The Front Lines of the Fight Against COVID-19

A TOWN HALL CONVERSATION XVI

We will begin at 10 a.m.
U.S. News & World Report Best Hospitals Rankings 2021 - 2022

Marc L. Boom, MD
August 12, 2021
EXCELLENCE IN PATIENT CARE & SAFETY

Houston Methodist Hospital is recognized by U.S. News & World Report as

**NO. 1 IN TEXAS** and **NO. 16 IN THE NATION**.

- 4,750 hospitals *evaluated* this year
- 20 hospitals are on the Honor Roll
- 1 nationally ranked Honor Roll hospital in Texas

![U.S. News & World Report Best Hospitals Honor Roll 2021-22](image)
Ranked in 10 of 15 Specialties:

- Cancer (#23)
- Cardiology & Heart Surgery (#15)
- Diabetes & Endocrinology (#16)
- Gastroenterology & GI surgery (#10)
- Geriatrics (#22)
- Gynecology (#19)
- Neurology & Neurosurgery (#21)
- Orthopedics (#12)
- Pulmonology and Lung Surgery (#19)
- Urology (#29)
<table>
<thead>
<tr>
<th>Benchmark Scorecard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Honor Roll</strong></td>
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<tr>
<td>------------------</td>
</tr>
<tr>
<td>Mayo Clinic</td>
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<tr>
<td>Cleveland Clinic</td>
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<tr>
<td>UCLA Medical Center</td>
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<tr>
<td>Johns Hopkins Hospital</td>
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<tr>
<td>Massachusetts General Hospital</td>
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<tr>
<td>Cedars-Sinai Medical Center</td>
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<tr>
<td>New York-Presbyterian Hospital</td>
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<tr>
<td>NYU Langone Hospitals</td>
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<tr>
<td>UCSF Medical Center</td>
</tr>
<tr>
<td>Northwestern Memorial Hospital</td>
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<tr>
<td>University of Michigan Hospitals</td>
</tr>
<tr>
<td>Stanford Health Care</td>
</tr>
<tr>
<td>Hospitals of the University of Pennsylvania</td>
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<tr>
<td>Brigham and Women's Hospital</td>
</tr>
<tr>
<td>Mayo Clinic-Phoenix</td>
</tr>
<tr>
<td>Houston Methodist Hospital</td>
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<tr>
<td>Barnes-Jewish Hospital</td>
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<tr>
<td>Mount Sinai Hospital</td>
</tr>
<tr>
<td>Rush University Medical Center</td>
</tr>
<tr>
<td>Vanderbilt University Medical Center</td>
</tr>
</tbody>
</table>

*Last available public data from 2019*
Confirmed COVID-19 Lab Tests

Positive COVID-19 Tests
7 Day Rolling Average of Percent of Positive Tests
Life was almost normal.

What the @*#$ happened?
DELTAVARIANT

VACCINATION RATES
Delta Variant Dominates

Why is this happening?

- Delta Infectiousness
- Low Vaccination Rates
- Little To No Community Mitigation
How Infectious is the COVID-19 Delta Variant?

The number of **people** that **one sick person** will infect (on average) is called $R_0$. Here are the maximum $R_0$ values for a few viruses.

- **COVID-19 (original strain)**: 3 people
- **COVID-19 (delta strain)**: 7 people
- **Chickenpox**: 10 people

Other viruses:
- **1918 flu**: 2 people
- **Ebola**: 2 people
- **HIV SARS**: 4 people
- **Mumps**: 12 people
- **Measles**: 18 people

More contagious

https://www.npr.org/sections/goatsandsoda/2021/08/11/1026190062/covid-delta-variant-transmission-cdc-chickenpox
United States COVID-19 Hot Spots

WSJ Analysis: “Highly Vaccinated States Keep Worst COVID-19 Outcomes in Check”
<table>
<thead>
<tr>
<th>Hospital</th>
<th>Number of Total Beds</th>
<th>% COVID Occupancy</th>
<th>State Vaccination Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Houston Methodist</td>
<td>2541</td>
<td>25.58%</td>
<td>44.60%</td>
</tr>
<tr>
<td>Alabama #1</td>
<td>1103</td>
<td>12.15%</td>
<td>34.90%</td>
</tr>
<tr>
<td>Arkansas #1</td>
<td>540</td>
<td>13.52%</td>
<td>37.70%</td>
</tr>
<tr>
<td>California #1</td>
<td>495</td>
<td>4.04%</td>
<td>53.70%</td>
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<tr>
<td>California #2</td>
<td>420</td>
<td>5.24%</td>
<td>53.70%</td>
</tr>
<tr>
<td>California #3</td>
<td>600</td>
<td>2.33%</td>
<td>53.70%</td>
</tr>
<tr>
<td>California #4</td>
<td>1005</td>
<td>3.88%</td>
<td>53.70%</td>
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<tr>
<td>Connecticut #1</td>
<td>1554</td>
<td>2.19%</td>
<td>63.90%</td>
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<tr>
<td>Florida #1</td>
<td>491</td>
<td>14.87%</td>
<td>49.70%</td>
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<tr>
<td>Florida #2</td>
<td>1700</td>
<td>22.18%</td>
<td>49.70%</td>
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<td>Florida #3</td>
<td>1041</td>
<td>18.54%</td>
<td>49.70%</td>
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<td>Georgia #1</td>
<td>2046</td>
<td>15.05%</td>
<td>39.10%</td>
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<tr>
<td>Georgia #2</td>
<td>630</td>
<td>14.60%</td>
<td>39.10%</td>
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<td>Indiana #1</td>
<td>1750</td>
<td>9.26%</td>
<td>44.70%</td>
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<td>Iowa #1</td>
<td>865</td>
<td>3.24%</td>
<td>50.00%</td>
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<tr>
<td>Kentucky #1</td>
<td>985</td>
<td>4.77%</td>
<td>46.30%</td>
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<td>Maryland #1</td>
<td>2591</td>
<td>3.09%</td>
<td>59.50%</td>
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<td>Massachusetts #1</td>
<td>3085</td>
<td>1.85%</td>
<td>64.40%</td>
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<td>Massachusetts #2</td>
<td>1050</td>
<td>2.00%</td>
<td>64.40%</td>
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<tr>
<td>Michigan #1</td>
<td>1000</td>
<td>2.00%</td>
<td>49.20%</td>
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<tr>
<td>Missouri #1</td>
<td>2544</td>
<td>10.42%</td>
<td>42.20%</td>
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<tr>
<td>Nebraska #1</td>
<td>520</td>
<td>7.12%</td>
<td>50.10%</td>
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<tr>
<td>New York #1</td>
<td>3100</td>
<td>4.61%</td>
<td>57.80%</td>
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<td>New York #2</td>
<td>624</td>
<td>5.45%</td>
<td>57.80%</td>
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<td>Pennsylvania #1</td>
<td>2940</td>
<td>1.94%</td>
<td>53.10%</td>
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<tr>
<td>Pennsylvania #2</td>
<td>860</td>
<td>2.91%</td>
<td>53.10%</td>
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<tr>
<td>Texas #1</td>
<td>4400</td>
<td>18.34%</td>
<td>44.60%</td>
</tr>
<tr>
<td>Texas #2</td>
<td>715</td>
<td>23.22%</td>
<td>44.60%</td>
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<tr>
<td>Texas #3</td>
<td>371</td>
<td>17.25%</td>
<td>44.60%</td>
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<tr>
<td>Vermont #1</td>
<td>505</td>
<td>1.58%</td>
<td>68.00%</td>
</tr>
<tr>
<td>Wisconsin #1</td>
<td>721</td>
<td>6.93%</td>
<td>52.30%</td>
</tr>
</tbody>
</table>
Is this really a “pandemic of the unvaccinated?” What about breakthrough infections?
Inpatient Breakthrough of COVID-19 Infections

