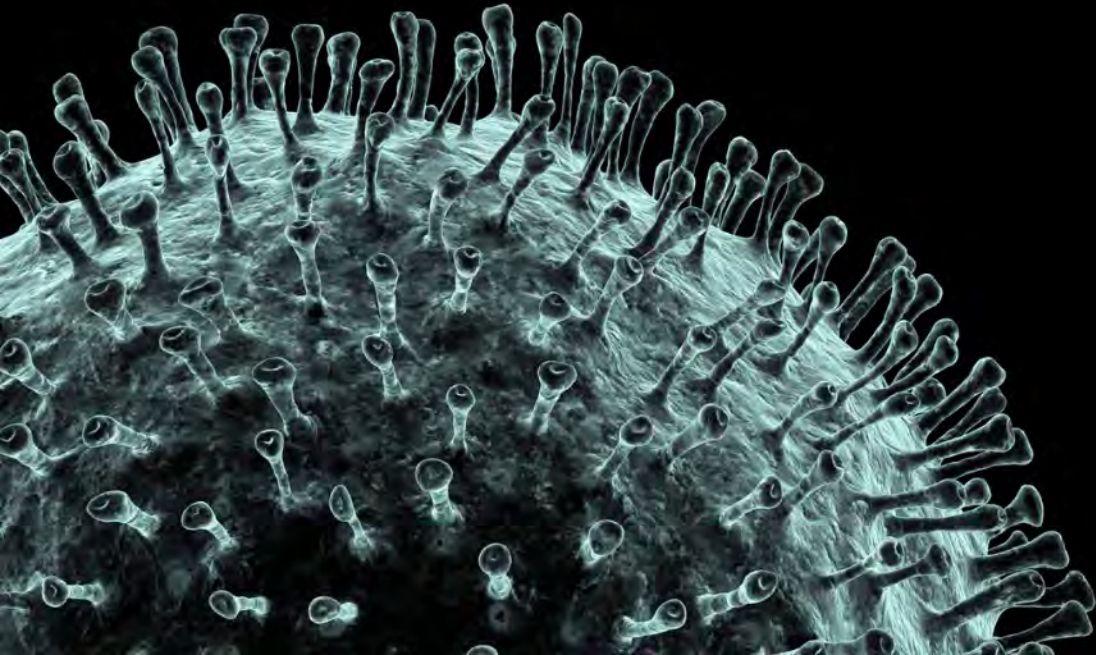


COVID-19 Conversations



George Rutherford

University of California, San Francisco



COVID19Conversations.org

[#COVID19Conversations](https://twitter.com/COVID19Conversations)

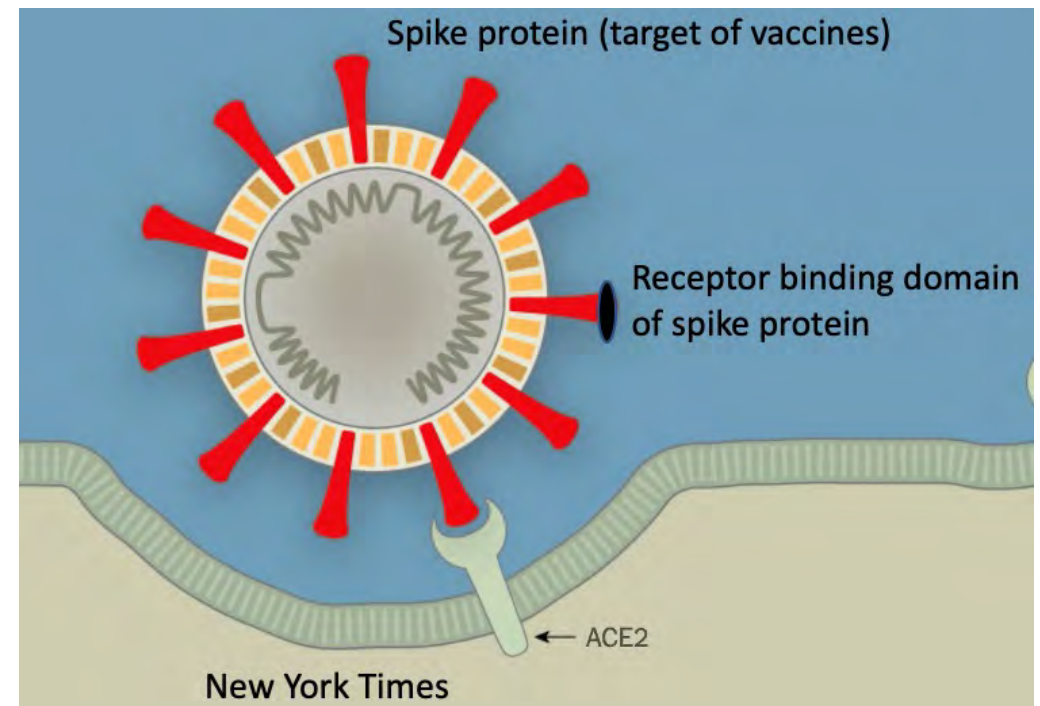


COVID-19 Conversations #21
The Fourth Wave: Vaccines,
Variants, and the Future
September 1, 2021

George W. Rutherford, M.D., A.M.
University of California, San Francisco

What are variants?

