THE OHIO STATE UNIVERSITY
WEXNER MEDICAL CENTER

The New Normal: Lessons from our Past and Present to Prepare for the Future

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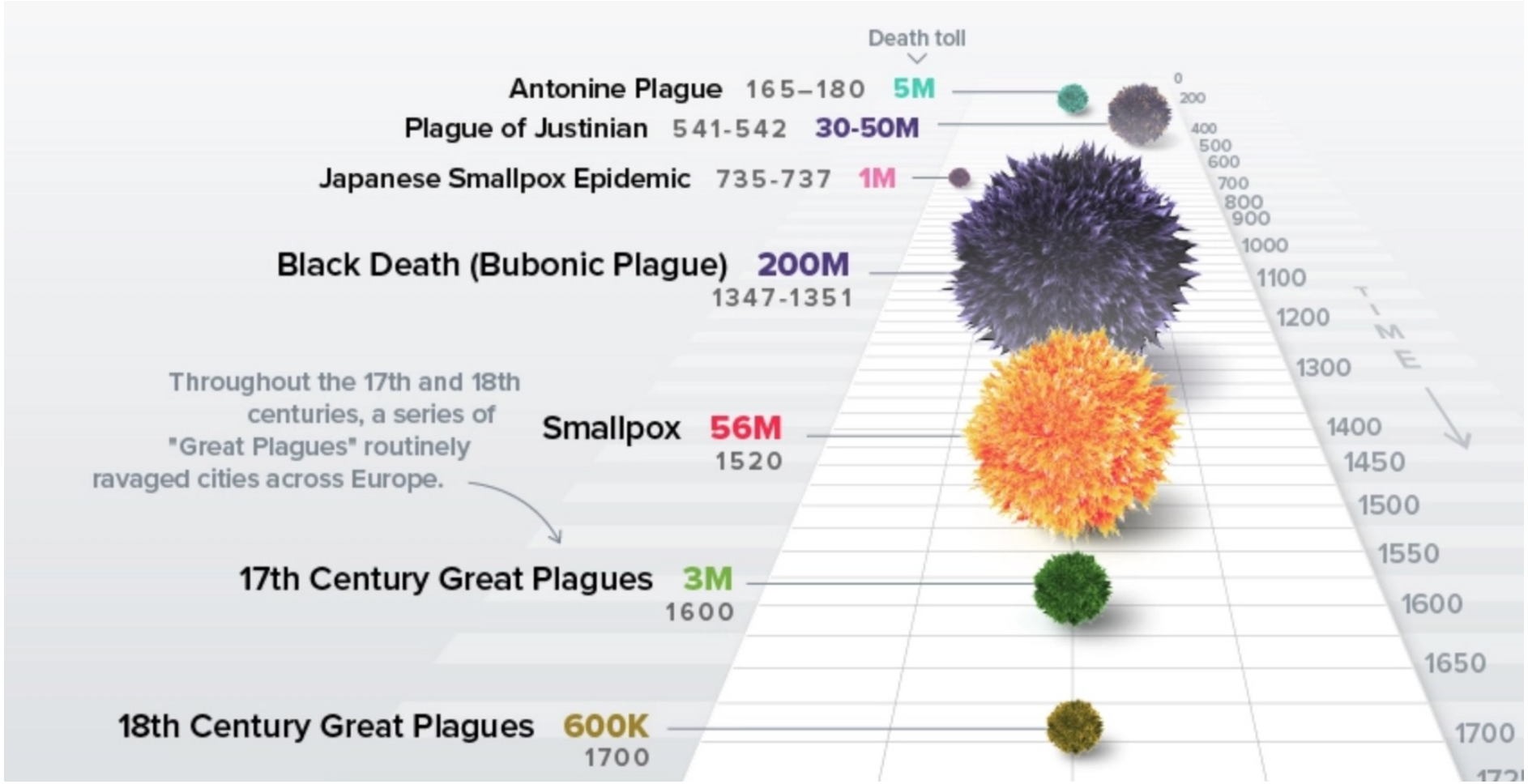
Disclosures

- Site Principal Investigator of BLAZE-1 Trial sponsored by Lilly Inc.
- Consultant for Viiv Healthcare and Gilead Sciences

Agenda

1. Brief History of Pandemics
2. Rapid Review of COVID-19 Pandemic
3. Defining the New Normal
4. Lessons Learned
    I. The Good
    II. The Bad
    III. The Ugly
5. Where do we go from here?

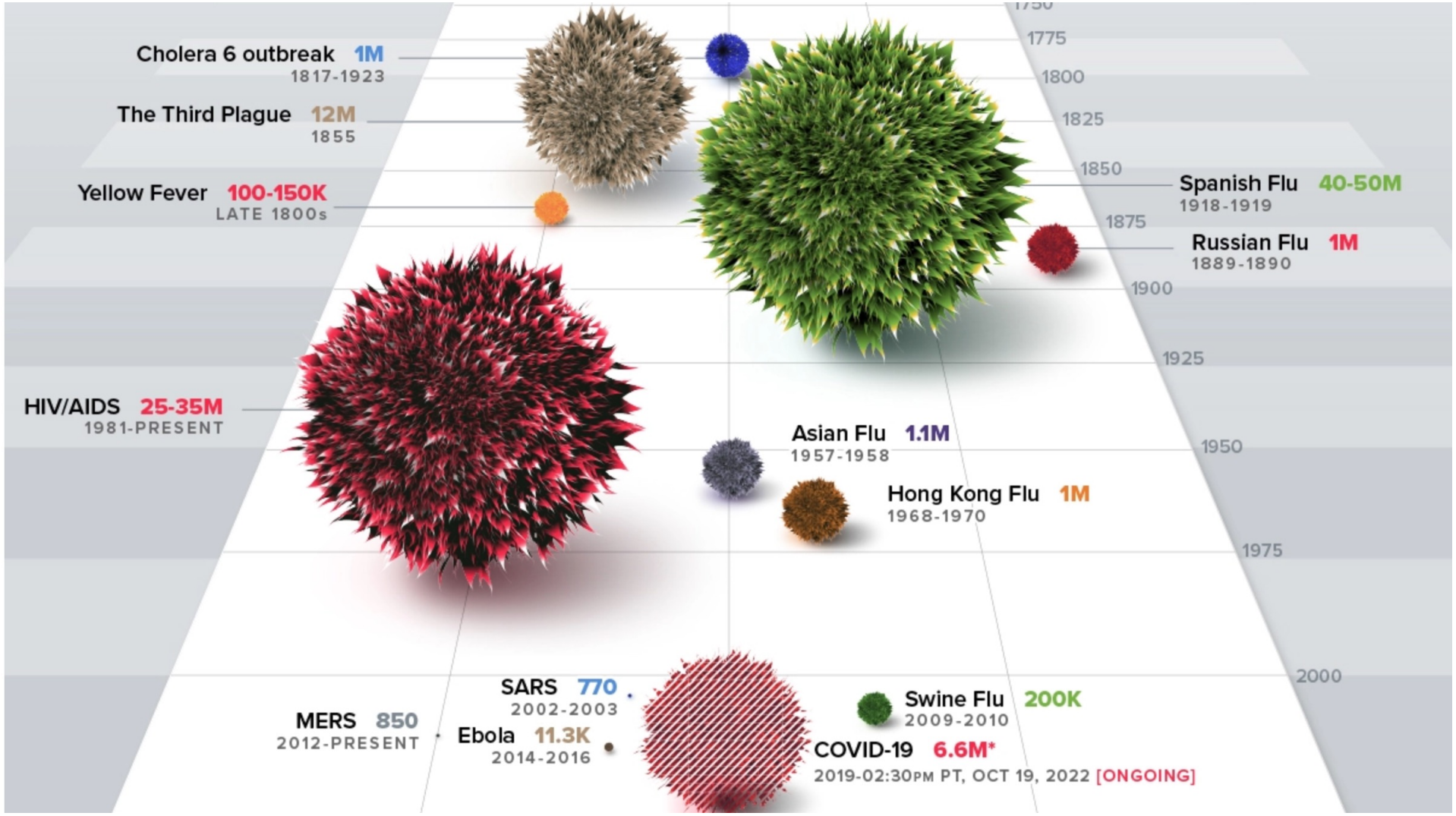
Pandemics In History: Through 1700s



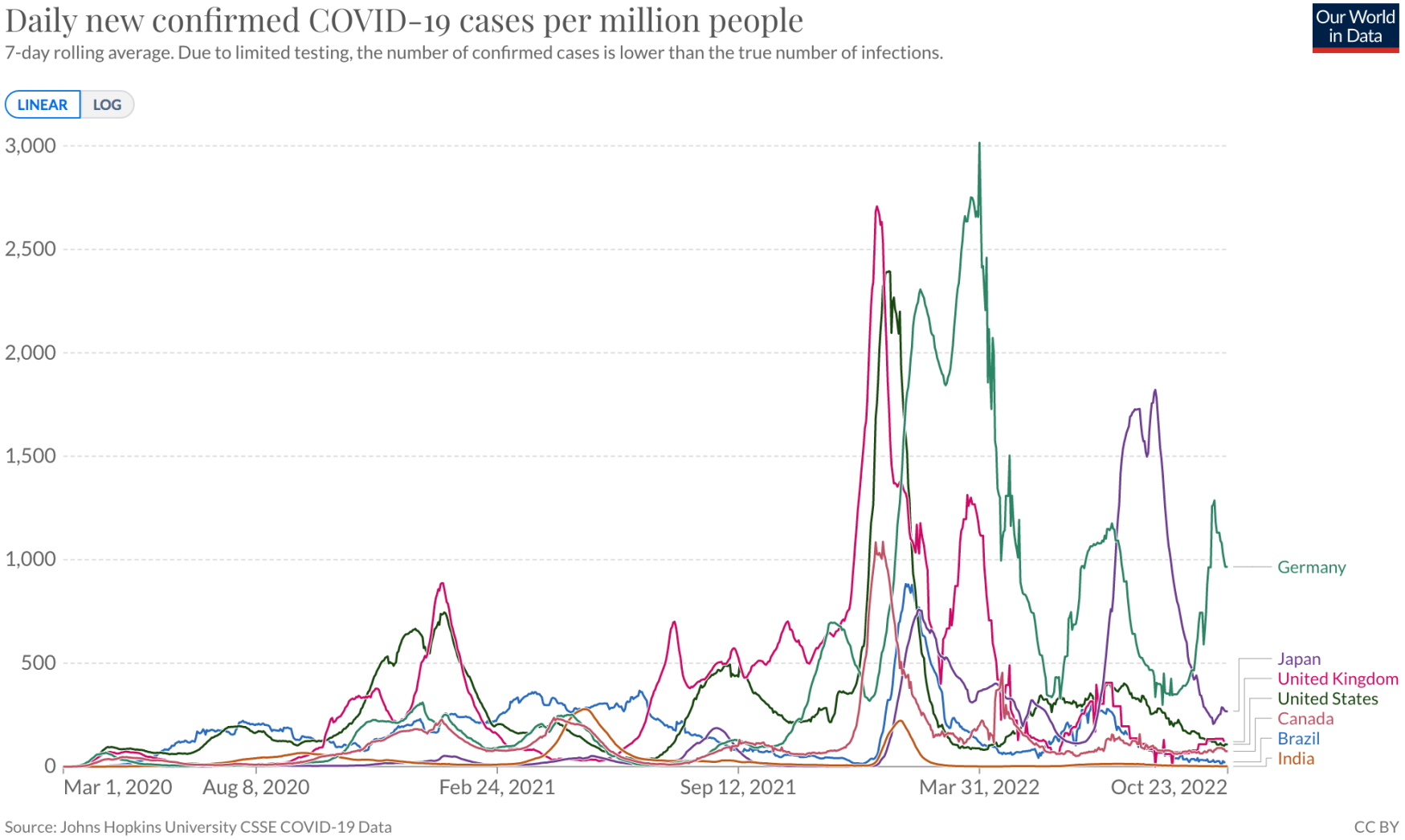
VISUAL CAPITALIST

Sources:
CDC, WHO, BBC, Wikipedia, Historical records, Encyclopedia Britannica Johns Hopkins University

