Where are we now in the COVID-19 pandemic?

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NOV 17, 2021
Globally > 251 Million cases & > 5 M deaths
- ~ 50% of deaths in: US (15%); Brazil (13%); India (10%); Mexico (6%); & Peru (5%)

US > 47 Million cases & > 776,000 deaths
- India > 34 M cases
- Brazil > 21 M cases
- U.K. > 9 M cases
- Russia & Turkey > 8 M cases
- France > 7 M cases
- Iran > 6 M cases
- Argentina, Spain & Colombia > 5 M cases
- Italy, Germany & Indonesia > 4 M cases
- Mexico, Poland & Ukraine > 3 M cases
- South Africa, Philippines, Malaysia, Netherlands, Peru & Iraq > 2 M cases
Coronavirus World Map: Tracking the Global Outbreak
INDIA

New reported cases

<table>
<thead>
<tr>
<th>Cases</th>
<th>AVG. ON JUN. 27</th>
<th>14-DAY CHANGE</th>
<th>TOTAL REPORTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>49,159</td>
<td>95% Gamma</td>
<td>-43%</td>
<td>30,279,331</td>
</tr>
</tbody>
</table>

Deaths

<table>
<thead>
<tr>
<th>Deaths</th>
<th>AVG. ON JUN. 27</th>
<th>14-DAY CHANGE</th>
<th>TOTAL REPORTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,228</td>
<td></td>
<td>-66%</td>
<td>396,730</td>
</tr>
</tbody>
</table>

BRAZIL

New reported cases

<table>
<thead>
<tr>
<th>Cases</th>
<th>AVG. ON JUN. 27</th>
<th>14-DAY CHANGE</th>
<th>TOTAL REPORTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>70,381</td>
<td>95% Gamma</td>
<td>+6%</td>
<td>18,420,598</td>
</tr>
</tbody>
</table>

Deaths

<table>
<thead>
<tr>
<th>Deaths</th>
<th>AVG. ON JUN. 27</th>
<th>14-DAY CHANGE</th>
<th>TOTAL REPORTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,664</td>
<td></td>
<td>-17%</td>
<td>513,474</td>
</tr>
</tbody>
</table>

https://covariants.org/per-country
The Global pandemic passed 200 million cases on August 6\textsuperscript{th}, 2021 & 5 million deaths on Nov 1\textsuperscript{st}, 2021

**CASES**
- 1 case to 25 million: 239 days
- 25 million to 50 million: 69 days
- 50 million to 75 million: 42 days
- 75 million to 100 million: 39 days
- 100 million to 125 million: 58 days
- 125 million to 150 million: 36 days
- 150 million to 175 million: 43 days
- 175 million to 200 million: 53 days

**DEATHS**
- 1 death to 1 million- 251 days
  - Sept 28\textsuperscript{th}, 2020
- 1 to 2 million- 114 days
  - Jan 15\textsuperscript{th}, 2021
- 2 to 3 million- 89 days
  - April 19\textsuperscript{th}, 2021
- 3 to 4 million- 89 days
  - July 8\textsuperscript{th}, 2021
- 4 to 5 million- 110 days
  - Nov 1\textsuperscript{st}, 2021
7,000 deaths each day are still attributed to Covid-19

Daily deaths attributed to Covid-19 (7-day rolling average)

Source: Johns Hopkins CSSE, WHO, national sources, FT research • N America includes Canada, Bermuda, Greenland and St Pierre and Miquelon
The number of people who have died from covid-19 is likely to be close to 17m

The official tally of 5m is a huge undercount

Global estimated excess deaths and official covid-19 deaths
- Official covid-19 deaths
- Estimated excess deaths
Death rates have climbed far above historical averages in many countries that have faced Covid-19 outbreaks.

