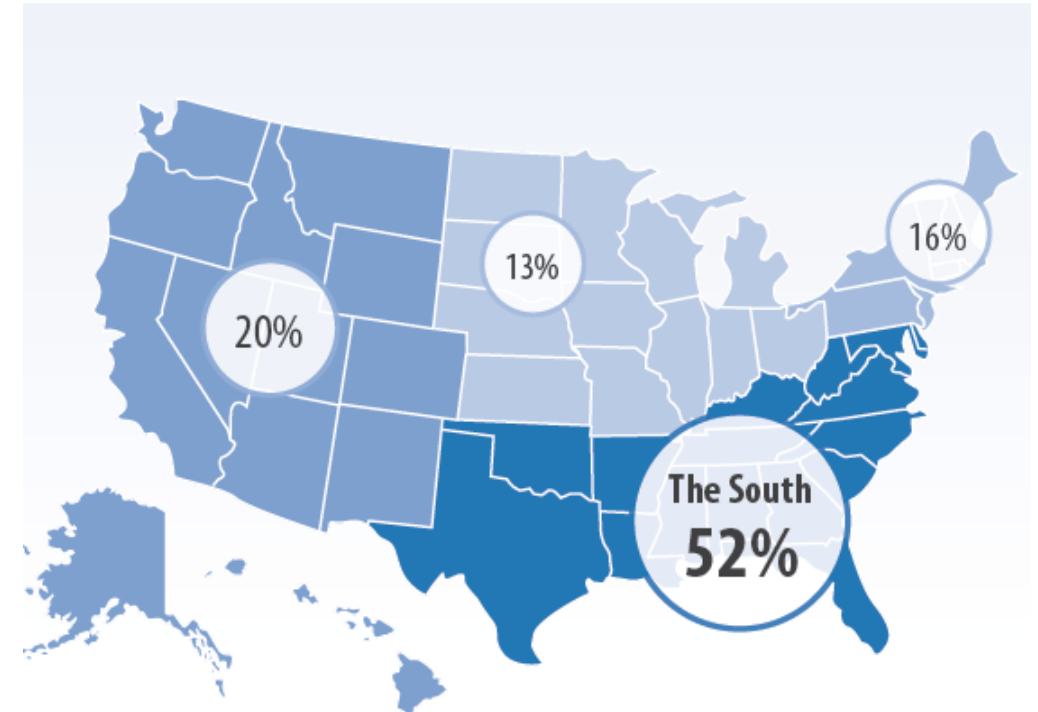
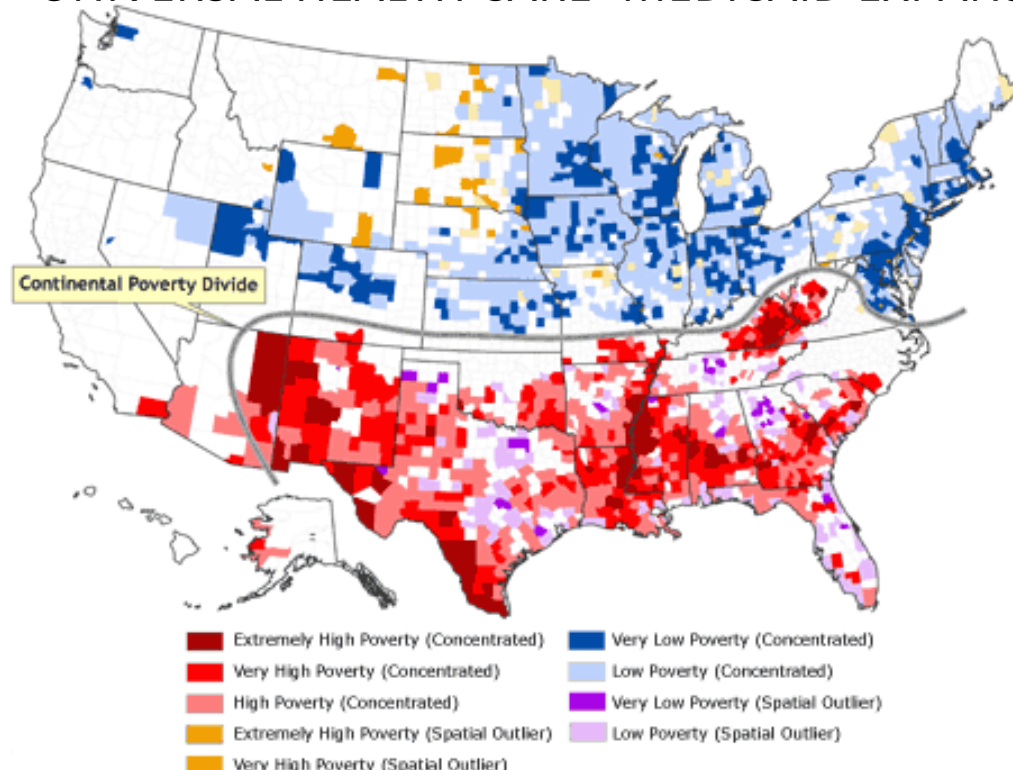


Note. Viral suppression was defined as <200 copies/mL on a VL test within 6 months of HIV diagnosis in 2018. Data are based on residence at diagnosis.



Risks in U.S. cluster with poverty, disease of disparities

- HIV clusters with poverty, interpersonal violence (women), incarceration, 52% new cases in South
- Key demographics of the new HIV diagnoses in 2019: 67% MSM; 24% heterosexual; 3% MSM and IDU together; 6% IDU
- Black Americans make up 42% of new HIV diagnoses in 2019 (12% population); Latino 27% of new diagnoses (19% population)
- Same initial disparities with COVID-19 although community efforts increased vaccine equity in black/brown communities- now White Americans more likely to have severe disease
- UNIVERSAL HEALTH CARE- MEDICAID EXPANSION





