2021 Vaccine (Space) Odyssey

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Disclosure

I, Robert Hopkins, have been asked to disclose any relevant financial relationships with ACCME-defined commercial entities that are either providing financial support for this program or whose products or services are mentioned during this presentation.

I have no relevant financial relationships to disclose.

I may discuss the use of vaccines in a manner not approved by the U.S. Food and Drug Administration, but in accordance with ACIP recommendations.

At the conclusion of my presentation, participants will:

- Understand the effects on aging on immune function and act using this knowledge in implementing adult immunization activities
- Be able to put processes in place to support shared decision making in accord with ACIP recommendations
- Understand and use effective communication techniques to diagnose and address vaccine hesitancy
- Understand and develop strategies to implement and/or refine COVID vaccination in their settings

Age and immunity

- Immune responses to infection and vaccines change with biologic aging
- May be further modified by certain chronic infections
  - CMV
  - EBV
- Can impact choice, benefits of some vaccines
- Many medical diagnoses and treatments have additional impact
  - beyond scope of this discussion but must be acknowledged

To summarize: We still have a lot to learn!

Immunosenescence=
Age related decline in immune function

- Affects demonstrated in innate and adaptive immunity
  - Changes in T- and B-lymphocyte populations and function
  - Connection between lymphocyte changes and clinical outcomes remains obscure
- Increase in susceptibility to infections
- Decreased responses to many vaccines
  - Successes with novel vaccine approaches

Overcoming Immunosenescence

- Increasing Antigen Dose
  - Live Zoster vaccine beneficial but…
  - HD Influenza vaccine
- Adjuvants
  - MF59 in Adjuvanted Influenza Vaccine
  - CpG1018 Adjuvant in New Hepatitis B vaccine

Ongoing Challenges in Immunizing Older Adults

- Personalized Vaccinology
  - Risk v. Reward [Reactogenicity and Increased Efficacy]
  - We still have a great deal to learn…
- Vaccine target examples- diseases affecting age extremes..
  - Varicella-Zoster
    - Live-Attenuated childhood vaccine highly effective 2 dose regimen
    - Live Zoster vaccine [High dose] effective but rapid waning of effectiveness in older, with time
    - Adjuvanted Subunit Vaccine: Highly effective and durable across ages
  - RSV:
    - Vaccine approaches for older and younger patients may need to be very different…
- Coronaviruses…
  - Multiple vaccine platforms and ongoing investment may lead to insights well beyond COVID-19 disease prevention…

Shared Clinical Decision Making

- Shared decision making is a new concept in vaccinology: **nuance**

  SDM is not new to medicine 'at large'…

- Recommended by ACIP for vaccines where benefits are more nuanced than 'recommended for all who meet criterion'
  - HepB in adults 60+ with diabetes
  - HPV in children 9-10 years, adults 27-45 years
  - MCV4 in adults 19-23 years
  - PCV13 in adults 65 and older
  - VAR in HIV patients with CD4 ≥200 cells/mm3

https://www.cdc.gov/vaccines/acip/acip-scdm-faqs.html

Shared Decision Making: ACIP Guidance

- Unlike routine, catch-up, and risk-based recommendations, shared clinical decision-making vaccinations are not recommended for everyone in a particular age group or everyone in an identifiable risk group. Rather, shared clinical decision-making recommendations are individually based and informed by a decision process between the health care provider and the patient or parent/guardian.
- The key distinction between routine, catch-up, and risk-based recommendations and shared clinical decision-making recommendations is the default decision to vaccinate.
- Generally, ACIP makes shared clinical decision-making recommendations when individuals may benefit from vaccination, but broad vaccination of people in that group is unlikely to have population-level impacts.
- ACIP to provide basis for SDM for vaccines with this recommendation

https://www.cdc.gov/vaccines/acip/acip-scdm-faqs.html

WHY SDM re: HBV in older Diabetics?

- Increased risk for HBV in patients with DM
  - Greater risk in those performing SMBG, using injectables
  - Greater risk in those in communal/residential care facilities
- Chronic liver disease in DM [NAFLD, NASH]
- Response to Hepatitis vaccine
  - Very high in Childhood through age 40
  - Lower with older age
  - Lower with obesity
  - Lower with longer duration of diabetes
- Vaccine [Do not mix products, Do not need to start over if delayed series completion]
  - Recombivax HB *or* Engerix B: 3 doses 0,1-2, 6 months
  - Heplisav-B 2 doses 0, 1 month
  - ESRD high dose vaccine…

https://www.cdc.gov/diabetes/pubs/pdf/hepb_vaccination.pdf
https://www.ohsu.edu/sites/default/files/2020-01/FINAL%20HBV%20in%20patients%20with%20DM%20brief.pdf
https://www.cdc.gov/vaccines/acip/recs/grade/hepb.html
https://www.nature.com/articles/srep27251
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3507602/

WHY SDM re: HPV vaccination?

- HPV 9 Vaccination: Routinely recommended at 11-12 years, range 9-26
  - SDM: May start as early as 9 years
  - SDM: May give to adults 26-45
- Dosing: Do not start over if completion of series is delayed
  - Initial vaccination before 14 years*: 2 doses [0, 6-12 months (minimum interval 5 mo.)]
  - Initial vaccination at/after 15 years: 3 doses [0, 1-2 mo (4 wk), 6 mo (12 wk, 5 mo.)]
  - Do not give during pregnancy or give additional doses after complete series
- Children 9-10 at increased risk may warrant early HPV [SA, assault]
- Most benefit of HPV vaccination is in women 11-26
- Selected persons aged 26-45 at increased risk and may benefit from HPV vaccination [Unvaccinated, new partner]

https://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/hpv.html
https://www.usnews.com/news/health-news/articles/2021-03-26/hpv-infections-are-plummeting-due-to-widespread-vaccination

*2 dose series not appropriate in HIV, Immune Compromised

WHY SDM re: MenB vaccination in persons 16-23?

SDM: MenB series for average risk persons aged 16–23 years (preferred16–18 years)

Considerations for vaccine administration and timing of administration might include

- Invasive Meningococcal infections are serious [high rates of death and permanent sequelae]
- Serogroup B meningococcal disease is infrequent (avg. 34 serogroup B cases/yr in US persons 16–23 years
- Increased risk: College students, esp. freshmen at 4-year universities, on-campus housing, (incl. sororities and fraternities)

- Protection from MenB vaccines against most strains serogroup B *N. meningitides*
  - Relatively short duration protection (antibody wanes 1–2 years after primary series)
  - MenB vaccination has (to date) shown no effect on meningococcal carriage (MenB vaccines might provide individual protection but herd protection unlikely).
- Dosing: 2-dose series of MenB vaccine
  - MenB-FHbp administered at 0 and 6 months If second dose of MenB-FHbp administered <6 months after 1st, a third dose should be given 4+ months after 2nd OR
  - MenB-4C administered at 0 and ≥1 month
  - MenB vaccines are not interchangeable, and the same vaccine product must be used for all doses.

https://www.cdc.gov/mmwr/volumes/69/rr/rr6909a1.htm

WHY SDM re: Pneumococcal Vaccination?