Number of deaths per week from all causes, 2020 vs recent years: Shading indicates total excess deaths since 100 confirmed cases in the country.
<table>
<thead>
<tr>
<th>COUNTRY / CITY</th>
<th>TIME PERIOD</th>
<th>COVID-19 DEATHS</th>
<th>EXCESS DEATHS</th>
<th>EXCESS DEATHS PER 100K PEOPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russia</td>
<td>Apr 1st 2020-Oct 31st 2021</td>
<td>234,180</td>
<td>904,340</td>
<td>620</td>
</tr>
<tr>
<td>United States</td>
<td>Mar 8th 2020-Aug 21st 2021</td>
<td>615,260</td>
<td>807,830</td>
<td>246</td>
</tr>
<tr>
<td>Brazil</td>
<td>Mar 1th 2020-Sep 30th 2021</td>
<td>596,750</td>
<td>649,970</td>
<td>304</td>
</tr>
<tr>
<td>Mexico</td>
<td>Mar 30th 2020-Oct 10th 2021</td>
<td>277,790</td>
<td>579,440</td>
<td>445</td>
</tr>
<tr>
<td>Iran</td>
<td>Feb 24rd 2020-Oct 31st 2021</td>
<td>126,300</td>
<td>252,260</td>
<td>297</td>
</tr>
<tr>
<td>South Africa</td>
<td>Apr 13th 2020-Oct 31st 2021</td>
<td>89,150</td>
<td>224,210</td>
<td>373</td>
</tr>
<tr>
<td>Egypt</td>
<td>Apr 1st 2020-Jun 30th 2021</td>
<td>16,120</td>
<td>205,730</td>
<td>197</td>
</tr>
<tr>
<td>Peru</td>
<td>Mar 23nd 2020-Oct 31th 2021</td>
<td>200,210</td>
<td>196,630</td>
<td>589</td>
</tr>
<tr>
<td>Italy</td>
<td>Mar 2st 2020-Aug 29th 2021</td>
<td>129,060</td>
<td>157,560</td>
<td>261</td>
</tr>
<tr>
<td>Colombia</td>
<td>Apr 6th 2020-Jul 11th 2021</td>
<td>112,790</td>
<td>135,850</td>
<td>265</td>
</tr>
<tr>
<td>Britain</td>
<td>Apr 16th 2020-Oct 17th 2021</td>
<td>138,950</td>
<td>134,270</td>
<td>197</td>
</tr>
<tr>
<td>Poland</td>
<td>Mar 30th 2020-Oct 10th 2021</td>
<td>75,850</td>
<td>128,060</td>
<td>339</td>
</tr>
<tr>
<td>Spain</td>
<td>Mar 9th 2020-Sep 26th 2021</td>
<td>86,210</td>
<td>106,920</td>
<td>229</td>
</tr>
<tr>
<td>Ukraine</td>
<td>Apr 1st 2020-Aug 31st 2021</td>
<td>56,990</td>
<td>105,300</td>
<td>242</td>
</tr>
<tr>
<td>France</td>
<td>Mar 9th 2020-Oct 3rd 2021</td>
<td>117,580</td>
<td>85,990</td>
<td>127</td>
</tr>
<tr>
<td>Germany</td>
<td>Mar 16th 2020-Oct 24rd 2021</td>
<td>95,110</td>
<td>81,810</td>
<td>98</td>
</tr>
</tbody>
</table>
The US pandemic has passed 700,000 deaths

- 1st confirmed COVID-19 death in the US
  - Feb 6th, 2020
- 100,000 deaths
  - May 27th, 2020
- 200,000 deaths
  - Sept 22nd, 2020
- 300,000 deaths
  - Dec 14th, 2020
- 400,000 deaths
  - Jan 19th, 2021
- 500,000 deaths
  - Feb 22nd, 2021
- 600,000 deaths
  - Jun 15th, 2021
- 700,000 deaths
  - Oct 1st, 2021

In 2020, COVID-19 was the third leading cause of death in the U.S.

- 377,883 deaths from COVID-19
  - 91.5 per 100,000 population
The US suffered 470,000 deaths in 2020 compared to 352,000 confirmed COVID-19 deaths that year.
‘This is trauma’: Grim reminder of how much is lost

1 in 500 Americans — many young people of color — died of COVID-19

BY DAN KEATING, ASKAR HILLIYID and MONICA ULMANE

At a certain point, it was no longer a matter of if the United States would reach the gruesome milestone of 1 in 500 people dying of COVID-19, but a matter of when. A year? Maybe 15 months? The answer: 19 months.

Given the mortality rate from COVID and our nation’s population size, “weird kind of where we predicted we would be with completely uncontrolled spread of infection,” said Jeffrey D. Samaha, clinical professor of radiology, population and public health sciences at the University of Southern California Keck School of Medicine. “Remember at the very beginning, when we don’t hear about numbers, it was all about flattening the curve.”

The idea, he said, was to prevent “the humanitarian disaster” that occurred in New York City, where ambulance crews were a constant as hospitals were overwhelmed and morgues needed mobile units to handle the additional cases.

The goal of testing, mask-wearing, keeping six feet apart and limiting gatherings was to slow the spread of the highly infectious virus until a vaccine could stamp it out. The vaccine came, but not enough people have been inoculated, and the triumph of science’s weapon against mass death and disease remains. The result: As the nation’s COVID death toll exceeded 695,000 this week, it meant roughly 1 in every 500 Americans had succumbed to the disease caused by the coronavirus.

While COVID’s toll slowly wears the imagination, even more stunning is the deadly efficiency with which it has targeted Black, Latino, and American Indian and Alaska Native people to their 30s, 40s and 50s. “So often when we think about the majority of the country who have lost people to COVID-19, we think about the older folks that have been lost, not necessarily younger people,” said Amy Espinosa, executive vice president at the Seattle Indian Health Board and director of the Urban Indian Health Institute. “Unfortunately, this is not my reality. Not that the Native community has been immune or that others have been spared. People that are so integral to building up our community, which has already been struggling for centuries against all these things that created the perfect environment for COVID-19 to kill us.”

