ASSESSING Recovery

Exploring the Impact of the COVID-19 Vaccine on the Recovery of Travel

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Prevention of COVID-19
Types of COVID-19 Vaccines

a. Inactivated vaccines
Inactivated vaccines contain SARS-CoV-2 viruses that are chemically inactivated.

b. Recombinant proteins vaccines
Vaccines composed of recombinant spikes with a receptor binding domain. Virus-like particles are devoid of genetic material but display spikes, M and E proteins on their surface.

c. Viral vector vaccines
Viral vector vaccines contain a virus modified to express S protein.

d. RNA vaccines
RNA vaccines consist of RNA lipid nanoparticles, with Spike protein.

e. DNA vaccines
DNA vaccines contain a circular DNA encoding the spike protein.

Live virus tends to illicit a very robust immune response, must pick correct vector, ex include Ebola vaccine, eg J&J and Oxford/AstraZeneca.

Easy to design & manufacture, no other vaccines in use, eg Pfizer, Moderna.

Indirect Effect of Vaccination: Herd Immunity

Indirect Effect of Vaccination: Herd Immunity

Some of the population gets immunized. Contagious disease spreads through some of the population.

Indirect Effect of Vaccination: Herd Immunity

Estimates are a population will need ~ 70% of individuals to be immune through vaccination or natural infection to achieve herd immunity

Operation Warp Speed

Typical Process:
- 3 months
- 5 months
- 21 months
- 23 months
- 15 months
- 6 months
- 73 months to completion

Accelerated Process:
- 5 months

1. A typical 8-month process is accelerated by:
   - Creating vaccine candidates immediately after viral genome sequence is available.
   - Using vaccine platforms developed for other diseases.

2. A typical 42-month process is accelerated by:
   - Large scale Phase III clinical trials of 30,000 volunteers allowing for rapid collection and earlier analysis of safety and efficacy data of demographically diverse populations by the FDA, reducing the typical 12-month approval process to three months.
   - Two promising candidates began Phase III clinical trials in July, with others to follow quickly in coming months. Before beginning Phase III, candidates must show safety data from animal and human studies.
   - The U.S. Government funding at-risk, large-scale manufacturing of the most promising vaccine candidates during Phase III clinical trials to ensure any vaccine proven to be safe and effective is available immediately upon FDA Emergency Use Authorization (EUA) approval or licensure.

3. A typical 6-month process is accelerated by:
   - A fixed approach based on CDC recommended allocation methodology used as part of pandemic flu planning and the COVID-19 response will be used to determine vaccine distribution.

4. A typical 15-month process is accelerated by:
   - Planning for infrastructure and distribution before the vaccines are approved or authorized.
   - CDC leading distribution planning with DoD augmentation.

5. A typical 12-month FDA review for EUA approval or licensure is accelerated by:
   - Providing continuous safety and efficacy data collected in large Phase III clinical trials.

- R&D + Preclinical Trials Vaccine Candidate/s Identified
- Phase I Clinical Trials
- Phase II Clinical Trials
- Phase III Clinical Trials
- Manufacturing
- Distribution

https://media.defense.gov/2020/Aug/13/200813-D-ZZ999-100.jpg
COVID-19 Vaccine: Phase 3 Trials Underway in the U.S.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxford/Astra Zeneca</td>
<td>Phase 3 preliminary analysis</td>
</tr>
<tr>
<td>Johnson &amp; Johnson</td>
<td>Phase 3 preliminary analysis</td>
</tr>
<tr>
<td>Pfizer</td>
<td>Phase 3 complete, EUA granted</td>
</tr>
<tr>
<td>Moderna</td>
<td>Phase 3 complete, EUA granted</td>
</tr>
</tbody>
</table>

*Phase 1: 37 vaccines testing safety and dosage
Phase 2: 17 vaccines in expanded safety trials
Phase 3: 13 vaccines in large-scale efficacy tests
Limited: 6 vaccines approved for early or limited use
Approved: 0 vaccines approved for full use