- UNDERLYING FACTS:
  - All adults 65+ SHOULD RECEIVE PPSV23, SDM RE: PCV13
  - When PCV13 given, best case is PCV13 BEFORE PPSV23
- Rate of invasive pneumococcal infections in seniors 65+ has fallen with routine childhood PCV vaccination
- Combined PCV/PPS strategy in all adults 65+ did not make further statistically significant decline in invasive pneumococcal disease rates
  - [ABCSS data presented to ACIP 2019]
- *However* some individuals may benefit more than 'average' with combined strategy- SDM facilitates MD-patient discussion and informed decision to give or not give PCV13

https://www.cdc.gov/vaccines/vpd/pneumo/hcp/recommendations.html

What factors should be considered in PNC SDM?

- Has this patient already received PCV13 as an adult?
  - If so- no further doses recommended.
  - If not, consider SDM re: administering PCV13..
- Does this patient have risk conditions for IPD in addition to AGE 65+?
  - Risk is *at least additive* if more than one risk condition.
- Is [your local] childhood pneumococcal vaccination rate HI/AVG/LO?
- Does this patient live communally (LTCF, assisted living) or attend ‘daycare’?

https://www.cdc.gov/vaccines/vpd/pneumo/hcp/recommendations.html

WHY SDM re: VAR vaccination in HIV with CD4 200+?

- Near all born before 1980 had ‘wild type’ varicella
- Many children vaccinated since
- Live virus vaccines have a low (but not zero) risk in HIV with CD4 with >200
- SDM: Immunize individuals with HIV and CD4 >200
  - Who have not been previously vaccinated against varicella or
  - Had HCW confirmed Varicella illness
- Dosing: 2 doses at least 4 weeks apart

https://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/varicella.html

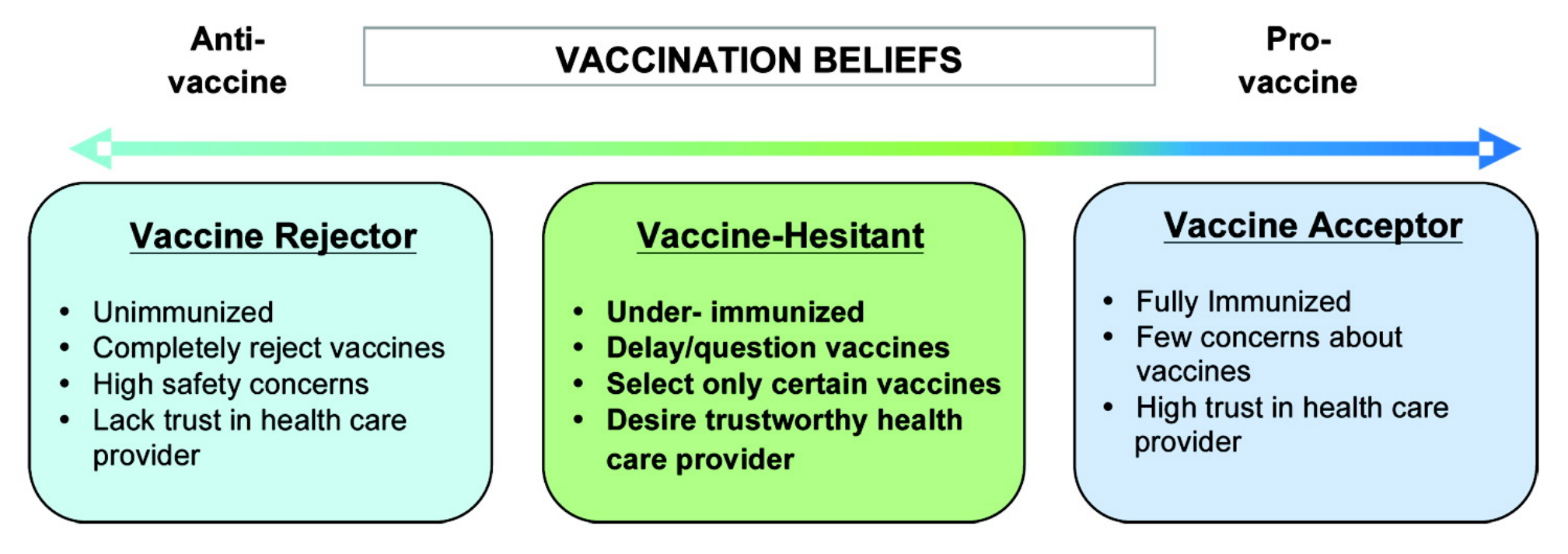
Vaccine Communication (Confidence, Hesitancy and Antivax)

- Confidence
- Hesitancy is a spectrum
- Anti-vaccine
- Bots and Trolls

Definitions

- **Vaccine Acceptance:** Timely receipt of recommended vaccine
- **Vaccine Confidence:**
  - Belief in value of recommended vaccine, including
    - providers administering the vaccine
      - the process that leads to vaccine development, licensure, and review.
- **Vaccine Hesitancy:** Uncertainty in a recommended vaccine, providers administering the vaccine, or the process that leads to vaccine development, licensure.

Spectrum of Vaccine Hesitancy



Gowda, Dempsey. https://www.tandfonline.com/doi/full/10.4161/hv.25085

Principles of Effective Risk Communication

- Do not wait
- Be credible
- Be clear
- Express empathy and show respect
- Acknowledge uncertainty and manage expectations

https://www.who.int/risk-communication/training/Module-B3.pdf
https://www.atsdr.cdc.gov/risk/riskprimer/vision.html

Strategies to Combat Mistrust, Build Public Confidence

- Develop (*or* renew) partnerships with community organizations
- Dialog and empower trusted messengers who have deep ties in community
- Use multiple communication channels to meet needs of those in community
- Begin to (*or* continue to) work toward racial equality
- Allow and encourage public ownership of vaccination and benefits to community as well as individuals
- Measure and communicate inequities in vaccine distribution

Adapted from https://www.nap.edu/catalog/26068/strategies-for-building-confidence-in-the-covid-19-vaccines accessed 4/7/2021

Decreasing Hesitance

- Trust provider
- Healthcare team all ‘on same page’ re: vaccination
- Strong provider recommendation
- Address patients questions supportively
- Minimize ‘hassle factor’- simplify vaccine access
- Minimize out of pocket cost

Communication principles for Groups

- Know your material
  - Be honest
  - Acknowledge unknowns
- Let audience ask questions without fear or intimidation
- Be kind, speak nicely, offer empathy
- Find, start with points of agreement
- Collaborate with trusted local experts
- Spokespeople who look like and understand audience experiences are more likely to be trusted.
- Do not bludgeon/berate/bully

Interventions that work in the office [1:1]:

Truth will set you free
Trust takes time
The Messenger matters

- Assess specific concerns, questions
- Speak to patient/family interests, motivations and goals
- Stories generally are more powerful than science or Data
- Serial assessment, followup
- Fear, scolding, chiding do NOT work
- Focus on hesitant, not the ‘hard cases’

National Academies of Sciences, Engineering, and Medicine 2021. Strategies for Building Confidence in the COVID-19 Vaccines. Washington, DC: The National Academies Press. https://doi.org/10.17226/26068.

Anti-Vaccine Movement

- Not a new issue
- Recent history associated with outbreaks in Measles in EU, US
- 2020-21 Antivaccine, Antimask -> “Personal Freedom”

The Challenges Posed by SoMe [Bots, Trolls, etc.]

