

Summer of '21: The Delta Variant

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Disclosure

- I have no actual or potential conflict(s) of interest in relation to this presentation.

Learning Objectives & References

- Objectives

- Learn how the Delta Variant has affected the epidemiology of COVID-19
- Understand the importance of vaccination to diminish Delta variant infections

- References

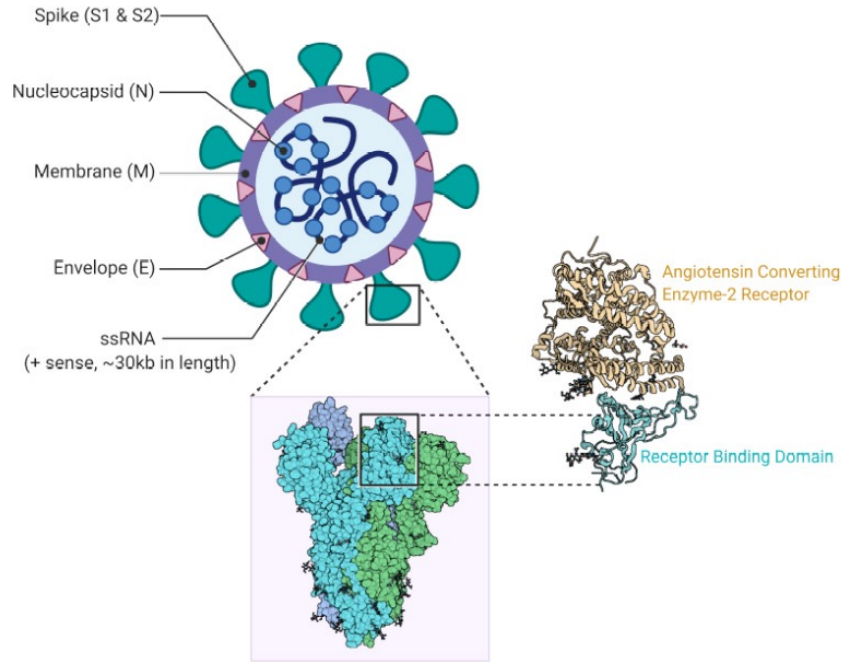
- <https://www.cdc.gov/coronavirus/2019-ncov/variants/delta-variant.html>
- <https://jamanetwork.com/journals/jama/fullarticle/2783478>

COVID-19

- SARS-CoV-2
 - ~30k bases
 - 15 genes
 - Exonuclease (corrects replication errors)
 - Spike protein – “S” – most outward, attachment
- Even with exonuclease, mutations often occur
 - Magnified by # of replications in **large** # of infections
 - Mutations that confer fitness will survive

SARS-CoV-2

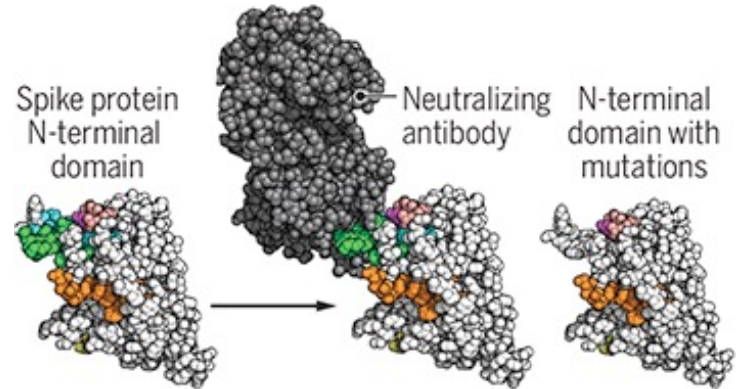
SARS-CoV 2 Structure



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Evasive maneuver

The spike protein's N-terminal domain (left) includes a "supersite" where powerful antibodies latch on to the virus (middle). Mutations there (right) can prevent them from binding.