Six of Espinosa’s friends and relatives — all under 55 — have died of COVID. “This is trauma. This is generational impact that we must have an intentional focus on. They are there,” said Mariah Simeon-Smith, chair of Paradise Valley’s COVID-19 Equity Task Force and associate dean for health equity research at KU Medical Center. “We can’t think that we’re going to test and vaccinate our way out of this deep pain and hurt.”

The pandemic has brought into stark relief centuries of uncompensated social, environmental, economic and political factors that erode the health and shorten the lives of people of color, putting them at higher risk of the disease conditions that leave immune systems

THE CORONAVIRUS PANDEMIC

Rates in states and D.C.

Age 55-89

One death in... 55-89 Native Americans 1,000 people

One death in... 55-89

Native Americans 1,000 people

Source: Centers for Disease Control and Prevention

1 in 500 Americans have died of COVID-19

One U.S. COVID-19 death in...

As of Sept. 14, 2021

Total

500 people

Age

85+ 35 people

80 to 84 150 people

65 to 64 760 people

40 to 64 760 people

Race/ethnicity

Native American 240 people

Hispanic 260 people

Black 260 people

White 1,200 people

Source: Centers for Disease Control and Prevention
Covid-19 impacts all aspects of society

**Education**

50% of students still affected by school closures*  

**Climate**

-30% investment in clean energy transition

**Poverty**

+135m people pushed into poverty by 2030

*one year into the pandemic

UNESCO: https://en.unesco.org/covid19/educationresponse
Wealthy countries have had the means to support people with cash through social protection programmes

$695 per person in wealthy countries

$4 to $28 per person in low- and middle-income countries

Extreme poverty has gone up for the first time in 20 years due to Covid-19

Percent change in number of people in poverty ($1.90)

-1.2% 2019

-1.5% 2019

7.1% 2020

How many COVID deaths in the US?

January 2020 – August 18, 2021

Deaths from January 2020 – February 2021 (Before vaccines became available) = 433,971

Deaths between February 1 and August 18, 2021 (After vaccines became available) = 180,560

= 614,531

Deaths among vaccinated people (1,400 or 0.77%)
DELTA CASES AND HOSPITALIZATIONS

Two example states with 1 million population and different levels of vaccination coverage (70% vs 30%)

Higher vaccination coverage leads to fewer cases and hospitalizations, but greater % of vaccinated cases and hospitalizations.

In both scenarios, cases and hospitalizations are greater among unvaccinated than vaccinated persons.
From June through August 2021, preventable COVID-19 hospitalizations among unvaccinated adults cost over $5 Billion

Estimated cost of preventable COVID-19 hospitalizations among unvaccinated adults in the U.S., June-August 2021

Over 280,000 COVID-19 hospitalizations could have been prevented by vaccination between June to August 2021

Preventable COVID-related hospitalization costs for unvaccinated people in the U.S., June-August 2021

<table>
<thead>
<tr>
<th></th>
<th>June 2021</th>
<th>July 2021</th>
<th>August 2021</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>New hospital admissions of adult patients with confirmed COVID-19</td>
<td>60,000</td>
<td>125,000</td>
<td>345,000</td>
<td>530,000</td>
</tr>
<tr>
<td>Estimated share of adults hospitalized with COVID-19 who were unvaccinated</td>
<td>86%</td>
<td>86%</td>
<td>86%</td>
<td>86%</td>
</tr>
<tr>
<td>Estimated number of unvaccinated adults hospitalized for COVID-19</td>
<td>1,000</td>
<td>108,000</td>
<td>297,000</td>
<td>456,000</td>
</tr>
<tr>
<td>Estimated share of hospitalizations primarily for COVID-19</td>
<td>75%</td>
<td>75%</td>
<td>75%</td>
<td>75%</td>
</tr>
<tr>
<td>Estimated number of unvaccinated adults hospitalized primarily for COVID-19</td>
<td>39,000</td>
<td>81,000</td>
<td>222,000</td>
<td>342,000</td>
</tr>
<tr>
<td>Estimated share of unvaccinated hospitalizations for COVID-19 that were preventable</td>
<td>84%</td>
<td>84%</td>
<td>84%</td>
<td>84%</td>
</tr>
<tr>
<td>Estimated number of preventable COVID-19 hospitalizations</td>
<td>32,000</td>
<td>68,000</td>
<td>187,000</td>
<td>287,000</td>
</tr>
<tr>
<td>Approximate cost per COVID-related hospital admission</td>
<td>$20,000</td>
<td>$20,000</td>
<td>$20,000</td>
<td>$20,000</td>
</tr>
<tr>
<td>Estimated preventable cost for unvaccinated COVID-related adult hospitalizations</td>
<td>$0.6 Billion</td>
<td>$1.4 Billion</td>
<td>$3.7 Billion</td>
<td>$5.7 Billion</td>
</tr>
</tbody>
</table>