Data was received from 38 hospitals across the region. A total of 1,554 inpatients with COVID were reported from the responding hospitals. A total of 1,410 of those patients were described as not vaccinated.

Overall, approximately 91% of inpatients diagnosed with COVID were unvaccinated on August 5, 2021.
Houston Methodist COVID-19 Inpatient Vaccine Status

Not Vaccinated Status by Age

- Below 18: 1
- 18-24: 38
- 25-40: 277
- 41-50: 267
- 51-60: 214
- 61-70: 189
- 71-80: 112
- Over 80: 52

Average Age: 53.39

Vaccinated Status by Age

- Below 18: 0
- 18-24: 1
- 25-40: 6
- 41-50: 23
- 51-60: 26
- 61-70: 62
- 71-80: 87
- Over 80: 44

Average Age: 68.83

Data as of August 9, 2021
Houston Methodist COVID-19 Inpatient Vaccine Status

Not Vaccinated Patients that Require ICU

- Yes: 16.50%
- No: 83.50%

Vaccinated Patients that Require ICU

- Yes: 13.70%
- No: 86.30%

Data as of August 9, 2021
### COVID-19 Vaccination Rate by Age

#### Percent of People Receiving COVID-19 Vaccine by Age and Date Reported to CDC, United States

December 14, 2020 – August 11, 2021

<table>
<thead>
<tr>
<th>Age Group</th>
<th>At Least One Dose</th>
<th>Fully Vaccinated</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;12 yrs</td>
<td>0.5%</td>
<td>0.3%</td>
</tr>
<tr>
<td>12-15 yrs</td>
<td>43.0%</td>
<td>30.8%</td>
</tr>
<tr>
<td>16-17 yrs</td>
<td>52.8%</td>
<td>41.7%</td>
</tr>
<tr>
<td>18-24 yrs</td>
<td>55.5%</td>
<td>45.0%</td>
</tr>
<tr>
<td>25-39 yrs</td>
<td>59.3%</td>
<td>49.6%</td>
</tr>
<tr>
<td>30-49 yrs</td>
<td>68.9%</td>
<td>58.7%</td>
</tr>
<tr>
<td>50-64 yrs</td>
<td>77.9%</td>
<td>68.1%</td>
</tr>
<tr>
<td>65-74 yrs</td>
<td>92.6%</td>
<td>82.4%</td>
</tr>
<tr>
<td>75+ yrs</td>
<td>87.9%</td>
<td>78.2%</td>
</tr>
</tbody>
</table>

**Race** | **Sex** | **Age**

12/13/2020 | 8/11/2021

Age data were available for 99.0% of vaccinations.

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https://covid.cdc.gov/covid-data-tracker/#vaccination-demographics-trends
"Back of the Envelope" Estimate of Vaccine Efficacy During Delta Surge in HM Experience

Estimated COVID-19 Vaccine Efficacy at Houston Methodist During Delta Surge

- 25-40: 97-98%
- 41-50: 95-97%
- 51-60: 95-97%
- 61-70: 91-95%
- 71-80: 83-94%
- Over 80: 78-88%
Enzyme-linked immunosorbent assay measurement of SARS-CoV-2 spike receptor-binding domain-specific antibody levels and association with age at time of vaccination for 50 participants 14 days after receiving their second vaccine dose. Prevaccination samples for all participants were below the limit of detection, indicating no prior exposure. Postvaccination samples displayed a significant negative association with age. The dotted line indicates the lower limit of quantification.

Live virus neutralization of participant serum samples collected 14 days after the second vaccine dose. Neutralization experiments were performed with the USA-WA1/2020 strain and P.1 variant. Both show a significant negative association with participant age. The dotted line indicates the lower limit of quantification.

Source: Age-Dependent Neutralization of SARS-CoV-2 and P.1 Variant by Vaccine Immune Serum Samples | Vaccination | JAMA | JAMA Network
COVID-19 Vaccine Effectiveness

Pfizer 2-Dose Vaccine Effectiveness for Alpha vs. Delta

England/Scotland
- Confirmed Infection: 79
- Symptomatic Disease: 88
- Hospitalization: 96

Canada
- Confirmed Infection: 87
- Symptomatic Disease: 100

Israel
- Confirmed Infection: 64
- Symptomatic Disease: 64

*Note two different time periods in Israel
### Table 5. Unadjusted and adjusted estimates of vaccine effectiveness against infection for self-reported vaccine status and linked vaccine status for rounds 12 and 13 of REACT-1 for participants aged 18 to 64 years.