CURRENT
EPIDEMIOLOGY OF
COVID-19

Daily new confirmed COVID-19 deaths per million people

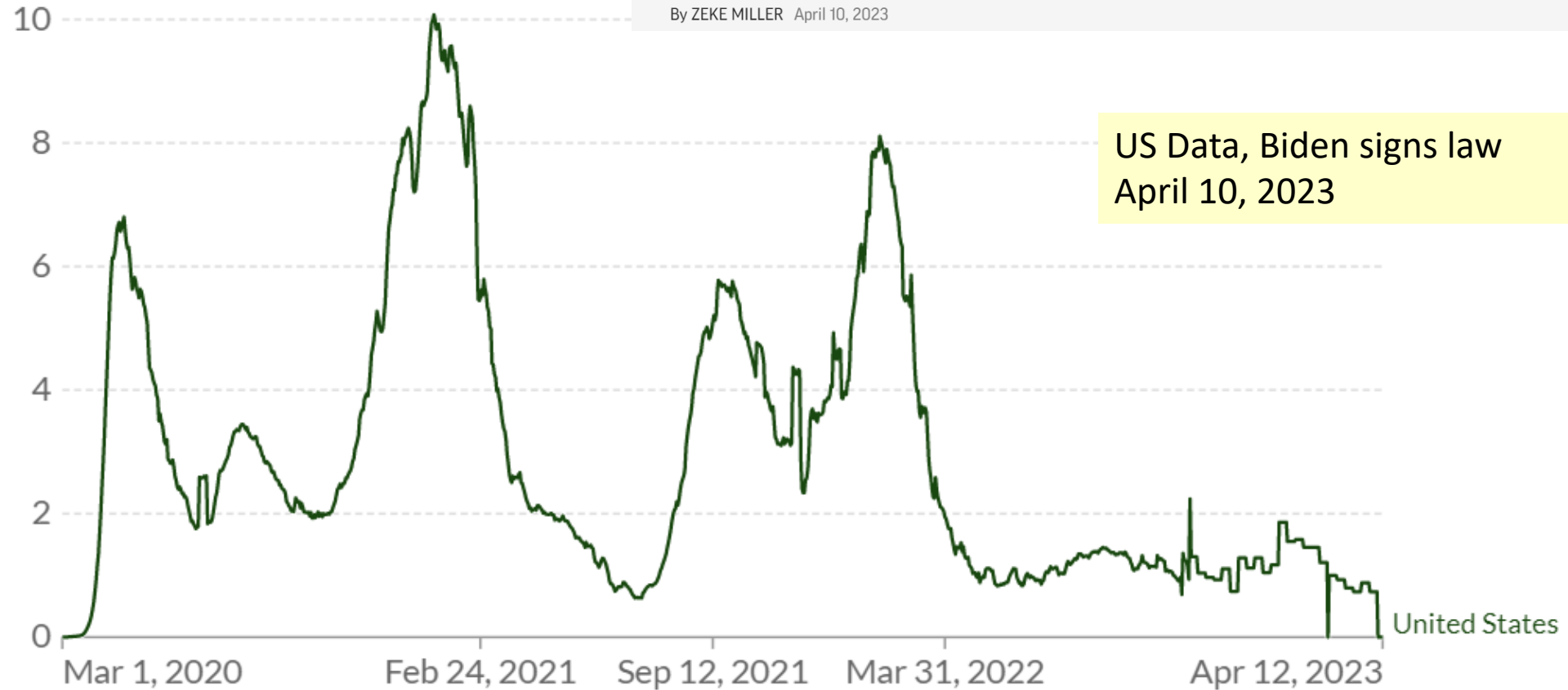
7-day rolling average. Due to varying protocols and challenges in the attribution of the cause of death, the number of confirmed deaths may not accurately represent the true number of deaths caused by COVID-19.

LINEAR

LOG

Biden ends COVID national emergency after Congress acts

By ZEKE MILLER April 10, 2023



Source: WHO COVID-19 Dashboard

CC BY



China -least natural and vaccination immunity- opened Dec 7, 2022

China races to vaccinate elderly, but many are reluctant

By JOE McDONALD December 26, 2022

WHO welcomes data on COVID-19 in China, meeting with Minister

14 January 2023 | Statement | Reading time: 1 min (344 words)

Earlier today, WHO Director-General Dr Tedros Adhanom Ghebreyesus spoke with Minister Ma Xiaowei, director of China's National Health Commission, about the COVID-19 situation in the country. WHO appreciates this meeting, as well as the public release of information on the overall situation.



WHO Lays Out Plan to Emerge From Emergency Phase of Pandemic

March 30, 2022- Excess mortality from other medical conditions not being worked on – so this is plan for COVID

By Julie Steenhuisen and Mrinalika Roy

March 31, 2022

 Added to Email Alerts



REUTERS

Base scenario



Vaccinate vulnerable groups every winter

Best case: Less virulent variant emerges



Most won't need re-vaccination

Worst case: More virulent variant emerges



Boost everyone & (my addition-consider whole virus vaccine)

ENDEMICITY

COVID-19 can be controlled not eradicated – so frequency of boosters will depend on variants



- **Control:** Reduction of disease incidence to acceptable levels
- **Elimination:** Reduction to zero incidence in a defined geographical area
- **Eradication:** Permanent reduction to zero worldwide
- **Extinction:** Infectious agent no longer exists in nature or laboratories.

COVID-19 does not have features of an eradicable infectious diseases, goal is control

Smallpox- eradicated

- No animal reservoir
- Clear pathogenic features
- Short period of infectiousness
- Immune for life, highly effective vaccine



