

Workshop: Innovation & Health Technology for Pandemics



ASEAN Military Medicine Conference Virtual Symposium

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Some examples of U.S. military participation and innovation during the COVID-19 pandemic

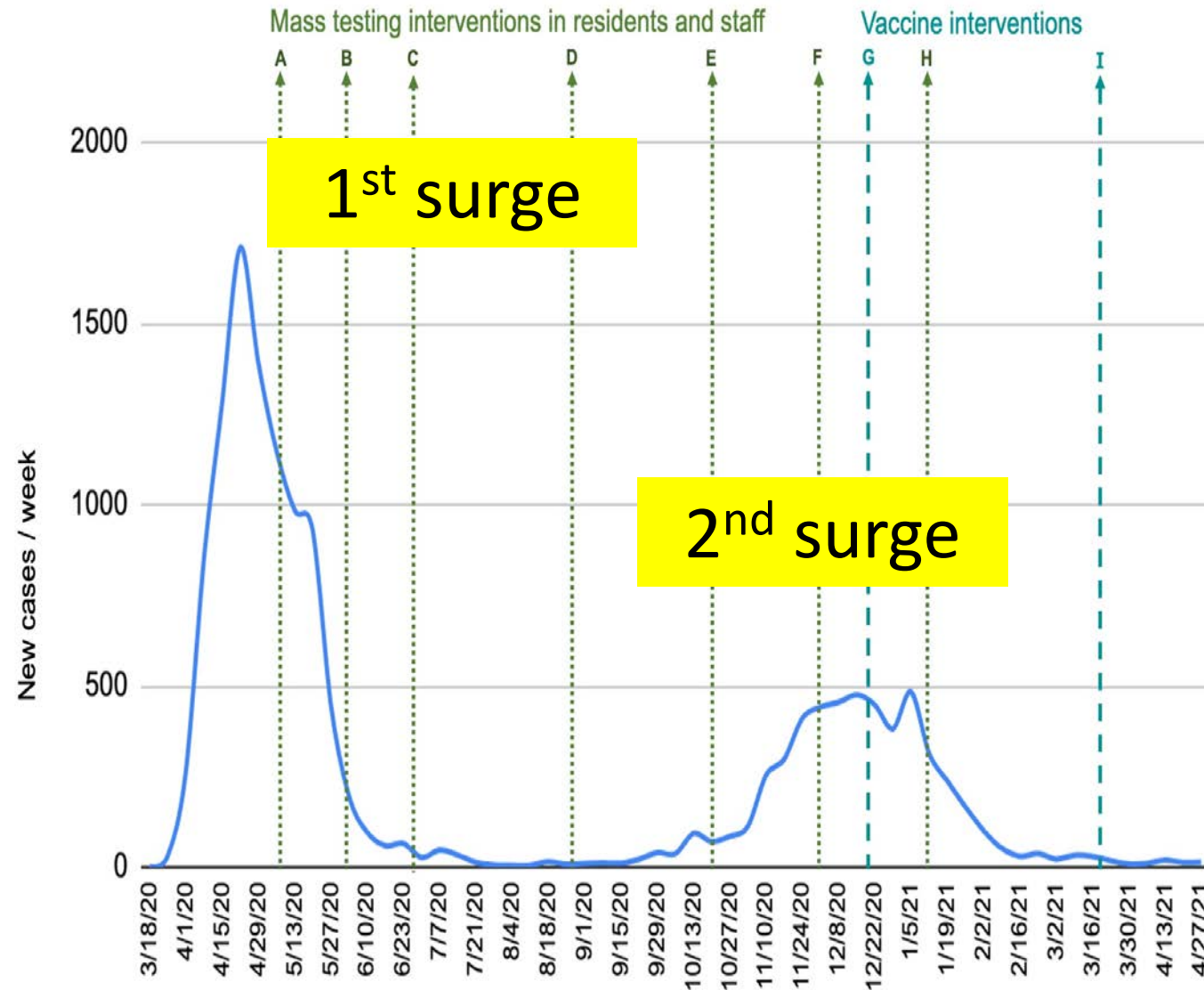
- Initial efforts were highly beneficial – USNS Comfort and USNS Mercy to NY and LA
- Field hospitals built and established in many cities early on
- National Guard used to provide emergency logistics and administrative support
- US. Air Force helped to deliver test kits and bring civilians back to the U.S.
- Rapid contracting capabilities leveraged
- Adaptation of field medical technologies for critical care/trauma
- Telemedicine has been a focus in the military long before COVID-19
- Operation Warp Speed – civilian-military partnership to develop and distribute vaccines

Overview of the workshop

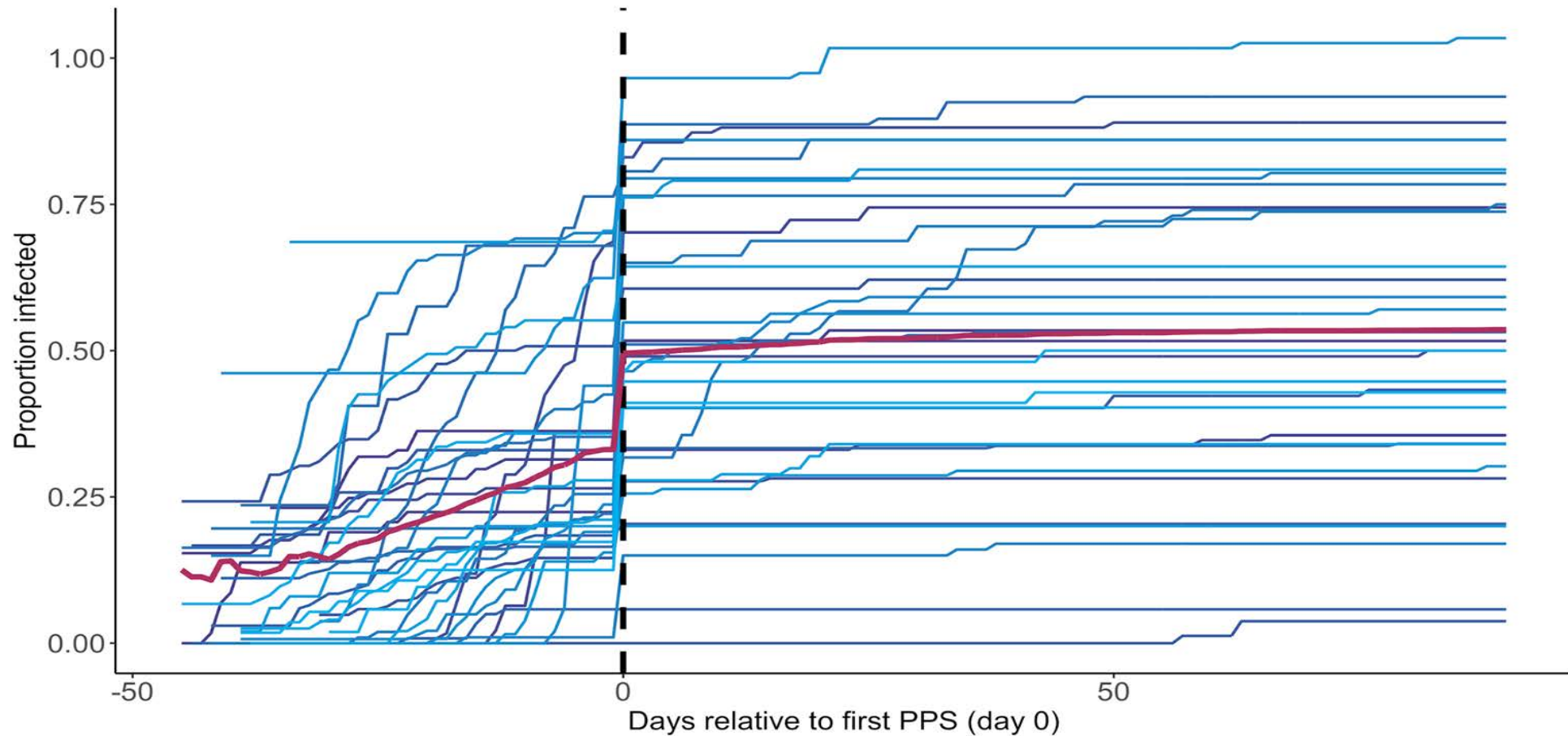
- Didactics (20 min)
 - Overview of COVID-19 vaccines
 - Vaccine impacts in the U.S.
 - COVID-19 in the U.S. military
 - Vaccine platforms
 - Vaccine efficacy
 - Global vaccine uptake
 - The U.S. military experience
 - Vaccine hesitancy and misinformation
- Small group discussions (20 min)
 - Sharing session (20 min)