- SARS-CoV-2 virus has a long spike protein that protrudes from its shell and attaches to certain cells
- Small variations in the amino acid sequences (mutations) can change the shape of the spike protein and change its properties
 - More easily transmitted
 - More difficult for antibodies to bind to

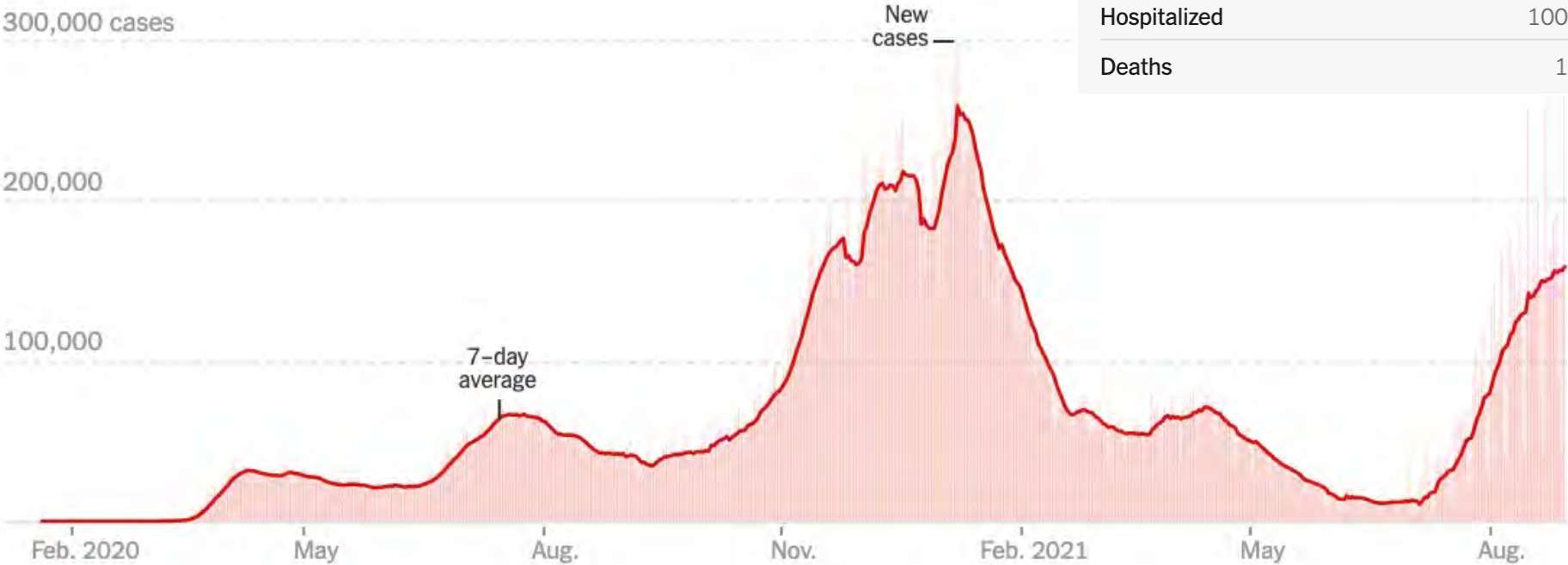


3 characteristics give the delta variant evolutionary advantage:

- Mutations in the receptor binding domain make the variant “stickier”
- Mutation in the furin cleavage site makes it more efficient in entering target cells
- Mutation in NTD-antigenic supersite makes it less readily recognized by antibodies

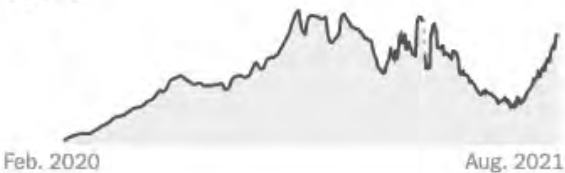
The fourth COVID-19 wave, United States, July-September, 2021

	DAILY AVG. ON AUG. 30	14-DAY CHANGE	TOTAL REPORTED
Cases	158,946	+12%	39,156,379
Tests	1,522,570	+45%	—
Hospitalized	100,663	+22%	—
Deaths	1,348	+91%	639,081



These are days with a reporting anomaly. Read more [here](#).