COVID-19 – will get under control

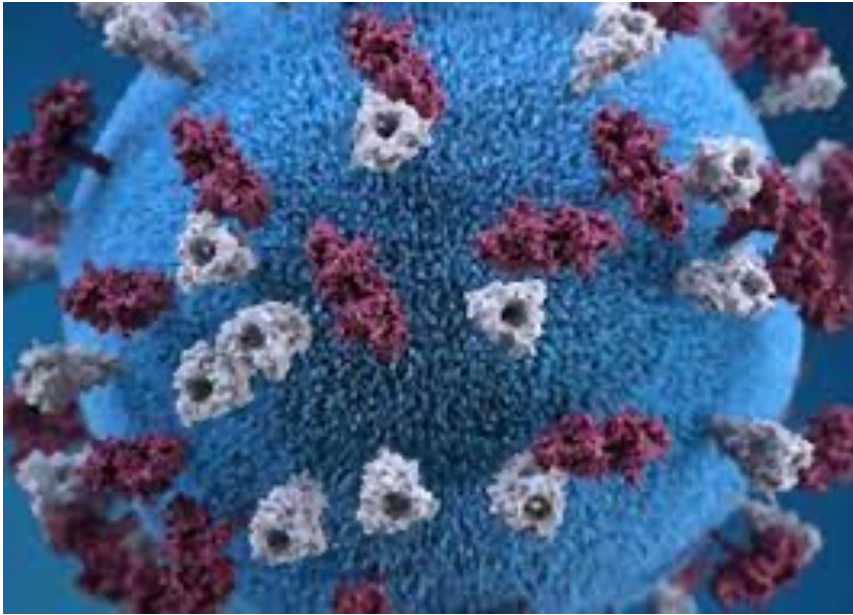
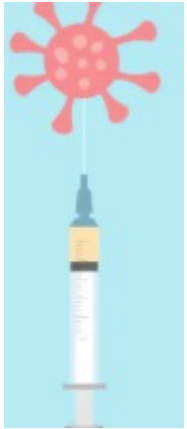
- Found in at least 30 species of animals
- COVID-19 looks like other respiratory illnesses
- Can spread when presymptomatic
- Highly effective vaccine for severe disease; increasingly non-sterilizing with variants

We won't eradicate covid. The pandemic will still end.

By Monica Gandhi

September 21, 2021

The Washington Post



Measles



Pertussis

Comes under control/elimination with vaccines (measles) and vaccines/treatment (pertussis)

COVID-19 has vaccines from age of 5 onwards now (prevention) and oral antivirals as of December 2021 (molnupiravir, Paxlovid)

The Atlantic

IDEAS

The New COVID Drugs Are a Bigger Deal Than People Realize

Vaccines are amazing, but people who become infected need effective treatments.

UNAIDS Global AIDS Update 2022

IN DANGER
IN DANGER
IN DANGER

UNAIDS: Major setbacks to HIV response during COVID (TB, malaria, etc.)

38.4 million people with HIV (highest), 1.5 million new infections last year, 650K deaths last year, 40.3 million deaths total, only 75% of adults (52%) children have ART access; with millions of girls out of school, had increase (young woman infected every 2 minutes)



PANDEMIC PREPAREDNESS

Vaccines are mainstay, along with global surveillance


REVIEW ARTICLE

<https://doi.org/10.1038/s41590-017-0007-9>

nature
immunology

2018

Emerging viral diseases from a vaccinology perspective: preparing for the next pandemic

Barney S. Graham * and Nancy J. Sullivan*

Emerging infectious diseases will continue to threaten public health and are sustained by global commerce, travel and disruption of ecological systems. Most pandemic threats are caused by viruses from either zoonotic sources or vector-borne sources.

By Gillian K. SteelFisher, Mary G. Findling, Hannah L. Caporello, Keri M. Lubell, Kathleen G. Vidoloff Melville, Lindsay Lane, Alyssa A. Boyea, Thomas J. Schafer, and Eran N. Ben-Porath

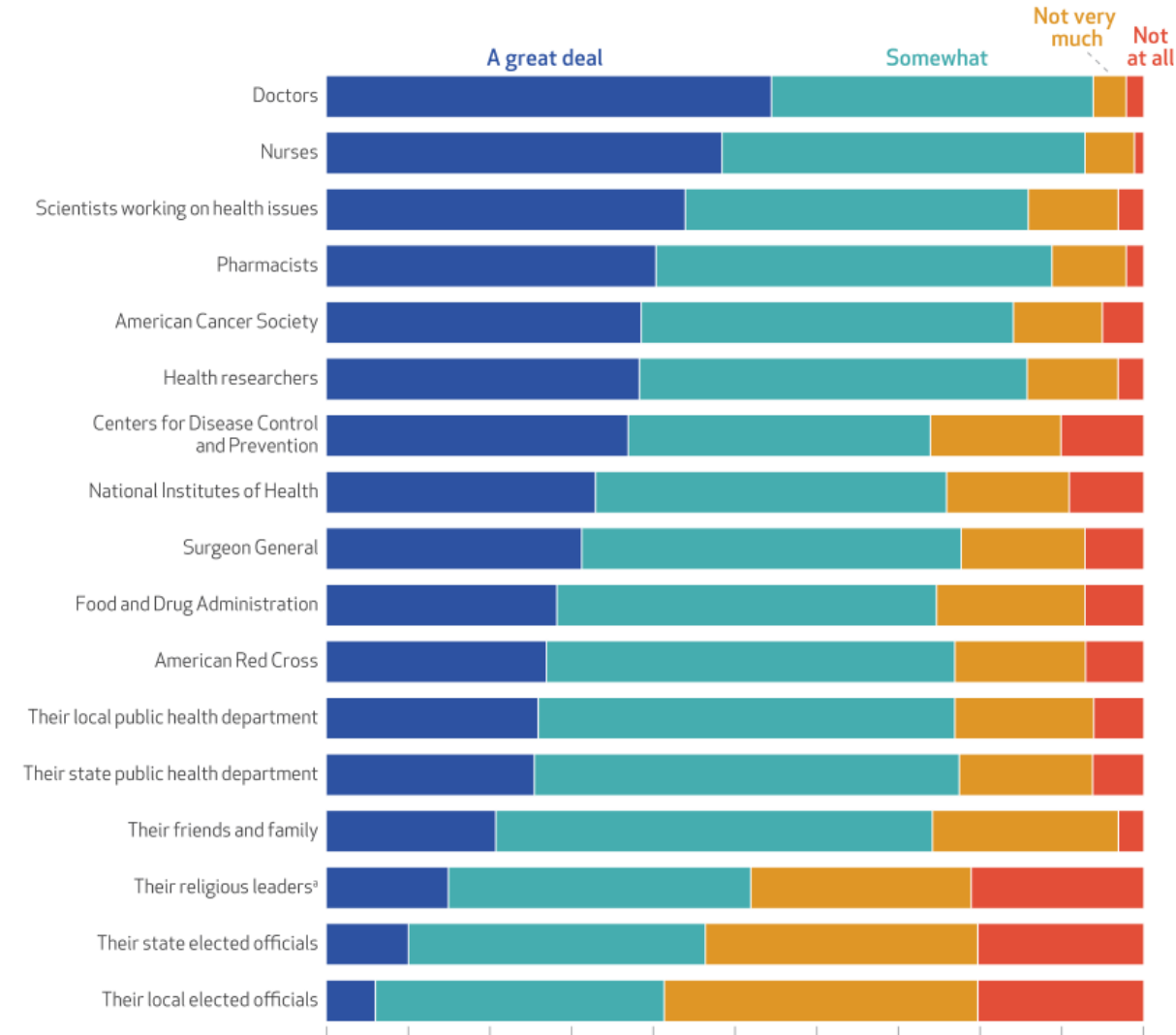
Trust In US Federal, State, And Local Public Health Agencies During COVID-19: Responses And Policy Implications