<table>
<thead>
<tr>
<th>Vaccination data source (n)</th>
<th>Adjustment</th>
<th>Vaccine effectiveness (2 doses)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Round 12</td>
</tr>
<tr>
<td></td>
<td>Age, Sex</td>
<td>61% (2%, 84%)</td>
</tr>
<tr>
<td></td>
<td>Age, sex, IMD, region, ethnicity</td>
<td>64% (11%, 85%)</td>
</tr>
<tr>
<td>Self-report, All positives, 18 to 64 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-report, Symptomatic only, 18 to 64 years</td>
<td>Age, Sex</td>
<td>81% (5%, 96%)</td>
</tr>
<tr>
<td></td>
<td>Age, sex, IMD, region, ethnicity</td>
<td>83% (19%, 97%)</td>
</tr>
<tr>
<td>Linked, All positives, 18 to 64 years</td>
<td>Age, Sex</td>
<td>75% (33%, 90%)</td>
</tr>
<tr>
<td></td>
<td>Age, sex, IMD, region, ethnicity</td>
<td>75% (35%, 90%)</td>
</tr>
</tbody>
</table>

https://spiral.imperial.ac.uk/bitstream/10044/1/50800/2/react1_r13_final_preprint_final.pdf
Elapsed Time Since Vaccine and Risk of COVID-19 Infection

Limitations:
• Most of infections occurred in last two weeks of study.
• Study occurred during a time of rising prevalence.
• Study occurred during time of Delta’s emergence.
• Study does not compare distribution of positive vs negative tests during the study period.

https://doi.org/10.1101/2021.08.03.21261496
Countries That Are Administering Third Dose Boosters

**Russia**
Began offering boosters in July to those vaccinated six months ago or more
Announced: Jul.1

**Hungary**
Began offering boosters as of Aug. 1 to healthcare workers
Announced: Jul.16

**Indonesia**
Began offering boosters in July to healthcare workers
Announced: Jul.27

**Israel**
Began offering boosters in July to those aged 60 or older
Announced: Jul.29

**United Kingdom**
Campaign begins Sept. for all
Announced: Aug.1

**Germany**
Campaign begins Sept. for elderly and vulnerable
Announced: Aug.2

**France**
Campaign begins Sept. for elderly and vulnerable
Announced: Aug.4
FDA Poised to Authorize 3rd Vaccine Dose for Immune-Compromised People

The Food and Drug Administration is poised to amend the emergency use authorizations for the Pfizer and the Moderna Covid-19 vaccines Thursday to allow people with compromised immune systems to get a third dose, according to two sources familiar with the plans.

The move would come after a panel of advisers to the Centers for Disease Control and Prevention met in July and urged action on extra doses for immunocompromised adults.
### Draft - August 9, 2021

**MEETING OF THE ADVISORY COMMITTEE ON IMMUNIZATION PRACTICES (ACIP)**

Centers for Disease Control and Prevention  
Atlanta, Georgia 30329  
August 13, 2021

<table>
<thead>
<tr>
<th>AGENDA ITEM</th>
<th>PRESIDER/PRESENTER(s)</th>
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<tr>
<td><strong>Friday, August 13, 2021</strong></td>
<td></td>
</tr>
<tr>
<td>11:00</td>
<td>Welcome &amp; Introductions</td>
</tr>
<tr>
<td></td>
<td>Dr. Grace Lee (ACIP Chair)</td>
</tr>
<tr>
<td></td>
<td>Dr. Amanda Cohn (ACIP Executive Secretary, CDC)</td>
</tr>
<tr>
<td>11:15</td>
<td>Coronavirus Disease 2019 (COVID-19) Vaccines</td>
</tr>
<tr>
<td></td>
<td>Introduction</td>
</tr>
<tr>
<td></td>
<td>Dr. Matthew Daley (ACIP, WG Chair)</td>
</tr>
<tr>
<td></td>
<td>Dr. Kathleen Dooling (CDC/NCIRD)</td>
</tr>
<tr>
<td></td>
<td>Updates on additional doses in immunocompromised individuals</td>
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<td></td>
<td>Break</td>
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<td></td>
<td>Public Comment</td>
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<tr>
<td></td>
<td>COVID-19 epidemiology and vaccine impact</td>
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<tr>
<td></td>
<td>Dr. Sara Oliver (CDC/NCIRD)</td>
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<tr>
<td></td>
<td>Considerations for booster doses of COVID-19 vaccines</td>
</tr>
<tr>
<td>1:30</td>
<td>Discussion</td>
</tr>
<tr>
<td>2:00</td>
<td>Adjourn</td>
</tr>
</tbody>
</table>
Some Individuals Are Opting For An Unauthorized Third Dose of the COVID-19 Vaccine

1.1 million people got unauthorized COVID-19 booster shot, CDC estimates

The CDC has estimated that 1.1 million people have received an unauthorized third dose of either Pfizer or Moderna's COVID-19 vaccine, according to an internal CDC document obtained by ABC News.

The publication reported Aug. 10 that the number is likely an undercount because it only included people who received Moderna or Pfizer’s shot and got a booster, not those who received Johnson & Johnson’s.

It’s unclear if the people who got a booster shot did so under the direction of a physician. The FDA has not authorized booster shots, but there have been reports of some physicians encouraging severely immunocompromised people to get them, ABC reported.

The FDA has said it expects to establish a national strategy on booster shots by early September. But the World Health Organization on Aug. 4 called for a moratorium on booster shots until more low-income countries receive access to first doses.

One million people have opted for a third COVID booster shot, CDC estimates

The Centers for Disease Control and Prevention estimates that 1 million people have opted to get a vaccine booster shot for COVID-19. Above, a syringe is filled with a first dose of the Pfizer vaccine at the Weingart East Los Angeles YMCA on August 7. (Patrick T. Fallon/AFP/Getty Images)

Chief White House medical adviser Anthony Fauci said this past Sunday on Meet the Press that booster shots will be needed "sooner or later."
HOW BAD WILL THIS SURGE GET?
New COVID-19 Cases Reported in the U.K. by Day


Approximate time from inflection to peak: 5 weeks
New COVID-19 Cases Reported in India by Day

All COVID-19 Cases Reported by Region in the U.S.