## What Do We Know About the Vaccine Frontrunners?

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Mechanism of Action</th>
<th>Phase</th>
<th>Efficacy Results</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfizer/BioNTech</td>
<td>mRNA</td>
<td>Phase 3 complete, EUA granted</td>
<td>95% efficacy after 170 cases, severe cases 9 placebo vs. 1 vaccine</td>
<td>Requires freezer for storage, efficacy over 94% in pts &gt; 65 years, no safety concerns</td>
</tr>
<tr>
<td>Moderna</td>
<td>mRNA</td>
<td>Phase 3 complete, EUA granted</td>
<td>94.5% efficacy after 95 cases, severe cases 11 placebo vs. 0 vaccine</td>
<td>Stable at refrigerator temp x 30 days, no safety concerns</td>
</tr>
<tr>
<td>Oxford/AstraZeneca</td>
<td>Chimp adenovirus vector</td>
<td>Phase 3 interim analysis</td>
<td>70% efficacy after 131 cases; 90% after half dose/full dose, 62% after 2 full doses</td>
<td>Less stability issues, but safety data remains open question</td>
</tr>
<tr>
<td>J &amp; J</td>
<td>Adenovirus vector</td>
<td>Phase 3 analysis</td>
<td>Unknown</td>
<td>Less stability issue, safety data pending, single dose</td>
</tr>
</tbody>
</table>
mRNA Trial Endpoints

**Primary endpoints:** Starting > 7 or 14 days after second dose of vaccine

- Incident COVID-19 symptomatic infection in those w/o past SARS-CoV-2 infection
- Incident COVID-19 symptomatic infection in those w/ or w/o past SARS-CoV-2 infection

**Secondary endpoints:** Severe COVID-19 infection (>7d or >14d after 2nd dose), Vaccine efficacy in key subpopulations, CDC defined SARS-CoV-2 infection

![Diagram showing criteria for COVID-19 case](image)
# Side effects, contraindications, special populations

<table>
<thead>
<tr>
<th>Vaccine</th>
<th># Doses</th>
<th>Side effects</th>
<th>Pregnancy</th>
<th>Immunosuppressed</th>
<th>Autoimmune</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfizer/BioNTech</td>
<td>50 million 12/2020, 1.3 billion in 2021</td>
<td>Pain, fatigue, HA, muscle, joint pain, chills, fever, vomiting; bell's palsy &gt; after 2\textsuperscript{nd} dose</td>
<td>Minimal data; can be given</td>
<td>Minimal data; can be given</td>
<td>Minimal data; can be given</td>
</tr>
<tr>
<td>Moderna</td>
<td>20 million 12/2020, 80 million in 2021 (US)</td>
<td>Pain, fatigue, HA, muscle, joint pain, chills, fever, vomiting; bell's palsy, allergic rnx; SE &gt; after 2\textsuperscript{nd} dose</td>
<td>Minimal data; can be given</td>
<td>Minimal data; can be given</td>
<td>Minimal data; can be given</td>
</tr>
<tr>
<td>Oxford/AstraZeneca</td>
<td>3 billion in 2021</td>
<td>Pain, fatigue, HA, muscle, joint pain, chills, fever, nausea; Rare transverse myelitis</td>
<td>unknown</td>
<td>unknown</td>
<td>unknown</td>
</tr>
<tr>
<td>J &amp; J</td>
<td>1 billion in 2021</td>
<td>Unknown</td>
<td>Unknown</td>
<td>unknown</td>
<td>unknown</td>
</tr>
</tbody>
</table>
# Reactogenicity: Comparison to Other Vaccines

<table>
<thead>
<tr>
<th>Side Effect</th>
<th>Shingrix</th>
<th>COVID-19 BNT162b2</th>
<th>Flu</th>
<th>Placebo (saline)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Pain</td>
<td>78%</td>
<td>83%</td>
<td>45%</td>
<td>14%</td>
</tr>
<tr>
<td>Redness</td>
<td>38%</td>
<td>5%</td>
<td>13%</td>
<td>1%</td>
</tr>
<tr>
<td>Swelling</td>
<td>26%</td>
<td>6%</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>Myalgia</td>
<td>45%</td>
<td>21%</td>
<td>15%</td>
<td>11%</td>
</tr>
<tr>
<td>Fatigue</td>
<td>45%</td>
<td>47%</td>
<td>18%</td>
<td>33%</td>
</tr>
<tr>
<td>Headache</td>
<td>38%</td>
<td>42%</td>
<td>19%</td>
<td>34%</td>
</tr>
<tr>
<td>Chills</td>
<td>27%</td>
<td>14%</td>
<td>6%</td>
<td>6%</td>
</tr>
<tr>
<td>Fever</td>
<td>21%</td>
<td>4%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>GI Symptoms</td>
<td>17%</td>
<td>11%</td>
<td>7%</td>
<td>12%</td>
</tr>
<tr>
<td>Overall</td>
<td><strong>38%</strong></td>
<td><strong>26%</strong></td>
<td><strong>14%</strong></td>
<td><strong>13%</strong></td>
</tr>
</tbody>
</table>