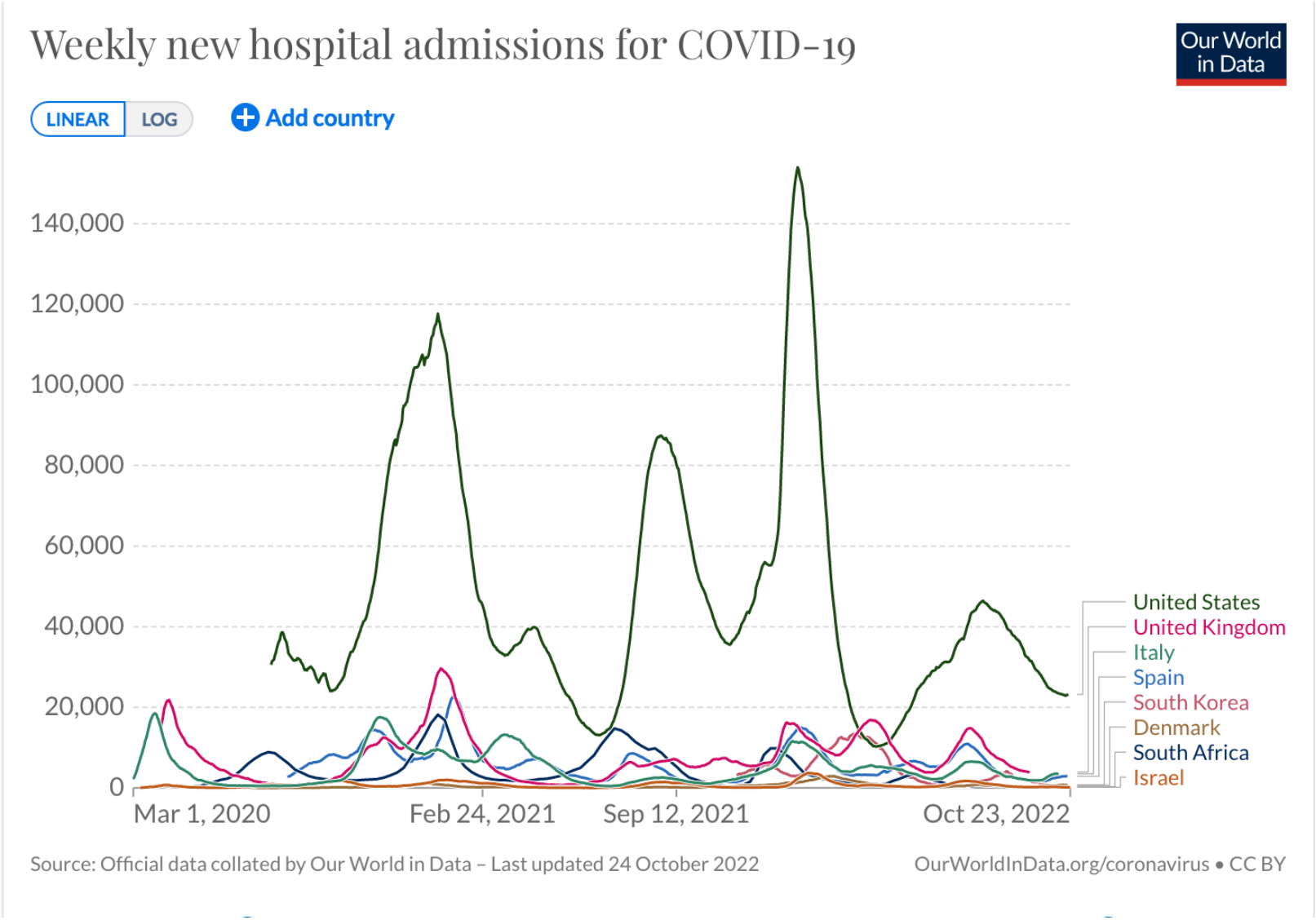
Pandemics in History: 1700s-Present



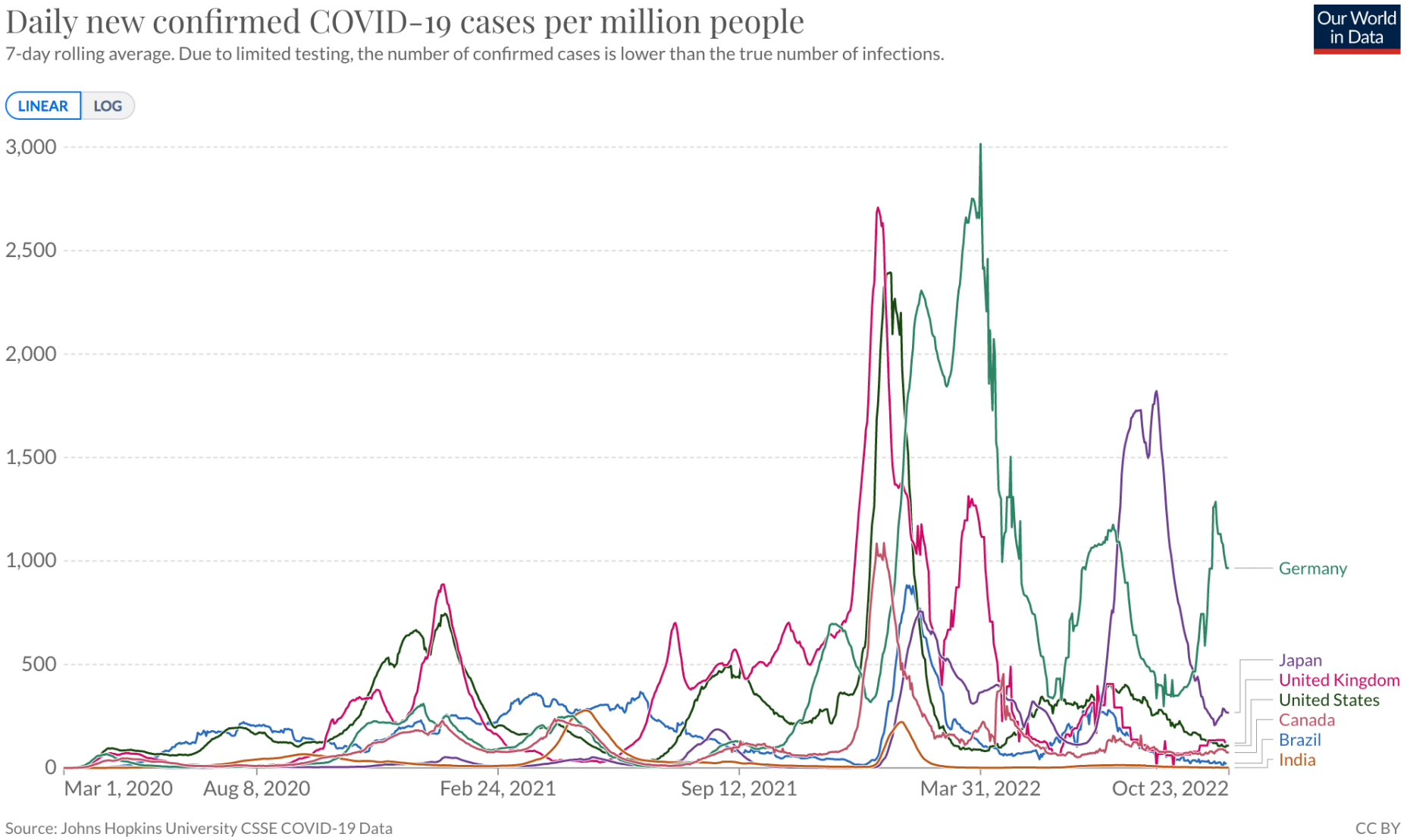
COVID-19 Cases



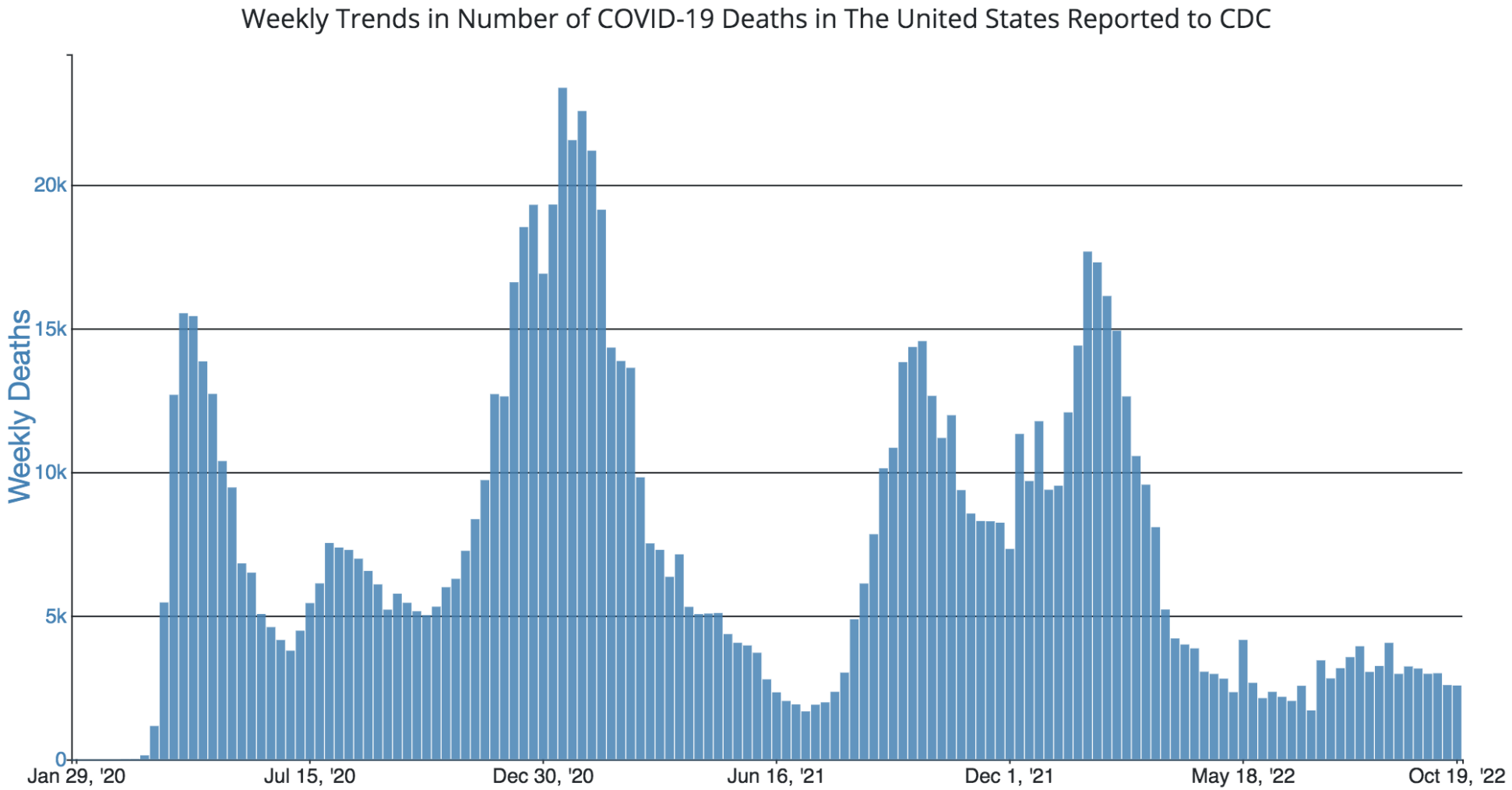
COVID-19 Hospitalizations



COVID-19 Deaths

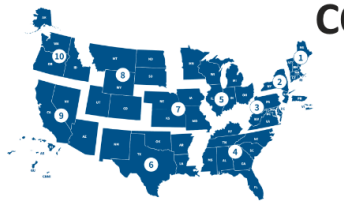


COVID-19 Mortality in the U.S.