- ‘Whack a mole’ efforts to remove anti-science messages
- Twitter, Facebook/Instagram, others have made/making efforts

Challenges in COVID Vaccination

- Vaccines:
  - Making a selection from the ‘Vaccine Menu’
  - Coming attractions
- Communications
  - Speed of development
  - New technologies
  - Benefits of vaccines
  - Acknowledging unknowns
- Vaccination of Children and Adolescents
- Community Immunity Challenge

Vaccines

Yes, we want happy patients and society; but we do not currently have adequate supply in all locations to meet the demands of every individual…

Vaccine	Pfizer-BioNTec	Moderna	Johnson & Johnson
Technology	mRNA	mRNA	Adenoviral Vector
Storage	-25 to -15 C	-15 to -10 C	2-8 C
Doses/Vial	5-6*	10-15*	5
Doses, Route	2 (21d), IM	2 (28d), IM	1, IM
Ages Auth.	16 years +	18 years +	18 years +
ADOL Trials	Complete?	Ongoing	
PED Trials	Started	Started	
Efficacy	95% Pub	94.10% Pub	68.6% Global FDA Brief
Severe Dz	~100%	~100%	85-100%

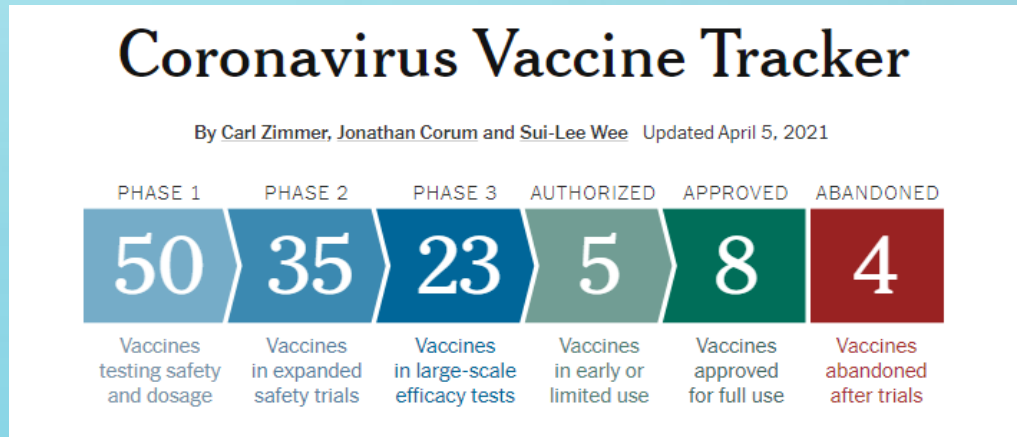
"I want XX vaccine?"
"My son had XX and had YY, so I want ZZ!"
'Well, maybe I'll just wait until I can get XX."
"I have VV condition and my nurse told me I should get XX."

Dr. Anthony Fauci says: "if a coronavirus vaccine is available, regardless of which one, take it." [Dr. Bob Hopkins agrees 100%!!]

What is ‘coming down the pipe?’

- Vaccines for children and adolescents
  - Completed trials: Pfizer 12-15 years — Press release: 2259 participants
  - Trials underway: Moderna 6 m-11 years — Started 3/19/2021
    Pfizer 6 m-11 years — Started 3/2021
    A-Z 6 y-17 years — Started 2/2021 [UK]
  - Planned: Johnson & Johnson 12-18 y then <12 years trials…
- Additional Vaccines likely to be submitted for EUA
  - Novavax [Protein subunit vaccine, 2 doses]
  - AstraZeneca [Adenoviral vector, 2 doses]

https://www.nytimes.com/interactive/2020/science/coronavirus-vaccine-tracker.html



COVID Vaccine Indications

Adults [16+ years] who need or want to reduce the risk for morbidity, mortality and or community spread of COVID-19.

- Pregnant and breastfeeding women MAY be vaccinated
- Immune suppressed MAY be vaccinated- vaccine may not be as effective
  - Little data in these populations
- DO NOT go for vaccination while under quarantine- poses risk to vaccinators.
- MAY DELAY following prior COVID-19 infection
  - Risk/Benefit of early vaccination
- SHOULD delay up to 90 days following any antibody treatment for COVID-19

- DO NOT Vaccinate those with prior serious allergic reaction to vaccine or vaccine component
- DO NOT Vaccinate children under age 16 (Pfizer) or 18 (Moderna)
  - Trials are underway but no studies available (yet)

Vaccination Process Issues

- **Mismatch of Supply and Demand**
  - Vaccine uptake varies widely
    - Racial and ethnic groups
    - Urban and rural
    - Political party
    - Antivax, conspiracy theorists and trolls…
  - Challenging requests for specific vaccine product(s)
- **WE have responsibility + opportunity to minimize disparities, increase uptake**
- **Maintain public health measures while vaccinating patients**
- Vaccination plans facilitate PH measures, post-vaccine observation and management of -rare- anaphylaxis
- Current recommendation: delay other vaccines x 2 weeks (*Caution, no data*)

https://www.cdc.gov/vaccines/covid-19/info-by-product/clinical-considerations.html

Immune Suppressed:
Transplant Recipients

Internet recruitment, US transplant recipients
1 dose mRNA Vaccine 12/16/2020-2/5/2021
n= 436, none with COVID PCR +
Evaluated measurable Ab after first dose
Median 55.9 years, 61% women, 89% white
52% Pfizer, 48% Moderna
Median time since transplant 6.2 years
At median 20 days post-vaccination: 17% detectable Ab

Receiving antimetabolite meds 37% v 63% not
Every decade older- less likely measurable Ab
Pfizer v Moderna 31% v 69%

Concerning but we need to await data for following completion of 2 dose series…

Table. Demographic and Clinical Characteristics of Study Participants, Stratified by Immune Response to the First Dose of SARS-CoV-2 Messenger RNA Vaccine, and Associations With Developing an Antibody Response (N = 436)

	Antibody, No. (%)					
	Detectable (n = 76)	Undetectable (n = 360)	Bivariable IRR (95% CI)	P value	Adjusted multivariable IRR (95% CI)[a]	P value
Age group, y						
18-39	30 (39)	69 (19)				
40-59	18 (24)	132 (37)	0.81 (0.71-0.93)[b]	.003	0.83 (0.73-0.93)	.002
≥60	28 (37)	159 (44)				
Sex[c]						
Female	48 (64)	212 (59)	1.12 (0.73-1.73)[d]	.60		
Male	27 (36)	138 (41)				
Race[e,e]						
Non-White[f]	8 (11)	38 (11)	0.99 (0.51-1.94)[g]	.99		
White	67 (89)	312 (89)				
Type of organ transplant[h]						
Kidney	31 (41)	188 (53)	0.68 (0.45-1.04)[i]	.07		
Liver	28 (37)	50 (14)				
Heart	9 (12)	57 (16)				
Lung	4 (5)	45 (13)				
Pancreas	1 (1)	4 (1)				
Other (multiorgan)	2 (3)	12 (3)				
Time since transplant, y[j]						
<3	13 (17)	106 (30)				
3-6	12 (16)	77 (22)	1.88 (1.21-2.93)[k]	.005	1.45 (0.96-2.20)	.08
7-11	19 (25)	82 (23)				
≥12	31 (41)	89 (25)				
Type of regimen						
Includes anti-metabolite maintenance immunosuppression[l]	28 (37)	292 (81)	0.21 (0.14-0.32)[m]	<.001	0.22 (0.15-0.34)	<.001
Does not include anti-metabolite maintenance immunosuppression	48 (63)	68 (19)				
Vaccine[n]						
mRNA-1273 (Moderna)	52 (69)	152 (43)	2.14 (1.24-3.69)[o]	.006	2.15 (1.29-3.57)	.003
BNT162b2 (Pfizer-BioNTech)	23 (31)	200 (57)				
Enzyme immunoassay manufacturer[p]						
Roche Elecsys	64 (84)	266 (74)	1.71 (0.96-3.05)[q]	.07		
EUROIMMUN	12 (16)	94 (26)				