Source: KFF analysis of CDC, CMS, and HHS Profect data • Get the data • PDF
Recent Covid-19 deaths compared with state vaccination rates

Note: The graphic shows deaths from Covid-19 since June 16, 2021, the day the United States reached 600,000 deaths according to a New York Times database. Data is as of Sept. 29. Sources: New York Times database of reports from state and local health agencies, Centers for Disease Control and Prevention, U.S. Census Bureau.
Covid hospital admissions for children are climbing in states with low immunization rates

Ten most vaccinated states

Ten least vaccinated states

10 new daily hospital admissions per 100,000 people

REPORTING DELAYS POSSIBLE

May 1, 2021 to Sept. 6, 2021
Protecting children from COVID-19

The single most important thing parents can do is to get vaccinated and to vaccinate all their kids who are 5 and older.

If you live in areas with low vaccination rates masking children over the age of 2 indoor (including in schools)
## Treatment Across the COVID-19 Spectrum

### Stage/Severity:

<table>
<thead>
<tr>
<th>Stage/Presymptomatic</th>
<th>Mild Illness</th>
<th>Moderate Illness</th>
<th>Severe Illness</th>
<th>Critical Illness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymptomatic/Presymptomatic</td>
<td>+ SARS-CoV-2 test but no symptoms</td>
<td>Mild symptoms (e.g., fever, cough, taste/smell changes); no dyspnea</td>
<td>O₂ saturation &gt;=94%, lower respiratory tract disease</td>
<td>O₂ saturation &lt;94%, respiratory rate &gt;30/min; lung infiltrates &gt;50%</td>
</tr>
</tbody>
</table>

### Disease Pathogenesis:

- Viral replication
- Hypercoagulability

### Potential Treatment:

- **Antivirals**
  - Molnupiravir
  - Paxlovid

- **Dexamethasone**
  - In some patients: tocilizumab, baricitinib (with RDV)

- **Anticoagulation?**
  - Remdesivir

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Gandhi RT, CID, 2020
Gandhi RT, Lynch J, del Rio C. NEJM 2020
Molnupiravir (EIDD-2801)

Merck and Ridgeback’s Investigational Oral Antiviral Molnupiravir Reduced the Risk of Hospitalization or Death by Approximately 50 Percent Compared to Placebo for Patients with Mild or Moderate COVID-19 in Positive Interim Analysis of Phase 3 Study

10/1/2021

Health Sciences Update

October 22, 2021

Game-changing COVID-19 drug discovered at Emory

As it has now for the past 20 months, the COVID-19 pandemic continues to dominate the local, regional, and national landscapes, with the tragic milestone of 700,000 lost lives, ongoing surges across the country, and continued widespread vaccine hesitancy.

However, there is also cause to be hopeful as scientists continue to develop exciting new therapeutics to combat the virus. One such drug is Molnupiravir, an investigational oral antiviral drug discovered by researchers here at Emory, which appears to significantly reduce the risk of hospitalization or death in patients with mild to moderate COVID-19.

Merck and Ridgeback Biotherapeutics are currently advancing the drug after licensing it from Drug Innovation Ventures at Emory (DRIVE). Initially named EIDD-2801, it is the first investigational antiviral that can be administered in pill form, which could ease distribution around the world. Merck has requested Emergency Use Authorization for Molnupiravir from the FDA.

This is a true breakthrough in the fight against COVID-19, and our team at DRIVE, a not-for-profit biotechnology company wholly owned by Emory, has done extraordinary work in bringing this drug to fruition. Congratulations to the DRIVE team and to all the Emory researchers whose work has contributed to this historic discovery and to the renewal of hope in the face of adversity.
Vaccines, Variants, Breakthroughs & Boosters
Total vaccination doses given globally so far: 7.28bn
High income countries are ahead on vaccinations

Progress on vaccinations by GDP per capita, circle size represents population.
### Total Vaccine Doses
- Delivered: 536,665,505
- Administered: 433,156,393

Learn more about the distribution of vaccines.