Kupferschmidt, Science, 2021

Mutations, Variants, Strains

- Mutation is a specific change in a sequence, *eg*, D614G
 - Code changes aspartic acid to glycine
- Variant & Strain (often interchanged)
 - Variant – change in genetics
 - Strain – change in genetics with a change in phenotype, *eg*, virulence, mode of transmission, antigenicity, *etc.*

Variants

Variant of Interest (VOI)



Variant of Concern (VOC)

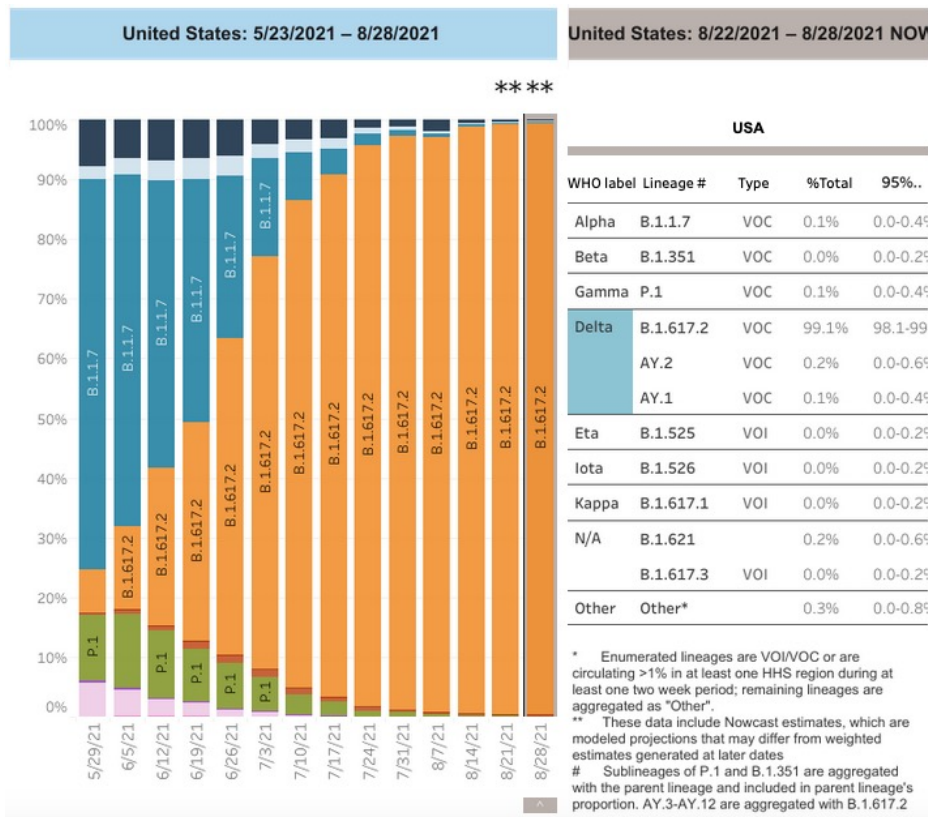


Variant of High
Consequence (VOHC)

Attributes


- Transmissibility
- Severity
- Immune escape
 - Vaccines
 - MAbs
- Rx failure
- Testing failure

Variants in the US



Current Variant of Concern

WHO Label: Delta

Pango Lineage: B.1.617.2, AY.1, AY.2, AY.3, AY.4, AY.5, AY.6, AY.7, AY.8, AY.9, AY.10, AY.11, AY.12 ([Pango lineage](#) )^a

Spike Protein Substitutions: T19R, (V70F*), T95I, G142D, E156-, F157-, R158G, (A222V*), (W258L*), (K417N*), L452R, T478K, D614G, P681R, D950N

Name ([Nextstrain](#) )^b: 21A/S:478K

First Identified: India

Attributes:

- Increased transmissibility²⁹
- Potential reduction in neutralization by some EUA monoclonal antibody treatments^{7, 14}
- Potential reduction in neutralization by post-vaccination sera²¹

Back to the Attributes

- **Clinical** – no consistent evidence that Delta disease is significantly different than prior
 - Incubation period may be shorter by 1 – 1.5 d.
- **Transmissibility** – Delta >> than Alpha (B.1.1.7) which was >> than D614G
 - Larger viral load in nasopharynx
 - More efficient binding and cell entry
- **Testing** – no evidence of commercial test failure
 - Most RT–PCR tests do not target S gene; none use it alone

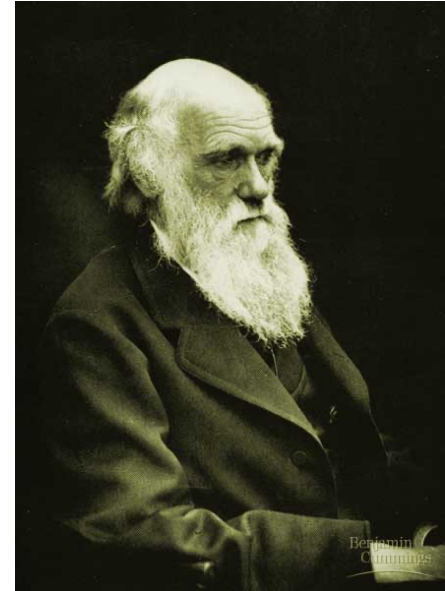
Back to the Attributes (2)