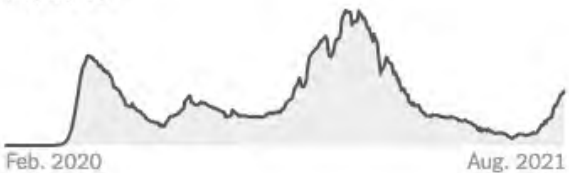
Tests



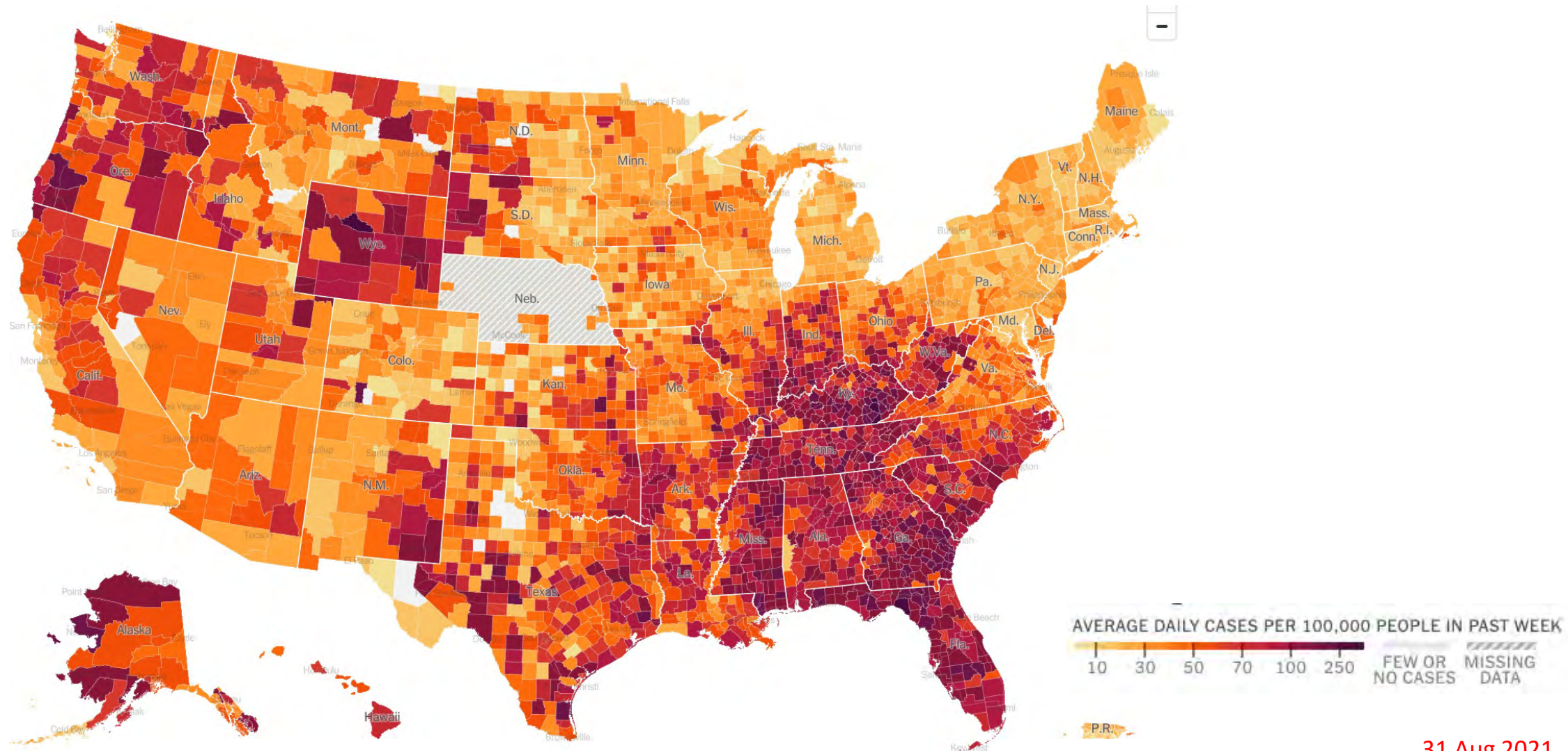
Hospitalized



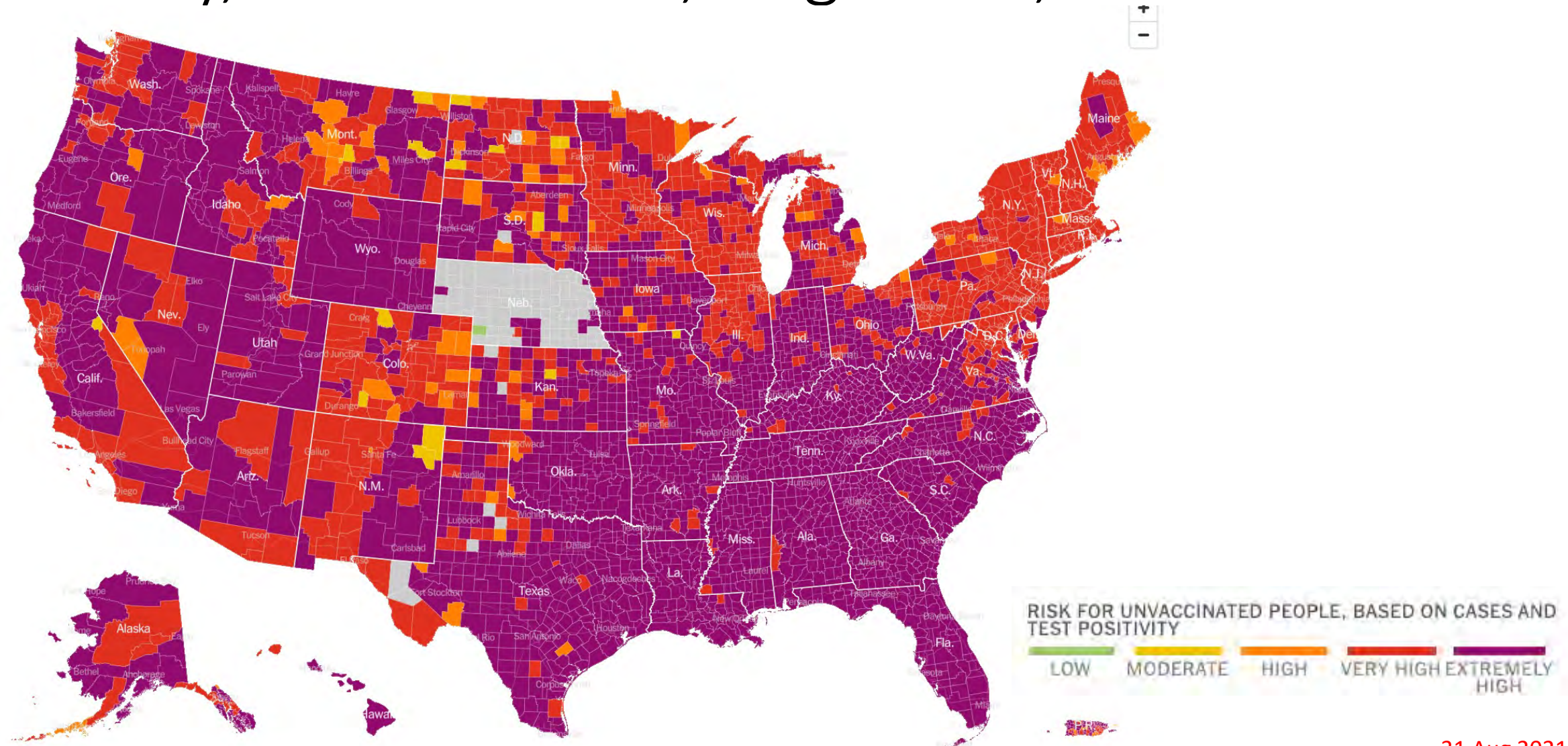
Deaths



Average daily cases per 100,000 