https://jamanetwork.com/journals/jama/fullarticle/2777685

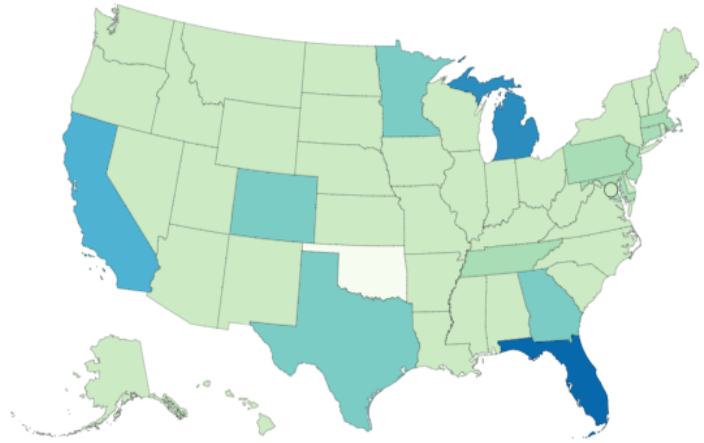
VARIANTS AND VACCINES

US COVID-19 Cases Caused by Variants

Updated Mar. 21, 2021 Languages Print

Variant	Reported Cases in US	Number of Jurisdictions Reporting
B.1.1.7	6390	51
B.1.351	194	27
P.1	54	18

Cases of Variants of Concern in the United States*†



Number of Cases

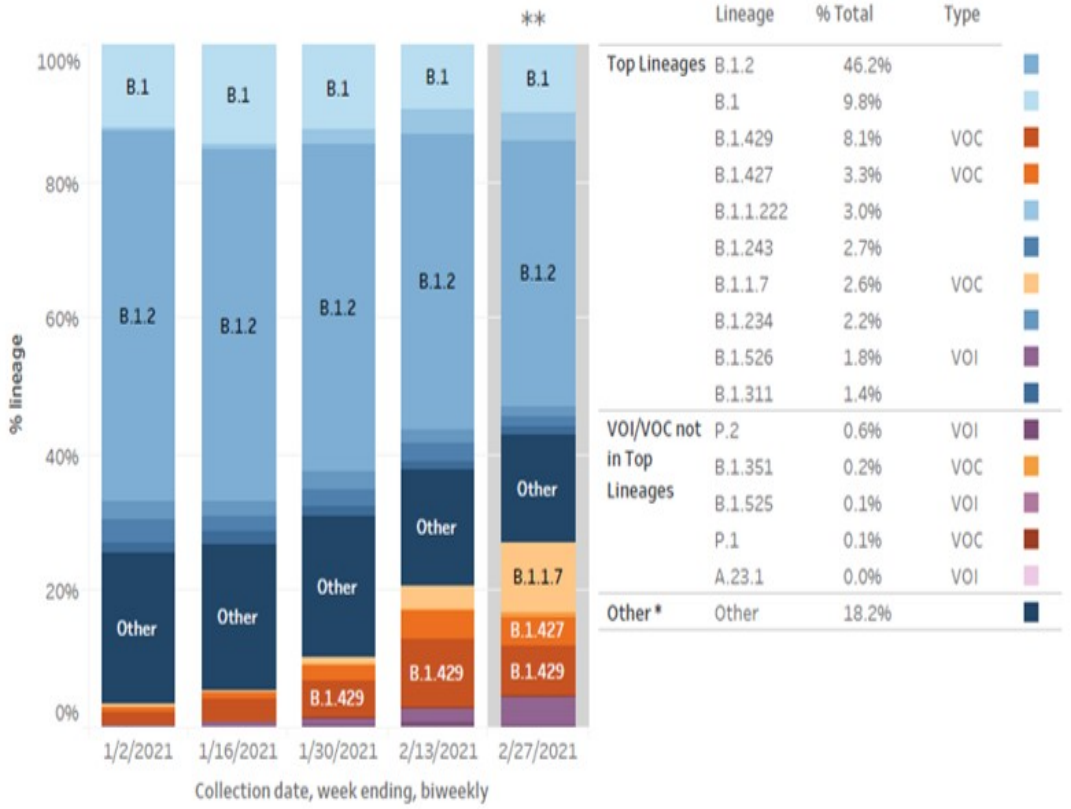
- 0 to 0
- 1 to 150
- 151 to 300
- 301 to 450
- 451 to 600
- 601 to 750
- 751+

Filters

Variant B.1.1.7

Territories AS GU MH FM MP PW PR VI

SARS-CoV-2 Variants Circulating in the United States



Percentages represent the proportion of viruses belonging to the indicated lineage, based on four weeks of data ending Feb 13.

*Other lineages represent >200 additional lineages which are each circulating at ≤2% of viruses.

**Most recent data (shaded in gray) are subject to change as samples from that period are still being processed.

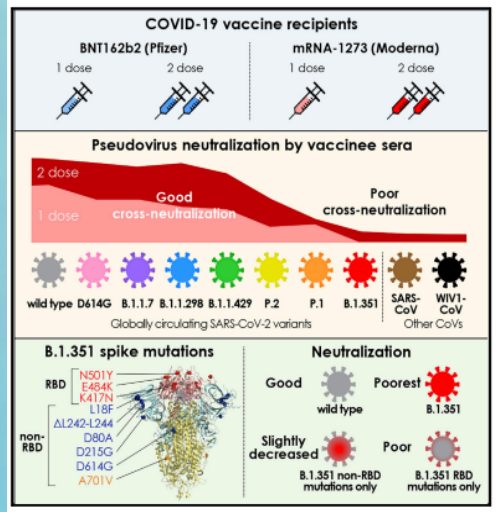
https://www.cdc.gov/coronavirus/2019-ncov/transmission/variant-cases.html
https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/variant-proportions.html
https://jamanetwork.com/journals/jama/fullarticle/2777988 Accessed 3/23, 24/2021

Cell

Article

Multiple SARS-CoV-2 variants escape neutralization by vaccine-induced humoral immunity

Graphical abstract



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In brief

Analyses of sera from individuals vaccinated with one or two doses of mRNA vaccines against 10 circulating variants of SARS-CoV-2 show that P.1 and B.1.351 in particular exhibit limited neutralization by vaccine-induced humoral immunity. This escape was found to be largely mediated by mutations in the receptor-binding domain of SARS-CoV-2 spike.