<table>
<thead>
<tr>
<th>At Least One Dose</th>
<th>Fully Vaccinated</th>
<th>Booster Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td><em><em>Fully Vaccinated</em> People</em>*</td>
<td>Count</td>
<td>Percent of US Population</td>
</tr>
<tr>
<td>Total</td>
<td>194,168,611</td>
<td>58.5%</td>
</tr>
<tr>
<td>Population ≥ 12 Years of Age</td>
<td>194,032,115</td>
<td>68.4%</td>
</tr>
<tr>
<td>Population ≥ 18 Years of Age</td>
<td>181,292,336</td>
<td>70.2%</td>
</tr>
<tr>
<td>Population ≥ 65 Years of Age</td>
<td>46,959,516</td>
<td>85.7%</td>
</tr>
</tbody>
</table>

*For surveillance purposes, COVID Data Tracker counts people as being “fully vaccinated” if they received two doses on different days (regardless of time interval) of the two-dose mRNA series or received one dose of a single-dose vaccine.

**The count of people who received a booster dose includes anyone who is fully vaccinated and has received another dose of COVID-19 vaccine since August 13, 2021. This includes people who received booster doses and people who received additional doses.

194.2M People fully vaccinated

25.4M People received a booster dose**
How State Vaccinations Stack Up
Vermont leads all states, with 163 doses per 100 people

Select a state or territory...

Doses per 100 people: 200

Note: Two doses are needed for full protection with the Pfizer and Moderna vaccines, while the J&J shot requires a single dose. Data from Bloomberg's Covid-19 Vaccine Tracker
After 10 cycles of transmission:

- Ro 2.5 leads to 9,536 cases
- Ro 6 leads to 60,466,176 cases

Herd immunity threshold:

- Ro 2.5 then ~ 60%
- Ro 6 then upwards of 85%
Figure 1. Adjusted VE Against SARS-CoV-2 Infections: KPSC Members ≥12 Years of Age

Adjusted VE against SARS-CoV-2 infections, KPSC members ≥12 years of age

97 (95–99)
93 (85–97)
67 (45–80)
53 (39–65)

Adjusted VE with 95% CI

Note: no statistically significant difference in rate of decline between Delta and other sequenced variants (P = .30)

*Whole genome sequencing was performed on all PCR+ samples collected Mar 4, 2021 – Jul 21, 2021.
The Unvaccinated Continue to Drive the Pandemic

By Zach Levitt and Dan Keating

September 12, 2021
Rates of COVID-19 Cases or Deaths by Vaccination Status and Vaccine Product

April 04 - September 04, 2021 (16 U.S. jurisdictions)

In August, unvaccinated persons had:

6.1X Greater Risk of Testing Positive for COVID-19

AND

11.3X Greater Risk of Dying from COVID-19

compared to fully vaccinated persons
Will vaccines work against variants? Short answer yes
Efficacy of mRNA vaccines against severe disease in settings where Delta variant is circulating, Sept 2021

<table>
<thead>
<tr>
<th>Study Location (reference)</th>
<th>Vaccine</th>
<th>Effectiveness vs. severe disease or hospitalization</th>
<th>Lower limit of 95% CI</th>
<th>Upper limit of 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA, Southern California KPSC (1)</td>
<td>BNT162b2 or mRNA-1273</td>
<td>.93</td>
<td>84</td>
<td>96</td>
</tr>
<tr>
<td>USA, Minnesota (2)</td>
<td>BNT162b2</td>
<td>.75</td>
<td>24</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>mRNA-1273</td>
<td>.81</td>
<td>33</td>
<td>96</td>
</tr>
<tr>
<td>USA, New York (3)</td>
<td>BNT162b2; mRNA-1273; Ad26.COV2.S</td>
<td>.944</td>
<td>92.7</td>
<td>95.7</td>
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<tr>
<td>USA 13 jurisdictions (5)</td>
<td>BNT162b2; mRNA-1273; Ad26.COV2.S</td>
<td>.904</td>
<td>87.7</td>
<td>92.5</td>
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<tr>
<td>USA, 7 locations VISION network (7)</td>
<td>BNT162b2</td>
<td>.87</td>
<td>85</td>
<td>90</td>
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<tr>
<td></td>
<td>mRNA-1273</td>
<td>.91</td>
<td>83</td>
<td>93</td>
</tr>
<tr>
<td>USA, 9 States VISION network (8)</td>
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<td>.80</td>
<td>73</td>
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<td></td>
<td>mRNA-1273</td>
<td>.95</td>
<td>92</td>
<td>97</td>
</tr>
<tr>
<td>USA, 5 VA Medical Centers (9)</td>
<td>mRNA-1273</td>
<td>.89</td>
<td>80</td>
<td>94</td>
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<tr>
<td>USA (14)</td>
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<td>.96</td>
<td>91</td>
<td>99</td>
</tr>
<tr>
<td>Israel (4)</td>
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<td>.88</td>
<td>94</td>
<td>91</td>
</tr>
<tr>
<td>Qatar (10)</td>
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<td>.897</td>
<td>61</td>
<td>98.1</td>
</tr>
<tr>
<td>Qatar (11)</td>
<td>mRNA-1273</td>
<td>.100</td>
<td>41.2</td>
<td>100</td>
</tr>
<tr>
<td>Singapore (12)</td>
<td>BNT162b2 or mRNA-1273</td>
<td>.93</td>
<td>66</td>
<td>98</td>
</tr>
<tr>
<td>UK (13)</td>
<td>BNT162b2</td>
<td>.96</td>
<td>82</td>
<td>99</td>
</tr>
</tbody>
</table>
Breakthroughs
469 COVID-19 cases were identified among those who had traveled to Provincetown during July 3–17