COVID-19 Cases Reported by Region in the U.S. in the Last 90 Days

Houston Methodist COVID-19 Cases by Day – Potential Peak

Data as of August 9, 2021

Potential peak date: Aug 14-21
Possible time from inflection to peak: 4-5 weeks
R(t) Shows Some Mitigation

UT School of Public Health
COVID-19 Dashboard

This graph shows the R(t) over time. R(t) is a measure of contagiousness or how many people one COVID-19 person infects. If R(t)>1, the epidemic is increasing. If R(t)<1, the epidemic is declining. There is higher alert if the whole interval is above the horizontal line at 1. For Q, Houston, the rate of contagiousness is 1.12; the epidemic is increasing.

The University of Texas COVID-19 Modeling Consortium

https://sph.uth.edu/dept/bads/covid19-dashboard
https://covid-19.tacc.utexas.edu/dashboards/texas/
Houston Methodist 7-Day Average COVID-19 Admissions Per Day

7-Day Average Admissions per Day
Highest 7p.m. Census to Date: 730 inpatients
Hospitalization Predictions

UT School of Public Health
COVID-19 Dashboard

Prediction of number of new cases in the next 10 days with 95% confidence intervals

Predictions in Q - Houston. If the upper band for the predictions is approximately below the current number of new cases, cases are expected to decrease. If the lower band for the predictions is approximately above the current numbers of new cases, cases are expected to increase. Otherwise, they are not expected to increase or decrease significantly. For dates prior to the predictions, the 7-day moving average is shown.

The University of Texas COVID-19 Modeling Consortium

https://sph.uth.edu/dept/bads/covid19-dashboard
https://covid-19.tacc.utexas.edu/dashboards/texas/
IHME: Projections for Texas

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.

Is this surge less severe in terms of death rates?
COVID-19 Infections and Hospital Admissions Increased In England

https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/articles/coronaviruscovid19lateinsights/overview
Texas COVID-19 Trends

New reported cases by day
Jan. 8: Peak

Hospitalizations
Jan. 16: Peak

Tests by day
Jan. 26: Peak

New reported deaths by day
Jan. 26: Peak

Texas COVID-19 Trends

New reported cases by day:
- 7 Day Average:
  - Aug. 8, 2021: 11,900
  - Nov. 23, 2020: 11,073

Hospitalizations:
- 7 Day Average:
  - Aug. 9, 2021: 8,289
  - Nov. 21, 2020: 8,981

Tests by day:
- 7 Day Average:
  - Aug. 9, 2021: 77.4K
  - Nov. 21, 2020: 107.6K

New reported deaths by day:
- 7 Day Average:
  - Aug. 9, 2021: 57 per day
  - Nov. 23, 2020: 141 per day

Texas COVID-19 Trends

**New reported cases by day**
- **7 Day Average:**
  - Aug. 8, 2021: 11,900
  - Nov. 23, 2020: 11,073

**Hospitalizations**
- **7 Day Average:**
  - Aug. 9, 2021: 8289
  - Nov. 21, 2020: 8981

**Tests by day**
- **7 Day Average:**
  - Aug. 9, 2021: 77.4K
  - Nov. 21, 2020: 107.6K

**New reported deaths by day**
- **7 Day Average:**
  - Aug. 8, 2021: 57 per day
  - Nov. 23, 2020: 141 per day

Houston Methodist COVID-19 Inpatient Demographics by Surge

Data as of August 9, 2021

Average Age of Houston Methodist COVID-19 Patients by Surge and ICU Status

Race Distribution of Houston Methodist COVID-19 Patients by Surge
Houston Methodist COVID-19 Inpatient Outcomes by Surge

Average LOS of Houston Methodist Inpatients by Surge and ICU Status

Mortality Rate of Houston Methodist Inpatients by Surge

Percent of Houston Methodist Inpatients Requiring ICU by Surge

*Note: It is likely that Surge 4 ICU utilization, LOS and mortality will increase as many sicker patients’ ultimate outcomes are yet to be determined.
How do we get out of this mess?
Five Difficult Lessons

1. Science, especially biological science, is messy in real time. Science is also our only real hope to conquer COVID-19

2. Hospitals together must work on their “Sacred AND” Care for COVID-19 patients AND care for traditional patients AND protect our staff and physicians

3. Our political leaders must work together on society’s “Sacred AND” Control COVID-19 AND protect the economy AND educate our children

4. Our social lives must take a backseat to the “Sacred AND” • No bars • No large gatherings, including sporting events • Limited social gatherings

5. Masks are a means to accomplish the “Sacred AND” • We have proven to be incapable of accepting this on our own • Masks must be mandatory until the virus is in control
Impact of COVID-19 Vaccination Campaign on Deaths

“The U.S. COVID-19 vaccination campaign has significantly curbed the virus’s spread and national death toll, saving an estimated 279,000 lives and averting up to 1.25 million hospitalizations.”
Reduced Risk of Reinfection with SARS-CoV-2 After COVID-19 Vaccination — Kentucky, May–June 2021

Although laboratory evidence suggests that antibodies responses following COVID-19 vaccination provide better neutralization of some circulating variants than does natural infection (1,2), for unvaccinated epidemiologic studies serve to support the benefit of vaccination for previously infected persons. This report details the findings of a case-control evaluation of the association between vaccination and SARS-CoV-2 reinfection in Kentucky during May–June 2021 among persons previously infected with SARS-CoV-2 in 2020. Kentucky residents who were not vaccinated had 2.24 times the odds of reinfection compared with those who were fully vaccinated (OR = 2.24; 95% confidence interval [CI] = 1.58–3.17). These findings suggest that among persons with previous SARS-CoV-2 infection, full vaccination provides additional protection against reinfection. To reduce early risk of infection, all eligible persons should be fully vaccinated, even if they have been previously infected with SARS-CoV-2 (3).

Kentucky residents aged ≥18 years with SARS-CoV-2 infection confirmed by positive nucleic acid amplification test (NAAT) or antigen test results reported in Kentucky’s National Electronic Disease Surveillance System (NEDSS) during March–December 2020 were eligible for inclusion. NEDSS data for all Kentucky COVID-19 cases were imported into a REDCap database that contains laboratory test results and case investigation data, including dates of death for deceased patients reported to public health authorities. The REDCap database was queried to identify previously infected persons, excluding COVID-19 cases resulting in death before May 1, 2021. A case was defined as a Kentucky resident with laboratory-confirmed SARS-CoV-2 infection in 2020 and a subsequent positive NAAT or antigen test result during May–June 30, 2021. May and June were selected because of vaccine supply and eligibility requirements; this period was more likely to reflect decisions made to be vaccinated, rather than eligibility to receive vaccine (3). Control participants were Kentucky residents with laboratory-confirmed SARS-CoV-2 infection in 2020 who were not reinfected through June 30, 2021. Case-patients and controls were matched on a 1:2 ratio based on sex, age (within 3 years), and date of initial positive SARS-CoV-2 test result in the 30-day period before the specimen collection date, if available. The report date in NEDSS was used if specimen collection data was missing. Random matching was performed to select controls when multiple possible controls were available to match per case (3).