Centers for Disease Control. Data as of 10/19/2022

People of Color Disproportionately Impacted by COVID-19



COVID-19 Weekly Deaths per 100,000 Population by Race/Ethnicity, United States

March 01, 2020 - October 15, 2022*

Jurisdiction

US

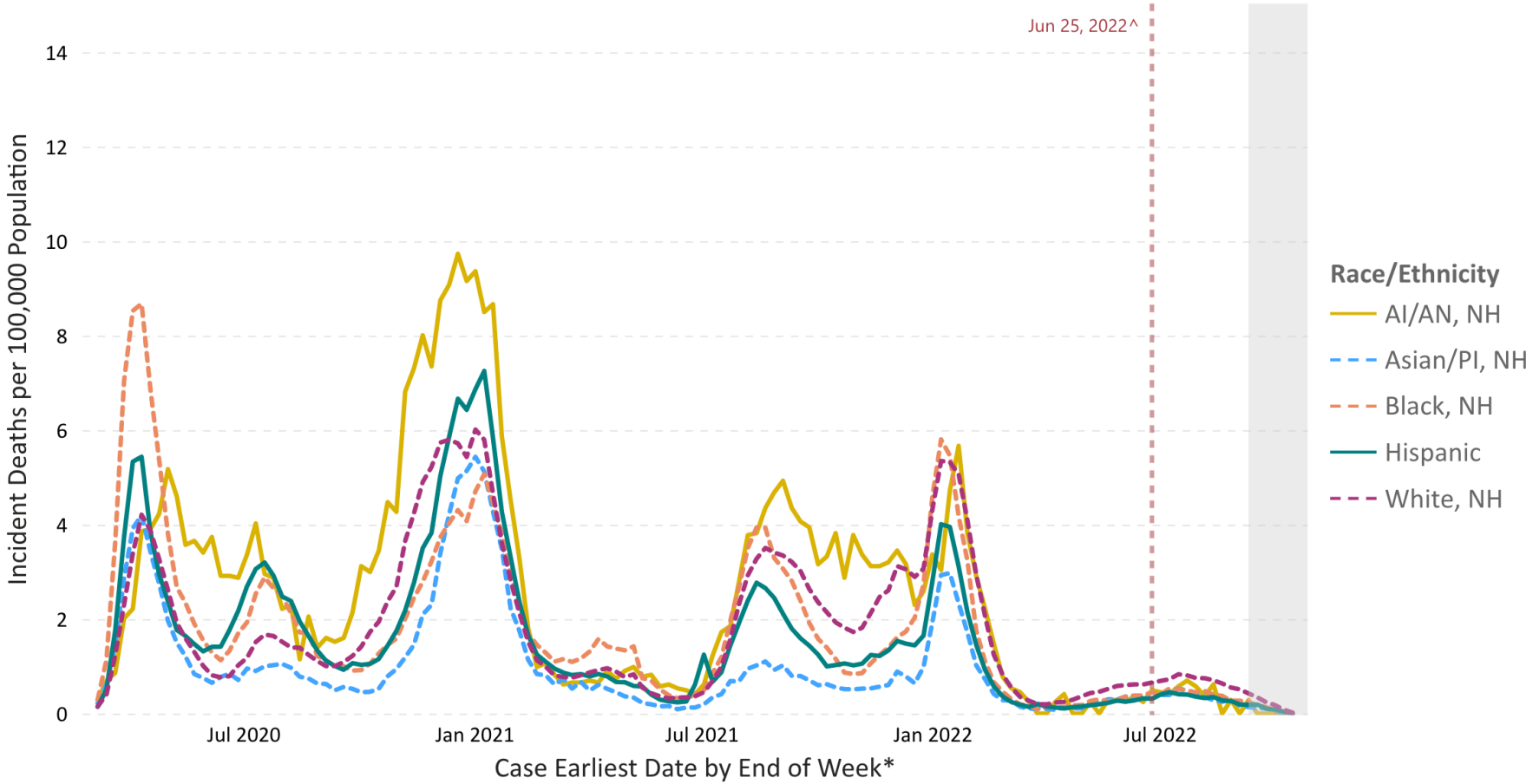
3/7/2020 10/15/2022

Cases

- Sex
- Age - All Groups
- Age by Race/Ethnicity
- Pediatric Case Proportions
- Race/Ethnicity
- Race/Ethnicity by Age

Deaths

- Sex
- Age - All Groups
- Age by Race/Ethnicity
- Race/Ethnicity
- Race/Ethnicity by Age

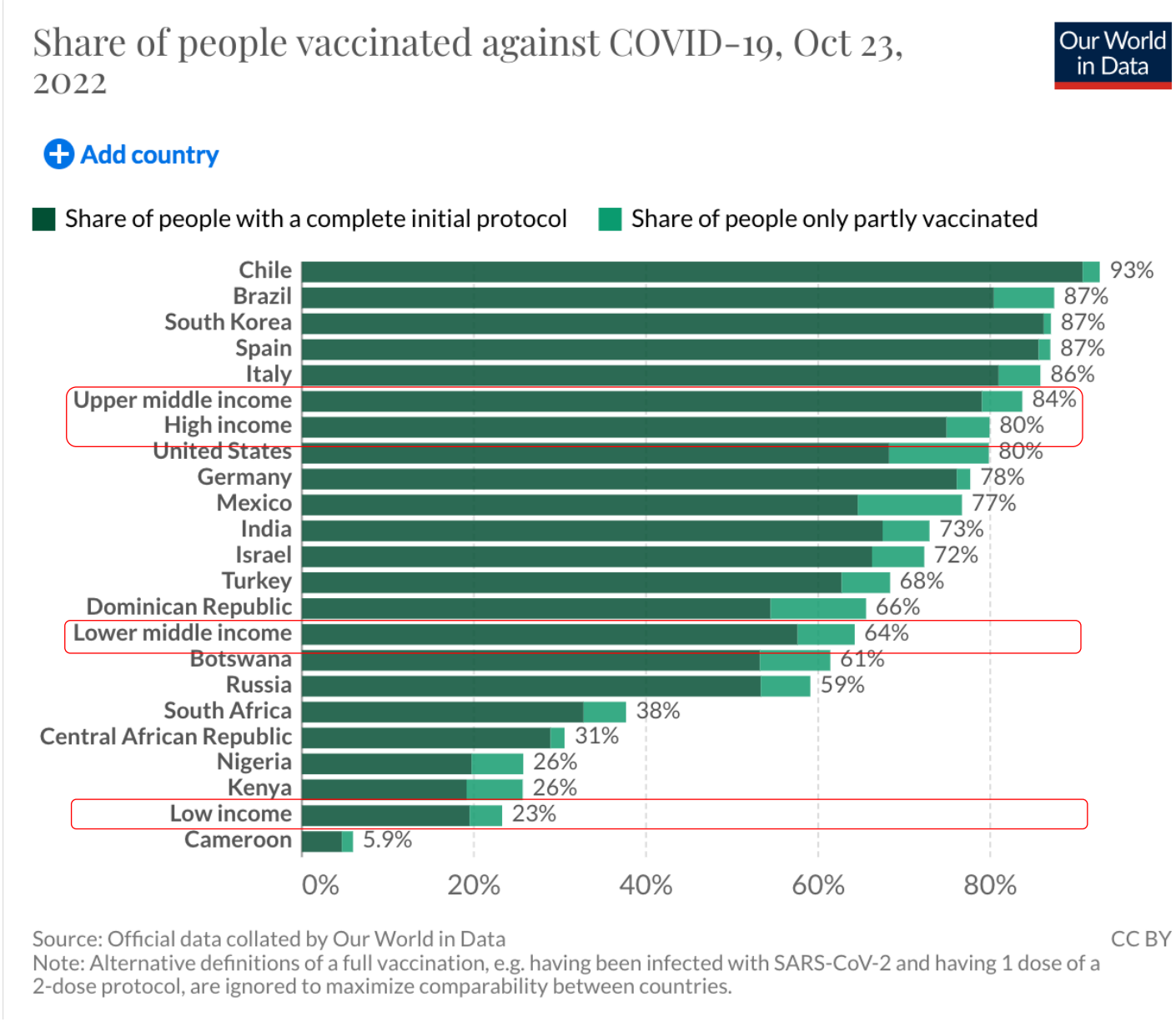


US: Includes data up to the week ending on Oct 15, 2022. Percentage of deaths among reported cases - 1.01%. Percentage of deaths reporting race by date - 83.39%.
US territories are included in case and death counts but not in population counts. Potential six-week delay in case reporting to CDC denoted by gray bars. Weekly data with five or less deaths have been suppressed.
AI = American Indian, AN = Alaska Native, NH = Non-Hispanic, PI = Pacific Islander. Excludes cases with unknown or multiple races. *Case Earliest Date is the earliest of the clinical date (related to illness or specimen collection and chosen by a defined hierarchy) and the Date Received by CDC. The date for the current week extends through Saturday. ^The death rate for Texas during the week ending Jun 25, 2022, are reflective of a data reporting artifact.

Last Updated: Oct 20, 2022

Source: CDC COVID-19 Case Line-Level Data, 2019 US Census, HHS Protect; Visualization: Data, Analytics & Visualization Task Force and CDC CPR DEO Situational Awareness Public Health Science Team

COVID-19 Vaccination Prevalence

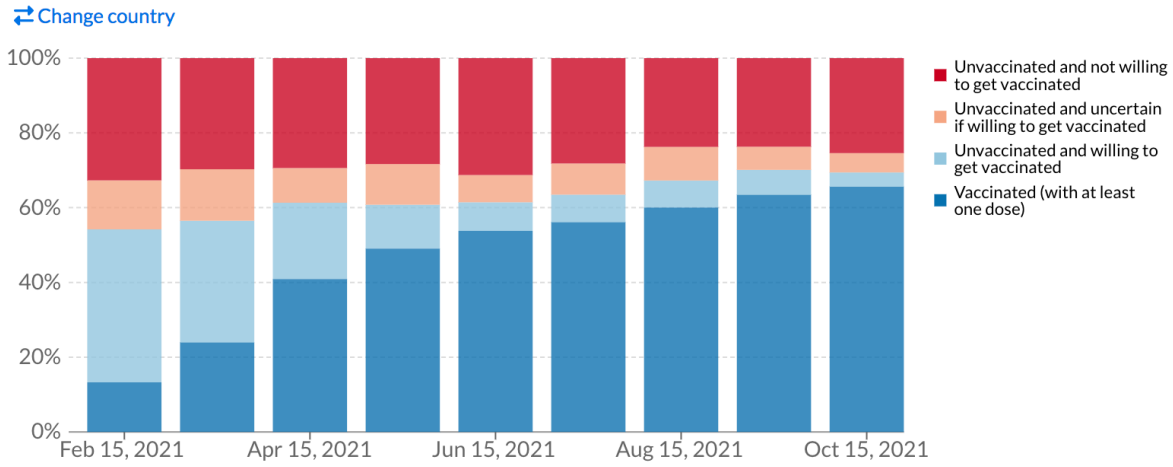


Attitudes toward Vaccines

Willingness to get vaccinated against COVID-19, United States, Feb 15, 2021 to Oct 15, 2021

Our World in Data

Share of the total population who has not received a vaccine dose and who are willing vs. unwilling vs. uncertain if they would get a vaccine this week if it was available to them. Also shown is the share who have already received at least one dose.

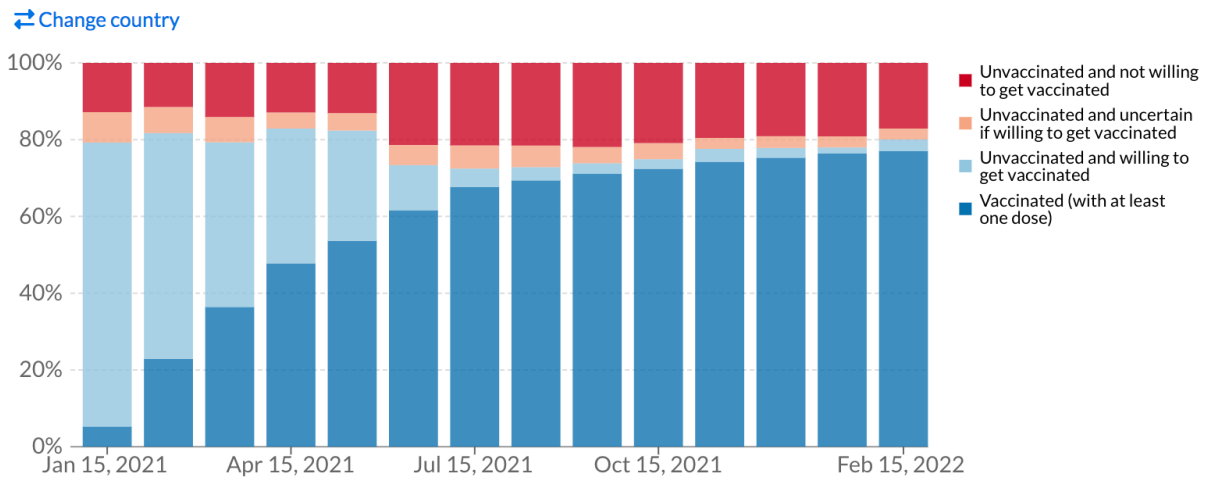


Source: Imperial College London YouGov Covid 19 Behaviour Tracker Data Hub – Last updated 15 March 2022, 09:00 (London time)
Note: Months containing fewer than 100 survey respondents are excluded. We infer willingness to get vaccinated in a country's population from survey responses of people aged 18 years and above, which may not be representative of the entire population. Nevertheless, we expect such differences to be small.
OurWorldInData.org/coronavirus • CC BY

Willingness to get vaccinated against COVID-19, United Kingdom, Jan 15, 2021 to Feb 15, 2022

Our World in Data

Share of the total population who has not received a vaccine dose and who are willing vs. unwilling vs. uncertain if they would get a vaccine this week if it was available to them. Also shown is the share who have already received at least one dose.