Highlights

- Numerous variants of SARS-CoV-2-harboring mutations in spike have arisen globally
- mRNA vaccines elicit potent neutralizing activity against homologous pseudovirus
- Cross-neutralization of strains with receptor-binding domain (RBD) mutations is poor
- Both RBD and non-RBD mutations mediate escape from vaccine-induced humoral immunity

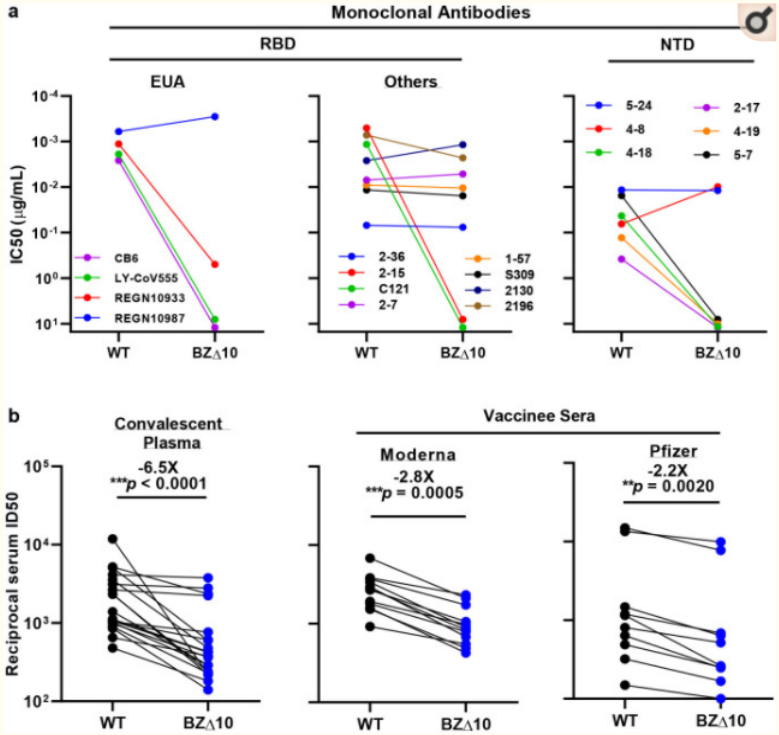


Fig. 1 |

Neutralization of WT and BZΔ10 pseudoviruses by mAbs, convalescent plasma, and vaccinee sera.

a, Changes in neutralization IC50 of select RBD and NTD mAbs. **b,** Changes in reciprocal plasma neutralization ID50 values of convalescent plasma and reciprocal serum ID50 values for persons who received Moderna or Pfizer vaccine. Mean fold change in ID50 relative to the WT is written above the *p* values. Statistical analysis was performed using a Wilcoxon matched-pairs signed rank test. Two-tailed p-values are reported.

Conclusions:

1. There is no pre-specified clinical trial assessment of vaccine protection against COVID variants
2. Limited in-vitro data similar to this.
3. Best clinical data
   - J&J Ph. 3 trial, VE (countries in RCT)
   - Novavax trial? [*press release*]
   - AZ trial? [*press release*]
4. Neutralizing Ab titers lower but likely high enough for some protection
5. Moderna, Pfizer, Novavax are working on modified vaccines targeting variants…

Laboratory assessment of Vaccine Neutralizing Ab v. Variants

Panel A: B1.351

Panel B: P-1

Panel C: Hopkins analysis…

https://www.sciencedirect.com/science/article/pii/S0092867421002981#undfig1
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7941628/

Primary Immune Correlates of Protection=

Not YET DEFINED

No commercial test has been formally evaluated or approved to assess post-vaccination immunity.

- Neutralizing antibodies
- Virus-Specific Helper T-cells
- Cytotoxic T-cells

Vaccine Value to Community: Israel early experience

The five outcomes of interest were documented SARS-CoV-2 infection confirmed by positive PCR test, documented symptomatic Covid-19, hospital admission for Covid-19, severe Covid-19 (according to National Institutes of Health criteria)[8] and death from Covid-19. Each of these outcomes includes the outcomes that follow it. In a supplementary analysis, we also evaluated an additional outcome, SARS-CoV-2 infection without documented symptoms, as an imperfect proxy for asymptomatic infection (since mild symptoms may not be documented).

STUDY POPULATION

Of 1,503,216 CHS members who were vaccinated, 1,163,534 were eligible for the study and 596,618 were matched to unvaccinated controls

This study evaluates the effectiveness of the novel BNT162b2 mRNA vaccine[1] against Covid-19 in a nationwide mass vaccination setting. Estimated vaccine effectiveness during the follow-up period starting 7 days after the second dose was 92% for documented infection, 94% for symptomatic Covid-19, 87% for hospitalization, and 92% for severe Covid-19. Estimated effectiveness during days 14 through 20 (after one dose) and days 21 through 27 (gradual shifting between the first and second vaccine doses) was 46% and 60% for documented infection, 57% and 66% for symptomatic Covid-19, 74% and 78% for hospitalization, 62% and 80% for severe Covid-19, and 72% and 84% for Covid-19–related death, respectively.

The NEW ENGLAND JOURNAL of MEDICINE

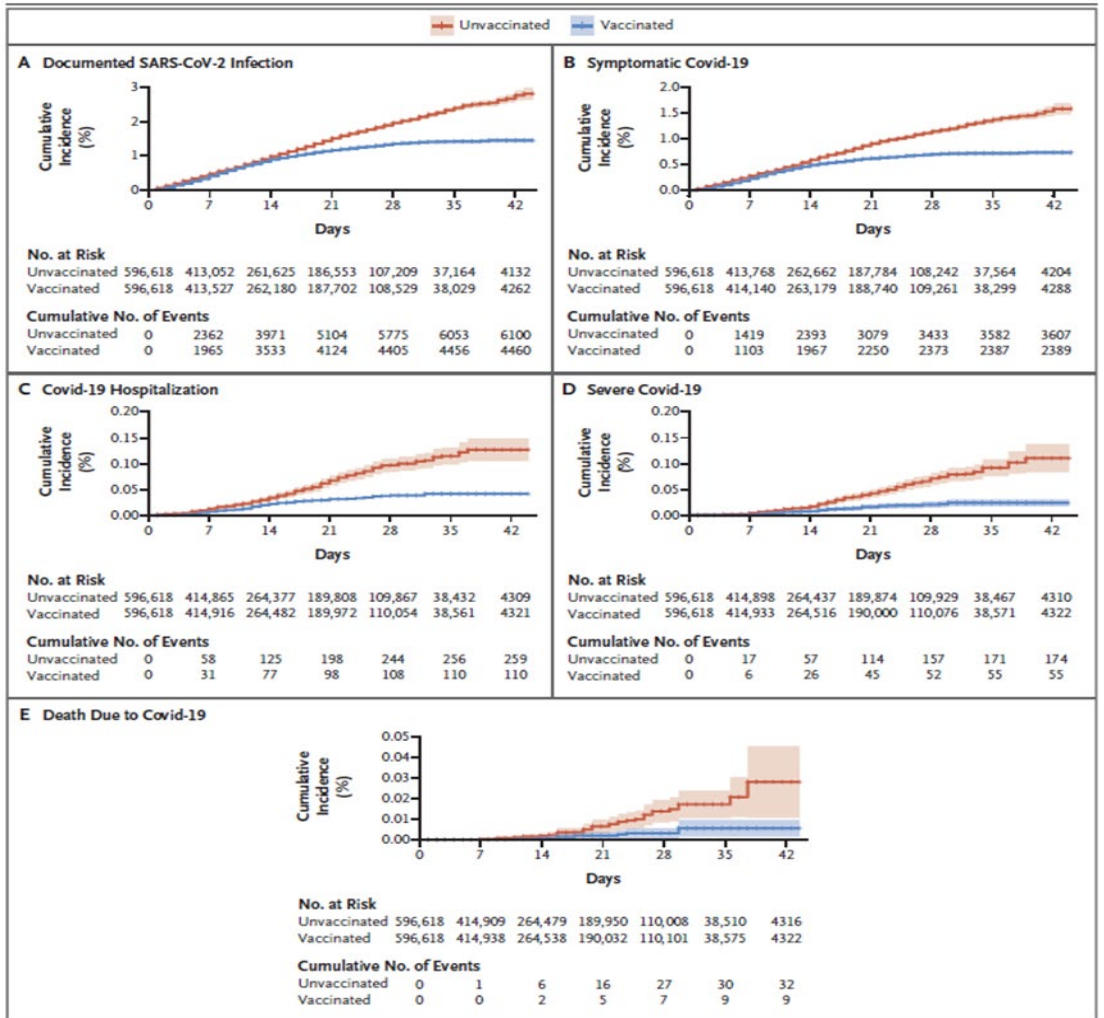


Figure 2. Cumulative Incidence of the Five Outcomes.