Vaccination status was determined using data from the Kentucky Immunization Registry (KIR). Case-patients and controls were matched to the KIR database using first name, last name, and date of birth. Case-patients were considered fully vaccinated if a single dose of Januvet (Johnson & Johnson) or a second dose of an mRNA vaccine (Pfizer-BioNTech or Moderna) was received ≤14 days before the specimen collection date. The outcome definition was applied using the incidence date of the matched case-patient. Partial vaccination was defined as receipt of ≤1 dose of vaccine, but either the
Cleveland Clinic: Necessity Of COVID-19 Vaccination In Previously Infected Individuals

Summary:
- Studied 52,238 employees
- Cumulative incidence of SARS-CoV-2 infection almost zero in previously infected unvaccinated, previously infected vaccinated, and previously uninfected vaccinated compared with a steady increase in previously uninfected subjects who remained unvaccinated
- Authors draw conclusion that prior infection is as protective as vaccination

Limitations:
- Preprint and not yet peer-reviewed
- No surveillance testing
- Only 5 months follow-up
- Occurred prior to Delta

Observations:
- Inconsistent with several antibody level studies
- Inconsistent with Houston Methodist experience

https://www.medrxiv.org/content/10.1101/2021.06.01.21258176v2.full.pdf
Summary:
- Studied 52,238 employees
- Cumulative incidence of SARS-CoV-2 infection almost zero in previously infected unvaccinated, previously infected vaccinated, and previously uninfected vaccinated compared with a steady increase in previously uninfected subjects who remained unvaccinated
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- Inconsistent with Houston Methodist experience
COVID-19 vaccination is recommended for all people aged 12 years and older, including people who are pregnant, breastfeeding, trying to get pregnant now, or might become pregnant in the future. Pregnant and recently pregnant people are more likely to get severely ill with COVID-19 compared with non-pregnant people. Getting a COVID-19 vaccine can protect you from severe illness from COVID-19.

Number of Vaccine Doses Administered by Day in the U.S.

New reported doses administered by day

HM COVID-19 Vaccines Administered

Individuals Vaccinated at HM by Day

Total First Doses: 439,556
Total Second Doses: 410,323
Multiple Hospitals Announce COVID-19 Vaccine Mandate for Employees – As of June 9

- Houston Methodist (26,000 Employees, Apr. 14)
- Benefis Health System (3,300 Employees, May 19)
- RWJBarnabas Health (35,000 Employees, May 26)
- Indiana University Health (36,000 Employees, Jun. 9)
- University of Maryland Medical System (29,000 Employees, Jun. 9)
- Children’s National (6,000 Employees, Jun. 9)

- Medical University of South Carolina (17,000 Employees, Mar. 31)
- Penn Medicine (44,000 Employees, Apr. 16)
- UL Hospital (12,000 Employees, May 20)
- DCHA (10 DC/VA/MD Hospitals, Jun. 1)
- Johns Hopkins Medicine (40,000 Employees, Jun. 9)
Support for Mandatory COVID-19 Vaccination for Healthcare Workers

American Academy of Pediatrics, American Medical Association, American Nursing Association, American Psychiatric Association and 53 other medical associations released a joint statement urging hospitals to require employees to get vaccinated.

“We call for all health care and long-term care employers to require their employees to be vaccinated against COVID-19,” the statement read. “We stand with the growing number of experts and institutions that support the requirement for universal vaccination of health workers.”
### Multiple Hospitals Announce COVID-19 Vaccine Mandate for Employees

<table>
<thead>
<tr>
<th>Hospital Name</th>
<th>Start Date</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methodist</td>
<td>MAR. 31</td>
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<tr>
<td>Barnabas Health</td>
<td>APR. 14</td>
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<td>Penn Medicine</td>
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<td>UH Hospital</td>
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<td>DOHA</td>
<td>MAY 20</td>
<td>10 DC/VA/MD hospitals</td>
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<td>Johns Hopkins</td>
<td>JUN. 1</td>
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<td>BJC HealthCare</td>
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<tr>
<td>Beth Israel Lahey Health</td>
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<td>St. Luke's</td>
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<td>Baptist Health System</td>
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<td>Baystate Health</td>
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<td>Pullman Regional Hospital</td>
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<td>uchealth</td>
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<td>Texas Health</td>
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<td>WHC</td>
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</tr>
</tbody>
</table>

Notes:
- Employees are counts at specific dates.
- Dates indicate when vaccine mandates were announced.
- Institutions are represented graphically with icons and colors.
## Multiple Hospitals Announce COVID-19 Vaccine Mandate for Employees