HealthAffairs

March 2023 (reflecting data to February 2022-Harvard survey)
Trust in CDC 37%
Trust in NIH 33%
Trust in FDA, state-local health departments 30%
Trust in state elected officials 15%

TRUST IN DOCTORS/NURSES HIGH 54%/48%

Public trust in sources of health information among US adults, by degree of trust, 2022



POLIO

unicef



Press release

COVID-19 pandemic fuels largest continued backslide in vaccinations in three decades

WHO and UNICEF sound the alarm as new data shows global vaccination coverage continued to decline in 2021, with 25 million infants missing out on lifesaving vaccines

14 July 2022

ID pandemics and
school closures-
Influenza doesn't
differentially spare
younger children

NATIONAL STRATEGY FOR
PANDEMIC
INFLUENZA

IMPLEMENTATION PLAN



HOMELAND SECURITY COUNCIL

MAY 2006

In 1918 influenza
pandemic,
schools closed for
4 months at most





AUG 5, 2020

At Height of the 1918 Pandemic, NYC and Chicago Schools Stayed Open. Here's Why

Amid fierce controversy, public health officials in both cities decided children would be better off in classrooms.

By 1918, high public school attendance and mandatory attendance laws in each state; schools were place for food, learning and safety

As the second wave of the Spanish flu hit in September 1918, Dr. Royal S. Copeland, a homeopathic physician and the city's health commissioner, initially considered school closures as a way of limiting the pandemic's spread. But Dr. S. Josephine Baker, director of the Department of Health Bureau of Child Hygiene and a leading Progressive reformer, persuaded Copeland to keep the city's schools open, according to [a 2010 article co-authored by Dr. Alexandra Stern](#). Baker argued that kids were better off contained in schools, and that regular medical inspections could identify sick students and keep healthy ones safe.

At the time, New York City's public school system contained close to 1 million children, and 750,000 of those lived in crowded and often unsanitary tenement homes. In an [article headlined "Epidemic Lessons Against Next Time,"](#) published in the *New York Times* in November 1918, after the worst of the pandemic had passed, Copeland described the advantages in keeping the schools open: "[Children] leave their often unsanitary homes for large, clean, airy school buildings, where there is always a system of inspection and examination enforced," he said.



“Better Off in School”: School Medical Inspection as a Public Health Strategy During the 1918–1919 Influenza Pandemic in the United States

ALEXANDRA MINNA STERN, PhD^a

MARY BETH REILLY, BA^a

MARTIN S. CETRON, MD^b

HOWARD MARKEL, MD, PhD^a

SYNOPSIS

During the 1918–1919 influenza pandemic in the United States, most cities responded by implementing community mitigation strategies, such as school closure. However, three cities—New York City, Chicago, and New Haven, Connecticut—diverged from the dominant pattern by keeping their public schools open while the pandemic raged. This article situates the experiences of these three cities in the broader context of the Progressive era, when officials and experts put great faith in expanding public programs in health and education. It adds an important dimension to the historical understanding of the

GUARD AGAINST INFLUENZA

Influenza is spread by drop-lets sprayed from the nose and throat.

Cover each cough and sneeze with handkerchief.

Avoid crowds.

Get plenty of fresh air.

Do not spit on the floor or on the sidewalk.

Do not use common drinking cups and common towels.

Avoid excessive fatigue.

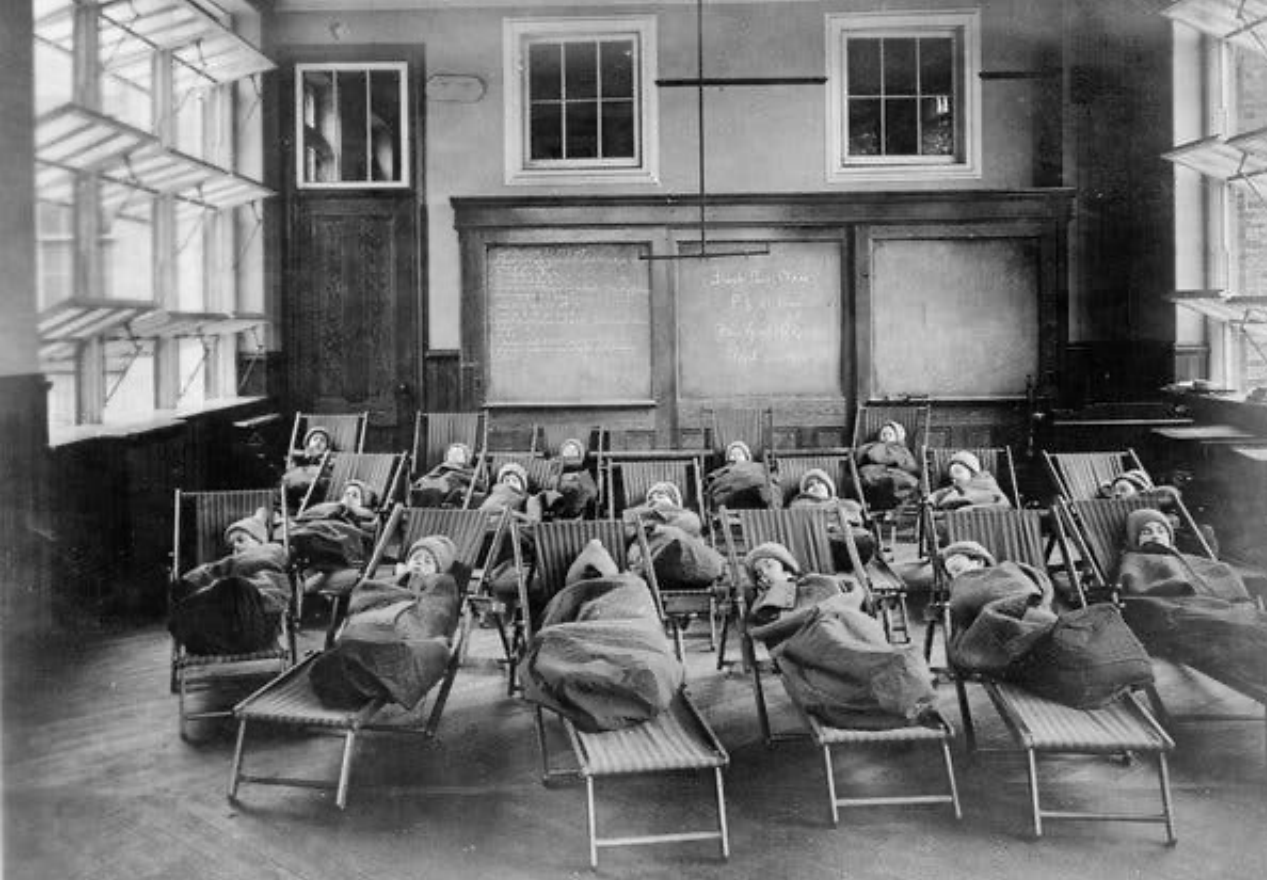
If taken ill, go to bed and send for a doctor.