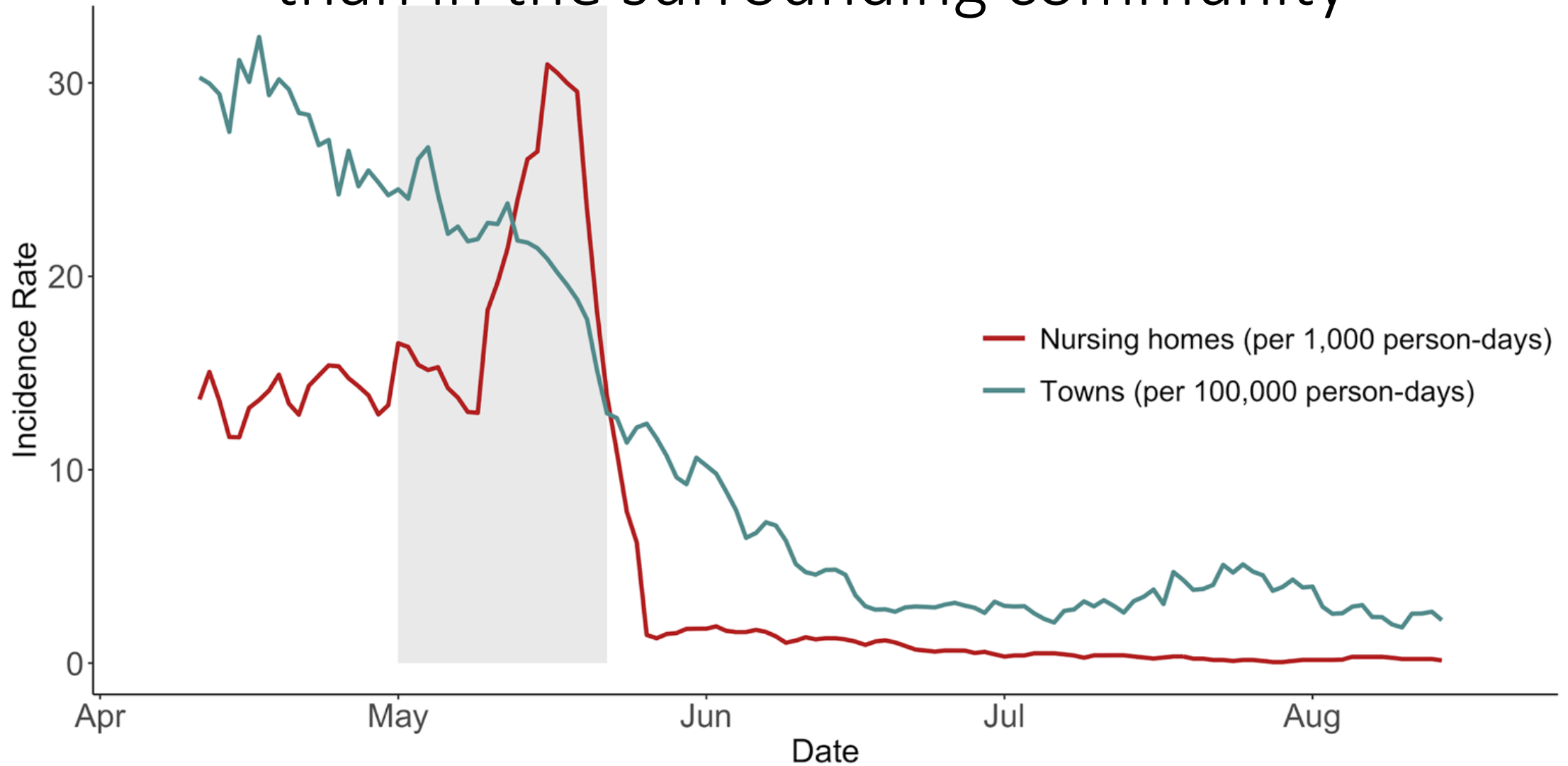
Vaccination had a tremendous impact in nursing homes during the 2nd surge



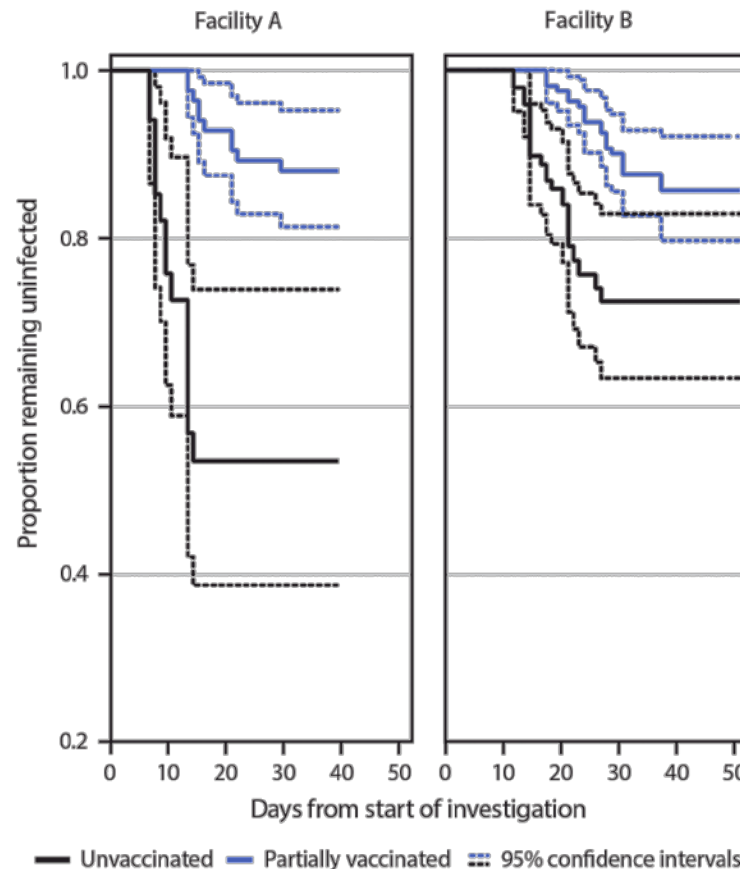
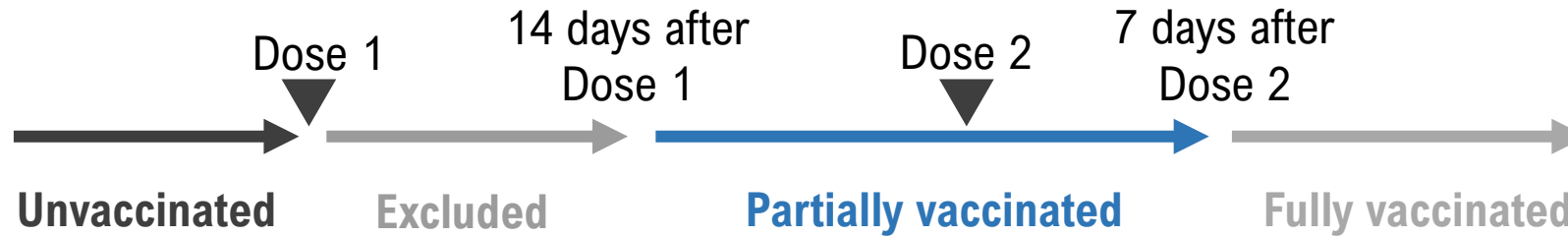
Repeat nursing home-wide prevalence testing is highly effective at containing outbreaks