<table>
<thead>
<tr>
<th>Hospital Name</th>
<th>Number of Employees</th>
</tr>
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<tbody>
<tr>
<td>Michigan Medicine</td>
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<tr>
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<td>Kaiser Permanente</td>
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<tr>
<td>Norton Healthcare</td>
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<tr>
<td>MultiCare</td>
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<td>Dartmouth-Hitchcock</td>
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<td>PeaceHealth</td>
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<tr>
<td>Nationwide Children's Hospital</td>
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</tr>
<tr>
<td>Advocate Aurora</td>
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<tr>
<td>Cardinal Health</td>
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</tr>
<tr>
<td>OHSU</td>
<td>12,600</td>
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<tr>
<td>Essentia Health</td>
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<tr>
<td>Cedars Sinai</td>
<td>10,000</td>
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<tr>
<td>CHI St. Joseph</td>
<td>16,000</td>
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<tr>
<td>Children's Hospital of Detroit</td>
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<td>Northwell Health</td>
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<tr>
<td>The Queen's Health System</td>
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<td>Pacific Health</td>
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<td>Rochester Regional Health</td>
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<td>Valley Children's Health</td>
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<td>OhioHealth</td>
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<td>TriHealth</td>
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<td>Dayton Health Care</td>
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<td>Emory Healthcare</td>
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<tr>
<td>Franciscan Healthcare</td>
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<td>Louisiana General</td>
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<tr>
<td>Kadlec</td>
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<td>Madigan</td>
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<td>MU Health</td>
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<td>VCU Health</td>
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<td>Mercy One</td>
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<tr>
<td>Texas Children's Hospital</td>
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<tr>
<td>Christ Health Network</td>
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<tr>
<td>UnityPoint Health</td>
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<tr>
<td>Providence</td>
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<tr>
<td>Kettering</td>
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<tr>
<td>CMS Health</td>
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</tr>
<tr>
<td>Summa Health</td>
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<tr>
<td>Swedish</td>
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<tr>
<td>PCH Health</td>
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<td>Franciscan Children's Hospital</td>
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<td>MemorialOne</td>
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<tr>
<td>Regional One Health</td>
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</tr>
<tr>
<td>Ellis Medicine</td>
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<tr>
<td>Jefferson Health</td>
<td>32,000</td>
</tr>
<tr>
<td>Allegheny Health Network</td>
<td>21,000</td>
</tr>
</tbody>
</table>
Nearly 1,500 health systems across the United States mandate Covid-19 vaccination

By Katheryn Houghton, Kaiser Health News

Updated 6:24 AM ET, Mon August 9, 2021
Houston Methodist COVID-19 Employees In House

August 9, 2020
- 12 Hospitalized
- 9 in the ICU
  - 2 on ECMO
  - 2 Passed Away

August 9, 2021
- 2 Hospitalized
  - Both unvaccinated with exemptions/deferrals
- 0 in the ICU

Our COVID-19 vaccine mandate protects patients, employees, and our employees’ ability to serve the community during a surge.
Countries that have a COVID-19 Vaccine Mandate for Health Workers

- **Italy**
  - April 1
  - All healthcare workers

- **Saudi Arabia**
  - May 7
  - Employees in the public, private, and non-profit sectors

- **England**
  - June 16
  - Care home workers

- **France**
  - July 12
  - All healthcare workers

- **Greece**
  - July 12
  - All healthcare workers

- **Kazakhstan**
  - June 23
  - People working in groups of more than 20

**Anticipated:**
- Poland
- Russia
- Ireland
- Canada
GHP Urges Businesses to Play a More Active Role in Controlling the Pandemic

“While the responsibility clearly rests with each of us individually as employers, the benefit of joint action will be profound.”

A Letter to the Business Community from the Partnership and Local Business and Health Care Leaders:

1. Be a forceful champion for vaccination.
2. Begin giving consideration, if you haven’t already, to requiring vaccination of your staff (with appropriate religious and medical exceptions).
3. Temporarily require masks for all indoor workspaces other than individual workspaces.
4. Temporarily reconsider any additional steps planned for bringing people back to the office in the next few weeks.

“Employers around the world are struggling with the question of whether they should mandate that their workers be vaccinated against Covid-19. Houston Methodist, an eight-hospital academic medical center, developed a seven-step process that can help all employers make this decision. It includes guidelines for allowing workers to be temporarily or permanently exempted from the mandate.”
“Employers have a central role to play in the drive to persuade people to get vaccinated against Covid-19. This article offers 12 strategies that leverage the power of behavioral economics.”
COVID-19 Vaccine Approval for Children Under 12

At the urging of federal regulators, two coronavirus vaccine makers are

At the F.D.A.’s urging, Pfizer-BioNTech and Moderna are expanding their trials for children 5 to 11.

• B.1.617.2 (Pango lineageexternal icon)a


• Name (Nextstrainexternal icon)b: 21A/S:478K

• WHO Label: Delta

• First Identified: India

• Attributes:
  – Increased transmissibility
  – Potential reduction in neutralization by some EUA monoclonal antibody treatments
  – Potential reduction in neutralization by post-vaccination sera

• May be TWICE as transmissible as D614G
Delta variant vaccine breakthrough cases may be as transmissible as unvaccinated cases

- Breakthrough cases reported to national passive surveillance have lower Ct values by 3 cycles (~10-fold increase in viral load) for Delta (Ct=18, n=19) compared with Alpha (Ct=21, n=207) and other lineages (Ct=21, n=251)

- Barnstable County, MA, outbreak: **No difference in mean Ct values in vaccinated and unvaccinated cases** [median among vaccinated (n=80): 21.9; unvaccinated (n=65): 21.5]
Delta variant may cause more severe disease than Alpha or ancestral strains: Published evidence

- Canada: Higher odds of hospitalization [aOR 2.20 (CI 1.93-2.53)], ICU admission [aOR 3.87 (CI 2.98-4.99)], and death [aOR 2.37 (CI 1.50-3.30)]

- Singapore: Higher odds of oxygen requirement, ICU admission, or death [aOR 4.90 (CI 1.43-30.78)] and pneumonia [aOR 1.88 (CI 0.95-3.76)]

- Scotland: Higher odds of hospitalization [HR 1.85 (CI 1.39-2.47)]

Viral Variants: Transmission vs. Lethality

Which is worse? 50% more transmissible or 50% more lethal?

- Covid-19
  - Rt 1.5
  - Mortality 0.5%
- Covid-19
  - Rt 1.5
  - Mortality 0.75%
- Covid-19
  - Rt 2.25
  - Mortality 0.5%

Exponential Function

Linear Function

10 transmission cycles (3 months) later

- 5800 infections
  - 29 deaths
- 5800 infections
  - 43 deaths
- 332,525 infections
  - 1663 deaths

Courtesy of Perry Wilson MD
Yale University
# Viral Variants and Vaccines

<table>
<thead>
<tr>
<th>Vaccine Efficacy</th>
<th>D614G</th>
<th>Alpha B.1.1.7</th>
<th>Beta - B.1.351</th>
<th>Delta B.1.617.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfizer</td>
<td>95%</td>
<td>85% - 95%*</td>
<td>75% - 100%</td>
<td>39% - 88%</td>
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<tr>
<td>Moderna mRNA-1273</td>
<td>94%</td>
<td>89%*</td>
<td>Probably similar to Pfizer based on single dose data</td>
<td>Probably similar to Pfizer based on single dose data</td>
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<tr>
<td>J&amp;J</td>
<td>72%</td>
<td>72%</td>
<td>57%</td>
<td>67%</td>
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<tr>
<td>Novavax</td>
<td>95%</td>
<td>89%</td>
<td>60% (HIV negative)</td>
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<tr>
<td>AstraZeneca</td>
<td>70%</td>
<td>76%</td>
<td>10%</td>
<td>60%</td>
</tr>
</tbody>
</table>