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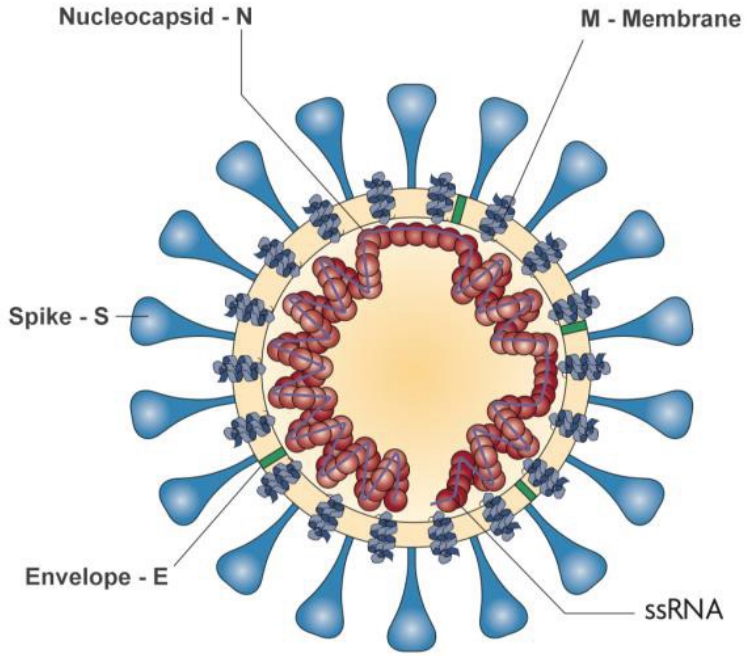
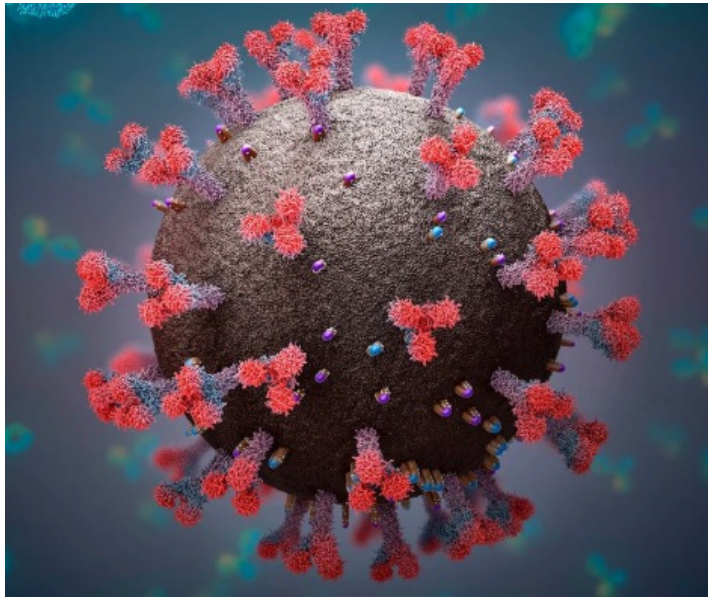
OurWorldInData.org/coronavirus • CC BY

