COVID-19 Vaccines

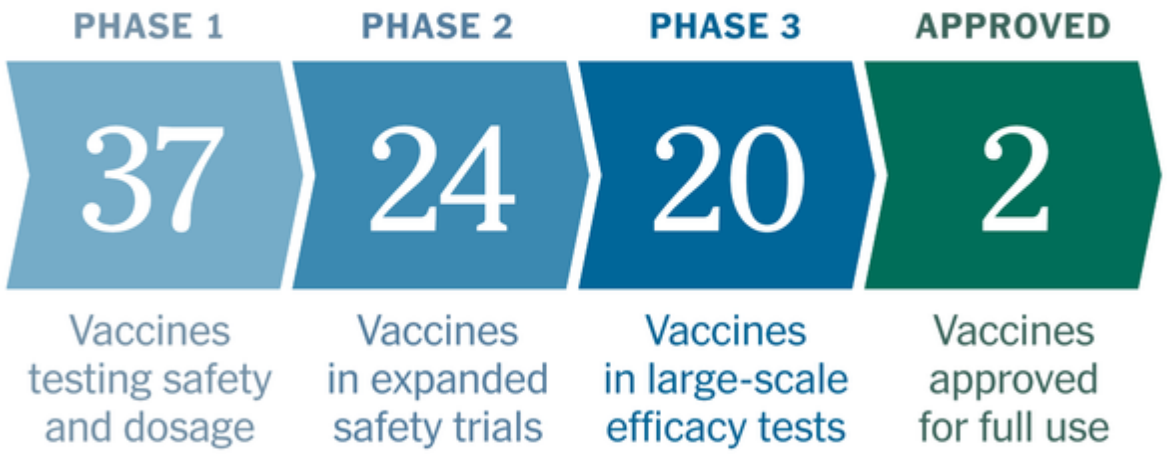
GREATER BROCKTON HEALTH ALLIANCE MEETING – FEBRUARY 5, 2021

Allyson Pinkhover, MPH, CPhT
Substance Use Services Program Manager
BNHC COVID Response Team

Agenda:

- Some overview
- Focus on equity & inclusion
- Addressing vaccine hesitancy
- FAQs & debunking myths

Fun fact: **Coronavirus vaccines** in human trials:



What vaccines exist?

Pfizer

- Received FDA EUA
- mRNA vaccine
- 2 doses, 21 days apart
- Requires extreme cold storage
- 95% effective 7 days after Dose 2

Moderna

- Received FDA EUA
- mRNA vaccine
- 2 doses, 28 days apart
- Requires freezing, but not extreme cold
- 94.1% effective 14 days after Dose 2

Johnson & Johnson

- Expect to have Phase 3 data very soon → will submit for FDA EUA
- Viral vector vaccine
- 1 dose, but 2 doses also being studied
- Frozen for extended storage, refrigerated for use
- Efficacy unknown (need Phase 3 data)

*66% effective

Astra-Zeneca

- Phase 3 data published, have not submitted for FDA EUA
- Viral vector vaccine
- 2 doses, 28 days apart
- Stored in refrigerator
- 70.4% effective after Dose 2

Adapted from: Clinical Resource, *COVID-19 Vaccines. Pharmacist's Letter/Prescriber's Letter.* January 2021.

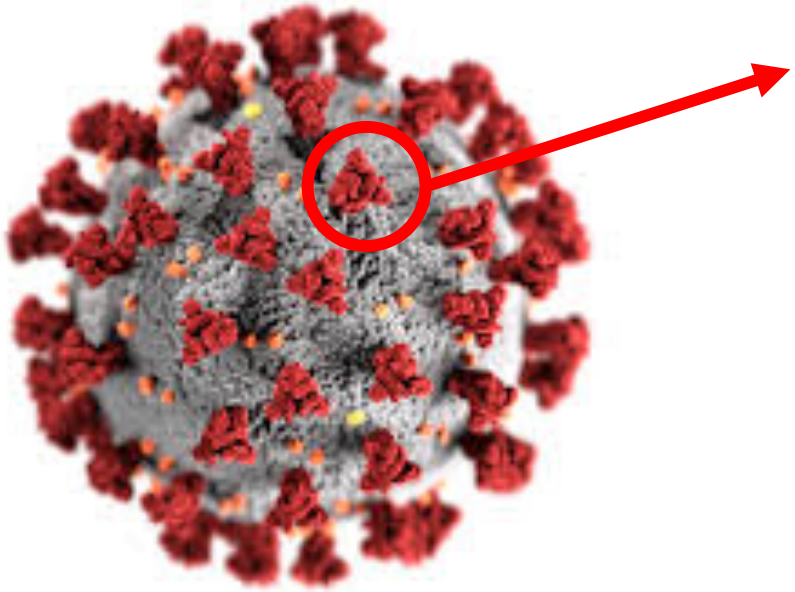
Pfizer - What do we know?