B.1.617 is now 90+% of isolates in Houston
Country of Qatar
- B.1.1.7 = 44.5% of cases, B.1.351 = 50% of cases
- Prevention of infection
  - B.1.1.7 – 89.5%
  - B.1.351 – 75%
- Prevention of severe, critical or fatal disease
  - Any form of SARS-CoV-2 – 97.4%
  - B.1.1.7 or B.1.351 – 100%

Country of Israel
- B.1.1.7 predominant period
  - Prevention of
    - Asymptomatic infection – 91.5%
    - Symptomatic infection – 97.0%
    - Hospitalization – 97.2%
    - Death – 96.7%
- B.1.617 predominant period
  - Prevention of
    - Asymptomatic infection – 39%
    - Symptomatic infection – 41%
    - Hospitalization – 88%
    - Severe illness – 91%
Correlates of Immunity

• Antibody
  - Antibodies to RBD of viral spike protein produced after natural infection or vaccination and are associated with neutralizing activity which is associated with protection against reinfection
  - Can measure COVID-19 Anti-spike IgG titer

• T cell
  - SARS-CoV-2-specific CD4 and CD8 T cell responses are generated after infection and vaccination as well
  - Cannot measure these in clinical laboratories
## Why Get Two Doses?

**Patient Outcomes**

<table>
<thead>
<tr>
<th>Pfizer Vaccine Houston Methodist Jan – April 2021</th>
<th>One Dose</th>
<th>Two Doses</th>
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<tbody>
<tr>
<td>Prevention of Hospitalization</td>
<td>77%</td>
<td>96%</td>
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<tr>
<td>Prevention of Death</td>
<td>64%</td>
<td>99%</td>
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<table>
<thead>
<tr>
<th>Public Health England Oct 2020 – May 2021</th>
<th>Pfizer Dose 1</th>
<th>Pfizer Dose 2</th>
<th>AZ Dose 1</th>
<th>AZ Dose 2</th>
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<tr>
<td>B.1.117 (alpha)</td>
<td>49%</td>
<td>94%</td>
<td>50%</td>
<td>75%</td>
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<tr>
<td>B.1.617.2 (delta)</td>
<td>31%</td>
<td>88%</td>
<td>33%</td>
<td>67%</td>
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</table>

Mixture of D.614.G and B.1.117

Bernal et al, NEJM July 2021
Vaccination appears to further boost antibody levels in persons previously infected with SARS-CoV-2 and might improve the durability and breadth of protection.

Case-control study from Kentucky of persons previously infected with SARS-CoV-2:
- 246 cases that had documented infection with SARS-CoV-2 in 2020 and documented reinfection in May or June 2021
- 492 controls matched by age, sex, date of initial infection in 2020
- 20.3% of case patients vs 34.3% of controls were fully vaccinated
- Risk of reinfection 2.34x higher in unvaccinated than fully vaccinated (OR = 2.34; 95% CI = 1.58–3.47)
- Partial vaccination was not significantly associated with reinfection (OR = 1.56; 95% CI = 0.81–3.01)

GET VACCINATED EVEN IF YOU HAVE HAD INFECTION WITH SARS-CoV-2!
Greater risk of disease, hospitalization and death among unvaccinated vs. vaccinated people: National estimates

At current incidence, 35,000 symptomatic infections per week among 162 million vaccinated Americans

Data from COVID Tracker as of July 24, 2021. Average incidence 100 cases per 100,000 persons per week. Vaccine effectiveness against symptomatic illness = 88% (Lopez Bernal et al. NEJM 2021), where risk is (1 – VE) or 12%. Vaccine effectiveness hospitalization (or death) = 96% (Stowe et al. PHE preprint), where risk is (1 – VE) or 4%. Rate in unvaccinated = Community rate/((1-fully vaccinated coverage) + (1-VE)*fully vaccinated coverage). Rate in fully vaccinated=(1-VE)*Rate in unvaccinated. Fully vaccinated coverage proportions were from COVID Data Tracker as of July 24, 2021 (50% for US.).
Increasing percentage of vaccinated persons among those hospitalized in COVID-NET

- Reflects increases in vaccine coverage, higher coverage in older adults
- Higher risk among older age groups for hospitalization and death relative to younger people (regardless of vaccination status)
• According to the CDC, as of July 19, a total of 4,072 vaccinated Americans had been hospitalized with symptomatic breakthrough infections, out of 161 million who have been fully vaccinated – a breakthrough hospitalization rate of less than 0.003%.

• Of those hospitalized, only 849 have died of COVID-19 – the death rate from those breakthrough infections is 0.0005%.

• Death rate from COVID-19 since 2020 = 1.8% (3540 times greater)

• Death rate from COVID-19 in USA last week = 0.4 % (800 times greater)

• The chance of dying from a lightning strike is .0007%, and the chance of dying from a seasonal flu is 0.1%. If you’re vaccinated, you have a much greater chance of dying from a hornet, wasp or bee sting, a dog attack, a car crash, drowning, sunstroke, or choking on food than you do of dying from COVID-19 infection.
Duration of immunity?  
Do I need a booster?  When?

• VE of BNT162b2 through 6 months f/u  
  – 91% (95% CI 89.0–93.2) against COVID-19  
  – 97% (95% CI 80.3–99.9) against severe disease  
  – 100% (95% CI 53.5, 100.0) in South Africa where variant of concern, B.1.351 (beta) was predominant  

• VE of mRNA-1273 through 6 months f/u  
  – 93% against COVID-19 (Moderna press release)
**COVID-19 Vaccine: Neutralization Titers Much Higher Post 3rd Dose Than Post 2nd for Wild Type and Beta Variants**

- **18-55 y/o (n=11/gp)**
  - Day 1: 407
  - Day 7: 1754
  - Month 1: 2032
- **65-85 y/o (n=12/gp)**
  - Day 1: 536
  - Day 7: 1547
  - Month 1: 1613

**COVID-19 Vaccine: 3rd Dose Strongly Boosts Neutralizing Titers Against Delta Strain**

- **18-55 y/o (n=13/gp)**
  - Post 1st Dose: 0.70
  - Post 2nd Dose: 0.85
  - Post 3rd Dose: 0.03
- **65-85 y/o (n=12/gp)**
  - Post 1st Dose: 0.92
  - Post 2nd Dose: 0.83
  - Post 3rd Dose: 0.05

*Post dose 3 titers vs. the Delta variant are >5-fold post dose 2 titers in 18-55 y/o & >11-fold post dose 2 titers in 65-85 y/o.

