COVID-19 Vaccines: What You Need To Know

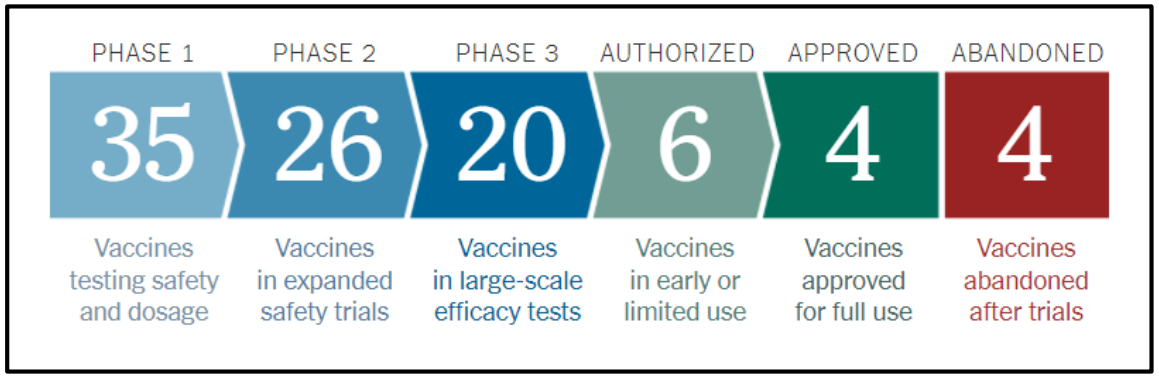
Aalok Khole, MD
Department of Infectious Diseases

Coffee and Conversation: Greater Keene and Peterborough Chamber Virtual Event
10th February, 2021

Sources of Information

- CDC
- ACIP
- Documents submitted by the companies to VRBPAC
- The New York Times
- NH DHHS

NYT Vaccine Tracker (as of 7 February, 2021)