Testing may have helped rates to decline faster than in the surrounding community



1st dose Pfizer vaccine effectiveness was estimated to be 63% in two Connecticut nursing homes experiencing outbreaks



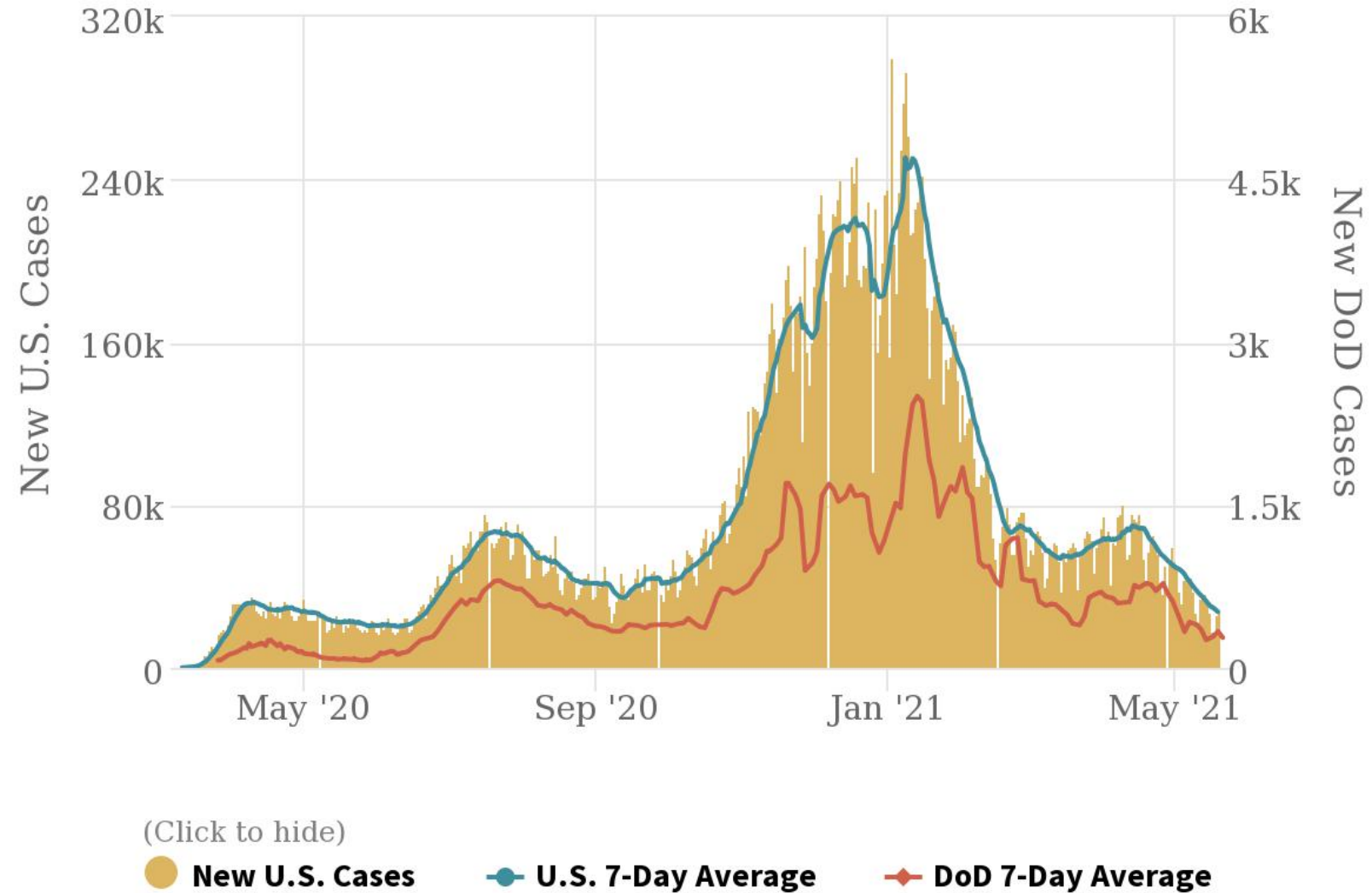
Full vaccination effectiveness could not be estimated because of declining cases and limited unvaccinated person-time.

Military and COVID-19

- Military are susceptible to COVID-19 and pandemics
- In the U.S., the DoD has experienced the same 3 waves as the general population
- USS Roosevelt – 1200 tested positive, 23 hospitalized
- Fatality rate much lower, as to be expected