in past week by county, United States, August 31, 2021



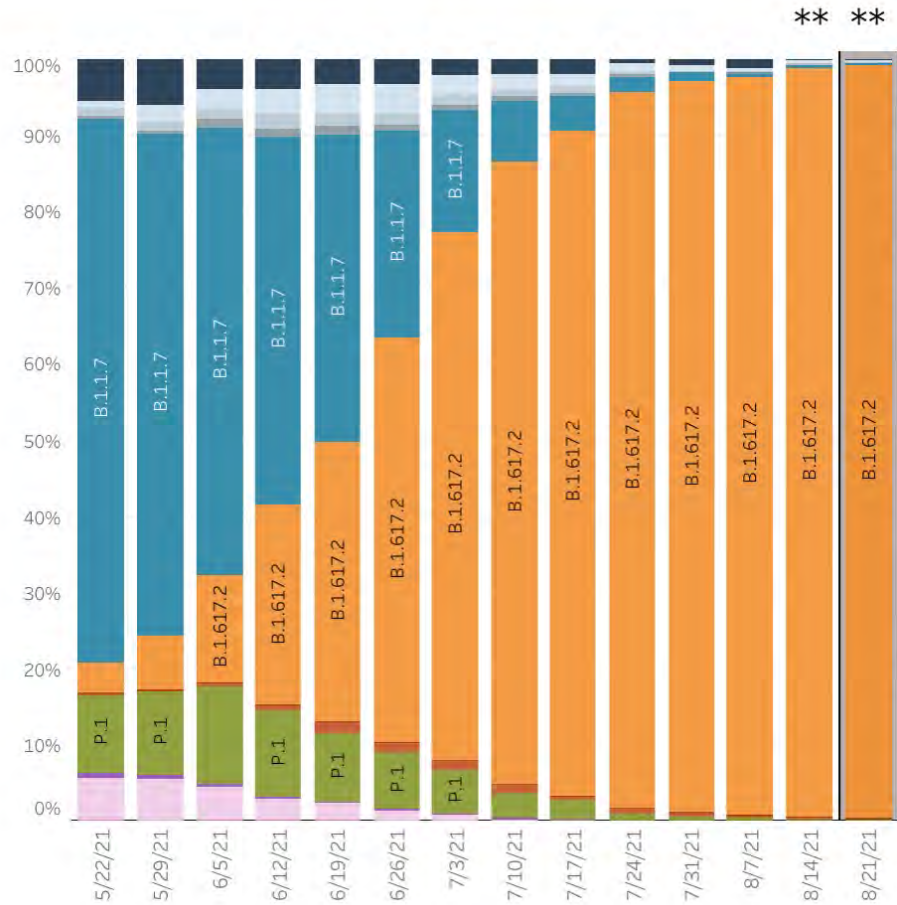
Risk for COVID-19-unvaccinated individuals by county, United States, August 31, 2021