- 2-dose series 21 days apart
- 0.3mL intramuscular injection from a 5-dose multi-dose vial
- Pfizer is requested FDA approval to administer to people age 16 years and older, though children as young as 12 were enrolled in the study
- Phase 1 of the trial enrolled 60 participants, and *everyone* received the vaccine
  - Was only healthy adults to reduce confounding
  - Gradually increasing doses of the vaccine so they could decide what dose to offer the larger study
  - Compared 1µg, 10µg, 20µg, 30µg → determined the 30µg dose produced the best immune response ✓
- Phase 2 enrolled 360 participants
  - Included individuals with higher risk of COVID-19
- Phase 3 (ongoing) has about 44,000 participants
  - Will be following participants for 2 years

Moderna - What do we know?

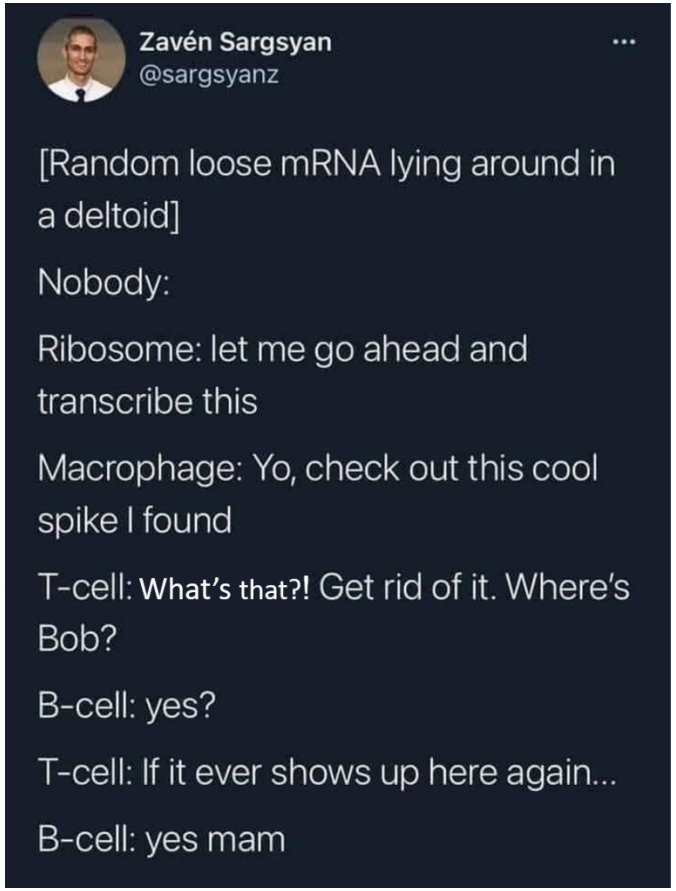
- 2-dose series 28 days apart
- 0.5mL intramuscular injection from a 10-dose multi-dose vial
- Moderna is requested FDA approval to administer to people age 18 years and older
- Did not include youth/adolescents
- Phase 1 of the trial enrolled 120 participants, and *everyone* received the vaccine
  - Was only healthy adults to reduce confounding
  - Gradually increasing doses of the vaccine so they could decide what dose to offer the larger study
  - Compared 25µg, 50µg, 100µg, 250µg → determined the 100µg & 250 µg doses produced the best immune responses; 100µg was selected because it resulted in lower occurrence of side effects from vaccine ✓
- Phase 2 enrolled 600 participants
  - To measure additional immune responses & safety
- Phase 3 (ongoing) has about 30,400 participants
  - Total study timeframe is 25 months

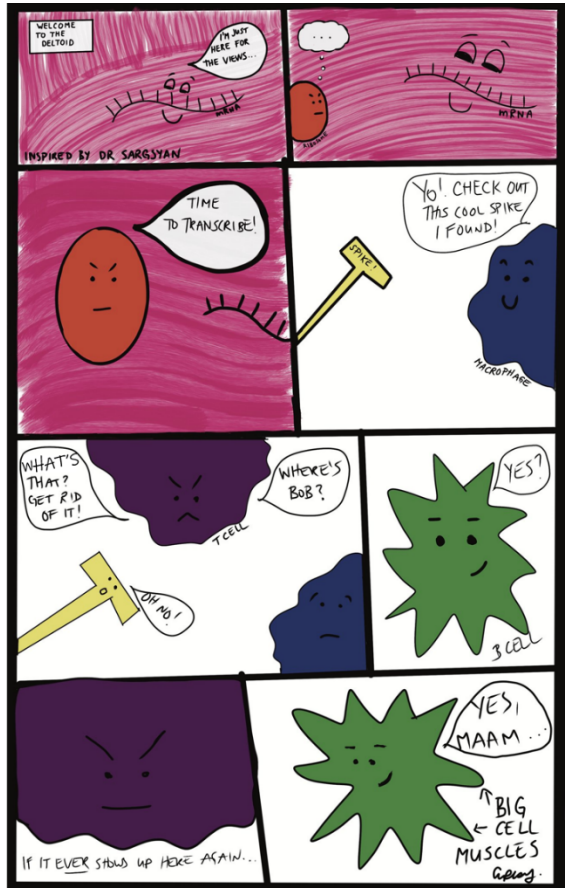
How do the vaccines work?