- **Immune Escape**

- Monoclonal Antibodies (MAbs)
 - Bamlanivimab (+/– etesevimab) – ineffective vs multiple variants
 - Casirivimab + imdevimab (REGEN-COV™), sotrovimab – remain active
- Convalescent Plasma
 - Generally not recommended
- Vaccine Induced Antibodies
 - Generally remain protective

Back to *The Beagle*

- Survival of the fittest
- Heritable variations
- Adaptive radiation



Charles Darwin
1809 – 1882

Case Rate

METRIC

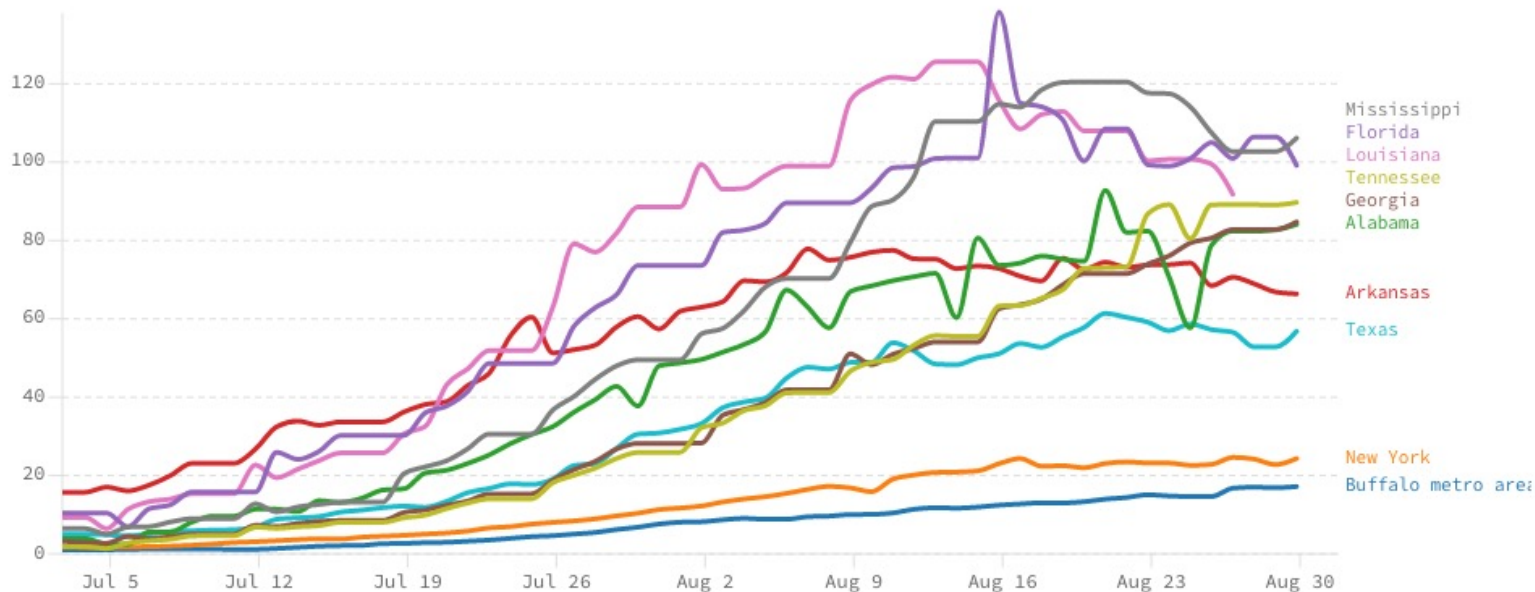
Cases per 100K

PAST # OF DAYS

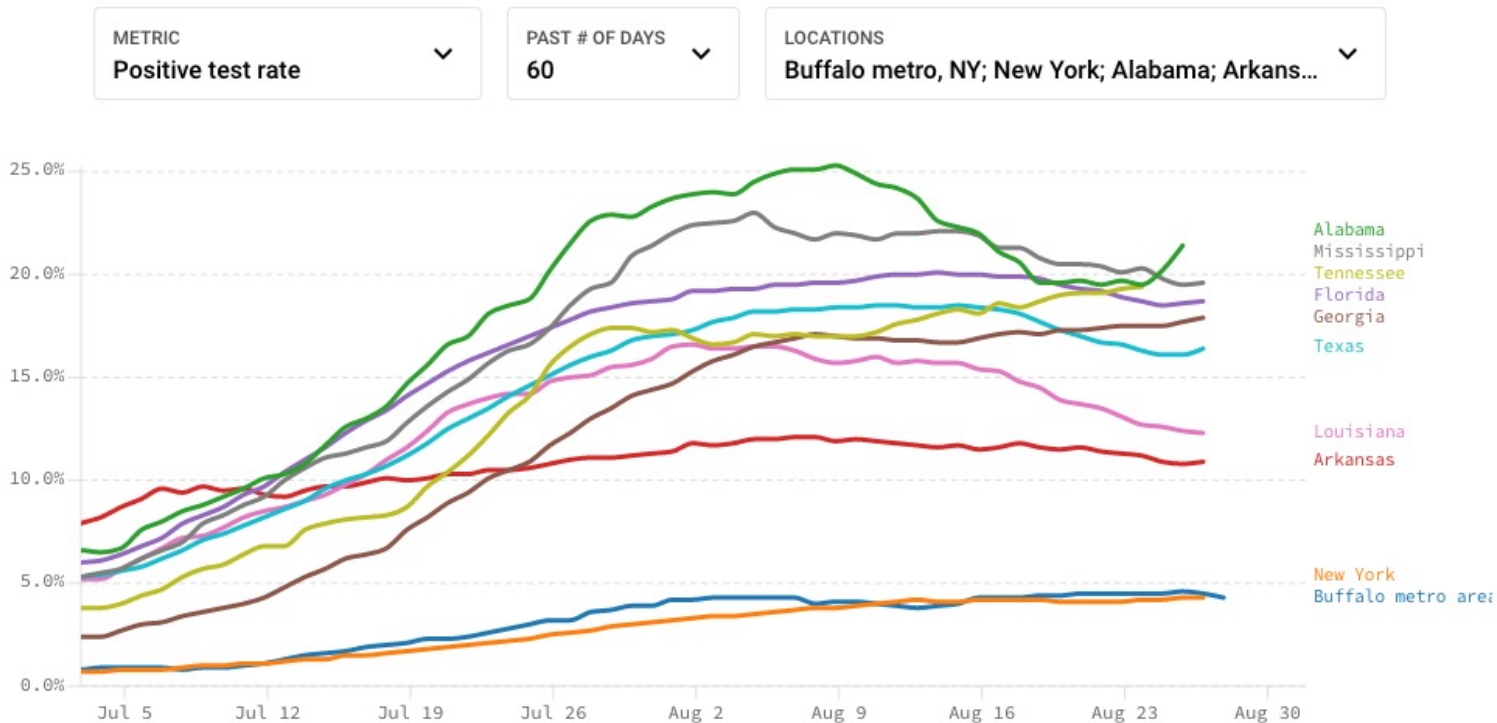
60

LOCATIONS

Buffalo metro, NY; New York; Alabama; Arkans...