Leading vaccines

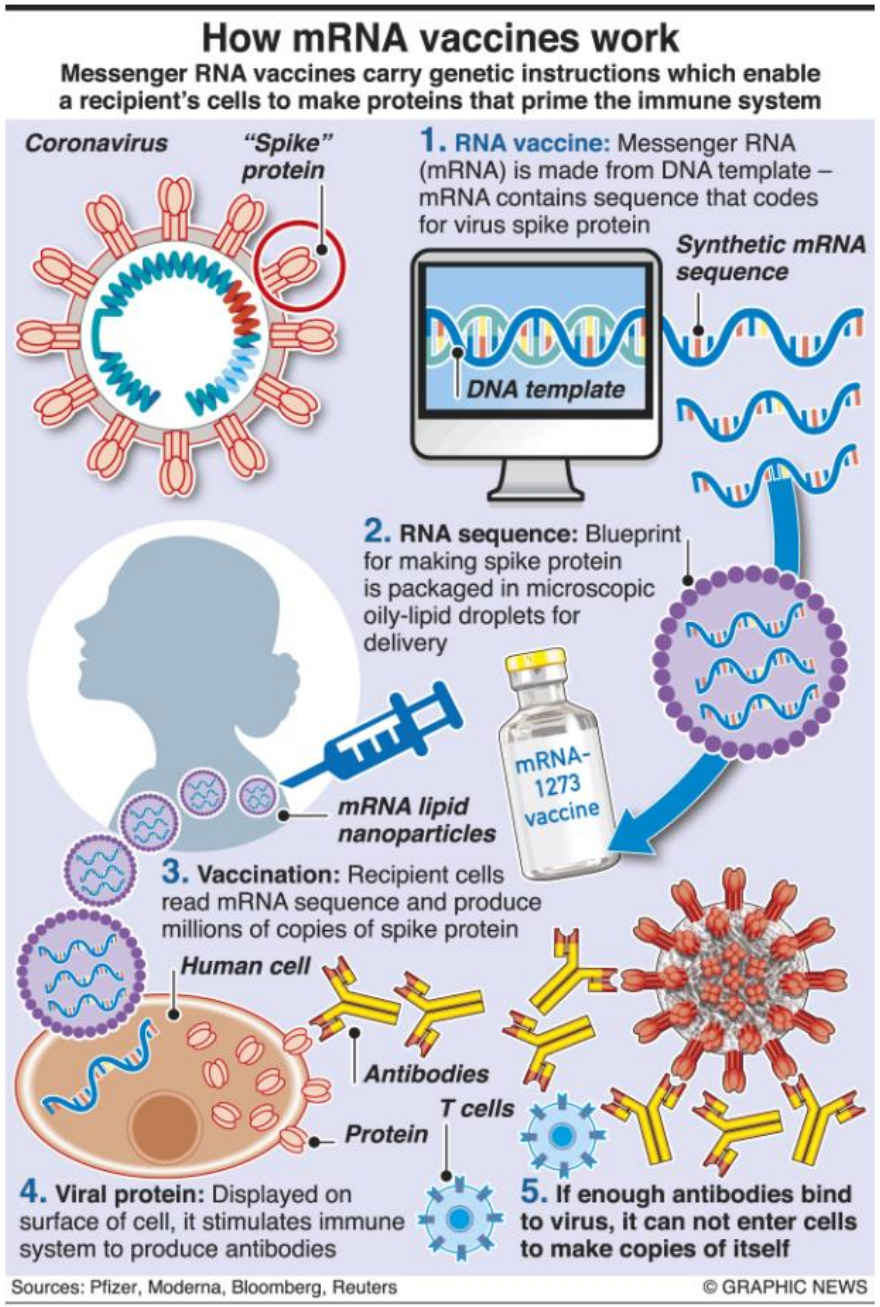
Developer	How It Works	Phase	Status
Pfizer-BioNTech	mRNA	2 3	Approved in Bahrain, Saudi Arabia, Switzerland. Emergency use in U.S., E.U., other countries.
Moderna	mRNA	3	Approved in Switzerland. Emergency use in U.S., U.K., E.U., others.
Gamaleya	Ad26, Ad5	3	Early use in Russia. Emergency use in other countries.
Oxford-AstraZeneca	ChAdOx1	2 3	Emergency use in U.K., E.U., other countries.
CanSino	Ad5	3	Limited use in China.
Johnson & Johnson	Ad26	3	
Vector Institute	Protein	3	Early use in Russia.
Novavax	Protein	3	
Sinopharm	Inactivated	3	Approved in China, U.A.E., Bahrain. Emergency use in Egypt, other coutries.
Sinovac	Inactivated	3	Conditional approval in China. Emergency use in Brazil, other countries.
Sinopharm-Wuhan	Inactivated	3	Limited use in China, U.A.E.
Bharat Biotech	Inactivated	3	Emergency use in India.

Vaccines in the US

- Pfizer/BioNTech vaccine – EUA granted 12/11/2020
- Moderna vaccine – EUA granted 12/18/2020
- Johnson and Johnson vaccine – submitted EUA application – VRBPAC to meet on 02/26/2021
- AstraZeneca/Oxford vaccine – Phase 3 results (US) likely in Mar 2021
- Novavax vaccine – Phase 3 results (US) likely in Mar 2021

mRNA vaccines

- Pfizer and Moderna vaccines
- Technology isn’t new
- Has been experimented with before
- Easily adaptable
- Easy to mass produce
- Strict cold chain requirements