SARS-CoV-2 variants of concern, United States and United Kingdom, 2021

United States: 5/16/2021 – 8/21/2021

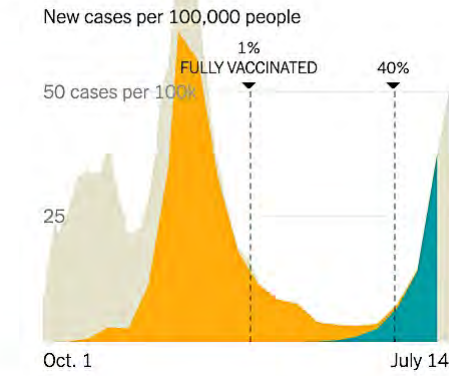
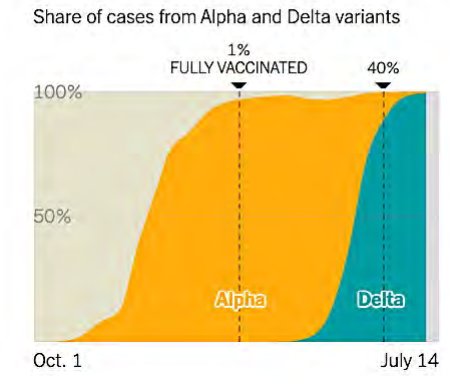
United States: 8/15/2021 – 8/21/2021 NOWCAST



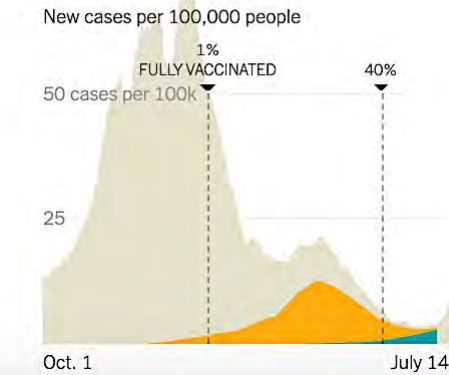
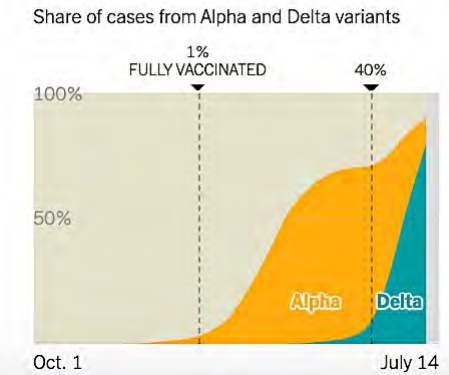
USA				
WHO label	Lineage #	Type	%Total	95%PI
Alpha	B.1.1.7	VOC	0.2%	0.0-0.7%
Beta	B.1.351	VOC	0.0%	0.0-0.2%
Gamma	P.1	VOC	0.1%	0.0-0.5%
Delta	B.1.617.2	VOC	98.8%	97.6-99.8%
	AY.2	VOC	0.2%	0.0-0.7%
	AY.1	VOC	0.1%	0.0-0.5%
Eta	B.1.525	VOI	0.0%	0.0-0.2%
Iota	B.1.526	VOI	0.0%	0.0-0.2%
N/A	B.1.621		0.3%	0.0-0.7%
	B.1.621.1		0.1%	0.0-0.5%
	B.1.628		0.1%	0.0-0.5%
Other	Other*		0.1%	0.0-0.5%

* Enumerated lineages are VOI/VOC or are circulating >1% in at least one HHS region during at least one two week period; remaining lineages are aggregated as "Other".
 ** These data include Nowcast estimates, which are modeled projections that may differ from weighted estimates generated at later dates.
 # Sublineages of P.1 and B.1.351 are aggregated with the parent lineage and included in parent lineage's proportion. AY.3-AY.12 are aggregated with B.1.617.2.