(+) Test Rate



Hospitalization Rate

METRIC

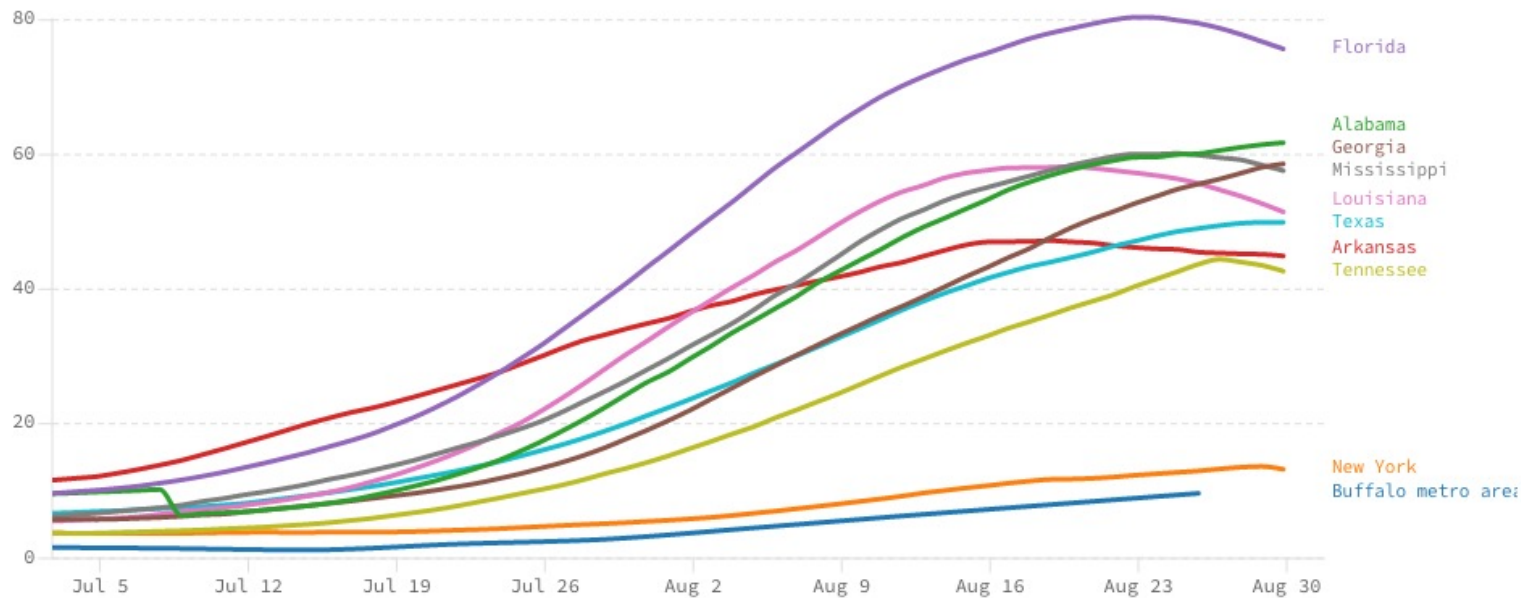
Hospitalizations per 100K

PAST # OF DAYS

60

LOCATIONS

Buffalo metro, NY; New York; Alabama; Arkans...



Mortality Rate

METRIC

Deaths per 100K



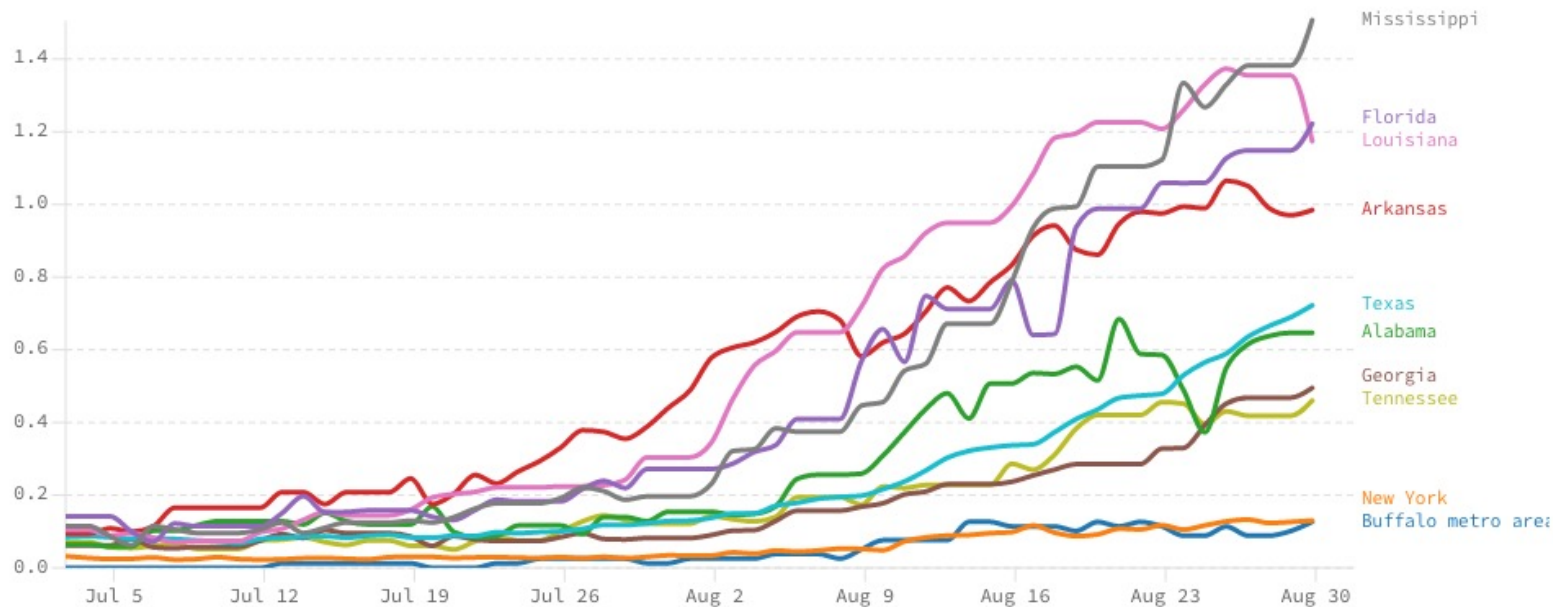
PAST # OF DAYS

60



LOCATIONS

Buffalo metro, NY; New York; Alabama; Arkans...