Cumulative incidence curves (1 minus the Kaplan–Meier risk) for the various outcomes are shown, starting from the day of administration of the first dose of vaccine. Shaded areas represent 95% confidence intervals. The number at risk at each time point and the cumulative number of events are also shown for each outcome. Graphs in which all data are shown with a y axis scale from 0 to 100 (along with the data shown, as here, on an expanded y axis) are provided in Figure S8 in the Supplementary Appendix.

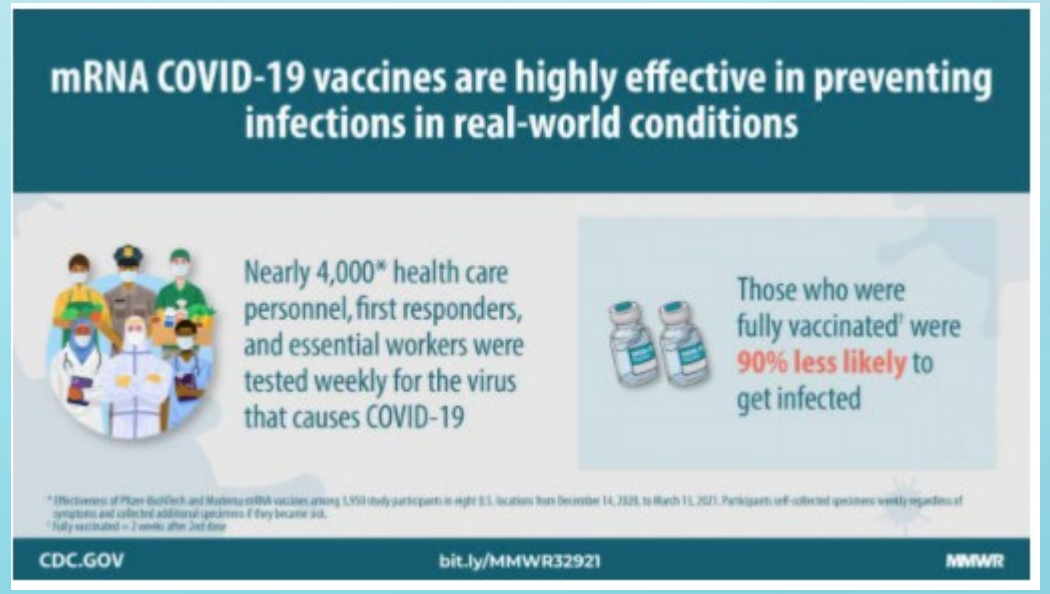
https://www.nejm.org/doi/full/10.1056/NEJMoa2101765

Vaccine Protection from Infection: Real World HCW

Characteristic	No. (column %) of participants	SARS-CoV-2 infection		Unvaccinated	Vaccinated with ≥1 dose*	
		No. (row %)	p-value†	No. (row %)	No. (row %)	p-value†
Total	3,950 (100)	205 (5.2)	—	989 (25.0)	2,961 (75.0)	—
Cohort location						
Phoenix, Arizona	555 (14.1)	39 (7.0§)	<0.001	147 (26.5)	408 (73.5)	<0.001
Tucson, Arizona	1,199 (30.4)	79 (6.6§)		325 (27.1)	874 (72.9)	
Other, Arizona	320 (8.1)	16 (5.0§)		88 (27.5)	232 (72.5)	
Miami, Florida	221 (5.6)	19 (8.6§)		118 (53.4)	103 (46.6§)	
Duluth, Minnesota	448 (11.3)	12 (2.7)		47 (10.5)	401 (89.5§)	
Portland, Oregon	468 (11.8)	4 (0.9)		61 (13.0)	407 (87.0§)	
Temple, Texas	289 (7.3)	18 (6.2§)		71 (24.6)	218 (75.4)	
Salt Lake City, Utah	450 (11.4)	18 (4.0)		132 (29.3)	318 (70.7)	
Sex						
Female**	2,453 (62.1)	109 (4.4)	0.007	529 (21.6)	1,924 (78.4)	<0.001
Male	1,497 (37.9)	96 (6.4)		460 (30.7)	1,037 (69.3)	
Age group, yrs						
18–49	2,839 (71.9)	146 (5.1)	0.83	735 (25.9)	2,104 (74.1)	0.48
≥50	1,111 (28.1)	59 (5.3)		254 (22.9)	857 (77.1)	
Race						
White	3,408 (86.3)	178 (5.2)	0.92	814 (23.9)	2,594 (76.1)	<0.001
Other	542 (13.7)	27 (5.0)		175 (32.3)	367 (67.7)	
Ethnicity						
Hispanic/Latino	674 (17.1)	57 (8.5)	<0.001	236 (35.0)	438 (65.0)	<0.001
Other	3,276 (82.9)	148 (4.5)		753 (23.0)	2,523 (77.0)	
Occupation††						
Primary health care personnel	835 (21.1)	16 (1.9)	<0.001	65 (7.8)	770 (92.2)	<0.001
Other allied health care personnel	1,335 (33.8)	67 (5.0)		242 (18.1)	1,093 (81.9)	
First responder	852 (21.6)	75 (8.8)		308 (36.2)	544 (63.8)	
Other essential and frontline worker	928 (23.5)	47 (5.1)		374 (40.3)	554 (59.7)	
Chronic condition						
None§§	2,723 (68.9)	141 (5.2)	0.92	711 (26.1)	2,012 (73.9)	0.11
≥1	1,227 (31.1)	64 (5.2)		278 (22.7)	949 (77.3)	

TABLE 2. Person-days, SARS-CoV-2 infections, and vaccine effectiveness among health care personnel, first responders, and other essential and frontline workers, by messenger RNA immunization status — eight U.S. locations, December 14, 2020–March 13, 2021