Walk to work, if possible.

These rules apply also to colds, bronchitis, pneumonia, and tuberculosis.



Ontario schools practiced
blowing noses but stayed open



Other cities (like Berkeley) closed schools but for 4 months at most as no other option; others held school outside

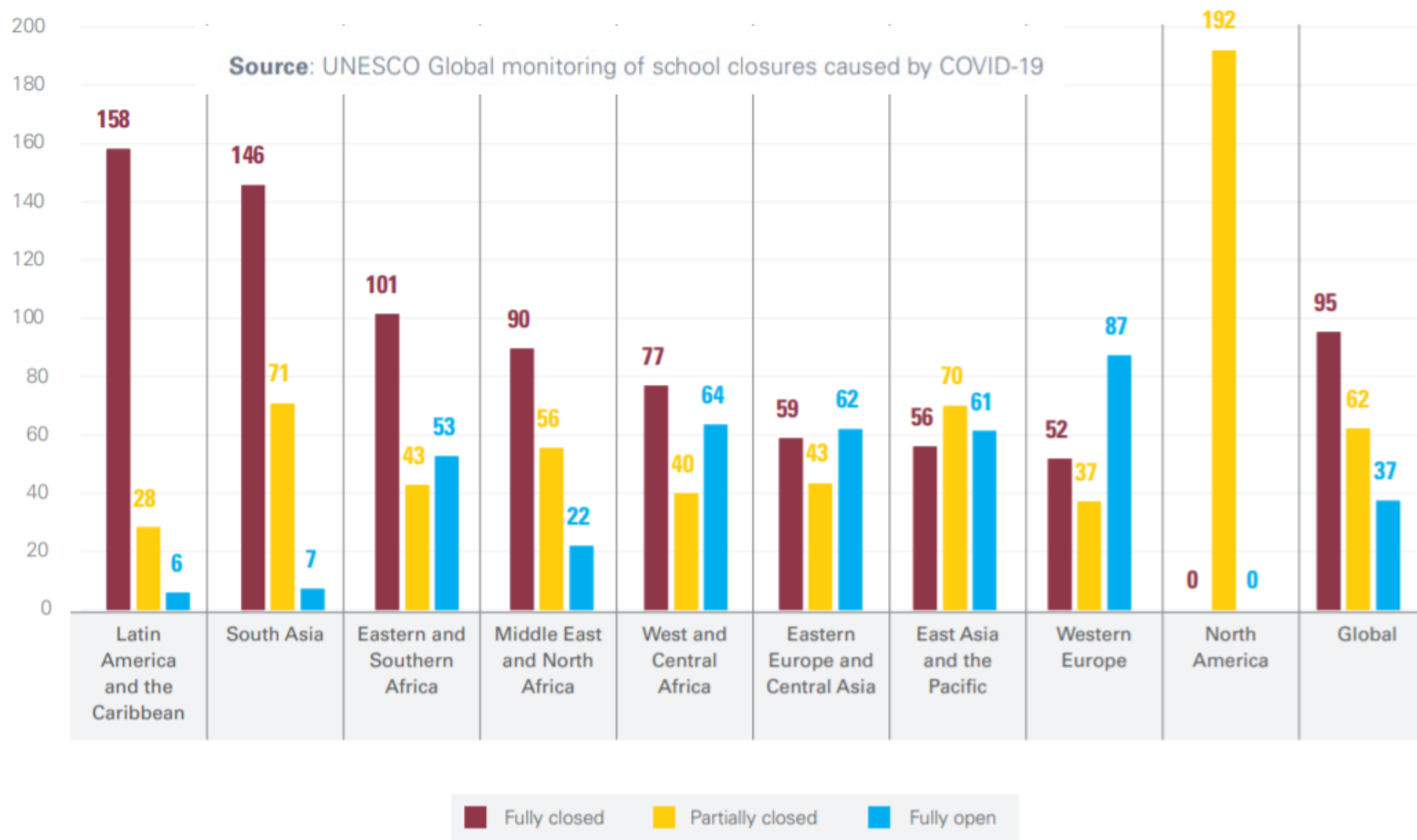


Schools re-opened in
US in 1918 with
following:

- Sometimes masks, not universally
- Outside work
- Wide open windows for ventilation
- School nurses
- Stay home when sick
- Wash hands
- School lunch programs

FIGURE 2

School closure status in number of days and by region, from March 2020 to February 2021 (weighted average)



Despite overwhelming evidence of the impact of school closures on children, and despite increasing evidence that schools are not drivers of the pandemic, too many countries have opted to keep schools closed, some for nearly a year.