United Kingdom



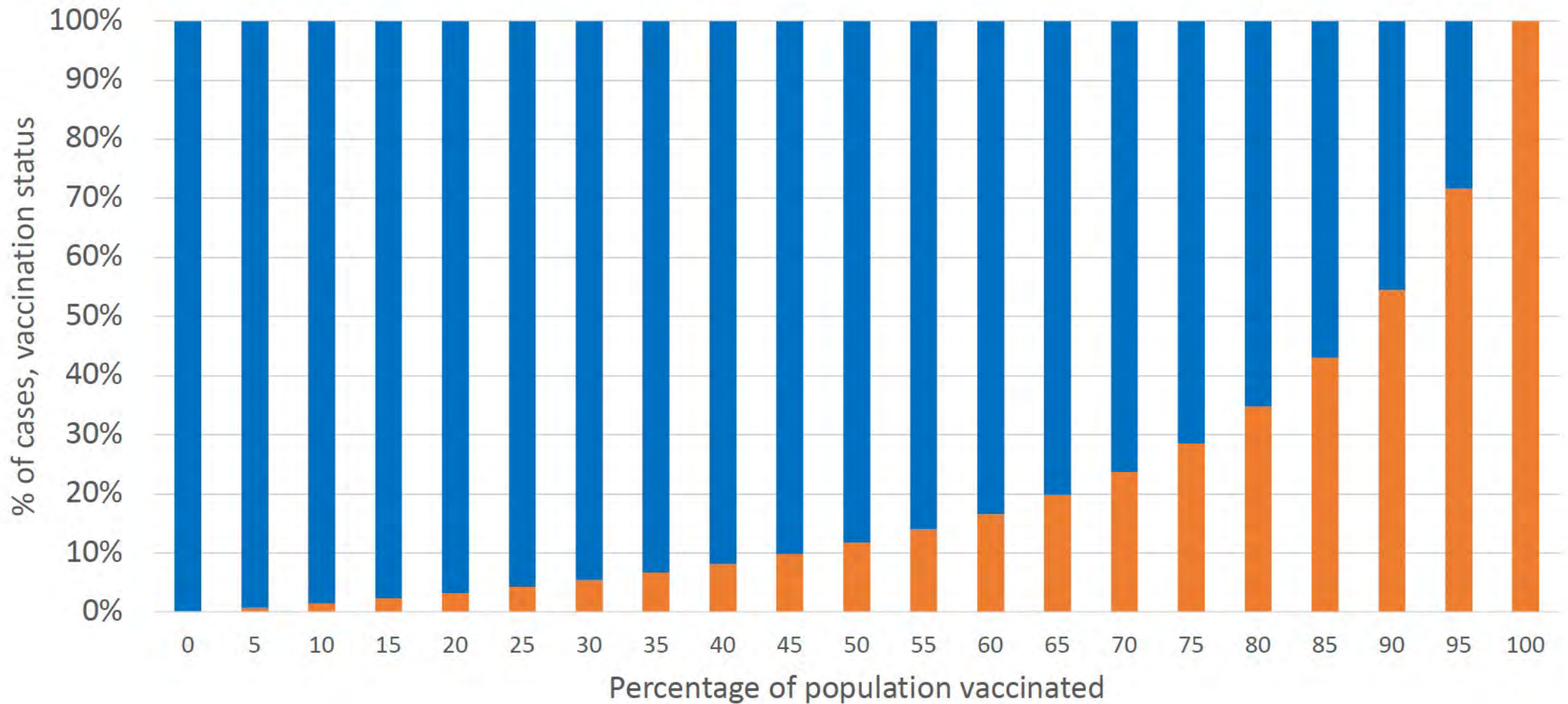
United States



What's going on in the U.S.?

- Rise of more transmissible delta variant – now almost 100% of isolates in the U.S.
- Failure to vaccinate - far more important than vaccine failure
- Continued mixing of unvaccinated people with resultant transmission
- Less than full adherence to non-pharmaceutical interventions
- Failure to develop immunity in some immunocompromised individuals
 - Need for an additional dose in primary series
- Some evidence of declining vaccine effectiveness temporally associated with rise of delta virus – waning immunity, escape mutations??
 - Breakthrough infections

Effects of community vaccination level upon the % of cases in the vaccinated: (RR 7.5x in unvaccinated)