346 (74%) occurred in fully vaccinated persons

- Delta variant in 90% of the 133 specimens tested
- Cycle threshold values were similar among specimens from patients who were fully vaccinated and those who were not (median 22.77 and 21.54)

“Persons with COVID-19 reported attending densely packed indoor and outdoor events at venues that included bars, restaurants, guest houses, and rental homes.”

https://www.cdc.gov/mmwr/volumes/70/wr/mm7031e2.htm
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 = 80% (Lopez Bernal et al. NEJM 2021), where risk is [1 – VE] or 12%. Vaccine effectiveness hospitalization (or death) = 96% (Stower et al. PNE 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 UK).
Daily average Covid cases per 10,000 residents around Seattle

July 1 → Aug. 26

- Fully vaccinated: 0.9
- Not fully vaccinated: 9

Those infected with Delta may clear infection faster if vaccinated

218 patients hospitalized with Delta in Singapore
  - 71 fully vaccinated
  - 130 unvaccinated

Vaccinated group older (median age 56 compared to 39.5) but

OR of developing severe disease 0.07 (95%CI (0.0115-0.335)

Ct values similar at time of diagnosis but faster decrease in vaccinated with development or robust antibody response

https://www.medrxiv.org/content/10.1101/2021.07.28.21261295v1.full.pdf
Post-dose 3 BNT162b2 GMTs Indicate a Substantial Boost to the Delta Variant Similar to Wild Type

18-55 Years Old
n=11/group

GMR_{Delta/WT} (95% CI)
0.78 (0.63, 0.96)
0.85 (0.71, 1.03)

1 Month After Dose 2
310
1 Month After Dose 3
241

65-85 Years Old
n=12/group

GMR_{Delta/WT} (95% CI)
0.63 (0.46, 0.86)
0.92 (0.71, 1.18)

1 Month After Dose 2
196
1 Month After Dose 3
123

50% Serum Neutralizing Titer

SARS-CoV-2 Neutralization with BNT162b2 Vaccine Dose 3 | NEJM (openathens.net), DOI: 10.1056/NEJMoa2113468.
Following the booster a decrease in confirmed infections was observed among people aged 60+

Based on PCR testing.

In Israel testing is performed either following symptoms or without symptoms for contact tracing and other reasons.

The Israel Experience
Booster reduces the rate of severe disease* in 60+ and 40-60 age groups

(Poisson regression controlling for age, gender, demographic group, 2nd dose period, and incidence in area of residence. Based on data from booster eligibility in age group until 9/29)

<table>
<thead>
<tr>
<th>Age</th>
<th>Non-booster severe cases (person-days at risk)</th>
<th>Booster group severe cases - day 12+ (person-days at risk)</th>
<th>Rate ratio for severe cases day 12+ relative to non-booster [95% CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td>60+</td>
<td>957 (20,894,746)</td>
<td>150 (39,630,040)</td>
<td>18.7 [15.7, 22.4]</td>
</tr>
<tr>
<td>40-59</td>
<td>160 (25,243,100)</td>
<td>7 (20,202,835)</td>
<td>22 [10.3, 47]</td>
</tr>
<tr>
<td>16-39</td>
<td>23 (36,907,240)</td>
<td>1 (9,761,068)</td>
<td>too few cases to estimate reliably</td>
</tr>
</tbody>
</table>

*Severe disease (NIH definition): resting respiratory rate >30 breaths per minute, or O2 saturation <94%, or PaO2/FiO2 <300

Absolute rates of confirmed infections per 100,000 risk-days

12+ days following booster versus 2nd dose only. Based on data from booster eligibility in age group until 10/4.

[Graph showing absolute rates of confirmed infections per 100,000 risk-days by age group.]