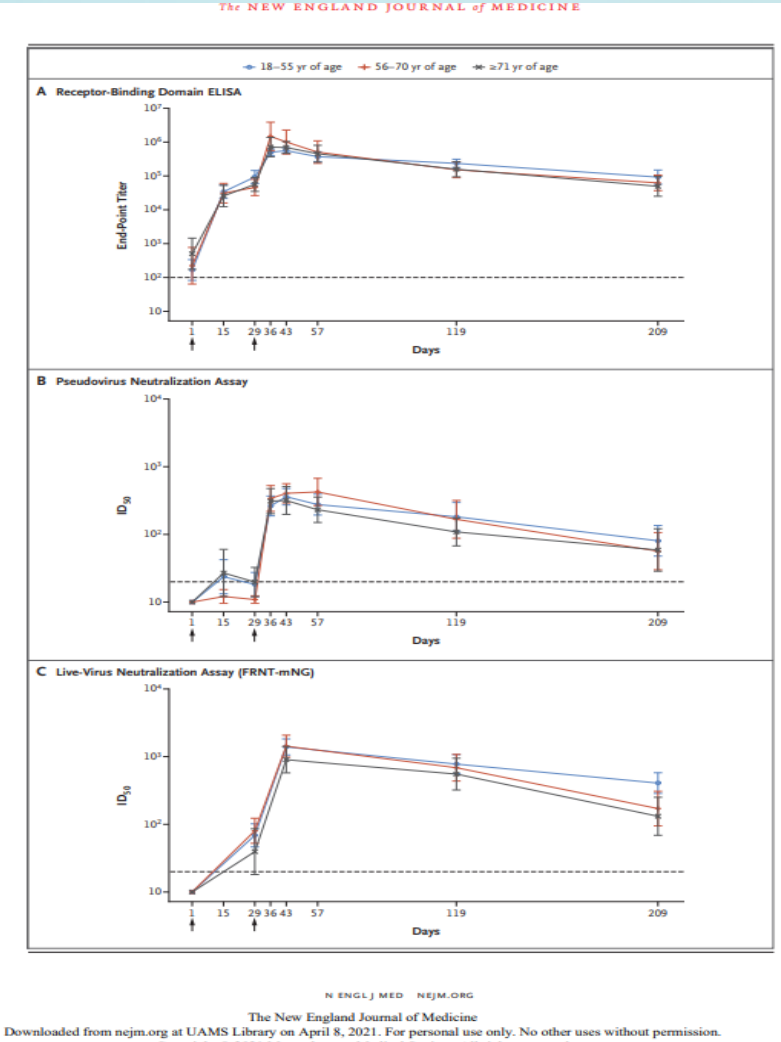
COVID-19 immunization status	Person-days	SARS-CoV-2 infections		Unadjusted vaccine effectiveness*	Adjusted vaccine effectiveness*,†
		No.	Incidence rate per 1,000 person-days	% (95% CI)	% (95% CI)
Unvaccinated	116,657	161	1.38	N/A	N/A
Partially immunized	41,856	8	0.19	82 (62–91)	80 (59–90)
≥14 days after receiving first dose only§	15,868	5	0.32		
≥14 days after first dose through receipt of second dose	25,988	3	0.12		
Fully immunized					
≥14 days after second dose	78,902	3	0.04	91 (73–97)	90 (68–97)



Thompson MG, Burgess JL, Naleway AL, et al. Interim Estimates of Vaccine Effectiveness of BNT162b2 and mRNA-1273 COVID-19 Vaccines in Preventing SARS-CoV-2 Infection Among Health Care Personnel, First Responders, and Other Essential and Frontline Workers — Eight U.S. Locations, December 2020–March 2021. MMWR Morb Mortal Wkly Rep 2021;70:495–500. DOI: http://dx.doi.org/10.15585/mmwr.mm7013e3external icon

Durability…

Moderna: 33 healthy adult participants in an ongoing phase 1 trial,[2-4] stratified according to age, at 180 days after the second dose of 100 µg (day 209)



NEWS / Pfizer and BioNTech Confirm High Efficacy and No Serious Safety Concerns Through Up to Six Months Following Second Dose in Updated Topline Analysis of Landmark COVID-19 Vaccine Study

PFIZER AND BIONTECH CONFIRM HIGH EFFICACY AND NO SERIOUS SAFETY CONCERNS THROUGH UP TO SIX MONTHS FOLLOWING SECOND DOSE IN UPDATED TOPLINE ANALYSIS OF LANDMARK COVID-19 VACCINE STUDY

Thursday, April 01, 2021 - 06:45am

- *Analysis of 927 confirmed symptomatic cases of COVID-19 demonstrates BNT162b2 is highly effective with 91.3% vaccine efficacy observed against COVID-19, measured seven days through up to six months after the second dose*
- *Vaccine was 100% effective in preventing severe disease as defined by the U.S. Centers for Disease Control and Prevention and 95.3% effective in preventing severe disease as defined by the U.S. Food and Drug Administration*
- *Vaccine was 100% effective in preventing COVID-19 cases in South Africa, where the B.1.351 lineage is prevalent*
- *Vaccine safety now evaluated in more than 44,000 participants 16 years of age and older, with more than 12,000 vaccinated participants having at least six months follow-up after their second dose*
- *The companies plan to share these results with worldwide regulatory agencies soon*

https://www.nejm.org/doi/pdf/10.1056/NEJMc2103916?articleTools=true

PUBLIC HEALTH MEASURES

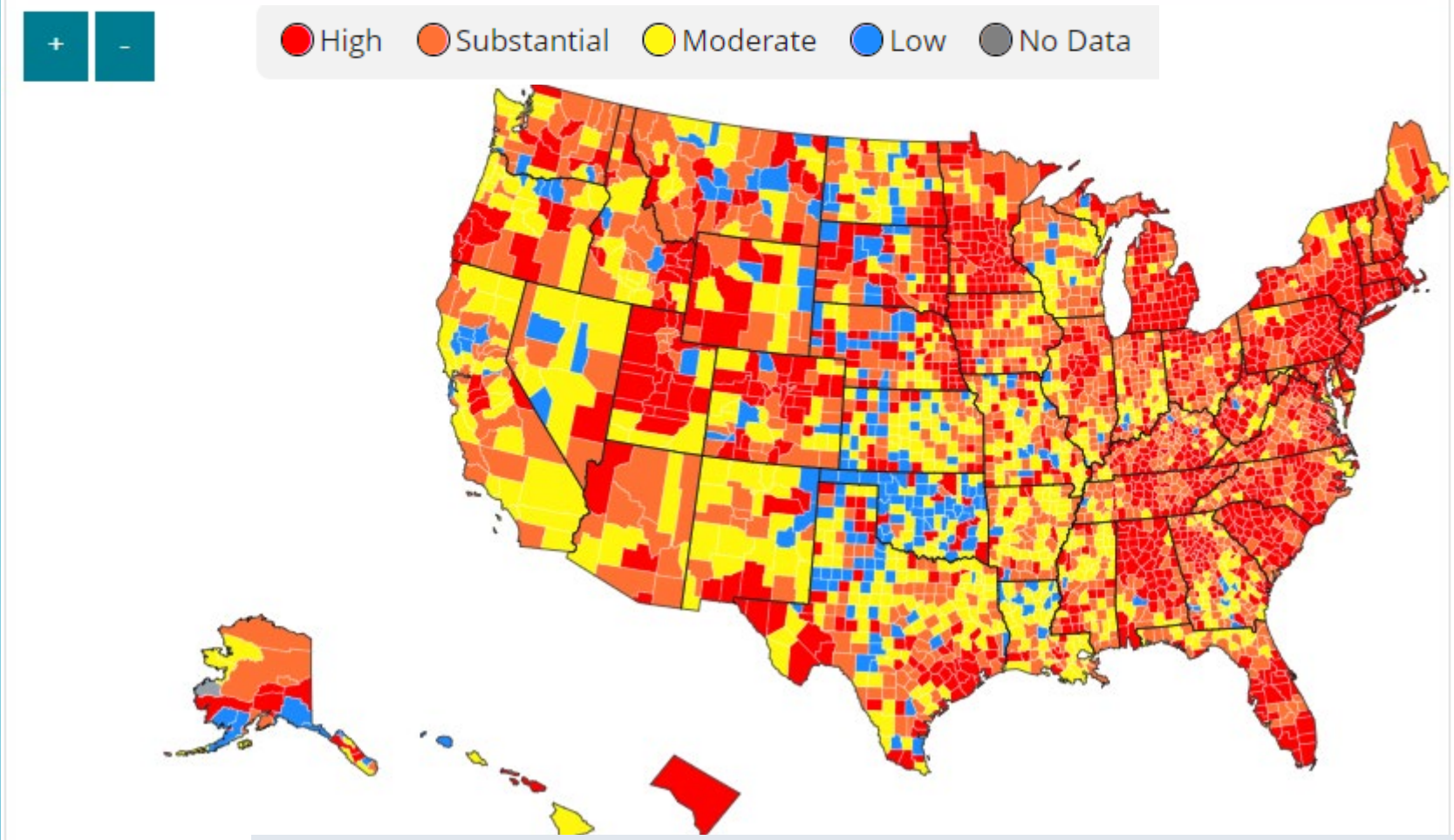
Map Data: Level of Community Transmission