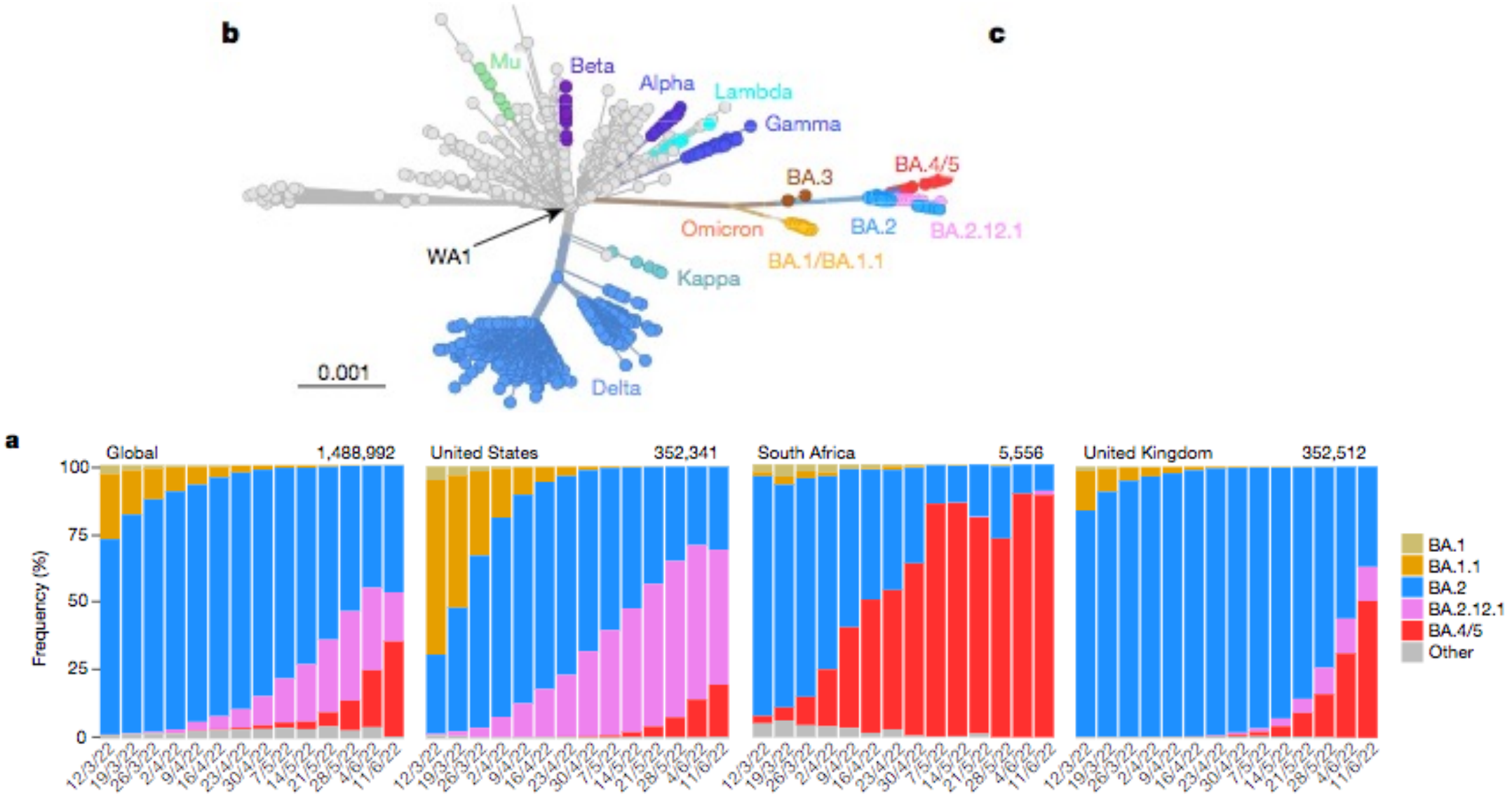
SARS-CoV-2 Emerging Variants

Structure of SARS CoV2 Virus



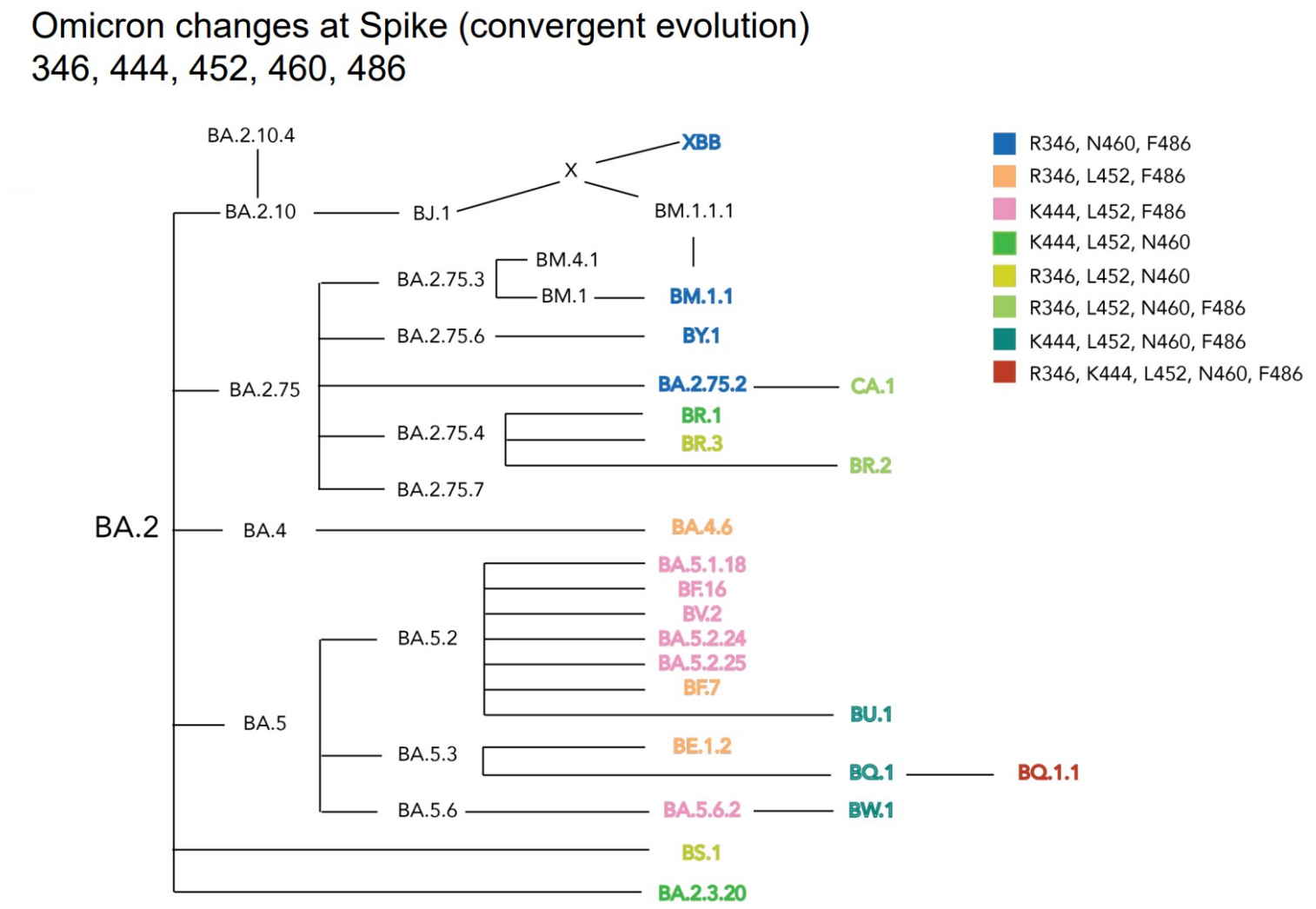


Omicron Subvariants



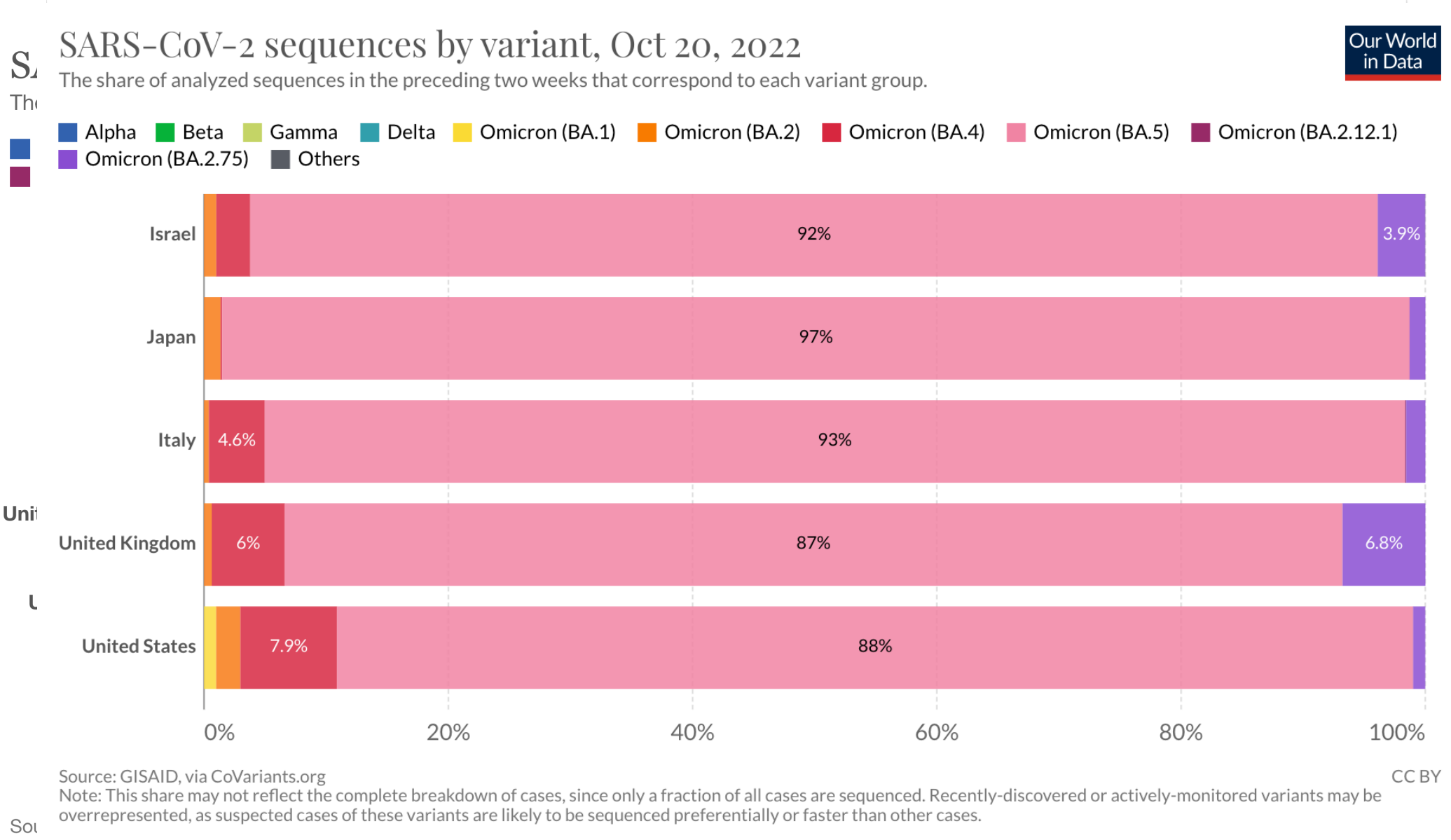
Wang et al. Nature 2022 Aug;608 (7923):603-608

SARS-CoV2 Continues to Evolve to Escape Immunity

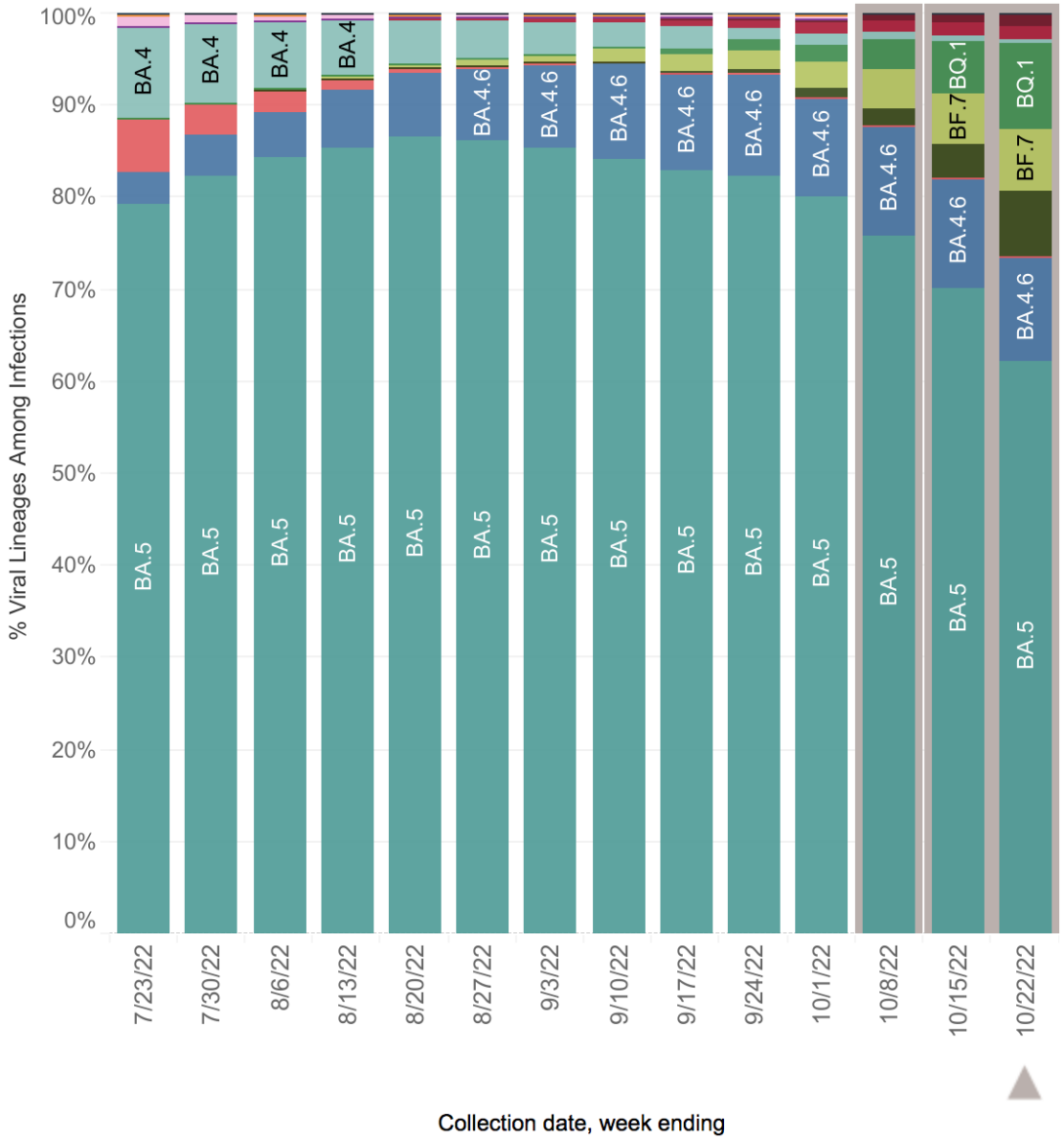


Ghedin, E. Symposium 77. IDWeek 2022. 10/20/22

SARS-CoV-2 Sequences by Variant



Omicron subvariants evolving rapidly



USA

WHO label	Lineage #	US Class	%Total	95%PI
Omicron	BA.5	VOC	62.2%	57.8-66.3%
	BA.4.6	VOC	11.3%	10.2-12.6%
	BQ.1	VOC	9.4%	6.7-12.9%
	BQ.1.1	VOC	7.2%	4.8-10.4%
	BF.7	VOC	6.7%	5.8-7.6%
	BA.2.75	VOC	1.6%	1.3-1.9%
	BA.2.75.2	VOC	1.3%	0.9-1.9%
	BA.4	VOC	0.4%	0.3-0.4%

CDC. https://covid.cdc.gov/COVID-data-tracker/#variant-proportions. Accessed 10/23/22

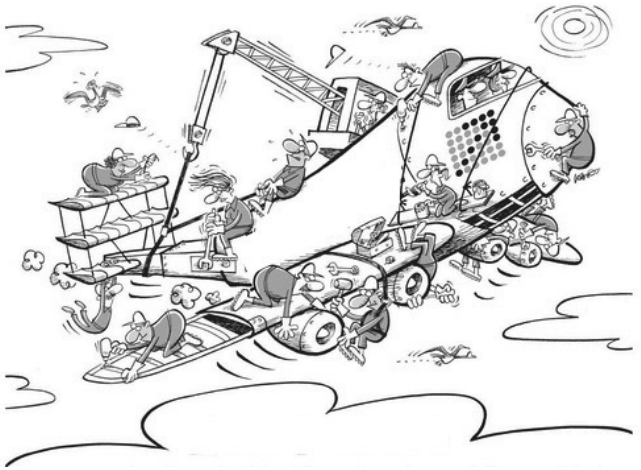
So What is the "New Normal"?

- COVID-19 is not going away. It is/will be endemic. New variants will continue to evolve resulting in new waves of cases.
- Vaccines offer the best protection against severe disease/death but protection may not be long lived. Will likely need at least annual boosters.
- 5-36% of people may have long term disability due to COVID-19
- We have 1 effective oral antiviral treatment option but of limited benefit to immunecompromised and with lots of drug-drug interactions. Need more safe, effective, and accessible therapies
- Misinformation is rampant. Public health messaging must be transparent, specific, clear. Investments and prioritization of public health messaging for all affected populations is essential
- Communities need reliable resources to rapidly dial up or down responses based on public health data
- The next pandemic is likely only a few years away

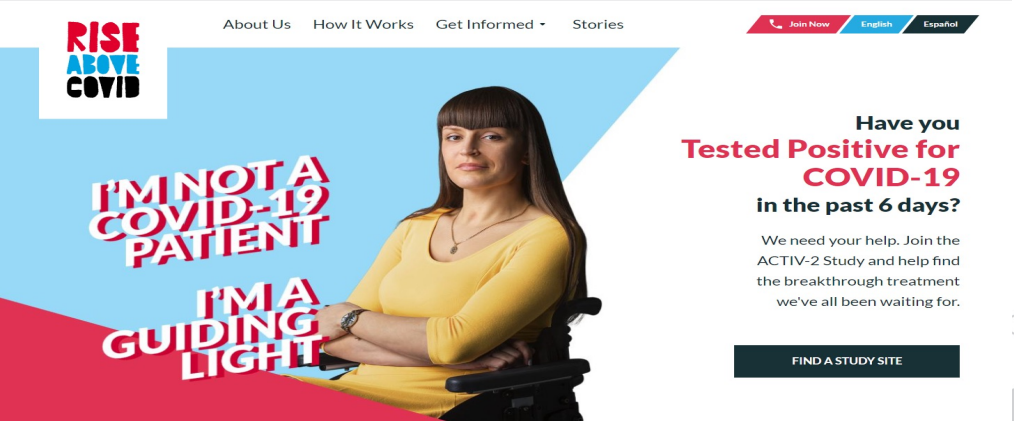
Lessons Learned: The Good

- Virus sequenced within days of the initial cases of pneumonia identified in Wuhan China
- Highly effective vaccines using mRNA technology developed and clinical trials phase 2/3 clinical trials reached primary endpoint within 7 months showing 95% protection against illness onset within 14 days of second dose.
- Operation Warp Speed funded the development and manufacture of 6 vaccine candidates and the clinical trial evaluation of multiple drugs for treatment and prophylaxis
- Highly effective antiviral oral (nirmatrelvir/ritonavir) and intravenous treatments (remdesivir, multiple monoclonal antibodies) became available
- Genomic surveillance increased to track emergence of new variants of concern globally
- Wastewater surveillance broadened to more than 900 sites to detect and track viral trends in communities

Clinical Trials During a Pandemic: "Building the plane while Flying It"