Schools are essential for children's learning, health, safety and well-being. For the most vulnerable children, school closures have deprived them of their one nutritious meal a day; children living in violent or dysfunctional family settings who rely on school to provide a safe, nurturing environment have also been cut off from this safety net (Borkowski *et al*, 2020; WHO, 2020). In many countries, schools also play essential role in immunization and health support.

UNICEF – 70% of children globally have learning poverty; \$17 trillion lost wages eventually; impact on girls – early marriage, HIV infection; impact on boys- early leaving of school to work for family



Global vaccine equity

The Most Important Thing Rich Countries Can Do to Help India Fight COVID-19



IDEAS

BY DR. MONICA GANDHI MAY 4, 2021 8:03 PM EDT

Gandhi MD, MPH is Professor of Medicine; Associate Division Chief of the Division of HIV, Infectious Diseases, and Global Medicine; Director of the Ward 86 HIV Clinic at San Francisco

- 1995 WHO TRIPS agreement
- 1996- Highly active ART for HIV in US/Europe
- 2001 – Pfizer made \$47 billion with fluconazole (one product) out of reach of AIDS patients with cryptococcus in SSA
- 2001 – India made ART; S. Africa sued
- 2004- PEPFAR
- 2022- 18.2 million doses provided by PEPFAR but still only 75% of adults, 52% of children with access

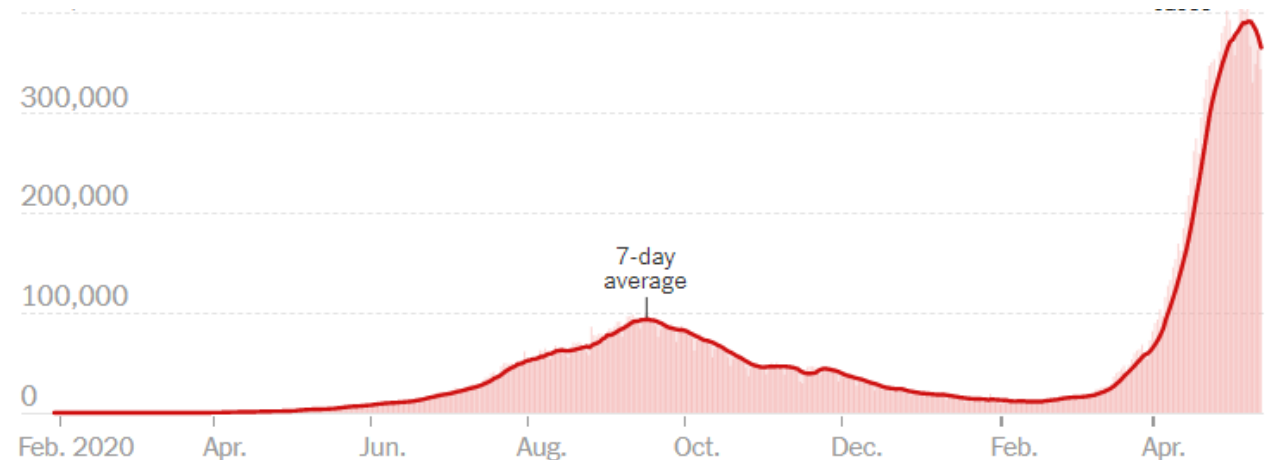
India & delta variant

THE LANCET
Global Health

Seroprevalence of SARS-CoV-2 in slums versus non-slums in Mumbai, India

PDF [49 KB]

- 55-61% seroprevalence in urban slums
- Thought more immunity than there was in February
- Country opened up
- Actually, much less exposure (12%) in non-slum settings
- Cases went up a “wall” not a wave (B.1.617 contributing)



Tragedy was that India/S. Africa had appealed for TRIPS waiver in October 2020

- October 2020- India & S. Africa appealed to WTO for waiver, denied
- March 2021- Cases started rising in India
- June 17, 2022 – did agree to TRIPS waiver but limited, vaccines only