Courtesy of Dr. R. Schechter, CDPH

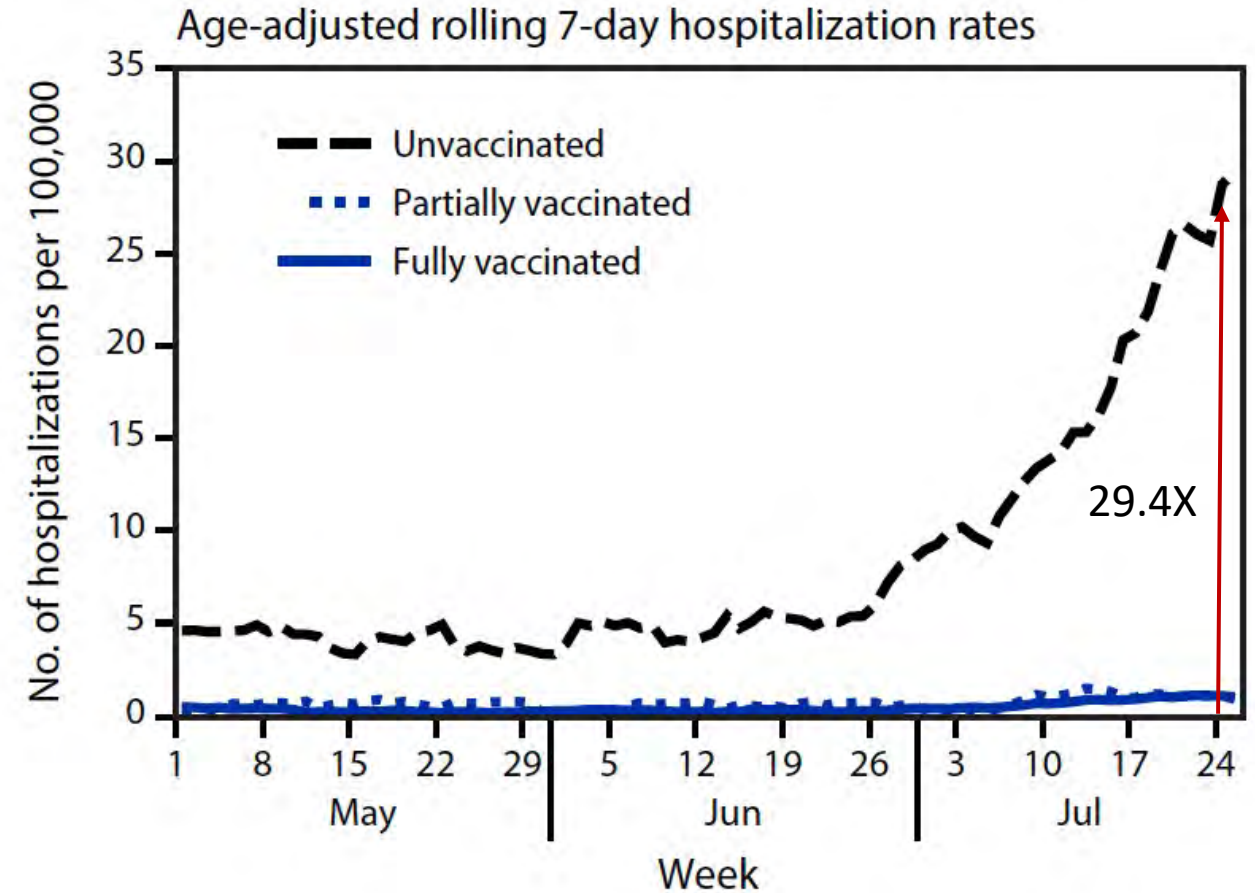
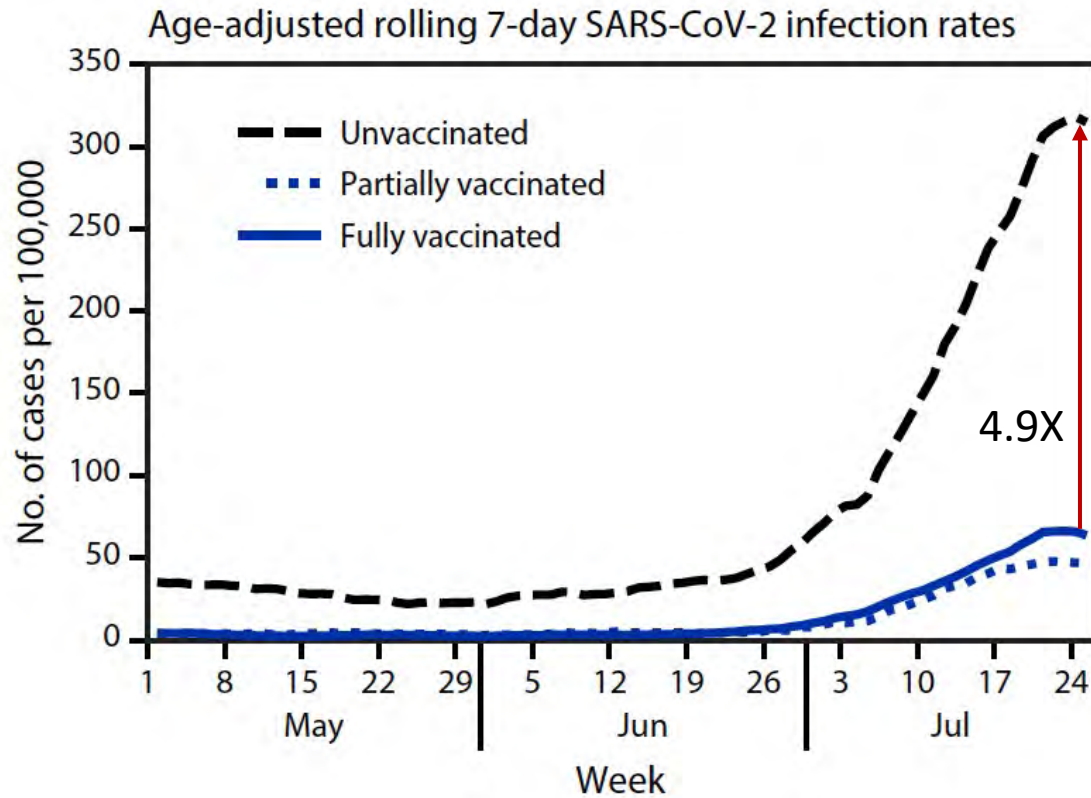
■ % cases who were vaccinated