Bar-on et al., [https://www.medrxiv.org/content/10.1101/2021.10.07.212864626v1.full.pdf](https://www.medrxiv.org/content/10.1101/2021.10.07.212864626v1.full.pdf)
Summary: Booster dose shows improved effectiveness over 2\textsuperscript{nd} dose across all tested age groups

- Booster dose shows \approx 10\textsuperscript{fold} improved protection over 2\textsuperscript{nd} dose against confirmed infection across age groups 16 years old and above.
- Booster dose is also effective against severe COVID19
  - For ages 60+ between 6 to 20\textsuperscript{fold} reduction (i.e. over 80\% decrease in rate ratio over 2\textsuperscript{nd} dose)
  - For ages 40-60 between 3 to 20\textsuperscript{fold} reduction (i.e. over 60\% decrease in rate ratio over 2\textsuperscript{nd} dose)
- Booster dose decreases COVID19 associated death rate 3 to 10\textsuperscript{fold} among the elderly
### Table 2. Primary Outcomes of Confirmed Infection and Severe Illness.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Nonbooster Group</th>
<th>Booster Group</th>
<th>Adjusted Rate Ratio (95% CI)†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confirmed infection</td>
<td>4439</td>
<td>934</td>
<td>11.3 (10.4 to 12.3)</td>
</tr>
<tr>
<td>No. of cases</td>
<td>5,193,825</td>
<td>10,603,410</td>
<td></td>
</tr>
<tr>
<td>No. of person-days at risk</td>
<td>4,574,439</td>
<td>6,265,361</td>
<td></td>
</tr>
<tr>
<td>Severe illness</td>
<td>294</td>
<td>29</td>
<td>19.5 (12.9 to 29.5)</td>
</tr>
<tr>
<td>No. of cases</td>
<td>4,574,439</td>
<td>6,265,361</td>
<td></td>
</tr>
</tbody>
</table>

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**Source:** Israeli health ministry

© FT
Immunity Boost

The FDA came out with new recommendations for Covid-19 vaccines, allowing for boosters for all three main vaccines for at least some people in the 18-64 age group.

AUTHORIZED FOR: ✔️ Everyone
✔️ People who are immunocompromised, have underlying conditions, are in high-risk occupations or live in high-risk areas

<table>
<thead>
<tr>
<th></th>
<th>Pfizer-Biontech</th>
<th>Moderna</th>
<th>Johnson &amp; Johnson</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First doses</td>
<td>Additional/booster</td>
<td>First doses</td>
</tr>
<tr>
<td>Under age 11</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Ages 12 to 17</td>
<td>✔️</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Ages 18 to 64</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Age 65 and older</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>
Am I eligible for a booster shot?

**Who?**
- If you received a Pfizer or Moderna series:
  - 65 years and older
  - Age 18+ who live in long-term care settings
  - Age 18+ who have underlying medical conditions
  - Age 18+ who work or live in high-risk settings
- If you received a J&J vaccine:
  - Age 18+

**When?**
- At least 6 months after Pfizer or Moderna
- At least 2 months after J&J

**Which booster shot do I get?**
- You may have a preference, but you can get any booster shot.

FIND OUT MORE AT CDC.GOV & VACCINES.GOV
India administers one billionth COVID-19 vaccine dose

India on Oct. 21 finished administering one billion doses, nearly 90% of them the AstraZeneca vaccine. It is only behind China in total inoculations, which has administered about 2.2 billion doses so far. A little over 50% of India’s population has received at least one dose and only 30% is fully vaccinated.

Dose progression | The chart shows the days taken for total COVID-19 vaccination doses in India to cross every 100 million dose mark:

It took 19 days for the total doses to cross one billion from 900 million

Oct 21st - India celebrates 1 billion COVID-19 vaccine doses with song and dance
# COVID-19 Vaccines
## Debunking the Myths

<table>
<thead>
<tr>
<th>Vaccine Myth</th>
<th>Vaccine Fact</th>
</tr>
</thead>
<tbody>
<tr>
<td>It was rushed and isn’t safe</td>
<td>Researchers took no safety shortcuts. Large studies show the vaccine is safe</td>
</tr>
<tr>
<td>It changes your DNA</td>
<td>It’s impossible for the vaccine to change your DNA</td>
</tr>
<tr>
<td>It can give you COVID-19</td>
<td>The vaccine doesn’t contain a live virus strain</td>
</tr>
<tr>
<td>It contains egg protein</td>
<td>It doesn’t contain egg proteins and can be given to people with egg allergies</td>
</tr>
<tr>
<td>It causes severe side effects</td>
<td>For most, the vaccine causes mild side effects that resolve in a few days</td>
</tr>
<tr>
<td>It makes women infertile</td>
<td>There is no evidence that the vaccine causes infertility</td>
</tr>
</tbody>
</table>
PATH OUT OF THE PANDEMIC

PRESIDENT BIDEN’S COVID-19 ACTION PLAN

President Biden is implementing a six-pronged, comprehensive national strategy that employs the same science-based approach that was used to successfully combat previous variants of COVID-19 earlier this year. This plan will ensure that we are using every available tool to combat COVID-19 and save even more lives in the months ahead, while also keeping schools open and safe, and protecting our economy from lockdowns and damage.
Vaccinating the Unvaccinated