Comparing New U.S. and DoD Case Trends

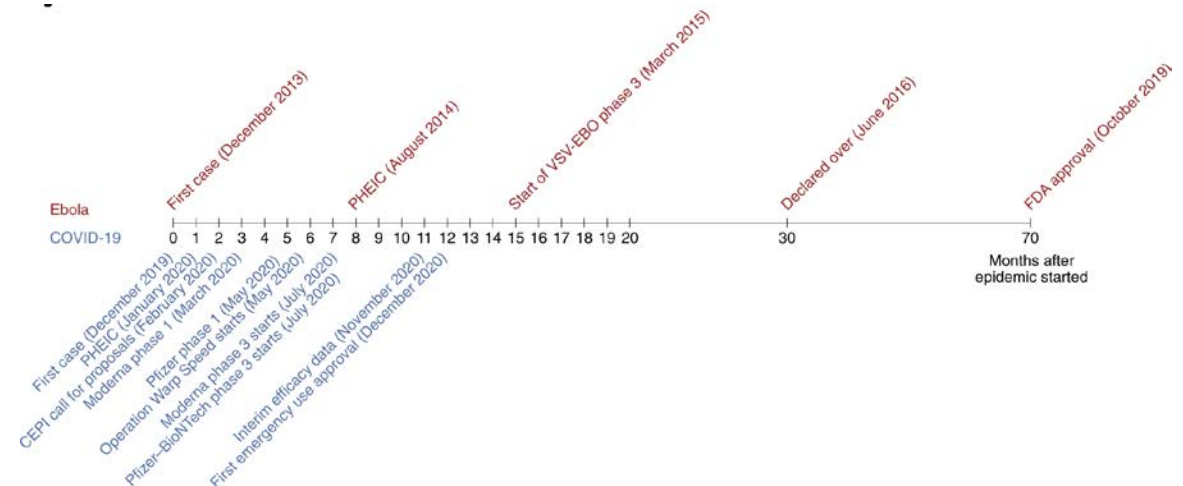
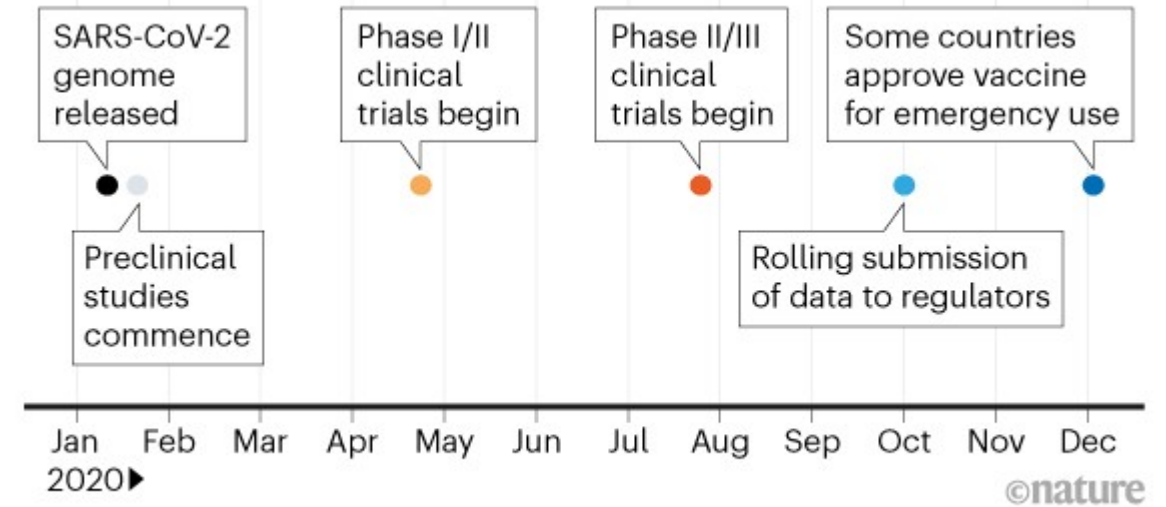
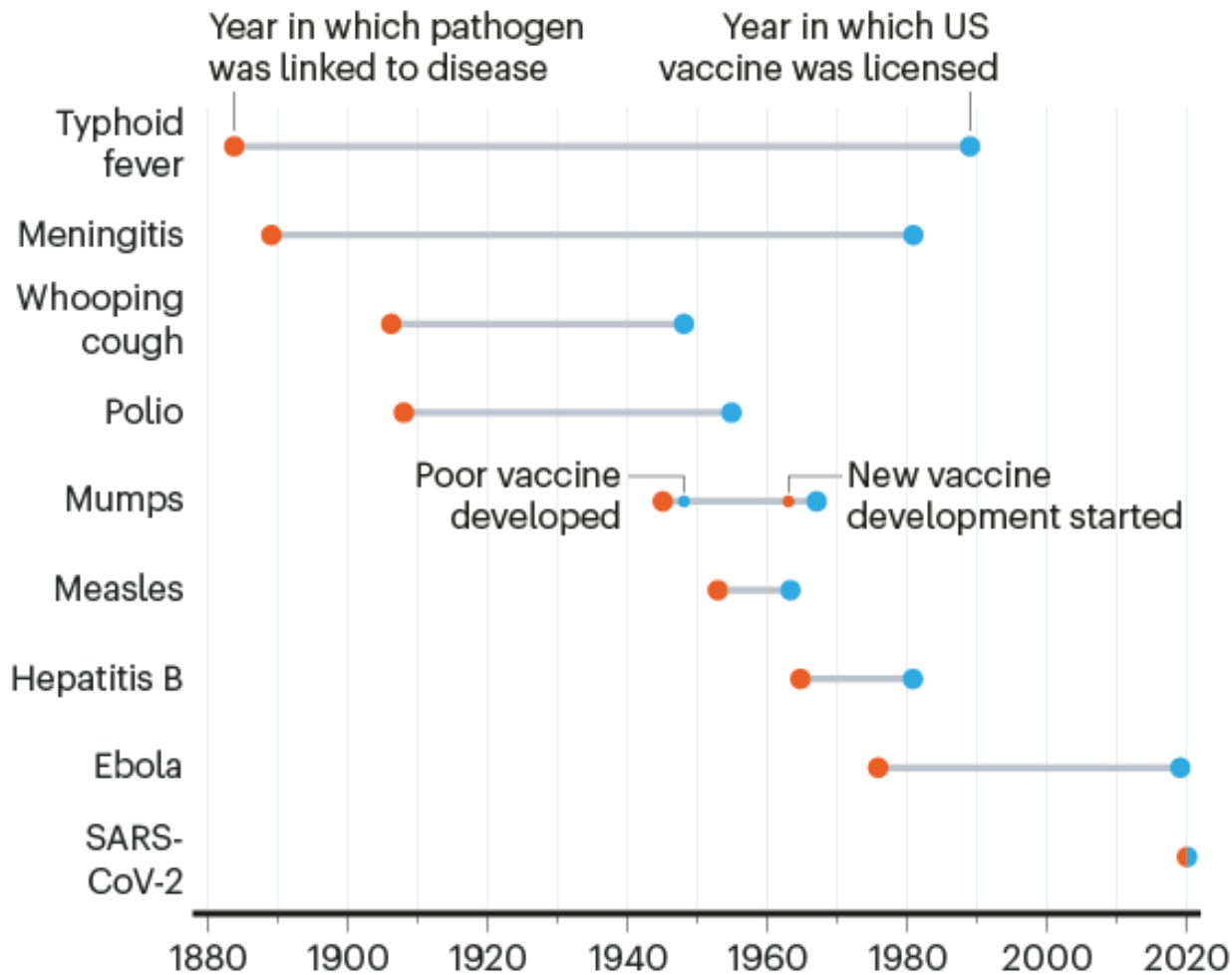
Different scales are used for comparison. Note dual axis.



CSIS Defense360

Source: Johns Hopkins Coronavirus Resource Center
& Coronavirus: DoD Response

What is so innovative about the COVID-19 vaccines?



COVID-19 - Landscape of novel coronavirus candidate vaccine development worldwide

Friday, May 21, 2021

DISCLAIMER: These landscape documents have been prepared by the World Health Organization (WHO) for information purposes only concerning the 2019-2020 pandemic of the novel coronavirus. Inclusion of any particular product or entity in any of these landscape documents does not constitute, and shall not be deemed or construed as, any approval or endorsement by WHO of such product or entity (or any of its businesses or activities). While WHO takes reasonable steps to verify the accuracy of the information presented in these landscape documents, WHO does not make any (and hereby disclaims all) representations and warranties regarding the accuracy, completeness, fitness for a particular purpose (including any of the aforementioned purposes), quality, safety, efficacy, merchantability and/or non-infringement of any information provided in these landscape documents and/or of any of the products referenced therein. WHO also disclaims any and all liability or responsibility whatsoever for any death, disability, injury, suffering, loss, damage or other prejudice of any kind that may arise from or in connection with the procurement, distribution or use of any product included in any of these landscape documents.

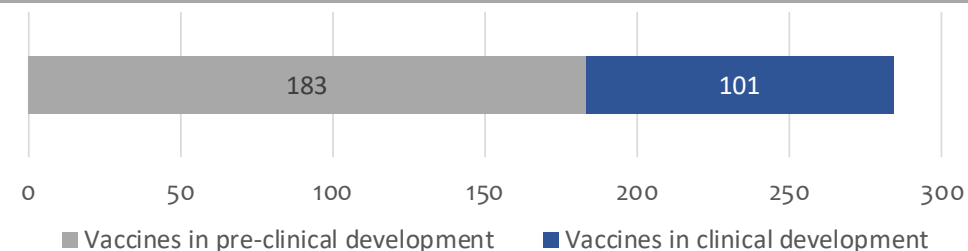
Summary Information on Vaccine Products in Clinical Development