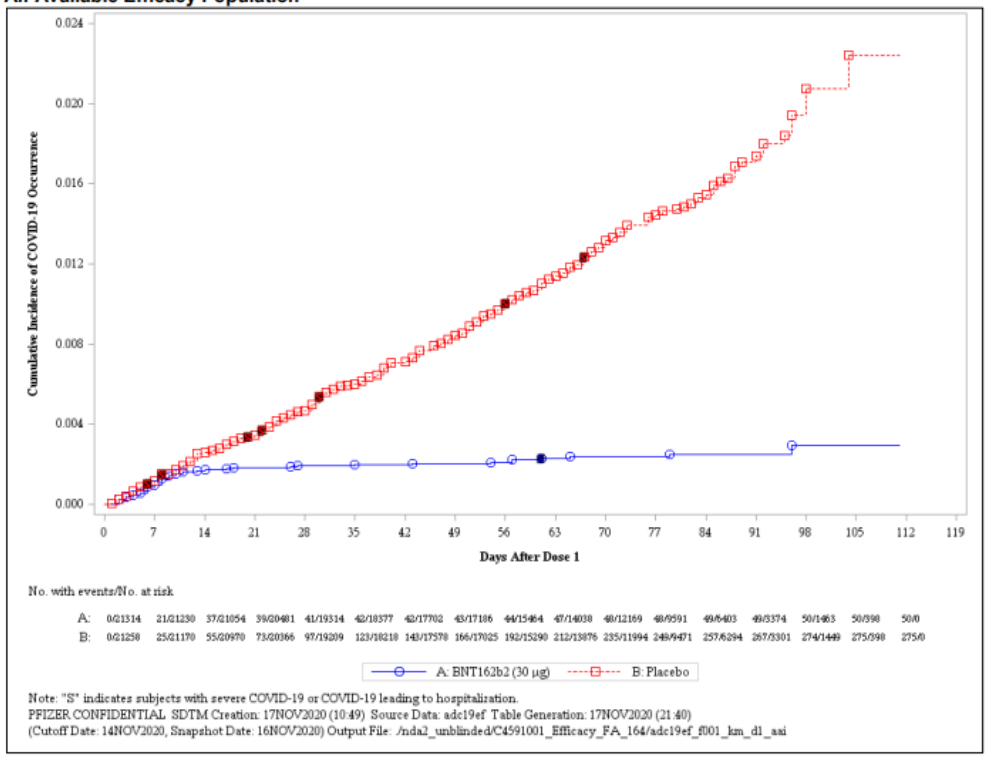
Vaccines under EUA

- First amongst mRNA vaccines to receive authorization for use
- Not live vaccines
- 2 doses – 21 or 28 days apart (data based off this regimen)
- Grace period of 4 days – exception and not a norm
- Up to 6 weeks out for second dose - okayed by CDC
- Trials were balanced for age, ethnicity, color, etc.
- Earliest data published at 2 months interval
- ~95% efficacy (comparable across age groups)

KM Curves

Pfizer-BioNTech COVID-19 Vaccine
VRBPAC Briefing Document

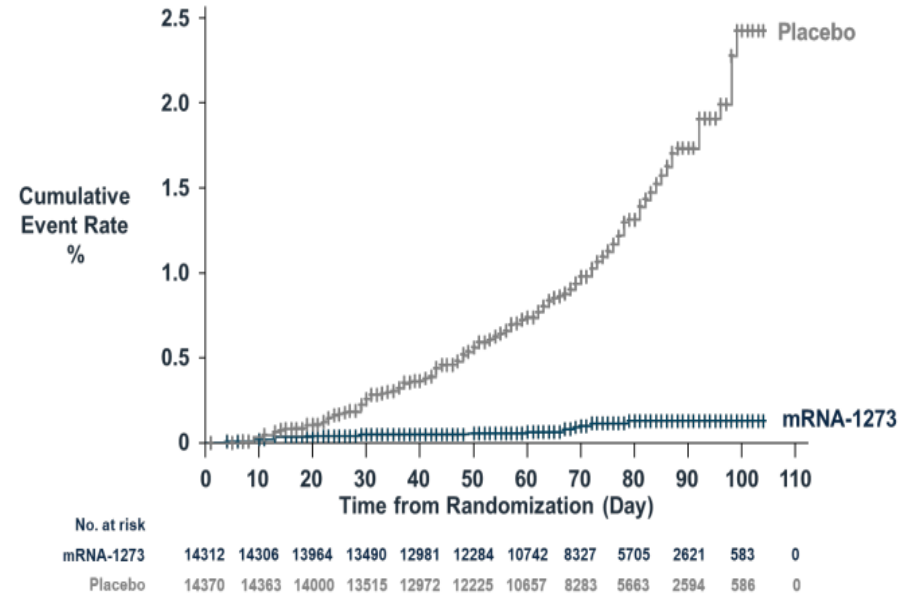
Figure 2. Cumulative Incidence Curves for the First COVID-19 Occurrence After Dose 1, Dose 1 All-Available Efficacy Population