- Requiring All Employers with 100+ Employees to Ensure their Workers are Vaccinated or Tested Weekly
- Requiring Vaccinations for all Federal Workers and for Millions of Contractors that Do Business with the Federal Government
- Requiring COVID-19 Vaccinations for Over 17 Million Health Care Workers at Medicare and Medicaid Participating Hospitals and Other Health Care Settings
- Calling on Large Entertainment Venues to Require Proof of Vaccination or Testing for Entry
- Requiring Employers to Provide Paid Time Off to Get Vaccinated

Further Protecting the Vaccinated

- Providing Easy Access to Booster Shots for All Eligible Americans
- Ensuring Americans Know Where to Get a Booster
“If you are vaccinated, it’s’ nothing. 
If you are not vaccinated, you’re hosed”

George Rutherford, MD, MPH
UCSF
What does the future hold?
New antivirals, improved antibody treatment and more vaccines make for a better future for those in the developed world.

In most LMIC the virus will still pose a deadly danger.

Unless vaccinations can be stepped up, COVID-19 will become just another of the many endemic diseases that afflict the poor but not the rich.
Reducing risk of COVID-19 during air travel

<table>
<thead>
<tr>
<th>Prevent</th>
<th>Keep</th>
<th>Minimize</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevent infected persons from boarding the airplane</td>
<td>Keep the airplane free of viruses</td>
<td>Minimize transmission of the virus on the airplane</td>
</tr>
</tbody>
</table>
| • Screening  
  • Testing | • Sanitation (cleaning and disinfecting of cabin)  
  • Air filtering | • Masking  
  • Decrease the number of passengers – block middle seat |
Get used to “immunity passports”
The Airline Vaccine Mandate Question

Shares of U.S. adults who said COVID-19 vaccines should be required for the following:

- **All adults**: 61% for domestic flights, 64% for international flights.
- **Democrats**: 80% for both domestic and international flights.
- **Independents**: 52% for domestic flights, 56% for international flights.
- **Republicans**: 44% for domestic flights, 50% for international flights.

*Poll conducted Sept. 21-26, 2021, among 4,400 U.S. adults, with a margin of error of +/-1%.*
The Future of Air travel

- Leisure trips will fuel the recovery.
- Business travel will take longer to recover, and even then, we estimate it will only likely recover to around 80 percent of pre-pandemic levels by 2024.
- Staggering debt levels will lead to ticket price increases.
- Aircraft markets may be oversupplied for some time to come.

The Health 202 asked experts via email to reflect on the following questions:

• At what point will we be able to declare the state of public health emergency over?
• What indicator will tell us when we’ve reached that goal?
• When can we ease up on public health restrictions?
• Are there any restrictions that may stick around?
Carlos del Rio, “I think if we get back to <10 new cases per 100,000 population and <100 deaths per day we will be in ‘good shape.’ … Not much is going on now in the U.S. as far as ‘public health restrictions.’ We have some very limited masking in some places but little in most. I personally think that masking should remain for the foreseeable future in certain situations… I also think that asking for proof of vaccination will become the new normal.”

Amesh Adalja, “To me, the public health emergency was premised on the ability of the virus to put a hospital into crisis. When enough high-risk people are immune through vaccination or natural infection and hospitals no longer have to worry about capacity, the public health emergency is over although Covid will still be present.”

Natalie Dean, “The goal is to reduce sickness and death to levels below which people feel safe resuming normal activities. … Easing up on restrictions will be a constant readjustment, as the virus can continue to throw curveballs at us. I can see vaccine mandates, vaccine passports, and routine testing sticking around for a while, as well as masks in crowded public indoor spaces while transmission levels are high.”

Monica Gandhi, “The public health emergency should be declared over based on hospitalization rates around our country….when hospitalization rates were <5/100,000 population. I think hospitalization metrics such as this are appropriate to ease restrictions in each county or state (mainly just masks at this point).”

Leana Wen, “I’d see lifting the state of emergency as being challenging as long as there is so much spread and a substantial proportion of the population — young children — who are not yet eligible to be vaccinated. As to when restrictions can be lifted later, this isn’t straightforward. It will depend on what level of infection and suffering we can tolerate, and what price we are willing to pay to reduce it.”
Longer-ranging longitudinal observational studies and clinical trials will be critical to elucidate the health consequences attributable to COVID-19 and how these may compare with other serious illnesses.
Conclusions – October 2021

- While the current situation continues to be serious, we are in a better place now than a year ago
- The available vaccines are highly effective and safe
- Vaccinated persons are much safer than unvaccinated persons – but not completely safe
- Breakthrough infections occur often enough that we will see them
- Masking indoors continues to be important as long as there is substantial community transmission
- This is now a *pandemic of the unvaccinated* – it is time for vaccine mandates
- The global pandemic is nowhere close to ending, we must double efforts to get everyone vaccinated
“By failing to prepare, you are preparing to fail.”

Benjamin Franklin

Questions?

@CARLOSDELRIO7