- The vaccine takes a tiny bit of RNA from the virus, and teaches your body what it looks like (our bodies have never seen COVID before, and they don't know how to fight it)
- The vaccine "teaches" your body how to fight it by focusing on the virus Spike Protein (the ugly little things sticking off the virus – also where the virus gets its name from!)
- This is why sometimes people feel a little "icky" after getting a vaccine – it's your body learning how to respond but you're NOT actually sick

How do the vaccines work?





How do we measure vaccine efficacy?

When Pfizer & Moderna say the vaccines are “95% effective” what does that mean?

People who got the vaccine

Pfizer n=18,198

Moderna n=13,934

Time

Look to see who got COVID-19

Pfizer n=8

Moderna n=5

People who did **not** get the vaccine

Pfizer n=18,325

Moderna n=13,883

Time

Look to see who got COVID-19

Pfizer n=162

Moderna n=90

We do this as a ratio:

Vaccine:

Pfizer: 8/18,198 = 0.00044

Moderna: 5/13,934 = 0.0003588

Placebo:

Pfizer: 162/18,325 = 0.0084

Moderna: 90/13,883 = 0.0065

0.00044/0.0084 = 0.052 x 100 = 5.2%

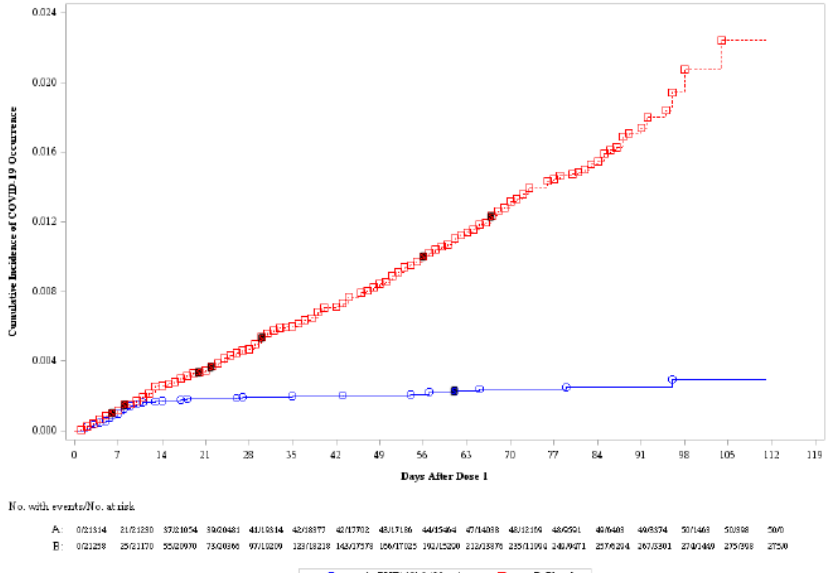
0.0003588/0.0065 = 0.055 x100 = 5.5%

100-5.2% = 94.8%

100-5.5% = 94.5%

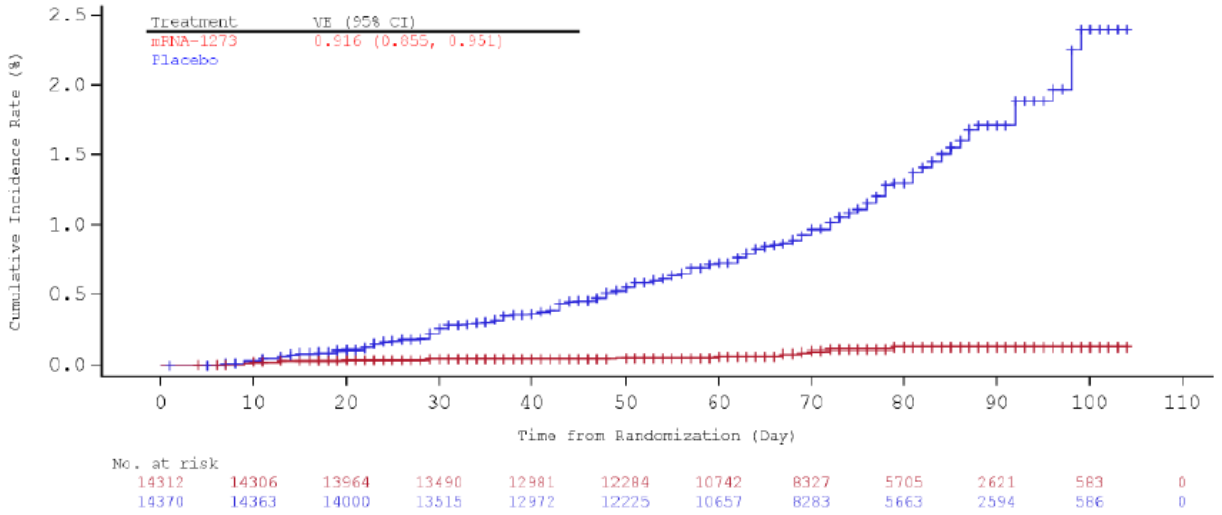
What does that look like?