Estimated potential for up to 100-fold increase in Delta neutralization post-dose three compared to pre-dose three.*

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1. Initial data. Phase 1 trial subjects received dose 1 & 2 of BNT162b2 in 21 days apart, subjects then were boosted with a 3rd booster dose in this trial.
2. Samples were treated against each variant separately: PRNT: Plaque Reduction Neutralization Test; GMT: Geometric Mean Ratio; WT: Wild Type; LCD: Limit of Detection.
• Compared three options
  – Third shot of mRNA-1273
  – Booster of mRNA-1273.351 (optimized to SA variant)
  – 50:50 mixture

• Before booster
  – 6-8 months after primary vaccination
  – 92.5% had titers against D614G
  – Only 50% had titers against B.1.351 or P.1

• After booster versus B.1.351
  – GMT = 1400 for mRNA-1273.351
  – GMT = 864 for mRNA-1273
Who could benefit from a COVID-19 vaccine booster?

• Elderly
  – Antibody response lower and wanes faster in the elderly
  – More comorbidities and at higher risk of progression to severe disease if infected with SARS-CoV-2

• Immunocompromised
  – Multiple studies now show inadequate response to vaccination in many of these groups with risk of infection, severe disease and death despite full vaccination

• Those who completed their vaccine series longer ago
  – Antibody titers wane with time from natural infection or vaccination
Lower estimates of VE for mRNA vaccines among immunocompromised populations: Published evidence

- 71% (CI 37-87%) **against SARS-CoV-2 infection** 7-27 days after 2nd dose of Pfizer-BioNTech vaccine among immunosuppressed* people vs. 90% (CI 83-96%) overall\(^1\)
- 80% **against SARS-CoV-2 infection** ≥7 days after 2nd dose of mRNA vaccine among people with IBD on immunosuppressive medication\(^2\)
- 75% (CI 44-88%) **against symptomatic COVID-19** 7-27 days after 2nd dose of Pfizer-BioNTech vaccine among immunosuppressed* people vs. 94% (CI 87-97%) overall\(^1\)
- 59% **against COVID-19 hospitalization** among immunocompromised ≥14 days after 2nd dose of mRNA vaccine\(^3\) vs. 91% (CI 86-95%) without immune compromise\(^3\)

*Immunocompromised conditions (e.g., recipients of hematopoietic cell or solid organs transplant, patients under immunosuppressive therapy, asplenia, and chronic renal failure: advanced kidney disease, dialysis, or nephrotic syndrome)

Age-Dependent Neutralization of SARS-CoV-2 and P.1 Variant by Vaccine Immune Serum Samples

JAMA Network

Figure 1. SARS-CoV-2-Specific Antibody Levels

Enzyme-linked immunosorbent assay measurement of SARS-CoV-2 spike receptor-binding domain-specific antibody levels and association with age at time of vaccination for 50 participants 14 days after receiving their second vaccine dose. Prevaccination samples for all participants were below the limit of detection, indicating no prior exposure. Postvaccination samples displayed a significant negative association with age. The dotted line indicates the lower limit of quantification.

Figure 2. Neutralization of Live SARS-CoV-2 Clinical Isolates

Live virus neutralization of participant serum samples collected 14 days after the second vaccine dose. Neutralization experiments were performed with the USA-WA1/2020 strain and P1 variant. Both show a significant negative association with participant age. The dotted line indicates the lower limit of quantification.

Source: Age-Dependent Neutralization of SARS-CoV-2 and P.1 Variant by Vaccine Immune Serum Samples | Vaccination | JAMA | JAMA Network
The booster debate in the U.S.

- Pfizer-BioNTech proposing third dose for those at highest risk particularly to augment protection against variants
- FDA and CDC said Americans don’t need third doses yet
- WHO has called for a moratorium on booster shots in wealthy countries until the end of September to focus on getting vaccine supplies to help all countries vaccinate at least 10% of their populations
- Latest update is FDA expects to have a strategy by early September 2021 about who will get booster and when
COVID-19 Monoclonal Antibody Therapy
Treatment

- Infuse monoclonal antibodies to non-hospitalized persons with confirmed SARS-CoV-2 infection and mild to moderate illness to reduce likelihood of hospitalization and severe disease
- Reduced risk of hospitalization and death vs placebo (1 vs 3.2%; 70% relative risk reduction)
  - Need to treat within 10 days of symptom onset
  - Need to have a +COVID test
  - Cannot be on supplemental oxygen for COVID
  - Need to have a risk factor for severe disease
    - BMI > 25
    - Chronic kidney disease
    - DM
    - Immunosuppressive disease or rx
    - Age > 65
    - Pregnant
    - Cardiovascular disease
    - COPD/chronic respiratory disease
    - Sickle cell disease
    - Other
Monoclonal Antibody Infusions at Houston Methodist
Vaccination is the best strategy to prevent COVID-19

- Vaccination coverage is not 100%
- Some persons have poor response to vaccination and remain at risk despite full vaccination

Monoclonal antibody casirivimab-imdevimab got EUA 7/30 for post-exposure prophylaxis for high-risk persons

- Patient has close exposure to a COVID+ person (>15 minutes in close contact)
- And person is either unvaccinated or unlikely to have responded to a vaccine (SOTR, immunosuppressed)
- And patient has a high-risk condition (list is the same as for treatment)
THANK YOU FOR ATTENDING OUR TOWN HALL CONVERSATION

If you’d like more information about the topics discussed today, or would like to support the COVID-19 Front-Line Heroes Appreciation Initiative, please contact us at foundation@houstonmethodist.org.

Take care and be well