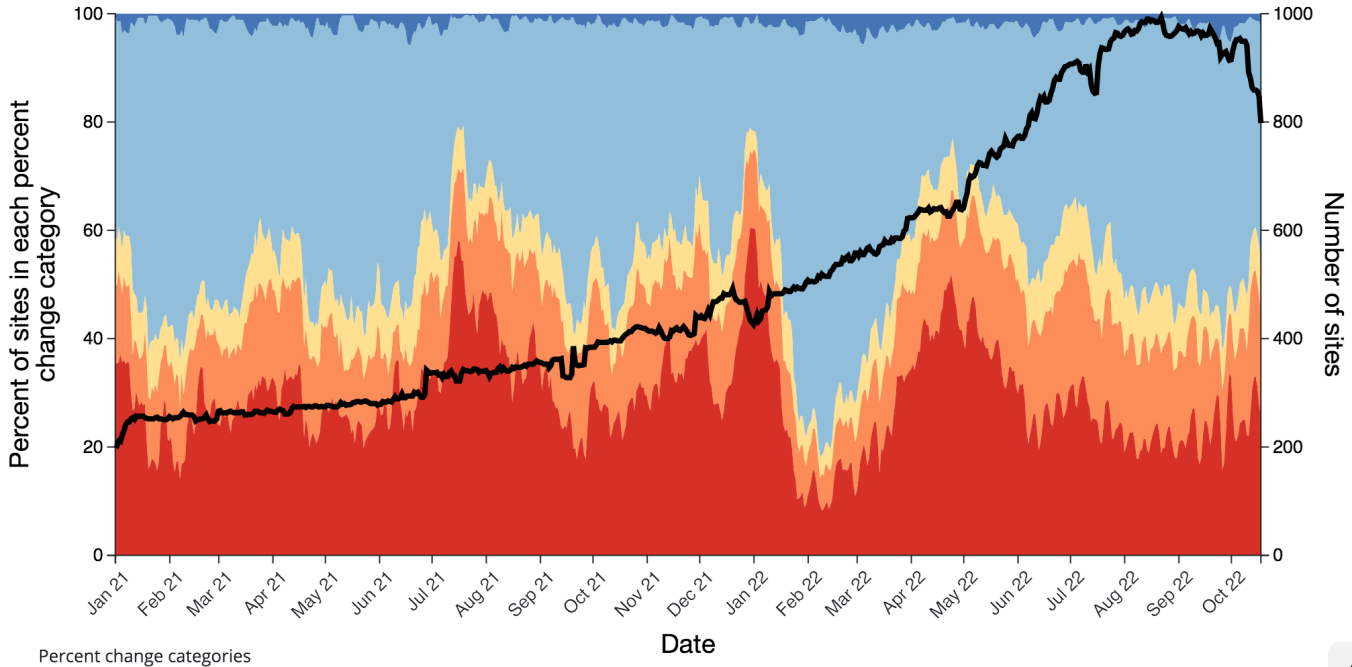


- Randomized multicenter platform trials developed and implemented very rapidly to evaluate multiple therapeutic options against a the same standard.
- Steroids lifesaving in critically ill requiring supplemental O2
- Remdesivir effective if given early in hospitalization and high] setting
- Hydroxychloroquine, ivermectin and others shown to be ineffective for treatment or prophylaxis and even harmful in some cases
- Implementation, data collection, analysis and dissemination of results done at an unprecedented pace.



Early Warning: Wastewater Surveillance

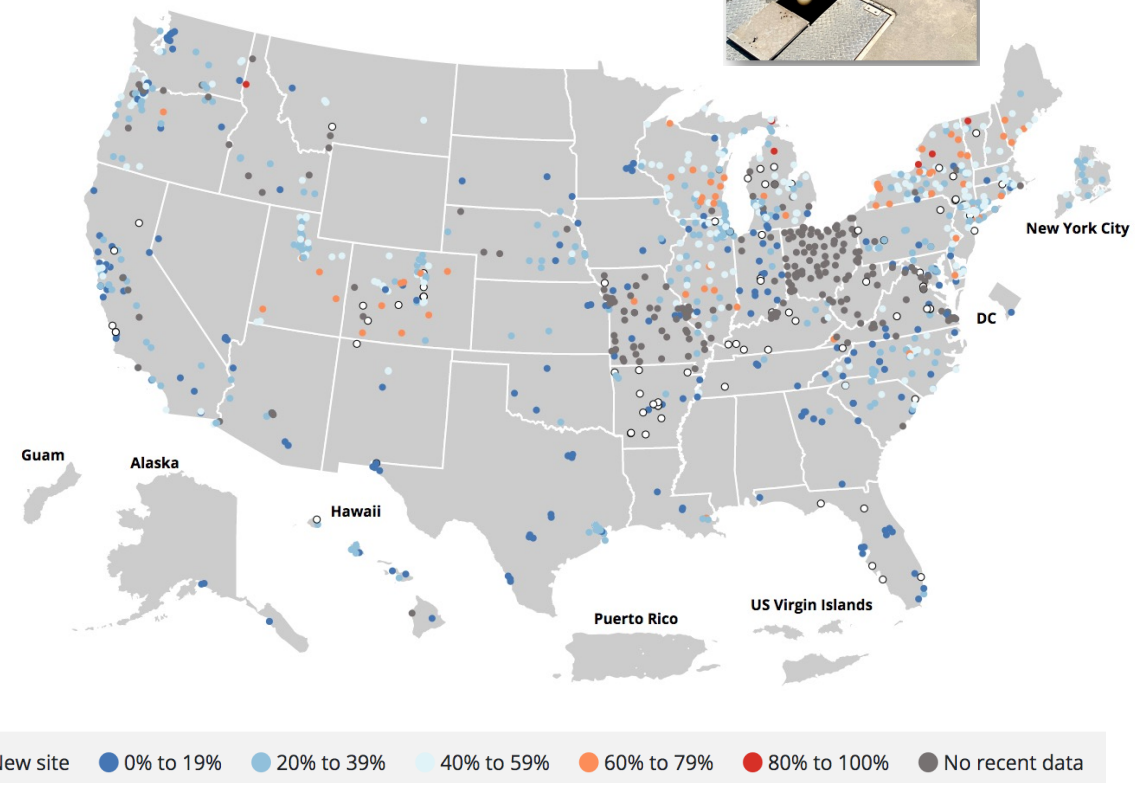
Percent of sites in each percent change category over time, United States



Percent change categories

- Large decrease (-100%)
- Decrease (-99% to -10%)
- Stable (-9 to 9%)
- Increase (10 to 99%)
- Large increase (100% or more)

Number of sites

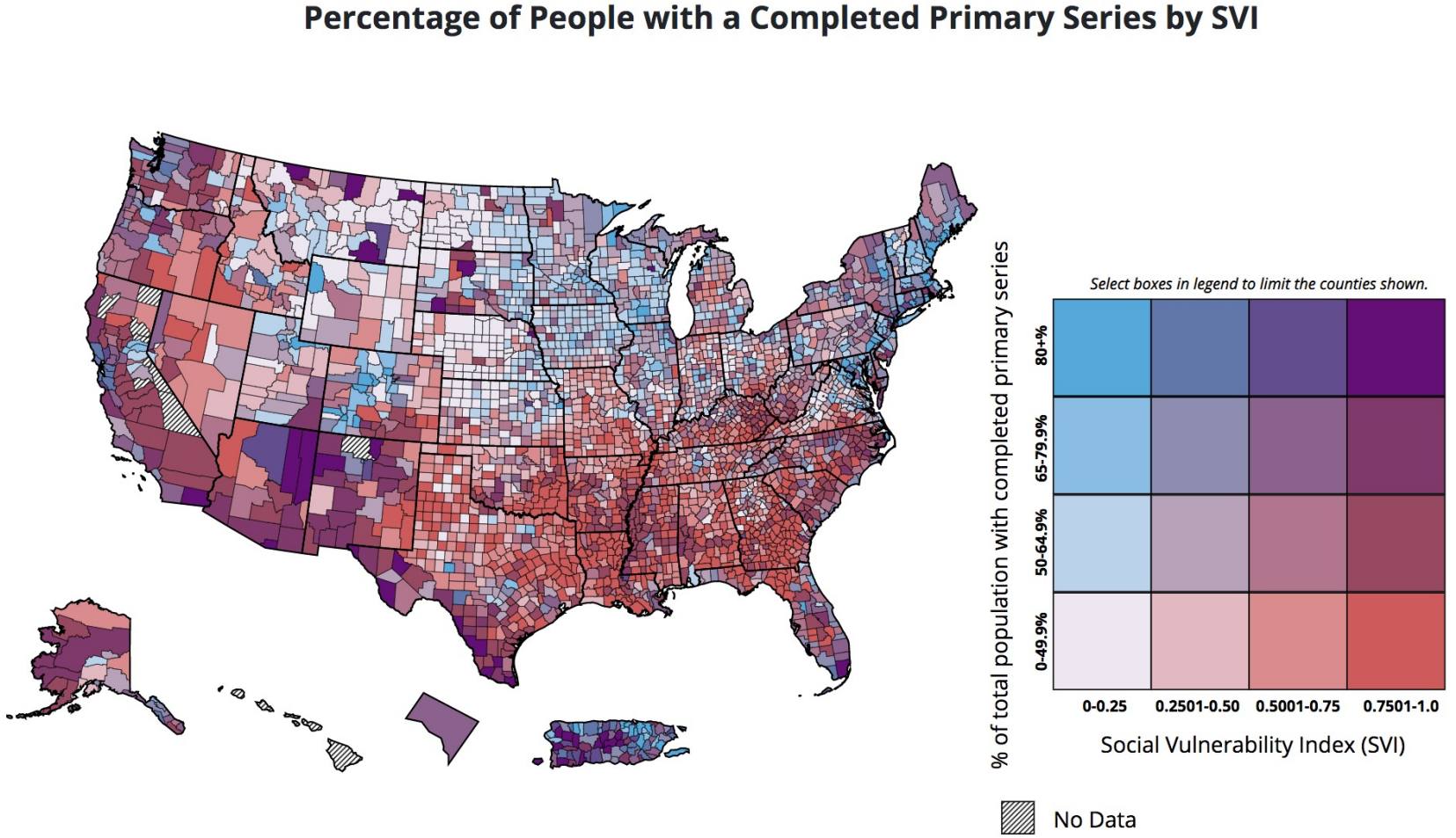


CDC. Covid.cdc.gov Accessed Oct 23, 2022

Lessons Learned: The Bad

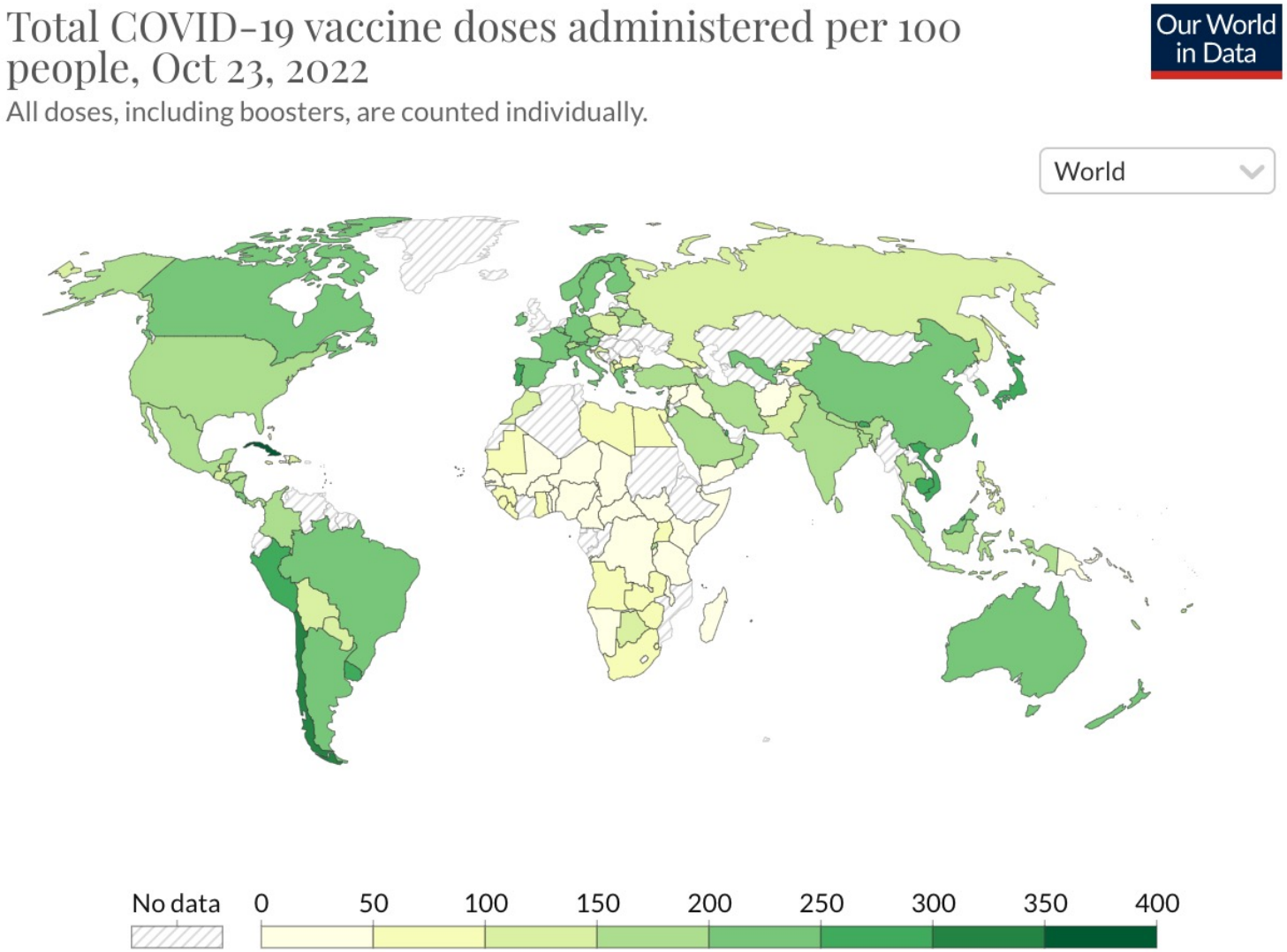
- Initial diagnostic tests by CDC early in the pandemic were faulty but FDA moved slowly to grant emergency use authorization for commercial tests
- Public health messaging bungled massively.
  - Mask mandates (first no mask, then only for unvaccinated and cloth masks ok, then indoors everywhere, then only in public transportation, now required in very few spaces)
  - Vaccine recommendations (High efficacy and safety message was lost. The rapid implementation of the clinical trials should have been a positive message but was seen as a negative)
- Implementation of policies was not driven by scientific evidence
- Politicians using COVID-19 for their own agenda sowing confusion and mistrust in public health authorities and scientists
- Ignoring the rest of the world at our own peril (e.g., U.S. leaving WHO, U.S. and China refusing to join COVAX)

Vaccine Equity in the U.S.