1. - Number of vaccines in clinical development

101

2. - Number of vaccines in pre-clinical development

183

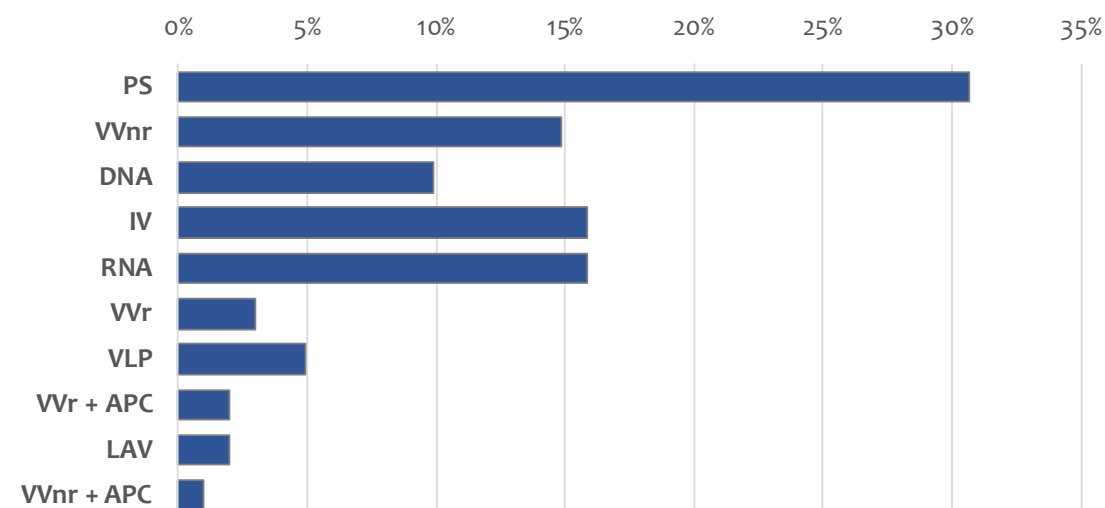


3. - Candidates in clinical phase

Filter

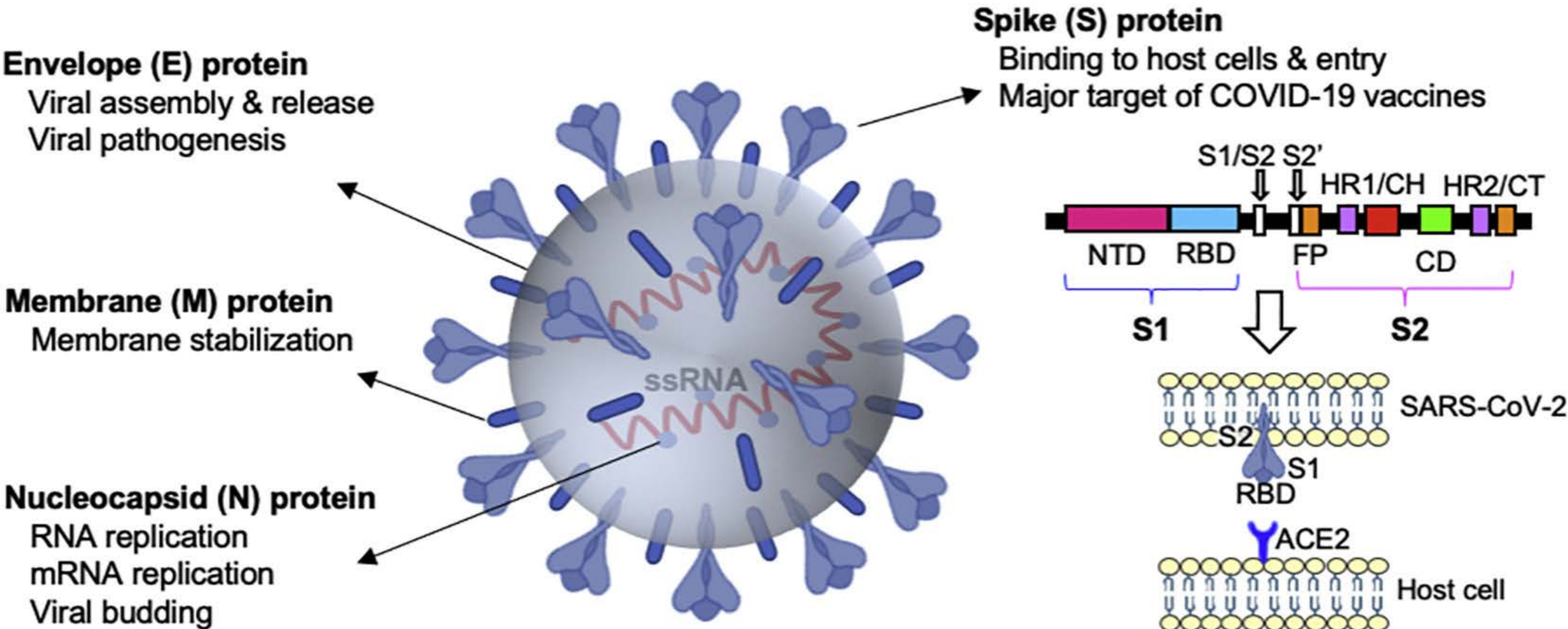
Select phase of development (default is all)

Platform		Candidate vaccines (no. and %)	
PS	Protein subunit	31	31%
VVnr	Viral Vector (non-replicating)	15	15%
DNA	DNA	10	10%
IV	Inactivated Virus	16	16%
RNA	RNA	16	16%
VVr	Viral Vector (replicating)	3	3%
VLP	Virus Like Particle	5	5%
VVr + APC	VVr + Antigen Presenting Cell	2	2%
LAV	Live Attenuated Virus	2	2%
VVnr + APC	VVnr + Antigen Presenting Cell	1	1%



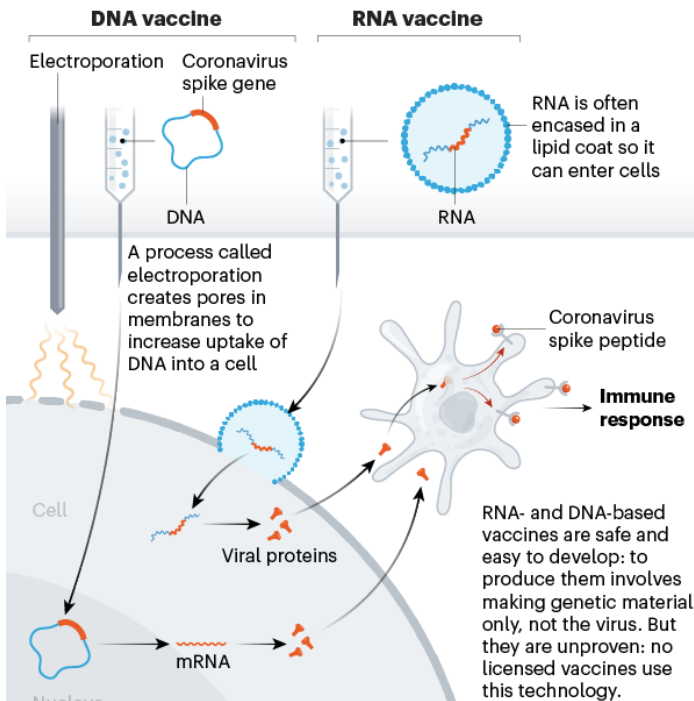
<https://www.who.int/publications/m/item/draft-landscape-of-covid-19-candidate-vaccines>

SARS-CoV-2 Virus structure



Main vaccine platforms

NUCLEIC-ACID VACCINES



Pfizer-BioNTech (BNT162b2)
Moderna (mRNA-1273)

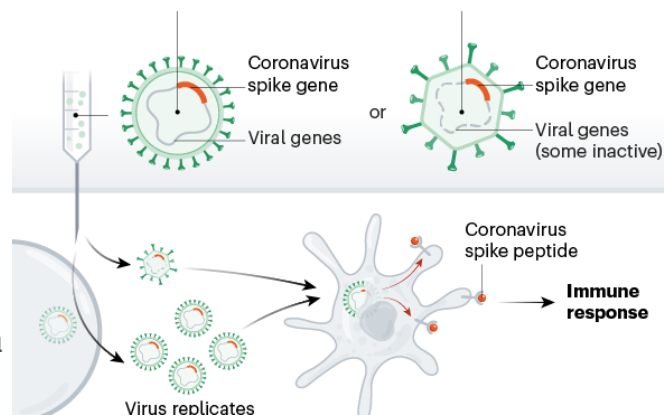
VIRAL-VECTOR VACCINES

Replicating viral vector (such as weakened measles)

The newly approved Ebola vaccine is an example of a viral-vector vaccine that replicates within cells. Such vaccines tend to be safe and provoke a strong immune response. Existing immunity to the vector could blunt the vaccine's effectiveness, however.

Non-replicating viral vector (such as adenovirus)

No licensed vaccines use this method, but they have a long history in gene therapy. Booster shots can be needed to induce long-lasting immunity. US-based drug giant Johnson & Johnson is working on this approach.