ModernaTX, Inc.
Briefing Document Addendum

mRNA-1273
Vaccines and Related Biological Products Advisory Committee

Figure 1: Kaplan-Meier Estimates of Time to First Occurrence of COVID-19 Starting After Randomization, mITT – Interim Analysis



Indications

- Adults >16 yrs of age for Pfizer vs >18 yrs of age for Moderna
- Ongoing trials for younger age groups – no data yet
- Phased approach
- NH DHHS launched Phase 1A – ‘Jumpstart’ phase
- Phase 1B ongoing

Contraindications

- H/o severe allergic reaction e.g. anaphylaxis to the vaccine or any component of the vaccine
- Predominant component being PEG in both vaccines (potential cross-reactivity with polysorbate)
- Other components include sodium, potassium salts, tromethamine (Moderna), etc.

- Allergies (including anaphylaxis) to other medications, vaccines or food products are not contraindications to receiving these vaccines
- Being a part of a special population isn't a contraindication either
- Data on special populations lacking – but recommendations based on risk-benefit analysis

Side effects

- More after Dose 2 than Dose 1
- Lesser in older adults
- Predominantly, injection site reactions including pain, redness and swelling
- Systemic side effects commonly noted include fatigue, myalgias, headache and fever. Lymphadenopathy and delayed allergic reactions more prominent with Moderna vaccine.
- *Expected to last 24-48 hrs – concern if longer*
- Severe adverse events – <0.5% and similar in placebo group and matched across both vaccines
- Bell's palsy in 4 patients in Pfizer vaccine group and 3 in Moderna vaccine group compared to 0 in placebo group for both products – similar to background rates of this phenomenon

Summary of v-safe data

	Pfizer-BioNTech	Moderna	All COVID-19 vaccines
People receiving 1 or more doses in the United States*	12,153,536	9,689,497	21,843,033
Registrants completing at least 1 v-safe health check-in†	997,042	1,083,174	2,080,216
Pregnancies reported to v-safe	8,633	6,498	15,131

* COVID Data Tracker data as of 1/24/2021
† v-safe data as of 1/20/2021, 5:00 AM ET

Reactogenicity reported to v-safe

Local and systemic reactions, day 0-7*,†	All vaccines %	Pfizer- BioNTech dose 1 %	Pfizer-BioNtech dose 2 %	Moderna dose 1 %
Pain	70.7	67.7	74.8	70.1
Fatigue	33.4	28.6	50.0	29.7
Headache	29.4	25.6	41.9	26.0
Myalgia	22.8	17.2	41.6	19.6
Chills	11.5	7.0	26.7	9.3
Fever	11.4	7.4	25.2	9.1
Swelling	11.0	6.8	26.7	13.4
Joint pain	10.4	7.1	21.2	8.6
Nausea	8.9	7.0	13.9	7.7

*v-safe data lock point 1/14/2021, 5:00 AM ET
†Reported on at least one health check-in completed on days 0-7 after receipt of vaccine

Most commonly reported adverse events to VAERS after COVID-19 vaccines*

Pfizer-BioNTech COVID-19 vaccine (N = 7,307)

Adverse event†	N (%)
Headache	1,550 (21.2)
Fatigue	1,192 (16.3)
Dizziness	1,113 (15.2)
Nausea	1,014 (13.9)
Chills	983 (13.5)
Pyrexia	962 (13.2)
Pain	958 (13.1)
Injection Site Pain	716 (9.8)
Pain In Extremity	610 (8.4)
Dyspnoea	536 (7.3)

Moderna COVID-19 vaccine (N = 1,786)

Adverse event†	N (%)
Headache	430 (24.1)
Pyrexia	333 (18.6)
Chills	315 (17.6)
Pain	290 (16.2)
Dizziness	289 (16.2)
Fatigue	287 (16.1)
Nausea	281 (15.7)
Injection Site Pain	208 (11.6)
Pain In Extremity	189 (10.6)
Dyspnoea	172 (9.6)

* Reports received through January 18, 2021; †Adverse events are not mutually exclusive

ACIP Vaccine Presentation 27 Jan, 2021 - https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2021-01/06-COVID-Shimabukuro.pdf

Anaphylaxis

Estimated anaphylaxis reporting rates following COVID-19 vaccines based on VAERS reports and reported doses administered*

Reported vaccine doses administered	Anaphylaxis cases	Reporting rate (analytic period Dec 14-Jan 18)
Pfizer-BioNTech: **9,943,247**	50	5.0 per million doses admin.
Moderna: **7,581,429**	21	2.8 per million doses admin.