■ % cases who were unvaccinated



COVID-19 cases by vaccination status, Los Angeles County, May 1-July 25, 2021

FIGURE 1. Age-adjusted rolling 7-day SARS-CoV-2 infection and hospitalization rates,* by vaccination status† — Los Angeles County, California, May 1–July 25, 2021



Griffin JB, Haddix M, Danza P, et al. SARS-CoV-2 infections and hospitalizations among person aged ≥ 16 year, by vaccination status – Los Angeles County, California, May 1-July 25, 2021. MMWR 2021; 70:1170-76.

Projections of incidence SARS-CoV-2 infection, United States, through December 31, 2021

Daily infections and testing [↗](#)

Trend

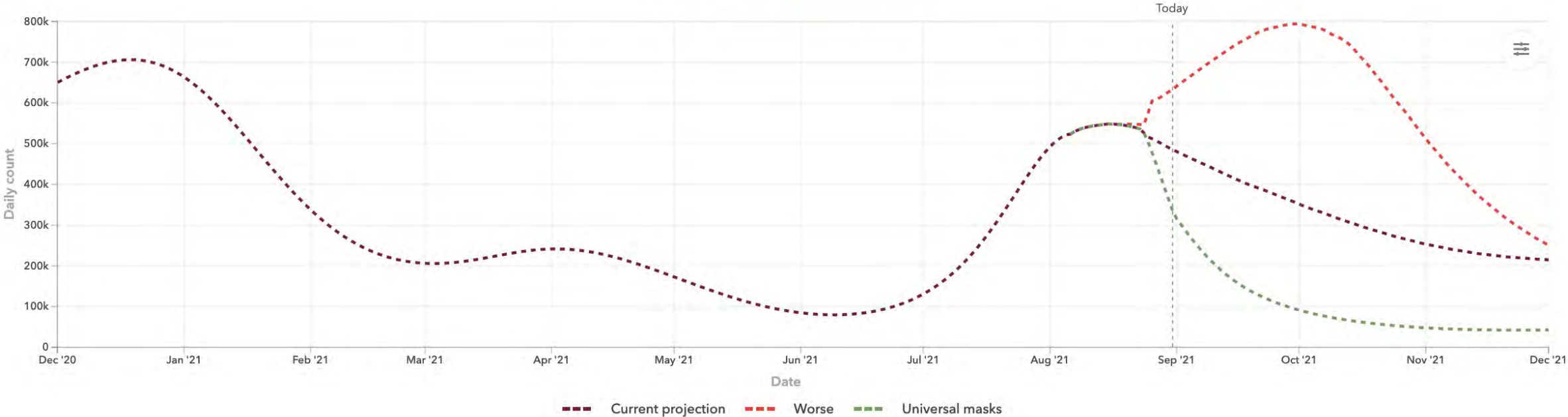
Compare

Map

Estimated infections are the number of people we estimate are infected with COVID-19 each day, including those not tested.

Estimated infections | Confirmed infections | Tests

Scenario ⓘ | Projection × | Worse × | Masks × ▾



Current projection: Vaccine distribution continues at current pace (57% fully vaccinated by 31 December), future mask use is the mean of mask use over the last 7 days, mobility increases in proportion to vaccine coverage. **Worst:** 100% of vaccinated individuals stop using masks, mobility increases irrespective of vaccine coverage, variants spread twice as fast. **Masks:** 95% mask usage is adopted

Projections of hospital resource utilization for COVID-19 patients, United States, through December 31, 2021

Hospital resource use [↗](#)

[Trend](#) [Compare](#) [Map](#)

Hospital resource use indicates how equipped a location is to treat COVID-19 patients for the **Current projection** scenario. Select **All beds** or **ICU beds** for descriptions of each measure.

All All beds ICU beds



SARS-CoV-2 variants of interest, World Health Organization, August 2021

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