@JesseOSheaMD
Comparing Pfizer and Moderna Vaccines
Post-Vaccine Safety Surveillance

- v-safe® (after vaccination health checker)
- CDC + FDA
- VAERS (Vaccine Adverse Event Reporting System)
- DoD VAES
- VA ADERS
- CISA (Clinical Immunization Safety Assessments [CISA] Project)

**Active Surveillance**

**Passive Surveillance**

- individual case consults

**Safety Monitoring Timeline**

**Large-linked database monitoring**

CDC VRBPAC Presentation  Dr. Nancy Messonier 12/10/20
• Give patients a v-safe information sheet at the time of vaccination

• Encourage them to enroll and fill out the surveys when prompted

https://vsafe.cdc.gov/
How Many People in the US Are in the Higher Priority Groups?

Vaccine prioritization under NASEM and ACIP priorities
Ordering of vaccination among 144.1 million people in the first 10 NASEM priority groups, accounting for overlap

NASEM
The first ten priority groups, in phases 1a to 2
- Phase 1a
  - Health care workers: 17.0
  - First responders: 2.3m
- Phase 1b
  - Two+ comorbidities: 31.0
  - Age 65+ in congregate setting: 2.3m
- Phase 2
  - Teachers: 13.1
  - Critical risk workers: 8.9
  - One comorbidity: 60.8
  - All age 65+: 6.7

ACIP
One possible reordering of the groups consistent with ACIP ethical principles
- Group 1
  - Health care workers: 17.0
  - Critical risk workers: 9.6
- Group 2
  - Teachers: 14.2
  - Two+ comorbidities: 29.3
- Group 3
  - One comorbidity: 62.7
  - Age 65+ in congregate setting: 0.5m
- Group 4
  - Incarcerated: 6.6
  - Homeless: 6.6

Group sizes vary across the two orderings because they exclude overlaps with preceding groups.
ACIP: McClung et al. ACIP’s Ethical Principles for Allocating Initial Supplies of COVID-19 Vaccine. MMWR. 2020;69:1782-6
Theoretical Vaccine Distribution Timeline

U.S. Vaccine Availability and Eligible Groups

Some Useful Numbers to Gauge Vaccine Timing (Ariadne estimates)
- Healthcare workers & first responders: 19.3M
- Patients with one or more comorbidities: 92M
- Patients over 65 with no comorbidities: 1.3M
- Over 65 in congregate settings: 2.3M
- Essential workers not fitting other categories: 22M
- Homeless: 6.7M
- Incarcerated: 0.7M

Total: ~144M

Number of people in U.S.: 329M

Herd immunity threshold (~70% of total population): 230M

@bob_wachter
Highlights on COVID-19 Vaccines Impact on Travel Sentiment
January 21st, 2021
METHODOLOGY

• Weekly tracking survey of a representative sample of adult American travelers in each of four U.S. regions
• Designed to track traveler sentiment and generate insights into when tourism businesses can expect demand to return and from whom
• Week 45 data (fielded January 15-17) will be presented today
• 1,200+ fully completed surveys collected each wave
• Confidence interval of +/- 2.8%
• Data is weighted to reflect the actual population of each region
A LOOK BACK ON 2020:
What One Word Best Describes How You Feel about Travel?
Feelings About Travel: Historical Perspective

**Marc**

What ONE WORD best describes how you feel about travel right now?

**April**

**May**

**October**

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*Question:* What ONE WORD best describes how you feel about travel right now?
What ONE WORD best describes how you feel about travel in 2021?
A majority of Americans feel their state is moving too slowly in distributing the COVID-19 vaccine, according to a poll released Sunday. Conducted from January 13 to 16, the survey from CBS News and YouGov also suggests that most Americans haven’t received helpful explanations as to why their state’s rollouts are taking so long.