- Total COVID-19 vaccine doses administered thru Jan 18 by sex: Female 61%, Male 36%, Unk 3%
- Previously reported rate for Pfizer-BioNTech vaccine: 11.1 per million doses admin (Dec 14-Dec 23)
  https://www.cdc.gov/mmwr/volumes/70/wr/mm7002e1.htm
- Previously reported rate for Moderna vaccine: 2.5 per million doses admin (Dec 21-Jan 10)
  https://www.cdc.gov/mmwr/volumes/70/wr/mm7004e1.htm

* Data through January 18, 2021

ACIP Vaccine Presentation 27 Jan, 2021 - https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2021-01/06-COVID-Shimabukuro.pdf

Special Populations

- Pregnant women and lactating mothers - endorsed
- Immunocompromised hosts - endorsed
- H/o severe allergic reactions/anaphylaxis – endorsed with caveats
- Anyone with active or h/o COVID-19 – endorsed with caveat
- Anyone with exposure to COVID-19 and on quarantine – endorsed with caveat
- Anyone that was treated for COVID with convalescent plasma or monoclonal antibody therapy – endorsed with caveat

In The Pipeline

- Johnson and Johnson vaccine – Phase 3 trial data seems promising per the company statement – formal data pending
- AstraZeneca/Oxford vaccine – EUA in GB, Argentina, India amongst others (not yet approved in the US - ? March)
- Long term data analysis with existing products will continue – especially for side effects (through v-safe, VAERS, etc.)
- DART studies ongoing – Moderna ahead of Pfizer
- Studies in special populations ongoing
- Studies ongoing to assess reduction in asymptomatic COVID-19 illness and transmission amongst vaccinated individuals – Moderna and AstraZeneca showed a positive signal

Johnson and Johnson vaccine

Efficacy of Johnson & Johnson Single-Shot Janssen COVID-19 Vaccine
Phase 3 ENSEMBLE Trial

	Moderate & Severe (28 days)	Severe (28 days)	Severe (>49 days)
US	72% ⬇	85% ⬇ (100% ⬇ death)	100% ⬇
Latin America	66% ⬇		
South Africa (95% B.1.351 variant)	57% ⬇		

- Awaiting actual data release
- Adenovirus vector platform
- Press releases looked promising – 72% efficacy in the US, 66% overall
- 85% protective against severe disease
- Dip in protection against SA variant
- Single dose, lesser cold chain requirements, longer shelf life – game changer for sure
- Applied for EUA last week – VRBPAC to meet on Feb 26

https://www.jnj.com/johnson-johnson-announces-single-shot-janssen-covid-19-vaccine-candidate-met-primary-endpoints-in-interim-analysis-of-its-phase-3-ensemble-trial