Figure 13 Cumulative Incidence Curves for the First COVID-19 Occurrence After Dose 1 – Dose 1 All-Available Efficacy Population



Pfizer

Figure 2. Cumulative Incidence Curves for the First COVID-19 Occurrence After Randomization, mITT Set

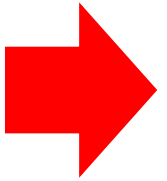


Moderna

What about Adverse Events/Side Effects?

Systemic events in the younger group compared with the older group, with frequencies increasing with number of doses (Dose 1 vs Dose 2), were:

- fatigue: younger group (47.4% vs 59.4%) compared to older group (34.1% vs 50.5%)
- headache: younger group (41.9% vs 51.7%) compared to older group (25.2% vs 39.0%)
- muscle pain: younger group (21.3% vs 37.3%) compared to older group (13.9% vs 28.7%)
- chills: younger group (14.0% vs 35.1%) compared to older group (6.3% vs 22.7%)
- joint pain: younger group (11.0% vs 21.9%) compared to older group (8.6% vs 18.9%)
- fever: younger group (3.7% vs 15.8%) compared to older group (1.4% vs 10.9%)
- vomiting: reported less frequently in the older group and was similar after either dose
- diarrhea: reported less frequently in the older group and was similar after each dose.



- Side effects more common in younger population
- Side effects more likely after Dose 2 than Dose 1

What about Adverse Events/Side Effects?

Table 6. Number (%) of Subjects Reporting at Least 1 Adverse Event From Dose 1 to 1 Month After Dose 2 – ~38000 Subjects for Phase 2/3 Analysis – Safety Population

Pfizer data

	Vaccine Group (as Administered)	
Adverse Event	BNT162b2 (30 µg) (N[a]=18801) n[b] (%)	Placebo (N[a]=18785) n[b] (%)
Any event	5071 (27.0)	2356 (12.5)
Related[c]	3915 (20.8)	953 (5.1)
Severe	220 (1.2)	109 (0.6)
Life-threatening	18 (0.1)	20 (0.1)
Any serious adverse event	103 (0.5)	81 (0.4)
Related[c]	3 (0.0)	0
Severe	57 (0.3)	48 (0.3)
Life-threatening	18 (0.1)	19 (0.1)
Any adverse event leading to withdrawal	34 (0.2)	25 (0.1)
Related[c]	14 (0.1)	7 (0.0)
Severe	13 (0.1)	7 (0.0)
Life-threatening	2 (0.0)	4 (0.0)
Death	1 (0.0)	2 (0.0)

Actually saw higher occurrence of life-threatening adverse events and deaths in the placebo group

Side effects? Let's compare:

Vaccine Side Effects Compared

	SHINGRIX (ZOSTER VACCINE RECOMBINANT, ADJUVANTED) Shingrix	Pfizer COVID-19 BNT162b2	Influenza Vaccine FLUCELVAX QUADRIVALENT Flu	Placebo (saline)
Local Pain	78%	83%	45%	14%
Redness	38%	5%	13%	1%
Swelling	26%	6%	4%	1%
Myalgia	45%	21%	15%	11%
Fatigue	45%	47%	18%	33%
Headache	38%	42%	19%	34%
Chills	27%	14%	6%	6%
Fever	21%	4%	1%	1%
GI Symptoms	17%	11%	7%	12%
Overall	38% ①	26% ②	14% ③	13%

And just one more comparison…

- One of the latest FDA-approved vaccines: Shingrix (for preventing shingles in adults)
- Had about 15,000 people total in the study (about 7,700 in vaccine group & 7,700 in placebo group) → much smaller study
- Had a wider range of geographic recruitment than Pfizer's COVID vaccine

Table 17 – Proportions of subjects completed and withdrawn by age and treatment group with reasons for withdrawal (Zoster-006 TVC – EOS)