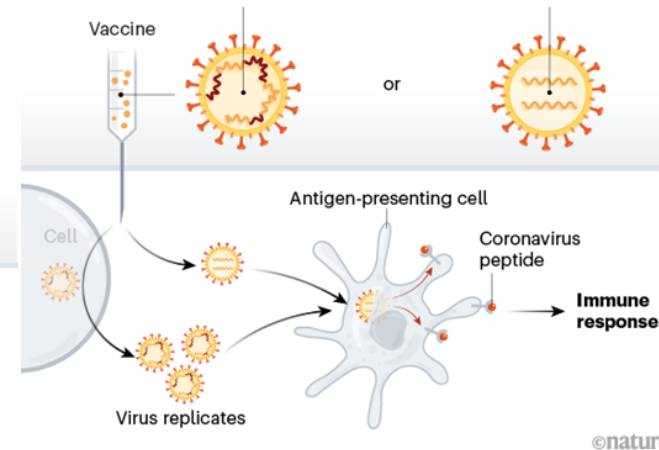
AstraZeneca (C19VAZ)
Janssen/Johnson & Johnson
Convidencia (Tianjin-CanSinoBIO)

Weakened virus

A virus is conventionally weakened for a vaccine by being passed through animal or human cells until it picks up mutations that make it less able to cause disease. Codagenix in Farmingdale, New York, is working with the Serum Institute of India, a vaccine manufacturer in Pune, to weaken SARS-CoV-2 by altering its genetic code so that viral proteins are produced less efficiently.

Inactivated virus

In these vaccines, the virus is rendered uninfected using chemicals, such as formaldehyde, or heat. Making them, however, requires starting with large quantities of infectious virus.

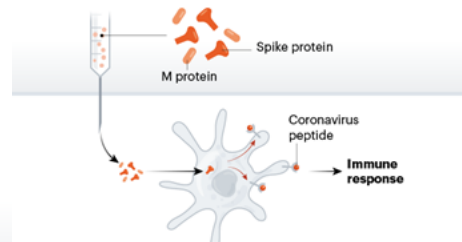


Sinovac (CoronaVac)
Sinopharm (BBIBP-CorV)
Sputnik V (Gamaleya)
Covaxin (Bharat Biotech)

PROTEIN-BASED VACCINES

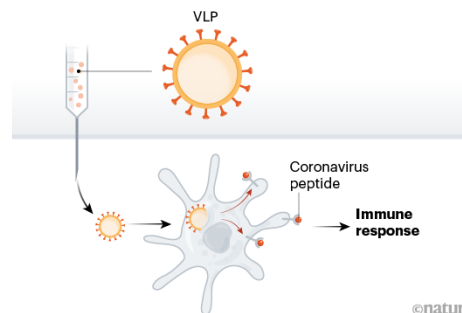
Protein subunits

Twenty-eight teams are working on vaccines with viral protein subunits — most are focusing on the virus's spike protein or a key part of it called the receptor binding domain. Similar vaccines against the SARS virus protected monkeys against infection but haven't been tested in people. To work, these vaccines might require adjuvants — immune-stimulating molecules delivered alongside the vaccine — as well as multiple doses.



Virus-like particles

Many virus shells mimic the coronavirus structure, but aren't infectious since they lack genetic material. Five teams are working on 'virus-like particle' (VLP) vaccines, which can trigger a strong immune response, but can be difficult to manufacture.



Novavax
Sanofi Pasteur/GSK
Serum Institute

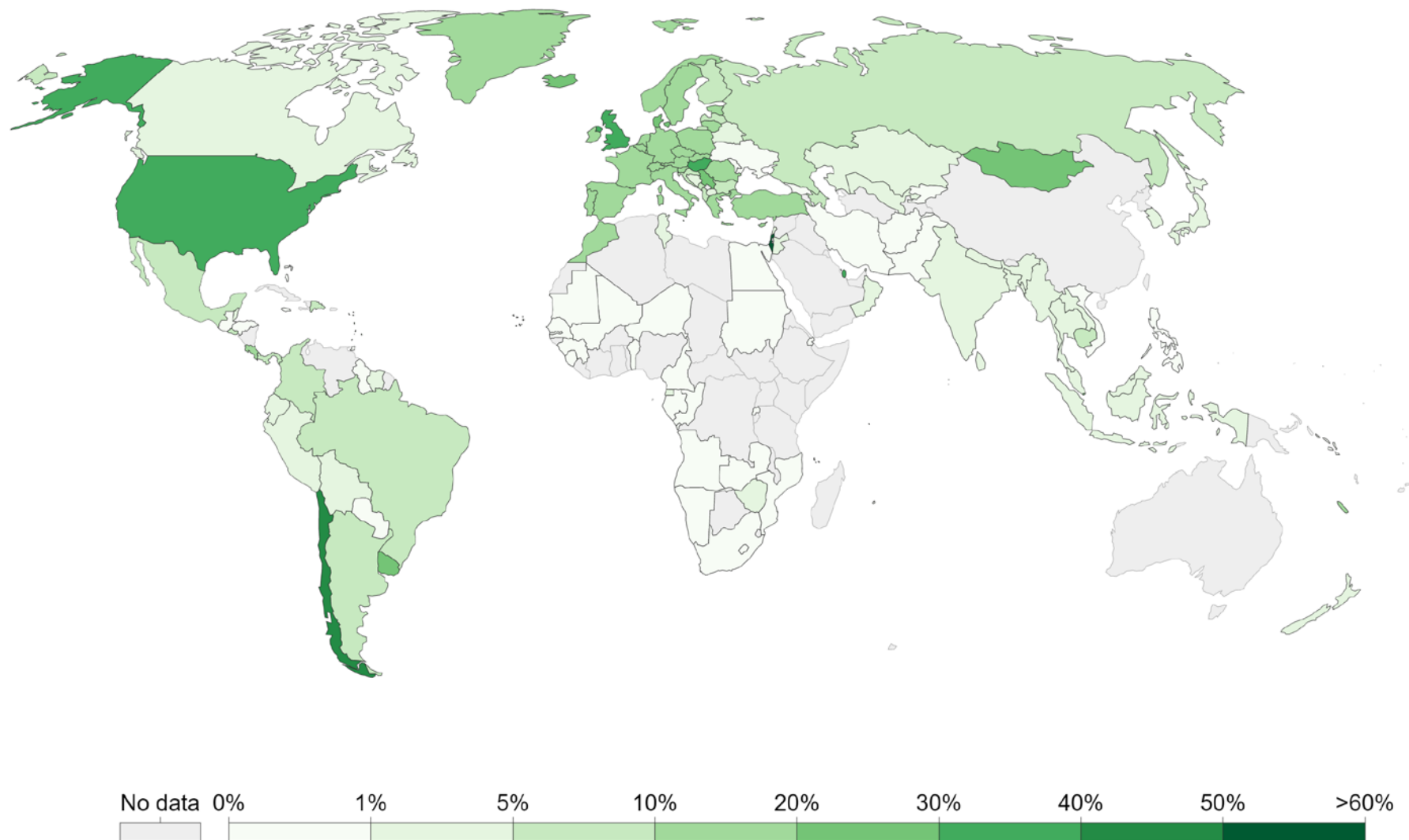
Nearly all vaccines have shown good efficacy, but there are some differences

	Prevention of disease	Prevention of infection	Prevention of disease	Prevention of infection
	Ancestral/B.1.1.7		B.1.351	
Pfizer/BioNTech	91%	86%	76%	72%
Moderna	94%	89%	79%	75%
AstraZeneca	74%	52%	10%	9%
Johnson & Johnson (Janssen)	72%	72%	64%	56%
Sputnik-V	92%	81%	70%	61%
Novavax	89%	79%	49%	43%
CoronaVac	50%	44%	38%	33%
Sinopharm	73%	65%	55%	49%
Tianjin CanSino	66%	58%	50%	44%
Covaxin	78%	69%	59%	52%
Other mRNA vaccines	91%	86%	76%	72%
All other vaccines	75%	66%	57%	50%