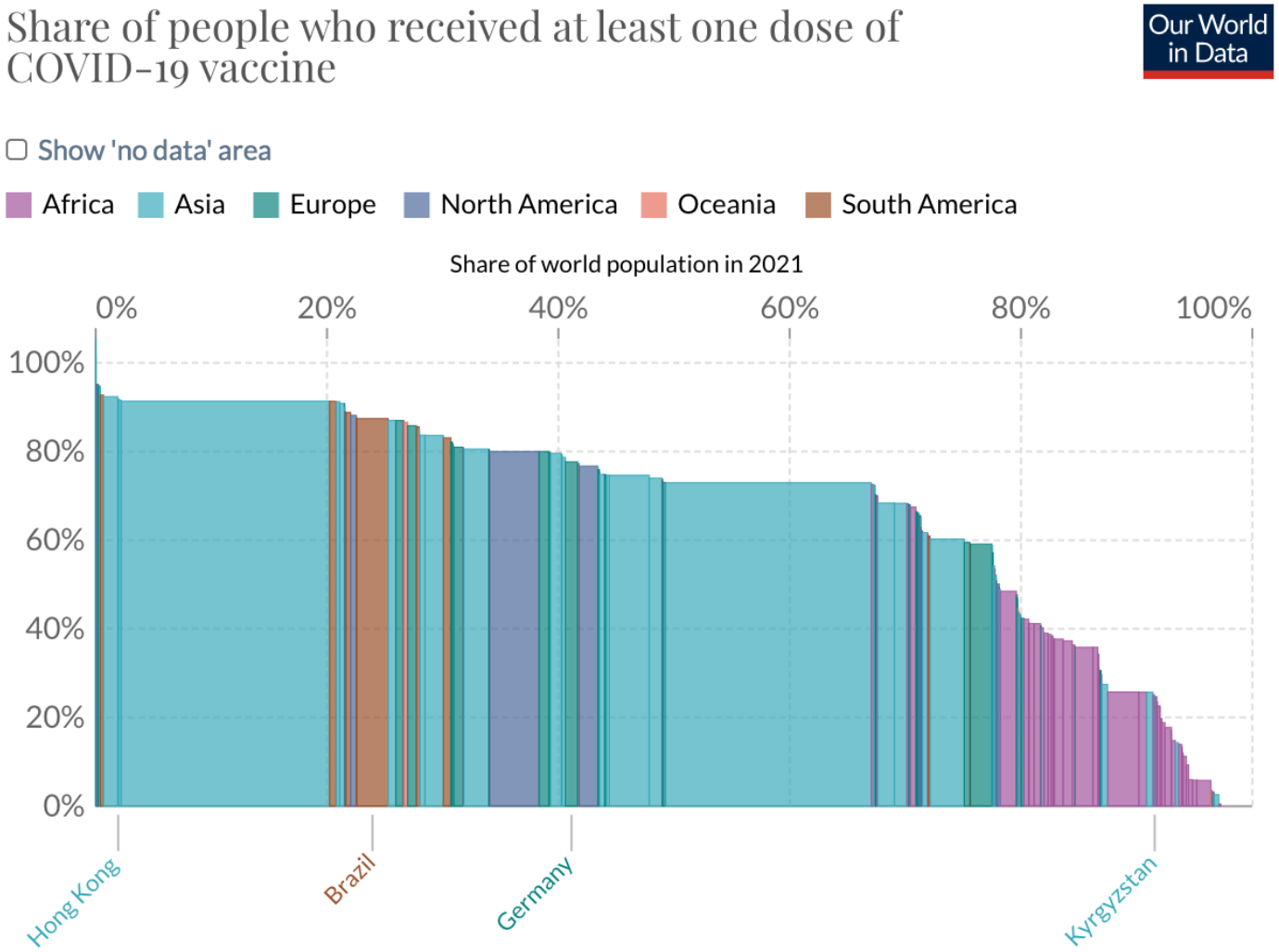


Centers for Disease Control. Data as of 10/19/2022

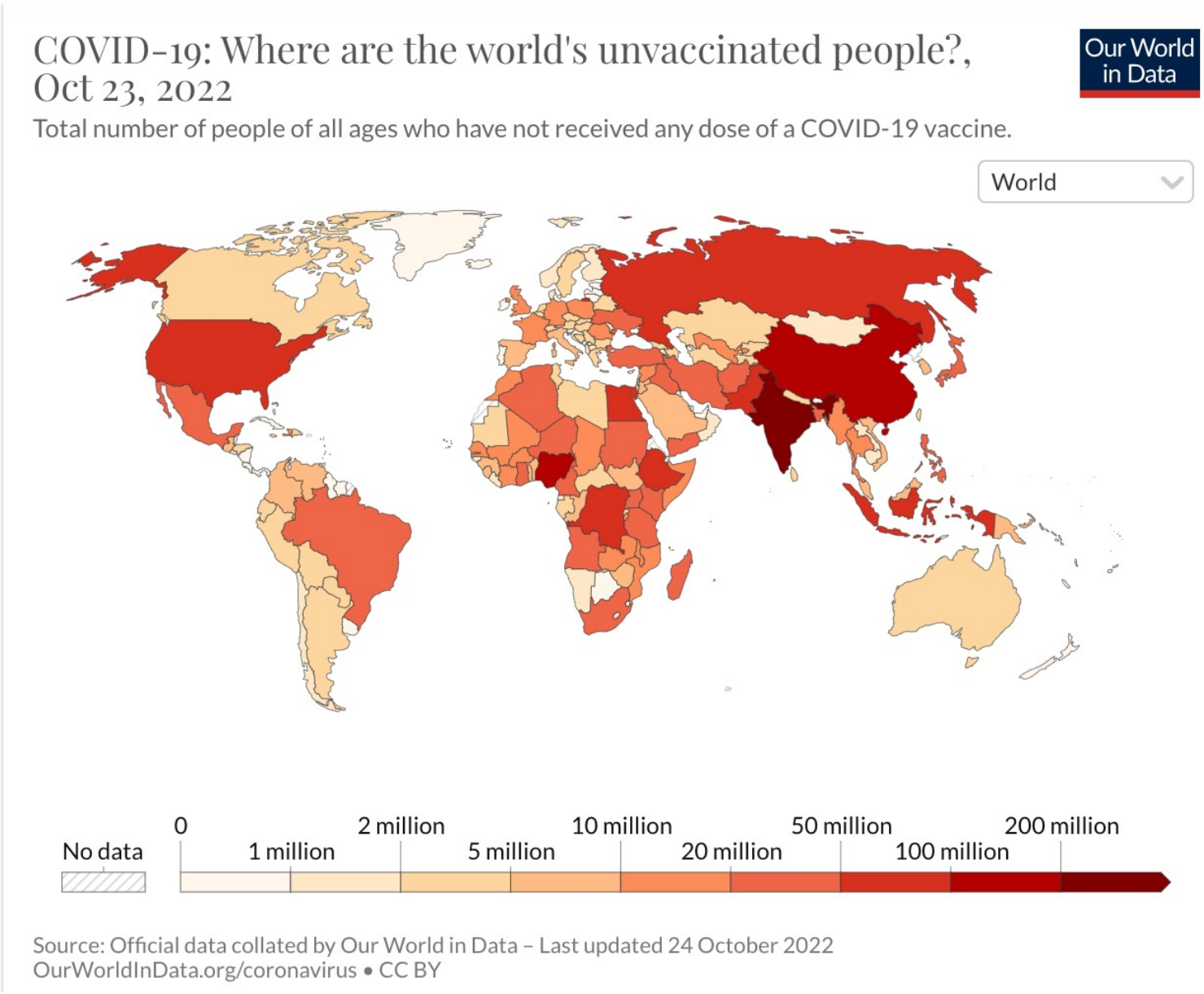
Inequity in Vaccination



COVID-19 Vaccination Prevalence



Still Large Number of Unvaccinated Everywhere

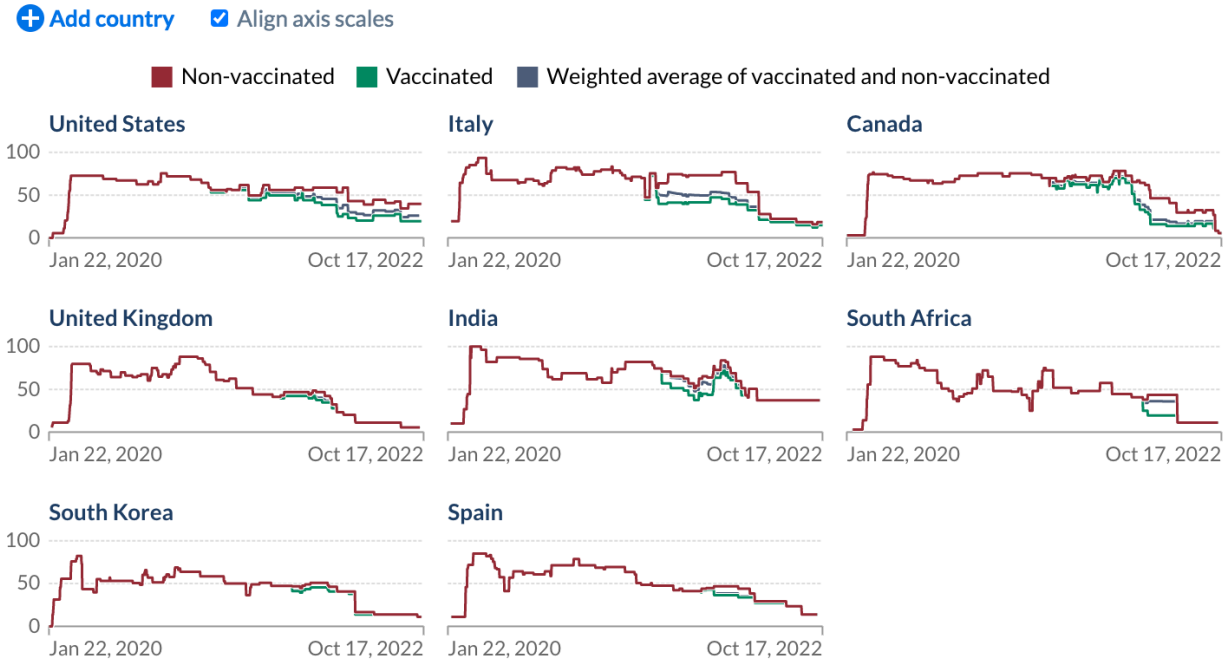


COVID-19 Policy Responses

COVID-19: Stringency Index

The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest).