	HZ/su 50 – 59 N = 3644	Placebo 50 – 59 N = 3642	HZ/su 60 – 69 N = 2243	Placebo 60 – 69 N = 2245	HZ/su ≥ 70 N = 1808	Placebo ≥ 70 N = 1823
Proportion of subjects completed	89.9%	90.9%	89.6%	89.4%	82.2%	81.8%
Proportion of subjects withdrawn	10.1%	9.1%	10.4%	10.6%	17.8%	18.2%
Reasons for withdrawal:						
Serious Adverse Event	1.4%	1.2%	2.6%	2.8%	6.5%	7.0%
Non-Serious Adverse Event	0.4%	0.2%	0.4%	0.2%	0.4%	0.4%
Protocol violation	0.2%	0.2%	0.2%	0.3%	0.3%	0.3%
Consent withdrawal (not due to an adverse event)	3.7%	3.7%	4.7%	4.8%	7.1%	6.2%
Migrated/moved from study area	0.7%	0.5%	0.4%	0.5%	0.7%	0.8%
Lost to follow-up (incomplete vaccination course)	0.6%	0.4%	0.3%	0.3%	0.2%	0.2%
Lost to follow-up (complete vaccination course)	2.4%	2.6%	1.4%	1.5%	1.8%	2.2%
Suspected HZ Episode	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
Sponsor study termination	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Others	0.7%	0.3%	0.4%	0.2%	0.8%	1.1%

Source: Adapted from 125614/0 Zoster-006 CR Table 6.37, p. 2323 and 125614/9 Table 6.37 (revised), p. 26

N = number of subjects vaccinated in that age and treatment group

% = Denominator is number of subjects vaccinated in that age and treatment group

Serious Adverse Events were actually higher in the Shingrix trial than in the COVID vaccine trial

Pfizer: Adolescent Data

Systemic Reactions in Younger Adolescents

Younger adolescents 12 to 15 years of age (N=100; 49 in the BNT162b2 group and 51 in the placebo group) contributed preliminary data to the reactogenicity subset and were analyzed separately. Most systemic events (other than vomiting and diarrhea, which had low incidences across groups) were reported at higher incidence in the BNT162b2 group than in the placebo group. However, there was no clear trend for increasing incidence or severity after Dose 1 compared to after Dose 2. In this age group, the most frequent prompted systemic events after Dose 1 compared to Dose 2 were (Dose 1 vs Dose 2):

- fatigue: BNT162b2 (49.0% vs 50.0%) compared to placebo (25.5% vs 6.5%)
- headache: BNT162b2 (42.9% vs 45.7%) compared to placebo (35.3% vs 21.7%)
- muscle pain: BNT162b2 (22.4% vs 30.4%) compared to placebo (13.7% vs 4.3%)
- chills: BNT162b2 (30.6% vs 28.3%) compared to placebo (7.8% vs 8.7%)
- joint pain: BNT162b2 (12.2% vs 17.4%) compared to placebo (9.8% vs 6.5%)
- fever: BNT162b2 (14.3% vs 19.6%) compared to placebo (0% vs 0%)
- vomiting: reported at similar frequencies in both groups and similar after each dose
- diarrhea: reported at similar frequencies in both groups and similar after each dose.

- Pfizer did study adolescents 12-15 years old
- Study is not yet complete to request approval to vaccinate under 16 years old
- Side effects were similar to younger adult population