* Shaded areas are modelled estimates; data as of May 19, 2021; IHME <http://www.healthdata.org/covid/covid-19-vaccine-efficacy-summary>

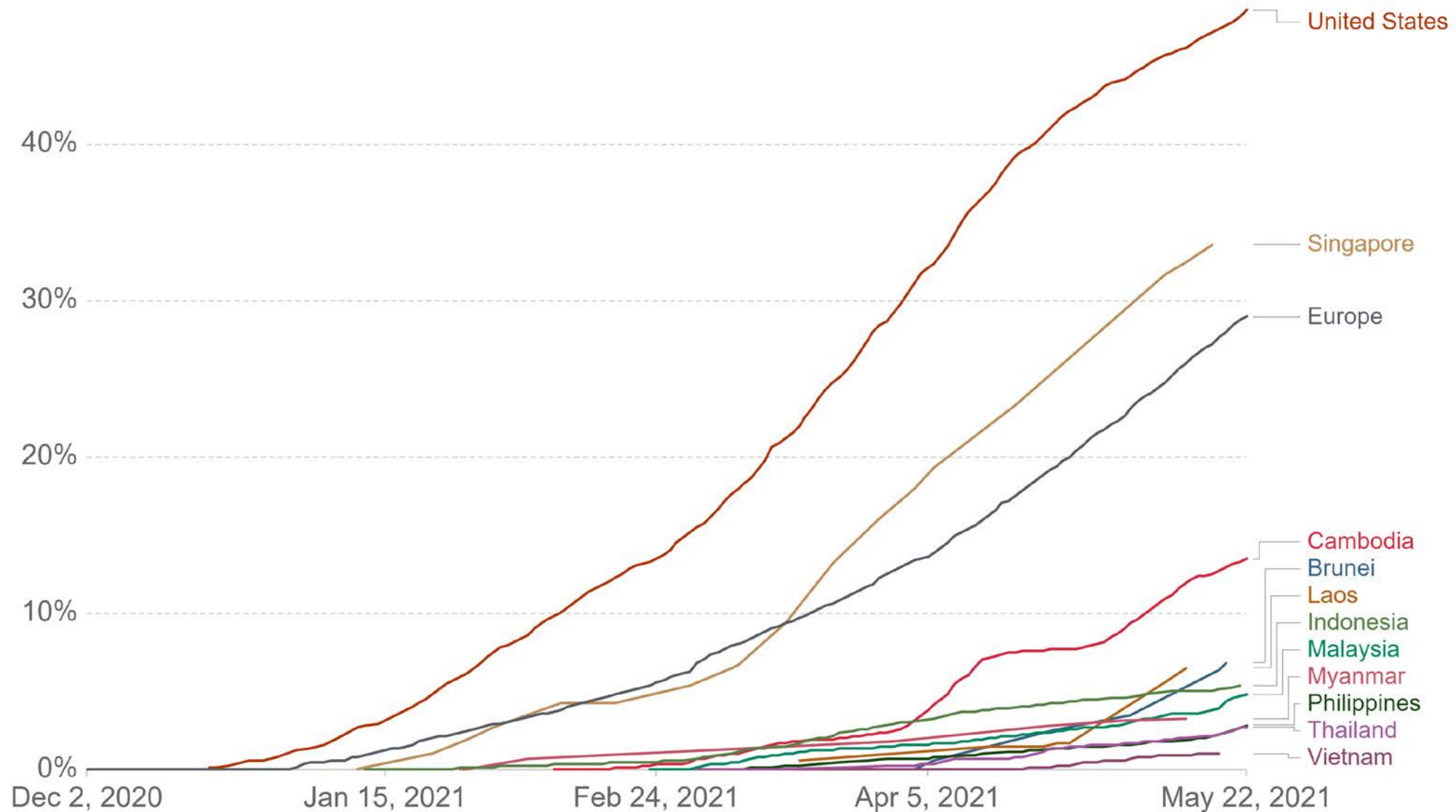
Share of the population fully vaccinated against COVID-19, May 23, 2021

Share of the total population that have received all doses prescribed by the vaccination protocol. This data is only available for countries which report the breakdown of doses administered by first and second doses.



Share of people who received at least one dose of COVID-19 vaccine

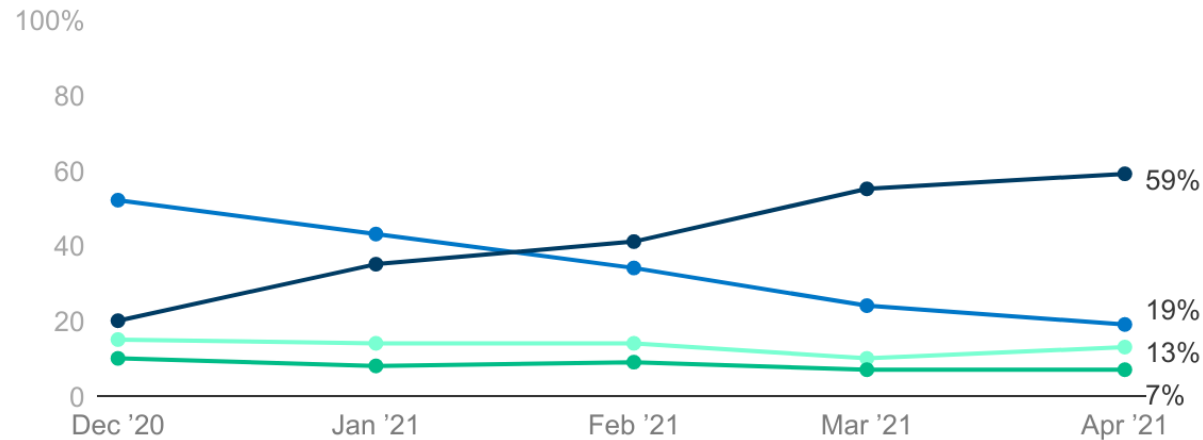
Share of the total population that received at least one vaccine dose. This may not equal the share that are fully vaccinated if the vaccine requires two doses.



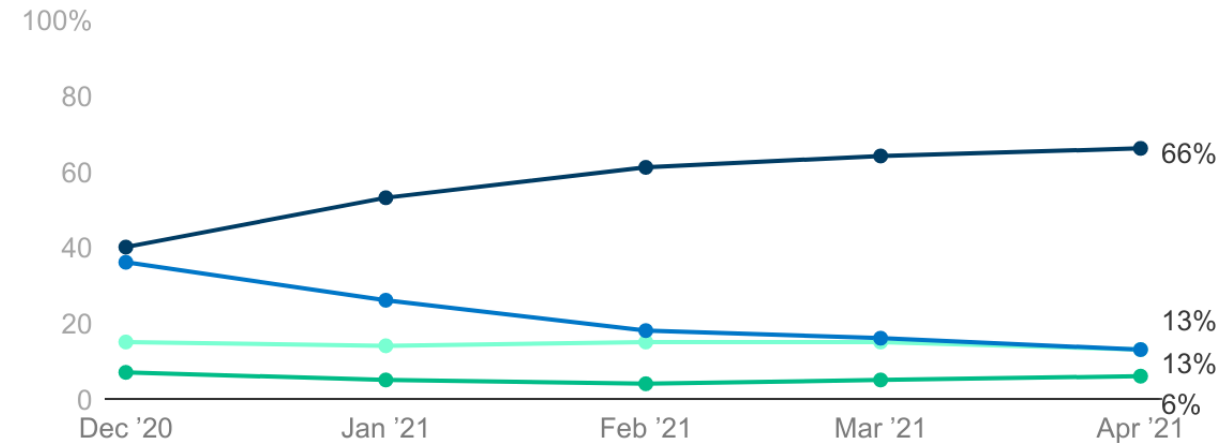
Ethnic/Racial differences exist, but can be addressed

Willingness/Acceptance for COVID-19 Vaccination in the U.S.