Vaccination Rate

METRIC

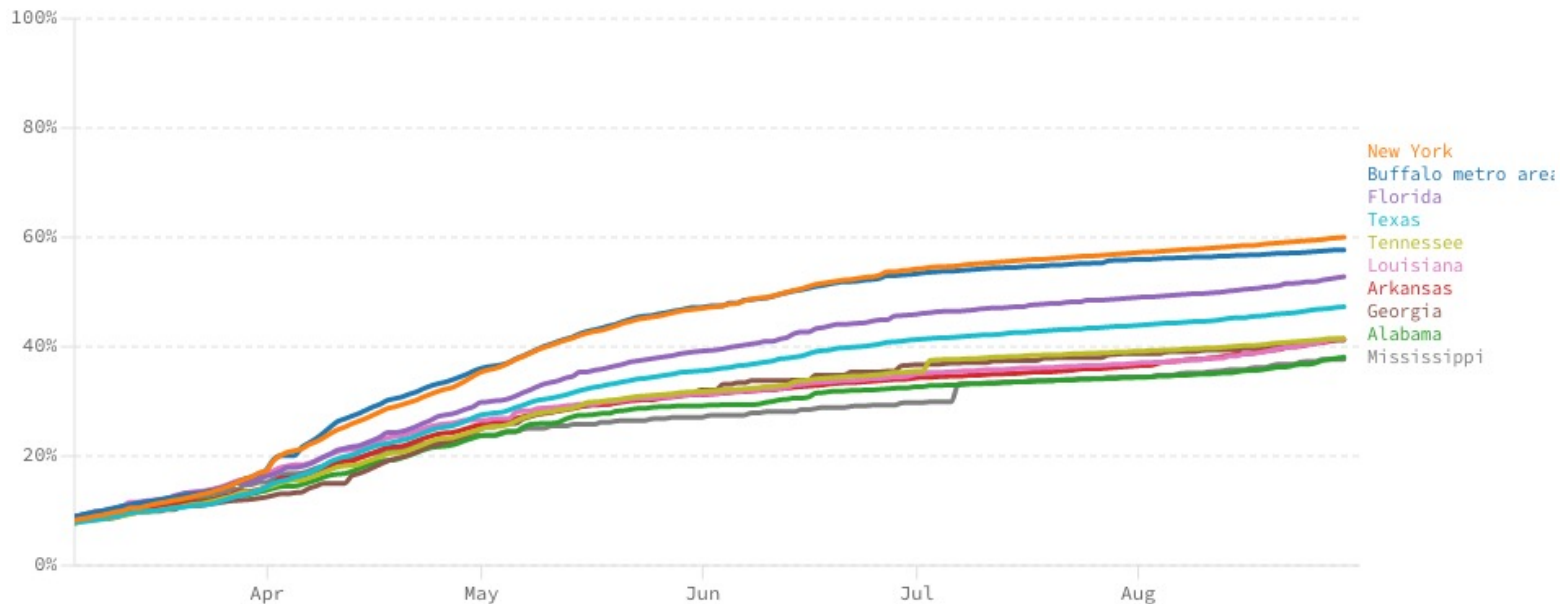
Percent vaccinated (fully) ▼

PAST # OF DAYS

180 ▼

LOCATIONS

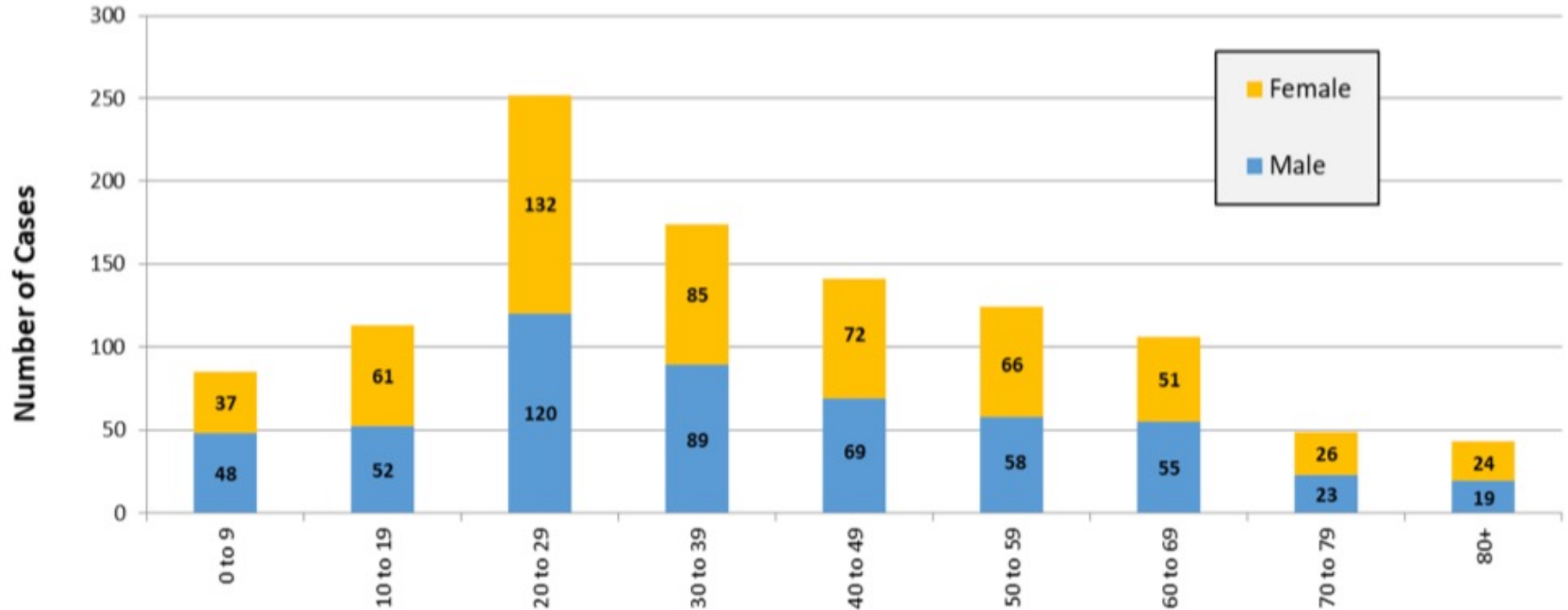
Buffalo metro, NY; New York; Alabama; Arkans... ▼



Erie County Cases

Confirmed COVID-19 Cases by Age Group

8/22/2021-8/28/2021



Erie County Deaths

ERIE COUNTY COVID-19 FATALITIES BY AGE

Jan. 2021-August 26, 2021

Age Group	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total
<40	3	4	0	4	2	0	1	0	14
40 to 49	4	3	1	8	2	0	1	0	19
50 to 59	8	11	5	7	5	4	1	5	46
60 to 69	31	22	6	24	11	5	1	5	105
70 to 79	60	34	16	30	21	4	6	3	174
80+	163	62	29	27	24	5	1	12	323
Total # of Deaths	269	136	57	100	65	18	11	25	681
Ave. Death Age	81	76	77	71	74	70	69	75	77