The COVID-19 vaccines from Pfizer and Moderna were both approved for emergency use authorization by the U.S. Food and Drug Administration last month. But as of Saturday, only about 10.6 million Americans have received a vaccine, according to the Centers for Disease Control and Prevention. As of Sunday, there are 22 million reported COVID-19 cases in the U.S., according to data from Johns Hopkins University, and the nation is nearing 400,000 deaths.
PERSONAL HEALTH CONCERNS
MARCH 13, 2020 – JANUARY 17, 2021

CONCERNED ABOUT PERSONAL HEALTH (AVERAGE SCORE ON AN 11-POINT SCALE)

QUESTION: THINKING ABOUT THE CURRENT CORONAVIRUS SITUATION, IN GENERAL, HOW CONCERNED ARE YOU PERSONALLY ABOUT CONTRACTING THE VIRUS?

(Base: Waves 1-45. All respondents, 1,201, 1,200, 1,201, 1,216, 1,263, 1,238, 1,208, 1,204, 1,200, 1,212, 1,223, 1,257, 1,214, 1,214, 1,205, 1,231, 1,365, 1,213, 1,200, 1,206, 1,224, 1,201, 1,202, 1,207, 1,250, 1,225, 1,205, 1,200, 1,205, 1,203, 1,203, 1,204, 1,203, 1,203, 1,205, 1,206, 1,205, 1,205, 1,204, 1,206, 1,201, 1,207, 1,266, 1,223 and 1,205 completed surveys.)
HEALTH CONCERNS (FAMILY & FRIENDS)
MARCH 13, 2020 – JANUARY 17, 2021

CONCERNED ABOUT THE HEALTH OF FAMILY OR FRIENDS
(AVERAGE SCORE ON AN 11-POINT SCALE)

QUESTION: THINKING ABOUT THE CURRENT CORONAVIRUS SITUATION, IN GENERAL, HOW CONCERNED ARE YOU ABOUT YOUR FRIENDS OR FAMILY CONTRACTING THE VIRUS?

(Base: Waves 1-45. All respondents, 1,201, 1,200, 1,201, 1,216, 1,263, 1,238, 1,208, 1,204, 1,200, 1,212, 1,223, 1,257, 1,214, 1,214, 1,205, 1,231, 1,365, 1,213, 1,200, 1,206, 1,224, 1,201, 1,202, 1,207, 1,250, 1,225, 1,205, 1,200, 1,205, 1,203, 1,203, 1,204, 1,203, 1,203, 1,205, 1,206, 1,205, 1,205, 1,204, 1,206, 1,201, 1,207, 1,206, 1,223 and 1,205 completed surveys.)
Question: In the NEXT MONTH, how (if at all) do you expect the severity of the coronavirus situation in the United States to change?

In the next month the coronavirus situation will ________

(Base: Waves 1-45. All respondents, 1,201, 1,200, 1,201, 1,216, 1,263, 1,238, 1,208, 1,204, 1,200, 1,212, 1,223, 1,257, 1,214, 1,214, 1,205, 1,231, 1,365, 1,213, 1,200, 1,206, 1,224, 1,201, 1,202, 1,207, 1,250, 1,225, 1,205, 1,200, 1,205, 1,203, 1,203, 1,204, 1,203, 1,203, 1,205, 1,205, 1,205, 1,204, 1,206, 1,201, 1,207, 1,206, 1,225 and 1,205 completed surveys.)
FEELINGS ABOUT A COVID-19 VACCINE
How much do you agree with the following statement?

**Statement:** I’m not traveling until I am able to get a vaccine.

(Base: Waves 6-45. All respondents, 1,238, 1,208, 1,204, 1,200, 1,212, 1,223, 1,257, 1,214, 1,214, 1,205, 1,231, 1,365, 1,213, 1,200, 1,206, 1,224, 1,201, 1,202, 1,207, 1,250, 1,225, 1,205, 1,200, 1,205, 1,203, 1,203, 1,204, 1,202, 1,203, 1,204, 1,205, 1,206, 1,205, 1,205, 1,204, 1,206, 1,201, 1,207, 1,206, 1,225 and 1,205 completed surveys.)
How much do you agree with the following statement?

Statement: I’m not traveling until vaccines are made widely available.