African-Americans



White Americans



— Already gotten/As soon as possible — Wait and see — Only if required
— Definitely not

<https://www.kff.org/coronavirus-covid-19/poll-finding/kff-covid-19-vaccine-monitor-april-2021>

Vaccine uptake in the U.S. Military – *many issues mirror those in civilian population*

- Assess vaccine initiation/completion amongst military from December 11th to March 12th, 2021
- 361,538 (27%) initiated the mRNA vaccine
- Non-Hispanic Blacks were 28% less likely to initiate the vaccine than non-Hispanic Whites
- 93.8% who initiated, completed the series
- Females 10% less likely than males
- Major differences seen between the 4 branches
- 55% of active healthcare personnel initiated the vaccine
- As of May 21st, 2021 - ~3.4 million doses administered and ~740,000 fully vaccinated service members – key driver has also been opening it up to everyone

Vaccine hesitancy and misinformation – *some based in fact, most in fiction*

Concerns/Misinformation (a sampling)

Vaccines were made too fast

The vaccine is unsafe and can kill you

The vaccine will make me test positive for COVID-19

The vaccine causes infertility

The vaccine will cause a miscarriage

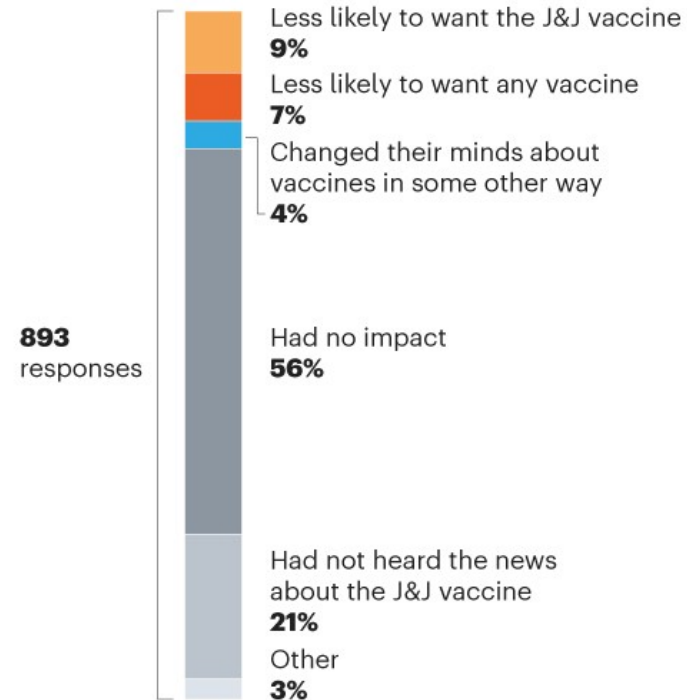
Vaccinated people shed the virus

The vaccine will change your DNA

* As of March 25, 2021, the most popular news story on vaccines in 2021 was about a doctor who died after the vaccine. There is zero evidence of it being related, but it had received 5 million clicks.

NEW HESITANCY

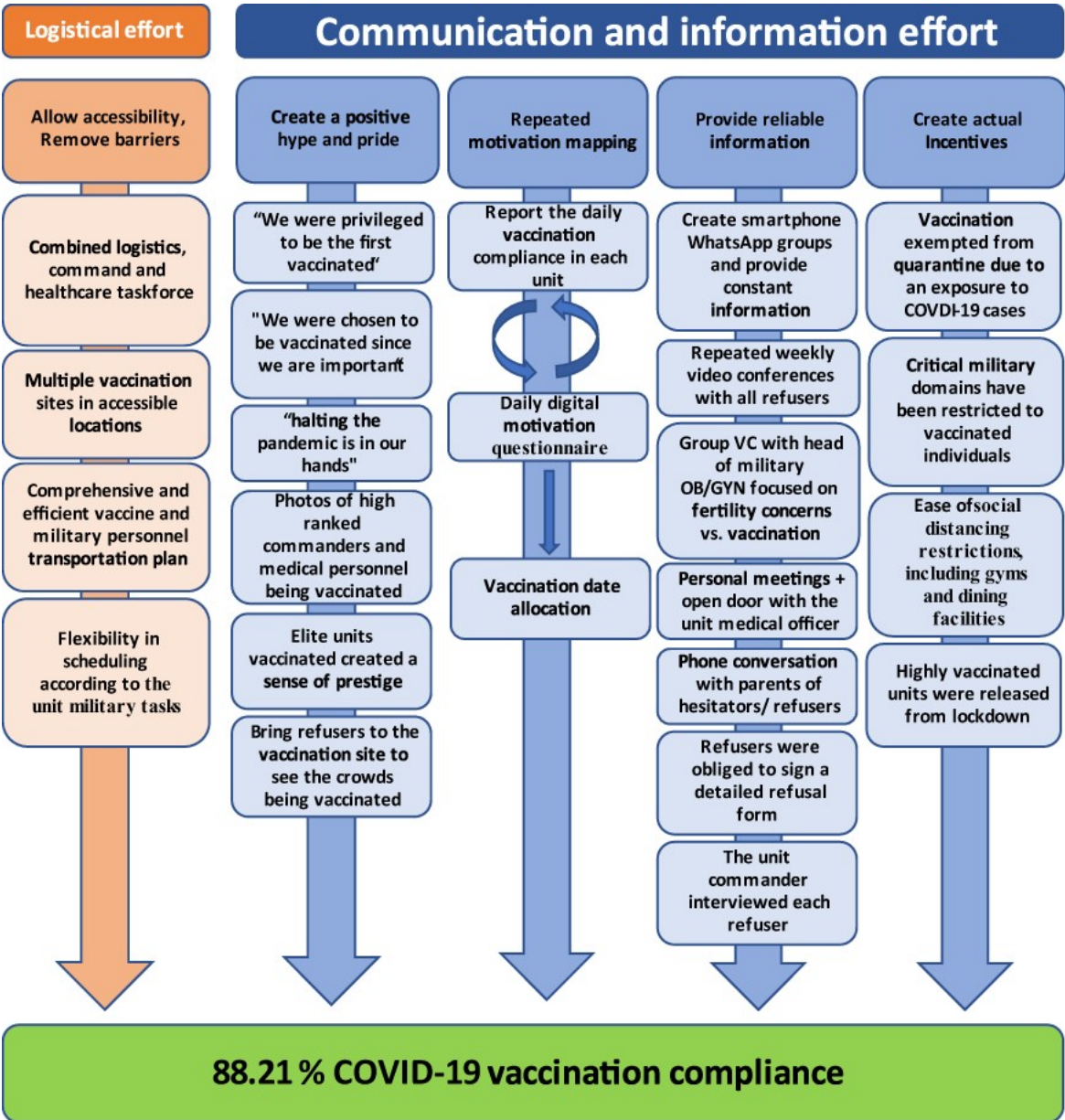
After US inoculations with the Johnson & Johnson (J&J) shot were paused owing to worries over blood clots, unvaccinated Americans' hesitancy to get a COVID-19 jab increased, according to a survey.



How to tackle misinformation

1. Find and bookmark sites with good information
2. Remember, science can be messy and provisional
3. Set norms by modeling good behavior
4. Depoliticize the science
5. Consider before you “like” and forward social media posts
6. Set realistic goals
7. Make it about protecting your neighbors
8. Aim for immunity within your community

Actions taken to maximize COVID-19 vaccination rates among 70 military units (n = 18,719 individuals) in the Israeli defense force, and the vaccination rate achieved 54 days after the vaccination campaign was launched





Summary

- COVID-19 has touched every corner of the globe, and reinforced how interconnected we are
- Like previous pandemics, COVID-19 has spawned many innovations in technology and therapeutics, amongst which, vaccine development has been the most dramatic
- Many vaccines are already in usage, all with good efficacy and safety, though minor variations do exist
- Military personnel are at risk for COVID-19, and in some cases, may be placed in situations that are higher risk
- Vaccine uptake in the military is suboptimal, and faces many similar challenges to those seen in civilian populations
- Proactive measures should be taken to combat vaccine disinformation in the military