6% <60 yo

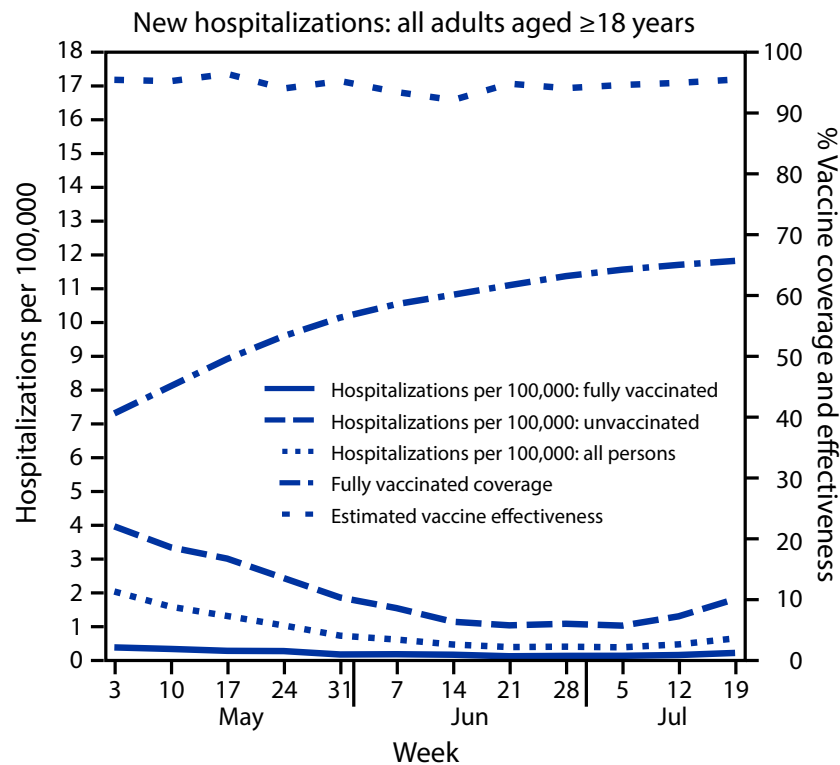
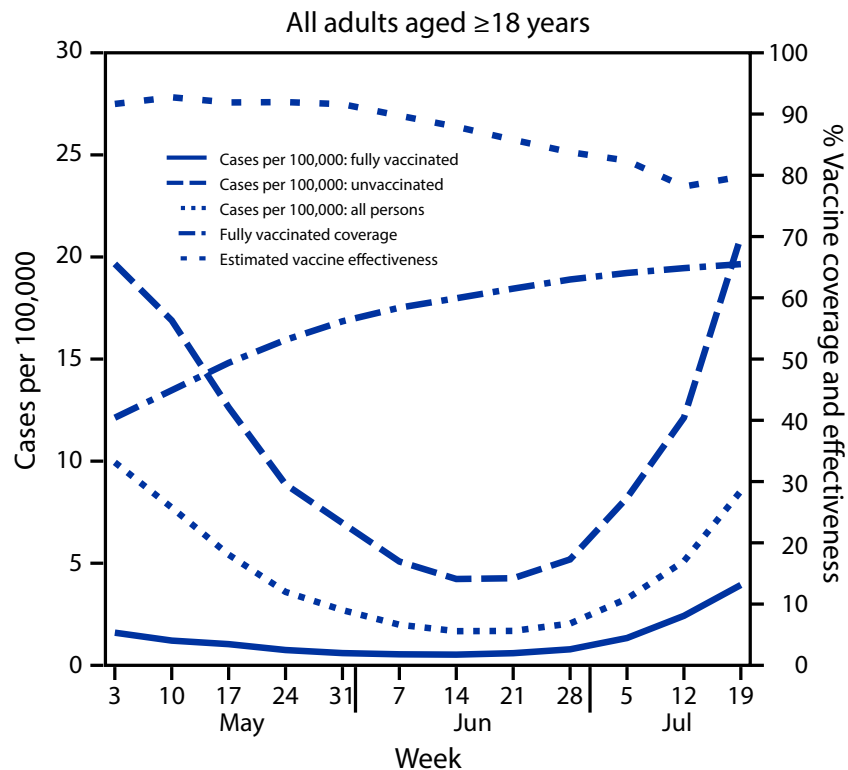
22% <60 yo

11% <60 yo

Vaccination Remains Critical!

- Endpoints of the original trials of the available vaccines:
 - Severe illness
 - Hospitalization
 - Death
- All 3 provided excellent – way better than expected – vaccine efficacy (VE) against these endpoints
- “Breakthrough” infections are expected!
 - None of the vaccines provided 100% VE against endpoints
 - Most breakthroughs are mild or asymptomatic

Vaccine Efficacy in NYS



What About...

- Provincetown?
 - 469 cases, 74% fully vaccinated, 90% Delta
 - **4 hospitalizations, no deaths**
 - Estimated 60,000 people in town!
- “Our” hospital/ICU?
 - 25 – 50% vaccinated but overall # still fairly low
 - >500,000 vaccinated Erie County residents are NOT in the hospital or ICU!
 - 92% of Erie County COVID-related deaths from 4/1 – 8/26 were among persons who were **not** fully vaccinated

Promoting Vaccination

- Those with “fixed beliefs” are unlikely to change
 - Fake experts (Dunning Kruger Effect)
 - Logical fallacies (*post hoc ergo propter hoc*)
 - Impossible expectations
 - Cherry-picking data
 - Conspiracy theories
- Disinformed may be able to be converted!
 - Addressing the above “5 techniques of science denial”
 - Non-dismissive, non-condescending

Final Key Points

- The Delta variant is very fit!
- Current approved MAbs remain effective
- VE remains high vs severe disease and death
 - Immunocompromised need a 3rd dose
 - Boosters for all are coming, timing TBD
- Wear masks in public indoor places and crowded outdoor places (for areas of substantial or high transmission)
 - Vaccinated people may spread virus
 - Protects unvaccinated and immunosuppressed who may not respond to the vaccines



**KEEP
CALM
AND
GET
VACCINATED**

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