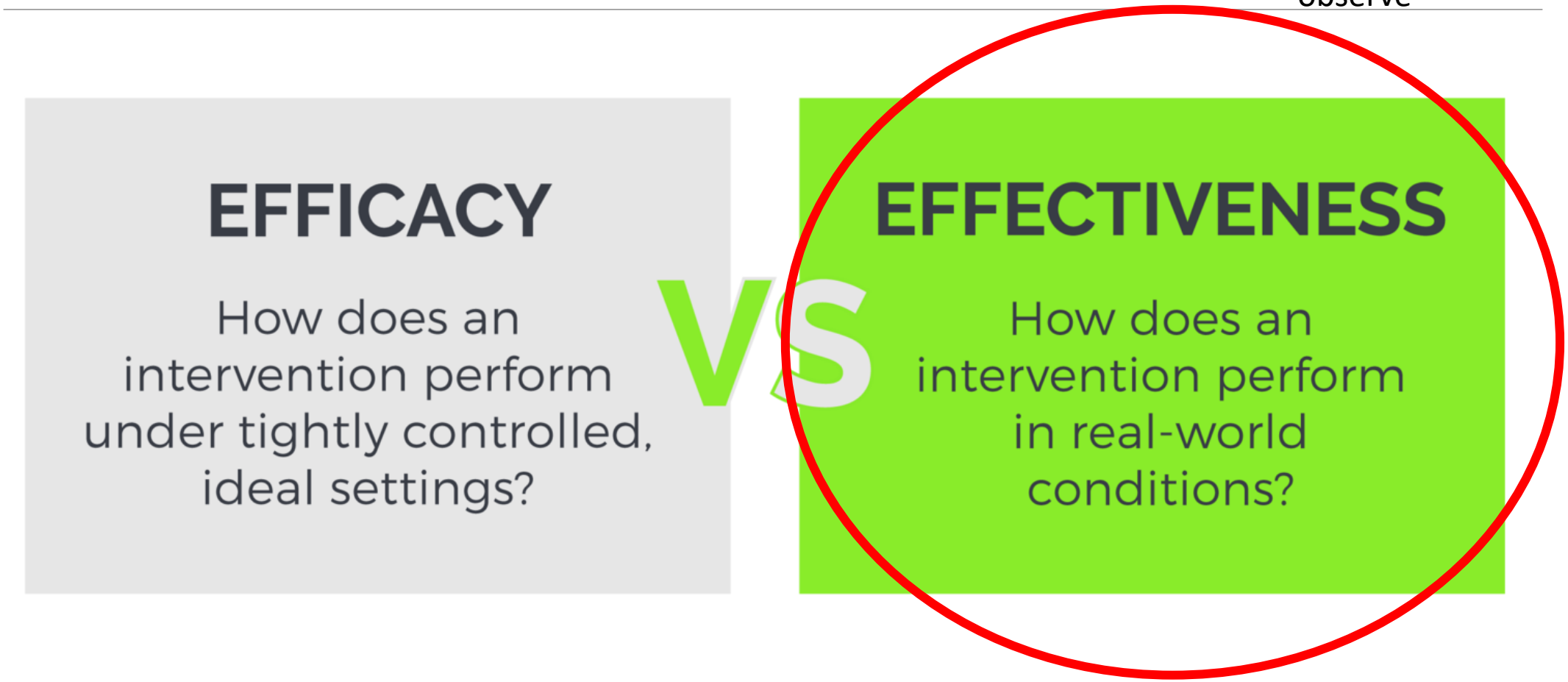
Special Populations

- Pregnant women → no definite answer, waiting on more data but experts think it's likely safe
  - While medical societies cannot officially "recommend" the COVID-19 vaccine for pregnant women, they have said the following:
  - Society for Maternal-Fetal Medicine: ***strongly recommends*** that pregnant individuals have access to COVID vaccines & should discuss with their healthcare provider
  - American College of Obstetricians and Gynecologists recommends that COVID vaccine should ***not* be withheld** from pregnant individuals
- Immunocompromised Individuals – were all included in Phases 2/3 of trials, not contraindications to vaccination
  - HIV+ → yes, both
  - Cancer/Chemotherapy → yes, both
  - Autoimmune diseases → yes, both
- Infants & youth → not yet, waiting on more data from Pfizer

Consider: https://www.bmc.org/sites/default/files/documents/covid/COVIDVaccineSharedDecisionMakingInformationfor%20PregnantWoman.pdf as a resource for pregnant individuals

Other “Food for Thought”

This is what we will be starting to learn and observe



Lens on Equity & Inclusion

- ***Medical Apartheid: The Dark History of Medical Experimentation on Black Americans from Colonial Times to the Present*** by Harriet Washington
- Acknowledge that mistrust and hesitancy are valid
- Be transparent about data, processes, and decisions
- Prioritize *inclusion and shifts of power* in data, processes, and decisions
- Moderna intentionally slowed their Phase 3 study to increase recruitment of BIPOC
  - "I would rather we have higher diverse participants and take one extra week," - Moderna CEO Stéphane Bancel said. Diversity "matters more to us than speed."
  - Moderna study population was more diverse than Pfizer's

Study demographics

Pfizer

Table 4. Demographic Characteristics – ~38000 Subjects for Phase 2/3 Analysis – Safety Population

	Vaccine Group (as Administered)		
	BNT162b2 (30 µg) (N^a=18860) n^b (%)	Placebo (N^a=18846) n^b (%)	Total (N^a=37706) n^b (%)
Race			
White	15636 (82.9)	15630 (82.9)	31266 (82.9)
Black or African American	1729 (9.2)	1763 (9.4)	3492 (9.3)
American Indian or Alaska native	102 (0.5)	99 (0.5)	201 (0.5)
Asian	801 (4.2)	807 (4.3)	1608 (4.3)
Native Hawaiian or other Pacific Islander	50 (0.3)	26 (0.1)	76 (0.2)
Multiracial	449 (2.4)	406 (2.2)	855 (2.3)
Not reported	93 (0.5)	115 (0.6)	208 (0.6)
Ethnicity			
Hispanic/Latino	5266 (27.9)	5277 (28.0)	10543 (28.0)
Non-Hispanic/non-Latino	13482 (71.5)	13459 (71.4)	26941 (71.5)
Not reported	112 (0.6)	110 (0.6)	222 (0.6)