Our World in Data

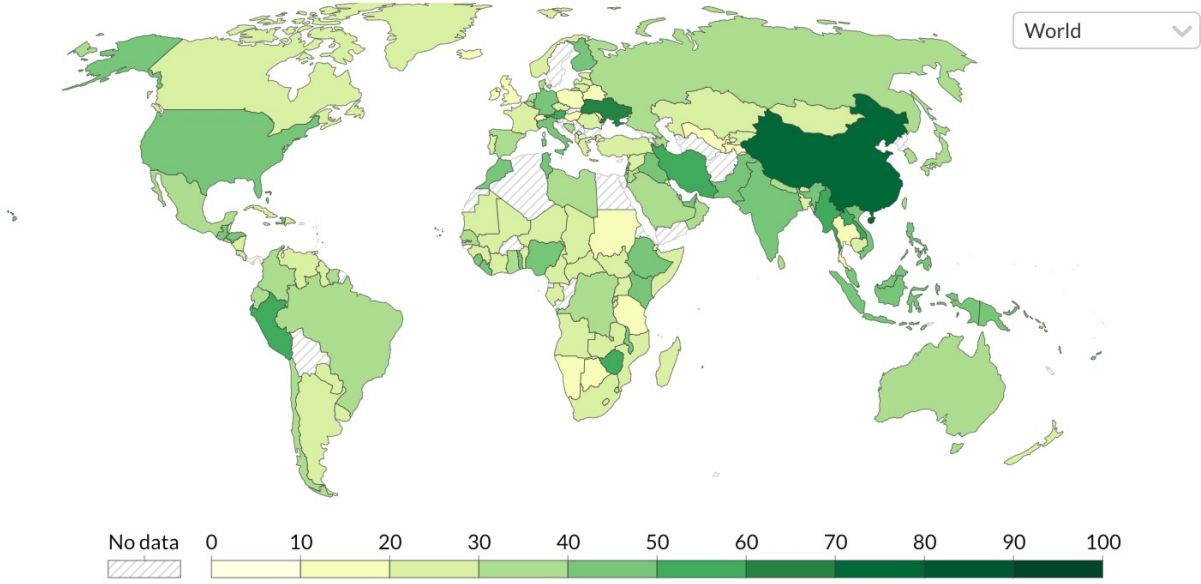


Source: Hale, T., Angrist, N., Goldszmidt, R. et al. A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker). Nat Hum Behav 5, 529–538 (2021). https://doi.org/10.1038/s41562-021-01079-8
CC BY

COVID-19 Containment and Health Index, Oct 5, 2022

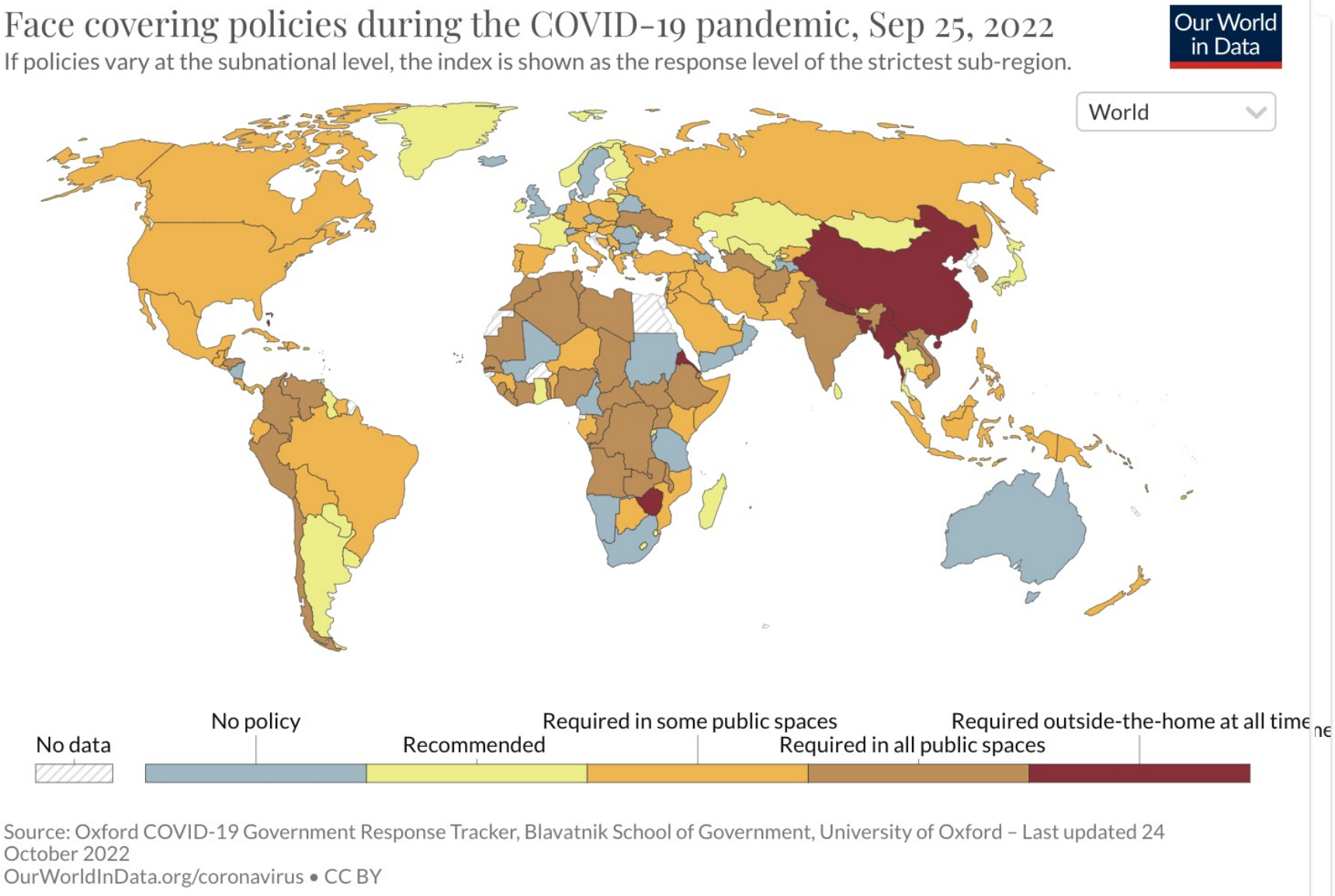
This is a composite measure based on thirteen policy response indicators including school closures, workplace closures, travel bans, testing policy, contact tracing, face coverings, and vaccine policy rescaled to a value from 0 to 100 (100 = strictest). If policies vary at the subnational level, the index is shown as the response level of the strictest sub-region.

Our World in Data



Source: Oxford COVID-19 Government Response Tracker, Blavatnik School of Government, University of Oxford – Last updated 24 October 2022
OurWorldInData.org/coronavirus • CC BY

Face Mask Requirements



https://ourworldindata.org/grapher/face-covering-policies-covid?time=2022-09-

Lessons Learned: The Ugly

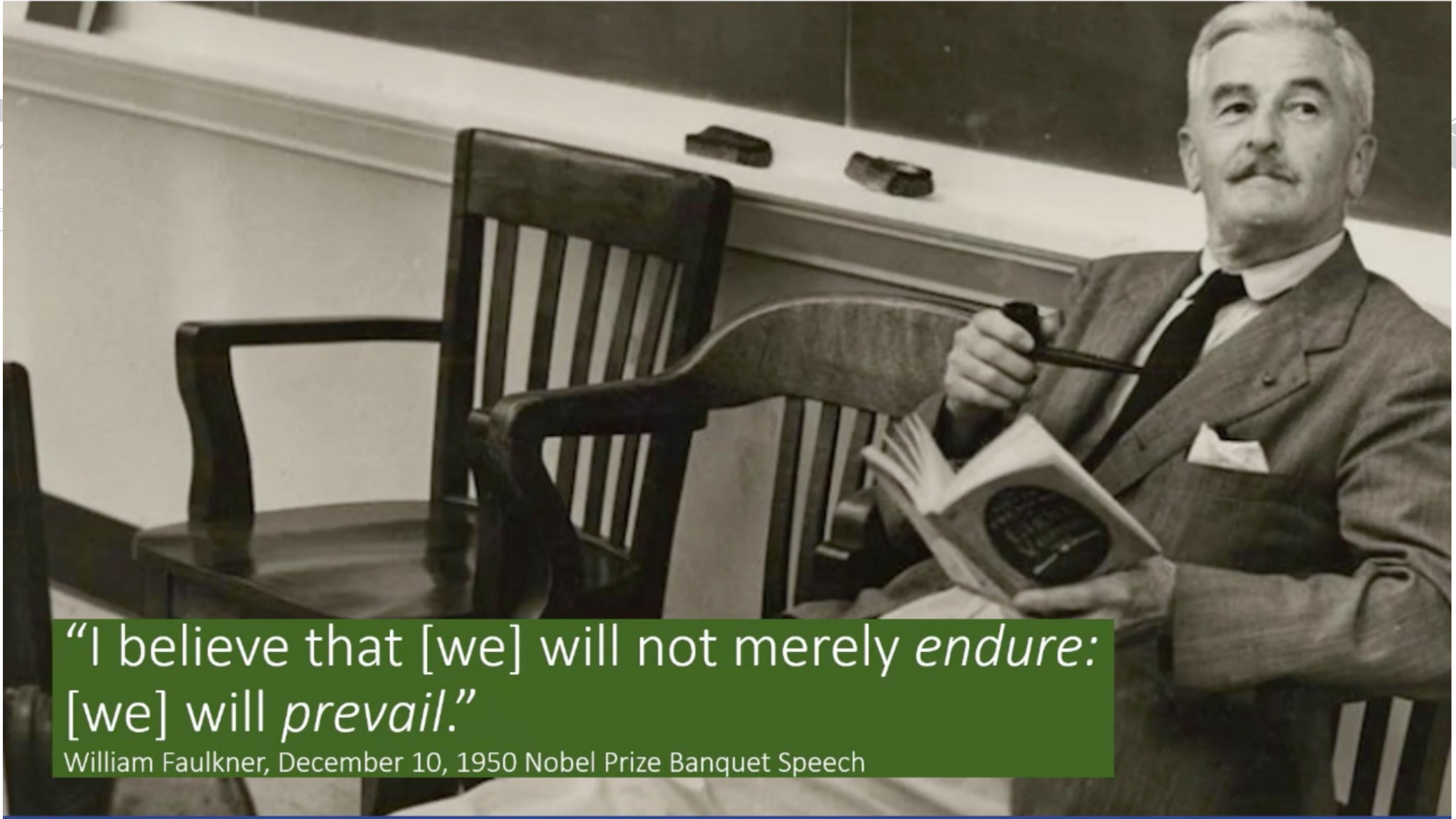
- Congress refusing to sustain funding for COVID treatments, research and local public health resources
- The pandemic exposed the large racial/ethnic inequities in the U.S. and between rich and poor countries in access to healthcare including testing, vaccines, and treatment
- Vaccine nationalism. Rich countries hoarding vaccine supplies and not ensuring equitable access to vaccines.
- Corporate greed (poor countries pushed to sign vaccine agreements in very unfavorable terms, high cost of medications developed with NIH support)

Preparing For The Next Pandemic

- In last 100 years, there have been 4 influenza pandemics separated by about 30 years and in the last 20 years most emerging infections have been of animal origin .
- Intervals likely to shorten
- Next pandemic likely to be respiratory virus: likely new strain of influenza like the H7N9 avian flu or H1N1 swine flu or another novel coronavirus
- Large intensive livestock farms, trade of wild animals, encroachment into virgin forests and mining can result in "spillover infections" from animals to people (e.g., avian flu, SARS, Ebola).
- Climate change is also associated with increased risk of pandemics as rising temperatures and flooding allow mosquitoes, ticks and other vectors of viruses to proliferate.
- We have techniques to rapidly identify clusters of cases in animals and humans but we have to be able to do this anywhere in the world and then deploy a rapid response to contain an outbreak before it spreads

Where do we go from here?

- Most respiratory viruses evolve and vary rapidly so we will continue to deal with epidemics and pandemics of these viruses
- Avoid the cycle of PANIC-NEGLECT
- We need to continue to develop vaccines that are safe, effective and we must ensure equitable access globally
- We need to invest in global systems to detect outbreaks early and have a plan for global rapid response to contain them before they grow out of control.
- Rich countries have a moral responsibility to provide low income countries with infrastructure to manufacture and administer new vaccines and therapeutics
- Fight health misinformation!
- Need sustained investments in science and public health (including a well trained health workforce)
- Need to empower communities to be resilient so that they can continue to function and protect the most vulnerable during health emergencies


“I believe that [we] will not merely *endure*: [we] will *prevail*.”
William Faulkner, December 10, 1950 Nobel Prize Banquet Speech

THANK YOU!