12th WTO MINISTERIAL CONFERENCE GENEVA 2022

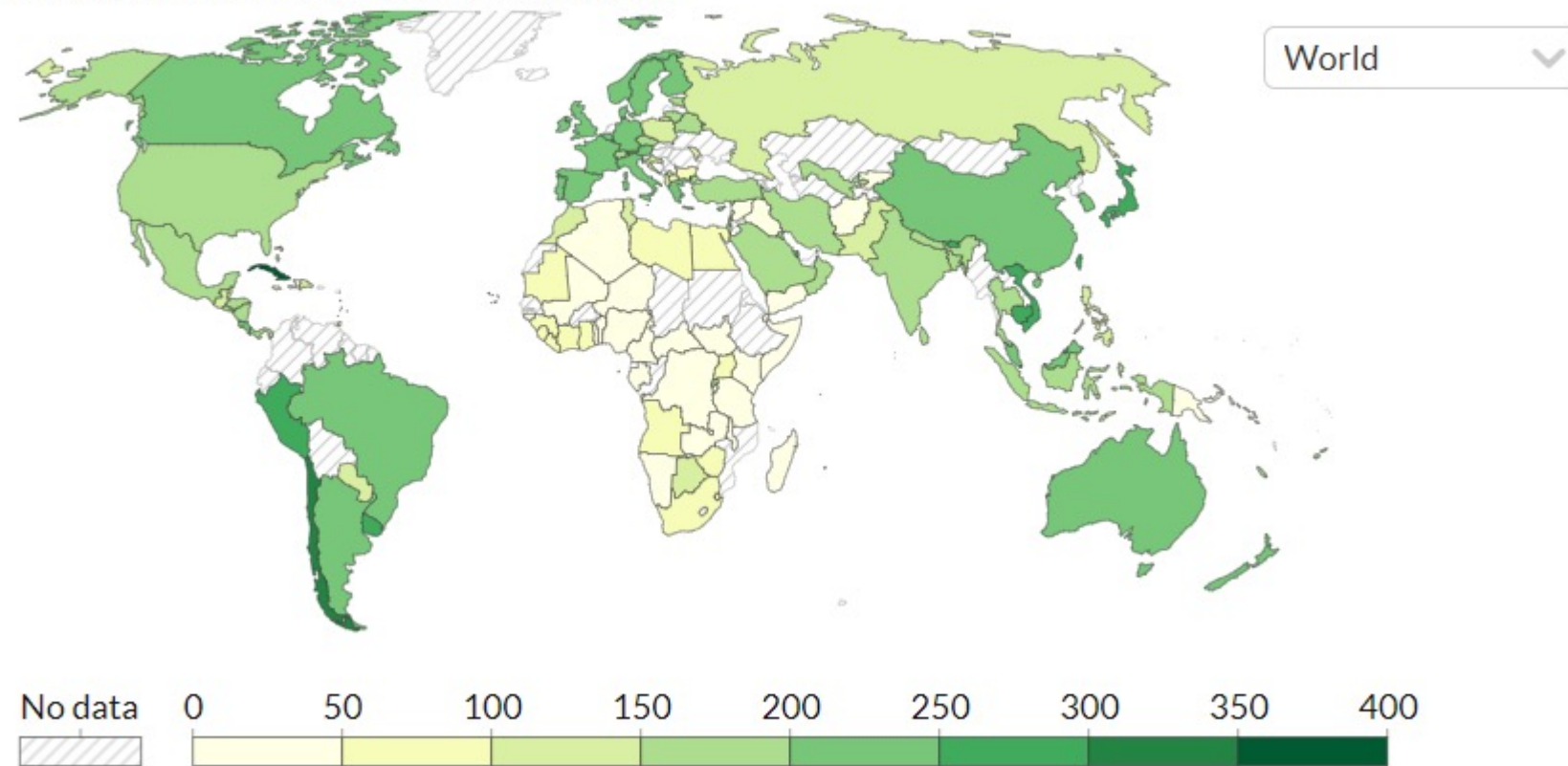
TWELFTH WTO MINISTERIAL CONFERENCE
CO-HOSTED BY KAZAKHSTAN / GENEVA, JUNE 2022

The five-year agreement was struck after a marathon negotiating session at the WTO's highest meeting. It allows low- and middle-income countries to temporarily waive protections on those patents to produce the shots, either to use domestically or to send abroad. It pushes a decision on treatments and tests

Total COVID-19 vaccine doses administered per 100 people, Oct 4, 2022

Our World
in Data

All doses, including boosters, are counted individually.

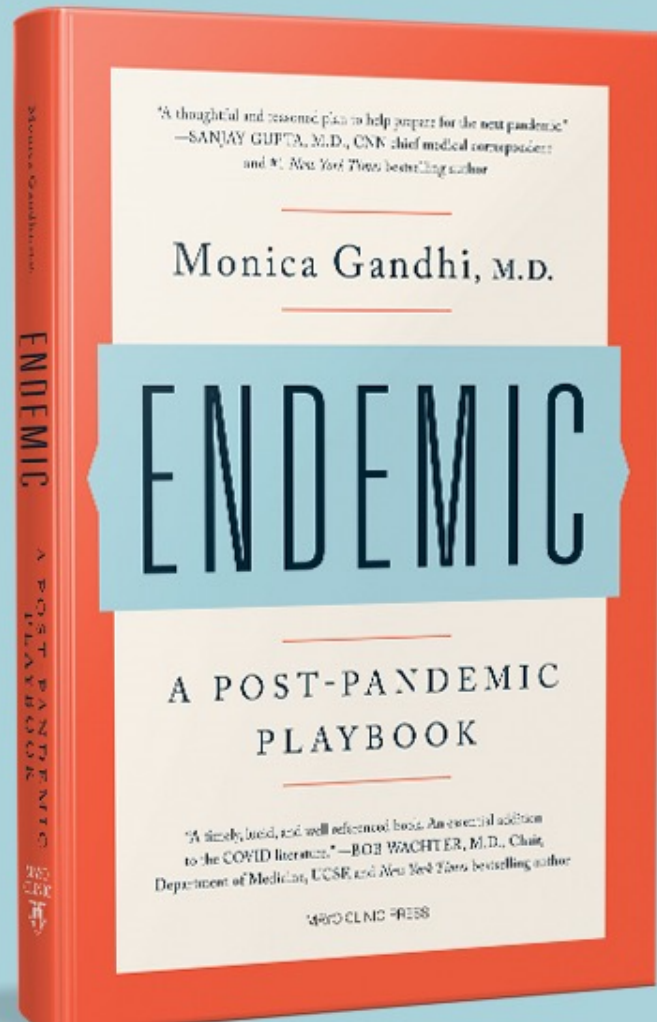


Source: Official data collated by Our World in Data - Last updated 5 October 2022

69.9% of the world population has received at least one dose of a COVID-19 vaccine.

13.37 billion doses have been administered globally, and **105,980** are now administered each day.

29.3% of people in low-income countries have received at least one dose.



“A timely, lucid, and well referenced book. An essential addition to the COVID literature.

– Robert Wachter, M.D., Chair, Department of Medicine, UCSF and New York Times bestselling author of *The Digital Doctor*

Available July 11, 2023

HARM REDUCTION: *Concept that public health recommendations to minimize the impact of a pathogen must also consider the other needs of affected individuals and communities to minimize harm*