Moderna

Table 7. Demographic Characteristics[a], Safety Set

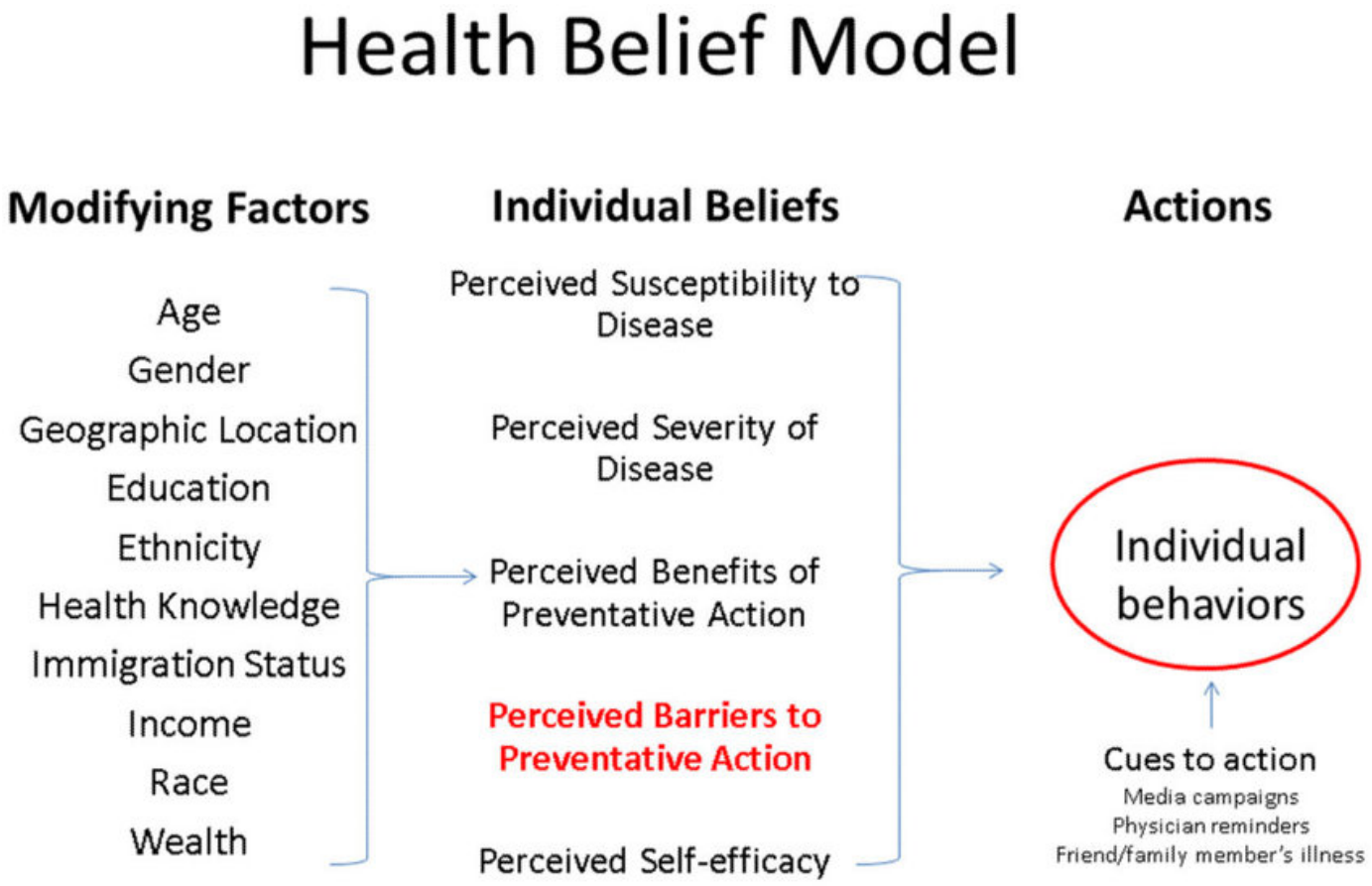
Characteristic	Vaccine Group (N=15184) n (%)	Placebo Group (N=15165) n (%)	Total (N=30350) n (%)
Race			
American Indian or Alaska Native	110 (0.7)	120 (0.8)	230 (0.8)
Asian	653 (4.3)	732 (4.8)	1385 (4.6)
Black or African American	1562 (10.3)	1528 (10.1)	3090 (10.2)
Native Hawaiian or other Pacific islander	34 (0.2)	32 (0.2)	66 (0.2)
White	12032 (79.2)	11990 (79.1)	24023 (79.2)
Other	321 (2.1)	315 (2.1)	636 (2.1)
Multiracial	315 (2.1)	319 (2.1)	634 (2.1)
Ethnicity			
Hispanic or Latino	3121 (20.6)	3112 (20.5)	6234 (20.5)
Not Hispanic or Latino	11920 (78.5)	11914 (78.6)	23834 (78.5)
Race and Ethnicity			
Non-Hispanic White	9534 (62.8)	9458 (62.4)	18992 (62.6)
Communities of color	5624 (37.0)	5680 (37.5)	11305 (37.2)

For reference, demographics of adults in the United States:

White (73.0%)
Black/African American (12.7%)
American Indian/Alaska Native (0.8%)
Asian (5.4%)
Native Hawaiian/Pacific Islander (0.2%)
Other (4.8%)

Hispanic/Latino (17.6%)
Not Hispanic/Latino (82.4%)

Addressing Vaccine Hesitancy



Addressing Vaccine Hesitancy

Trust in personal doctors

- Black and Latino residents are more likely to say they trust their own doctors, followed by major hospitals and the CDC.