(Base: Waves 41-45. All respondents, 1,201, 1,207, 1,206, 1,225 and 1,205 completed surveys.)
EXPECTED SAFETY OF COVID-19 VACCINES

Question: How safe do you expect a COVID-19 vaccine will ultimately be? (Select one)

(Base: Waves 45 data. All respondents, 1,205 completed surveys. Data collected Jan 15-17, 2021)
**Question:** Do you expect that you will take one of the recently developed COVID-19 vaccines?

(Base: Waves 45 data. All respondents, 1,205 completed surveys. Data collected Jan 15-17, 2021)
WHEN AMERICAN TRAVELERS EXPECT TO BE VACCINATED AS OF JANUARY 17TH

EXPECTED VACCINATION BY JUNE 2021

BY GENERATION:
- Millennials/Gen Z: 52.7%
- Gen X: 56.5%
- Boomers: 68.6%

BY REGION:
- West: 66.9%
- Midwest: 61.3%
- Northeast: 62.8%
- South: 54.3%

**QUESTION:** GIVEN WHAT YOU KNOW NOW, IN WHICH MONTH DO YOU EXPECT TO RECEIVE A VACCINE? (SELECT ONE)

(IF YOU ARE UNCERTAIN, SELECT THE MONTH YOU THINK IT IS MOST LIKELY YOU WILL GET A VACCINATION)
Question: Will you have your children take a COVID-19 vaccine? (Select one)

(Base: Wave 45 data. Respondents with school-aged children, 441 completed surveys. Data collected Jan 15-17, 2021)

Yes, 50.4%
No, 27.1%
I don't know, 6.5%
Maybe, 15.9%
SUMMER TRAVEL & CHILDREN’S VACCINATION

Question: Please think now about your family travels NEXT SUMMER. Imagine that by next summer COVID-19 vaccinations have been widely distributed amongst adults, but children have not yet been widely vaccinated. Your children have not yet been vaccinated.

Would this situation be likely to stop you from taking a family vacation next summer? (Select one that best describes you)

Yes, I won't travel if the... 25.8%
Maybe, I'd assess the... 25.7%
This would likely stop... 32.4%
I don't know / n not sure 11.8%
Applicable 4.2%

(Base: Wave 39 data. Respondents with school age children they travel with, 353 completed surveys. Data collected December 4-6, 2020)
**Question:** Does recent news about vaccine developments affect your optimism about life returning to normal (or near normal) in the next SIX (6) MONTHS? (Select one to fill in the blank)

The vaccine news has made me __________________ about life returning to normal (or near normal) in the next six months.

(Base: Waves 45 data. All respondents, 1,205 completed surveys. Data collected Jan 15-17, 2021)
VACCINES AND OPTIMISM FOR SAFE TRAVEL

**Question:** Does recent news about vaccine developments affect your optimism about being able to travel safely in the next SIX (6) MONTHS? (Select one to fill in the blank)

The vaccine news has made me __________________ about BEING ABLE TO TRAVEL SAFELY in the next six months.

(Base: Waves 45 data. All respondents, 1,205 completed surveys. Data collected Jan 15-17, 2021)
Question: Have you begun planning (or booking) any future travel in anticipation of the COVID-19 vaccine being widely available? (Select one)

(Base: Waves 45 data. All respondents, 1,205 completed surveys. Data collected Jan 15-17, 2021)

Yes, 31.4%

No, 68.6%

Millennials or younger – 42.6%
Gen X – 31.4%
Baby Boomers or older – 20.2%
**Question:** If proof of having taken a vaccine is required of all attendees at a live event or festival, how would that affect your level of comfort in attending the event? (Select one to complete the sentence)

If all attendees were required to have taken a vaccine, I’d be _______________ attending.

(Base: Waves 45 data. All respondents, 1,205 completed surveys. Data collected January 15-17, 2021)
KEY TAKEAWAYS

• Right now, 58.6% of Americans expect to take a COVID-19 vaccine and the majority expect they will be inoculated by this June

• Older Americans are likeliest to feel the current COVID vaccines are safe and most willing to take one. Younger travelers, while not as likely as older travelers to take a vaccine, are likeliest to be planning travel in anticipation of vaccines being widely available

• Despite challenges, vaccine distribution is still driving optimism about a return to normal—and travel normal—in the next 6 months
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TORI EMERSON BARNES
Executive Vice President, Public Affairs and Policy
U.S. Travel Association