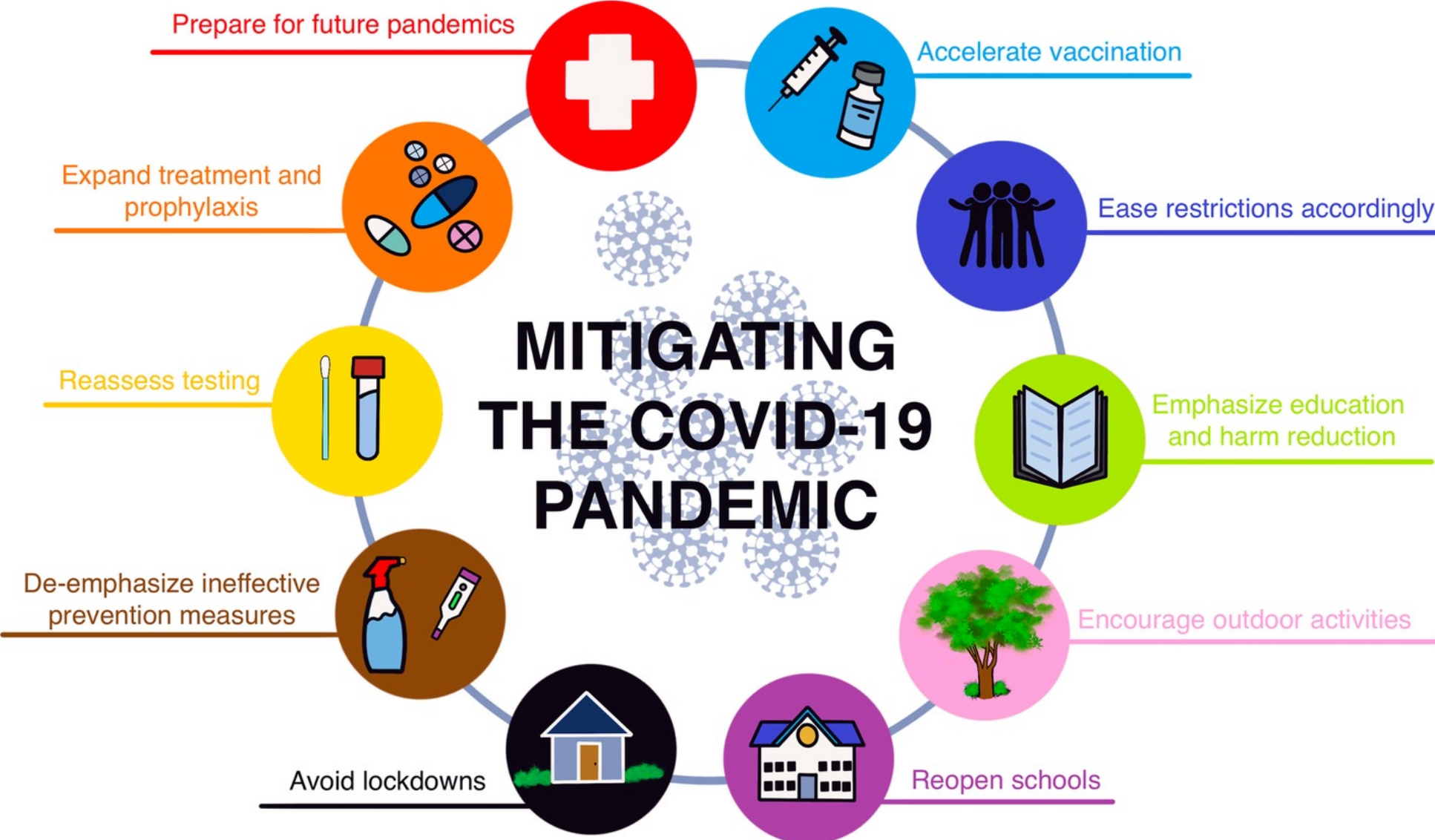
“Dr. Monica Gandhi’s work in global HIV gives her a long view of equity in antiretroviral treatment and prevention access. She is also an active infectious diseases clinician. This provided her with a unique, pragmatic view of the COVID-19 pandemic in terms of the need for global vaccine and treatment equity, as well as universal healthcare access coverage.”

-- Eric Goosby, M.D., former Global AIDS Ambassador under President Obama

Revisiting COVID-19 policies: 10 evidence-based recommendations for where to go from here

BMC Public Health

Halperin D...Gandhi M



WHO: Monkeypox cases drop 21%, reversing month-long increase

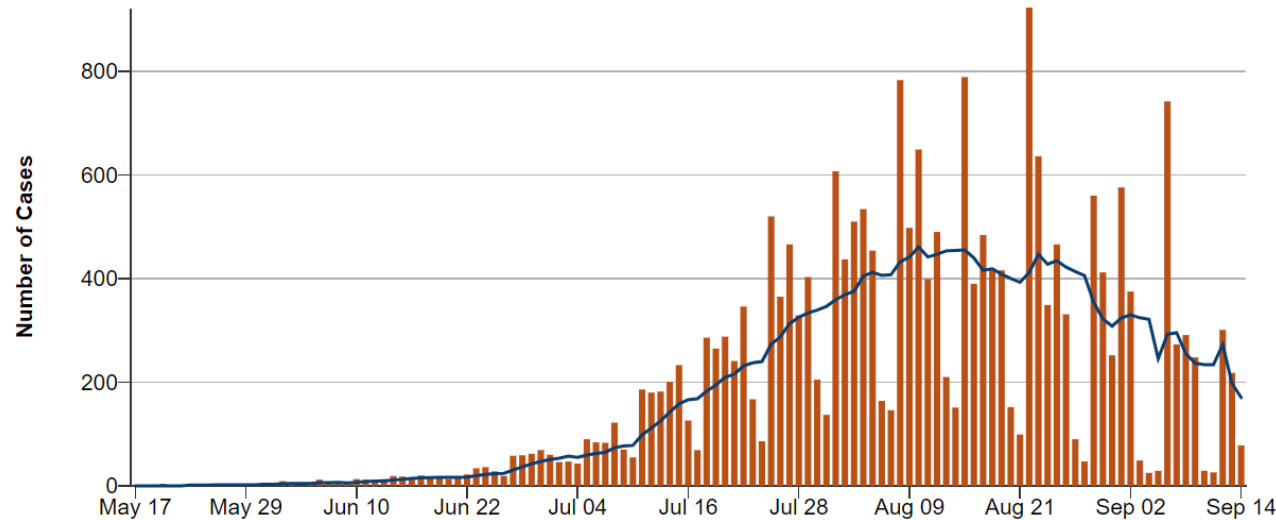
August 25, 2022

WORLD NEWS

SEPT. 2, 2022 / 10:28 PM

Declining monkeypox cases shows virus 'can be eliminated,' WHO boss says

Daily Monkeypox Cases Reported* and 7 Day Daily Average



Monkeypox: Daily confirmed cases

7-day rolling average

LINEAR LOG



Our World in Data

As Monkeypox Drops in the West, Still No Vaccines for Africa

Need to learn

ART access shows that we have not learned that protection from infectious diseases means we are all connected



Monkeypox vaccine – same thing happened!



COVID not eradicable – will need global vaccine and treatment equity. And a harm reduction approach