Testing, government trust are 2 top hesitations about taking the vaccine

% who say they completely or mostly trust each person or group about the COVID vaccine

	Black	Latino	White	All others
Your personal doctor	72%	74%	82%	74%
Major Boston hospitals	63%	63%	74%	67%
The Centers for Disease Control and Prevention (CDC)	62%	59%	73%	80%
The American Medical Association (AMA)	59%	56%	77%	74%
Harvard Medical School	55%	55%	68%	74%
Dr. Anthony Fauci	55%	45%	65%	58%
President-Elect Joe Biden	55%	44%	47%	50%
Your local community health center	52%	53%	53%	55%
The Food and Drug Administration (FDA)	51%	52%	65%	69%
The American Red Cross	46%	51%	30%	48%
Governor Charlie Baker	46%	38%	50%	48%
Massachusetts state government agencies	45%	43%	54%	61%
Friends, family, and neighbors	42%	42%	36%	45%
The Museum of Science, Boston	41%	44%	59%	60%
Local elected leaders	33%	27%	27%	35%
Local faith leaders such as pastors, rabbis, and imams	28%	27%	18%	33%
President Donald Trump	11%	17%	21%	17%

MassINC POLLING GROUP

Q: How much do you trust each of the following people or organizations to tell you a COVID vaccine works and is safe?

10

What are the barriers and facilitators to individuals' willingness to be vaccinated for COVID-19?

Prepared by:
Kristin J, Konnyu, MSc, BEd, PhD
Gregorio Benitez, AB, MPH Candidate
Brown University
School of Public Health
Center for Evidence Synthesis in Health

Prepared for:
Rhode Island Department of Health Mass Vaccination Taskforce

Recommended resources:

Museum of Science/MassINC Survey

RIDOH/Brown *Vaccine Hesitancy Rapid Review*

Table 2. Potential behavior change techniques (BCTs) to address identified behavioral domains

Theoretical domain	Behavior change technique to address domain (30)
Beliefs about consequences	*Information about emotional consequences – Provide information (e.g., written, verbal, visual) about emotional consequences of performing the behavior Covert sensitization – Advise to imagine performing the unwanted behavior in a real-life situation followed by imagining an unpleasant consequence Anticipated regret – Induce or raise awareness of expectations of future regret about performance of the unwanted behavior Social and environmental consequences – Provide information (e.g., written, verbal, visual) about social and environmental consequences of performing the behavior Comparative imagining of future outcomes – Prompt or advise the imagining and comparing of future outcomes of changed versus unchanged behaviour Vicarious reinforcement – Prompt observation of the consequences (including rewards and punishments) for others when they perform the behavior Threat – Inform that future punishment or removal of reward will be a consequence of performance of an unwanted behavior Pros and cons – Advise the person to identify and compare reasons for wanting (pros) and not wanting to (cons) change the behavior Covert conditioning – Advise to imagine performing the wanted behavior in a real-life situation followed by imagining a pleasant consequence
Emotion	Reduce negative emotions – Advise on ways of reducing negative emotions to facilitate performance of the behavior *Information about emotional consequences – Provide information (e.g., written, verbal, visual) about emotional consequences of performing the behavior *Social support (emotional) – Advise on, arrange, or provide emotional social support (e.g. from friends, relatives, colleagues, 'buddies' or staff) for performance of the behavior
Knowledge	Information about health consequences – Provide information (e.g. written, verbal, visual) about social and environmental consequences of performing the behavior (Note: consequences can be for any target, not just the recipient(s) of the intervention)
Social influences	Social comparison – Draw attention to others' performance to allow comparison with the person's own performance Social support or encouragement (general) – Advise on, arrange or provide social support (e.g., from friends, relatives, colleagues,' buddies' or staff) or noncontingent praise or reward for performance of the behavior. It includes encouragement and counselling, but only when it is directed at the behavior Information about others' approval – Provide information about what other people think about the behavior. The information clarifies whether others will like, approve or disapprove of what the person is doing or will do *Social support (emotional) – Advise on, arrange, or provide emotional social support (e.g., from friends, relatives, colleagues, 'buddies' or staff) for performance of the behavior

From *Vaccine Hesitancy Rapid Review*, Brown School of Public Health prepared for Rhode Island Dept. of Health