Novavax vaccine

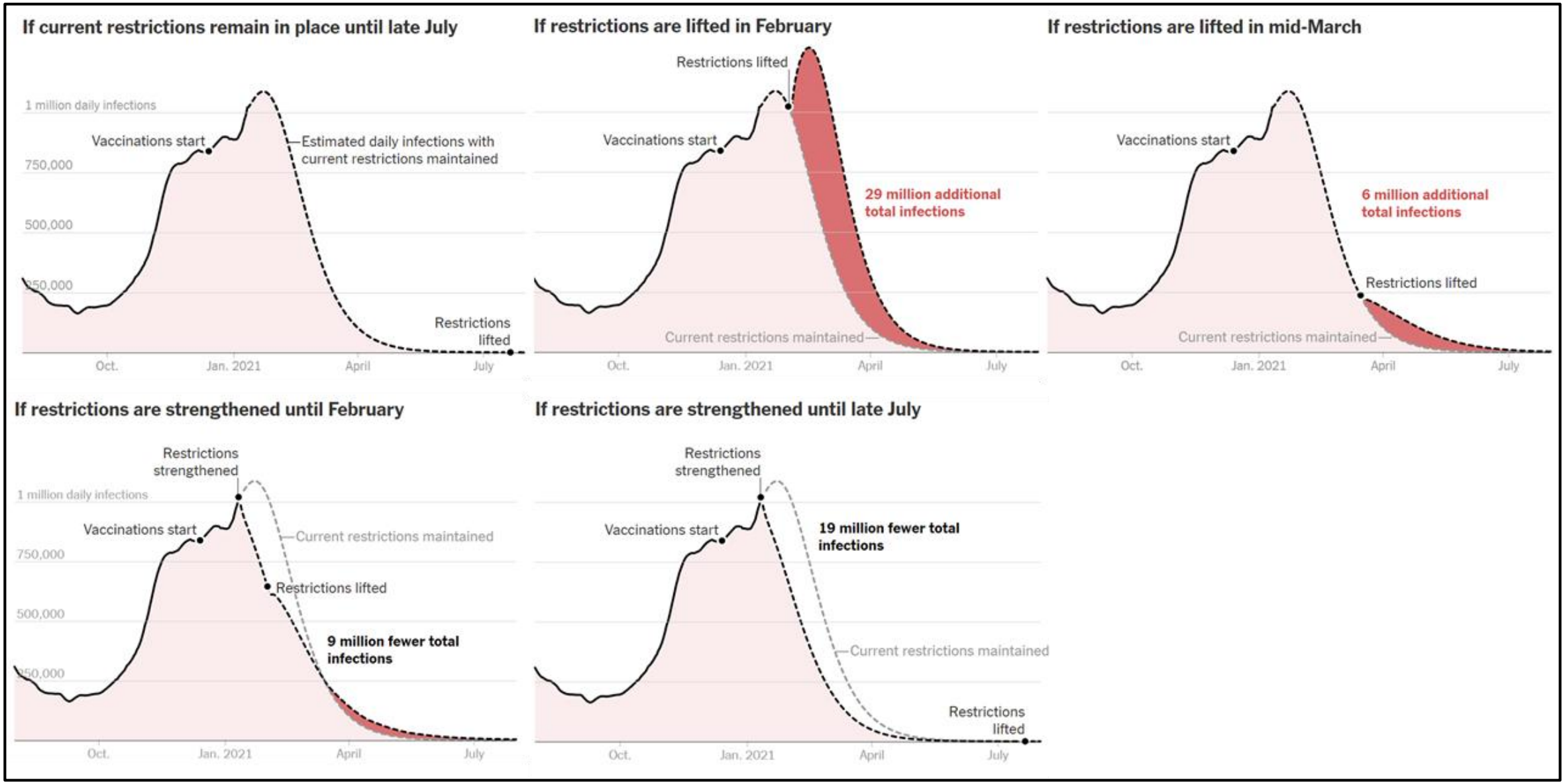
- Protein subunit vaccine
- 2 doses
- US trials - Phase 3 recruiting
- UK trial data promising - ~90% efficacy in the setting of mutant strains
- Wait and watch

Vaccines, Mutant Strains and Projections

- Concerning but waiting on conclusive evidence
- SA variant most concerning
- Continued research – results awaited
- Key step to vaccinate as many as fast as possible – move from 'pandemic' to 'endemic'
- https://blogs.jwatch.org/hiv-id-observations/index.php/are-we-expecting-too-much-from-our-covid-19-vaccines/2021/01/31/

Vaccine trial	Approximate # of people who received the vaccine	Of people vaccinated in the trial		
		# hospitalized for COVID	# who died from COVID	# who died from the vaccine
Moderna	15,000	0	0	0
Pfizer	18,600	0	0	0
Novavax*	13,000	0	0	0
Astra-Zeneca	5,800	0	0	0
J&J*	22,000	0	0	0

Courtesy: Ashish Jha, MD, MPH (Dean, Brown School of Public Health)



Source: The New York Times (Jan 24, 2021)

Courtesy: Michael Calderwood, MD, MPH (Regional Epidemiologist and ASQO, D-HH system)