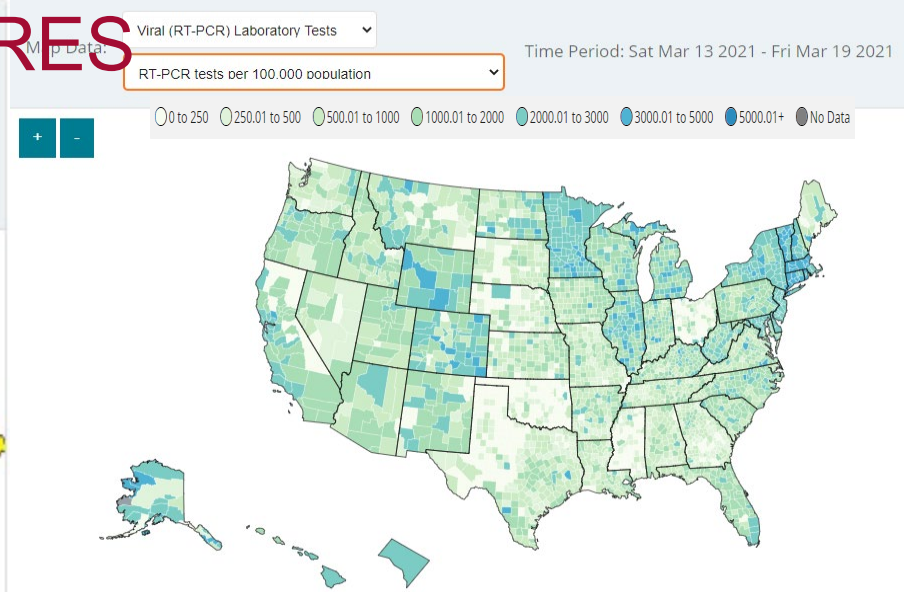
Level of Community Transmission

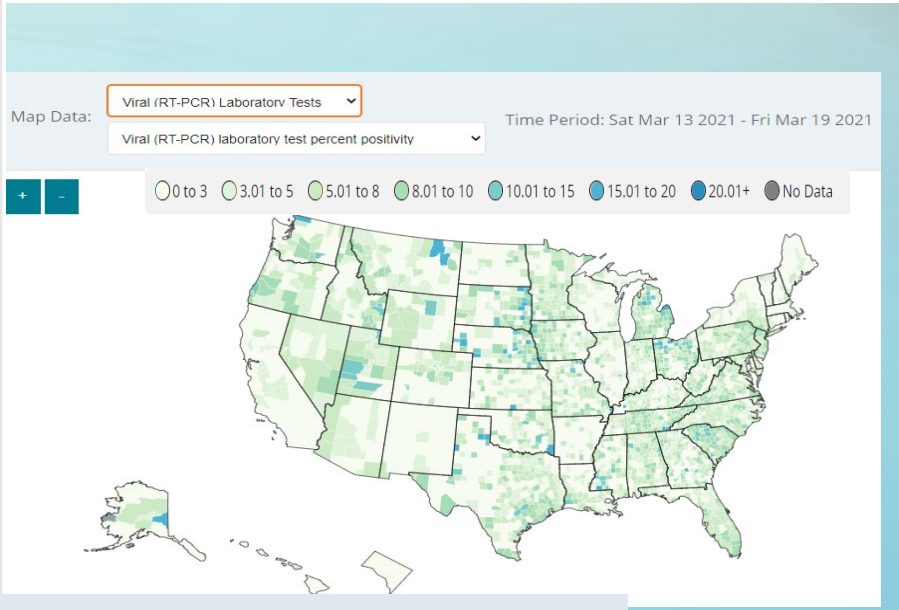
Time Period: Sun Mar 14 2021 - Sat Mar 20 2021

https://covid.cdc.gov/covid-data-tracker/#county-view

Downloaded 3/24/2021 11:00 am







What data should drive decisions to remove public health mandates???

> Level of community transmission?

> Tests/100K population?

> % Positive tests?

> Other (data on variants, COVID data from neighboring states, data on protection from vaccination,…) ?

Common Questions Reprise

Vaccinate in chronic disease?	YES		
Vaccinate in Immune suppressed?	YES		
Vaccinate w/ autoimmune dz?	YES		
Vaccination interval	Pfizer BioNTech	21 days	May delay up to 6 weeks if needed
	Moderna	28 days	May delay up to 6 weeks if needed
	Johnson & Johnson	Single dose	
	Oxford A-Z	*28 days*	*Not yet authorized*
	Novavax	*28 days*	*Not yet authorized*
Vaccination after COVID	Yes, 'complete series' (duration of delay after illness is a discussion point)		
Vaccination after Ab [mono or plasma]	Yes, delay 90 days		
Vaccination and testing	No indication to test before vaccination [*or after vaccination*]		
		No impact on PCR; May cause FP in some Spike protein antigen tests	
		Commercial Ab tests not designed to assess immunity	

Re: SoMe assertions… COVID Vaccines have NO effect on your DNA, fertility/fecundity, cannot give you COVID, do not cause serious side effects or death

https://www.cdc.gov/vaccines/covid-19/hcp/faq.html#:~:text=Current%20SARS%2DCoV%2D2%20infection%20or%20exposure%3A%20Vaccination%20of,for%20them%20to%20discontinue%20isolation

Safety Remains Priority 1

- Multiple overlapping systems in use in US and Internationally
- Rare Anaphylaxis detected and guidance on minimizing risk
- To date VAERS has not detected any safety signals, patterns to suggest vaccine cause in serious adverse events
- Recent reports of lightheadedness, dizziness, fainting after J&J
- WHO Global Advisory Committee on Vaccine Safety (GACVS) has reviewed reports of rare cases of blood clots with low platelets following vaccination with the AstraZeneca COVID-19 vaccine
- J&J Vaccine pause in US recommended by FDA, CDC 4/13/2021
  - 6 cases rare thrombosis in ~6 M vaccines administered

https://www.cdc.gov/coronavirus/2019-ncov/vaccines/safety/safety-of-vaccines.html
https://www.who.int/news/item/07-04-2021-interim-statement-of-the-covid-19-subcommittee-of-the-who-global-advisory-committee-on-vaccine-safety

COVID-19 Vaccine Summary

- Today: 3 safe and highly effective vaccines to prevent COVID-19
  - Likely more vaccines, more doses, more indications are on their way
- Getting vaccine into arms is currently greater challenge than availability
  - Strong recommendation is key
  - Coaching patients/families re: patience, collaboration and continued use of Public Health Measures remain critical
  - Vaccination is a benefit to individual and to community
- We need to continue to learn: safety, efficacy, correlates of protection,…
- We hope to have pediatric trial data [IMMUNIZATION!] in near future
- We cannot forget about the world beyond USA-
  - *Viruses do not respect borders.*
- *We are all in this together!!*

Questions