Weill Cornell Medicine

Scenario Planning and MCM Stockpiling Strategies

NAS Session IV

Panel - Meeting 3 of the Committee on the Current State of Smallpox MCMs

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https://phs.weill.cornell.edu/research-collaboration/our-divisions/disease-disaster-preparedness

Some Basic Disease Modeling

R_0 = basic reproduction number

= $p\ c\ D$

= {probability of infection given a contact}

*

{number of contacts}

*

{duration of infection}

No Equivalent Basic Response Modeling, but…

- Imagine if there were a V_0 = basic vaccination number
- What would it consist of?
- Components:
  1. Supply
  2. Demand
  3. A system to EFFICIENTLY AND EFFECTIVELY join the two at the level of the individual
- We have such systems all around us, *just not in public health*

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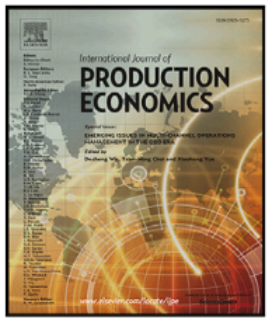

Efficient and effective large-scale vaccine distribution

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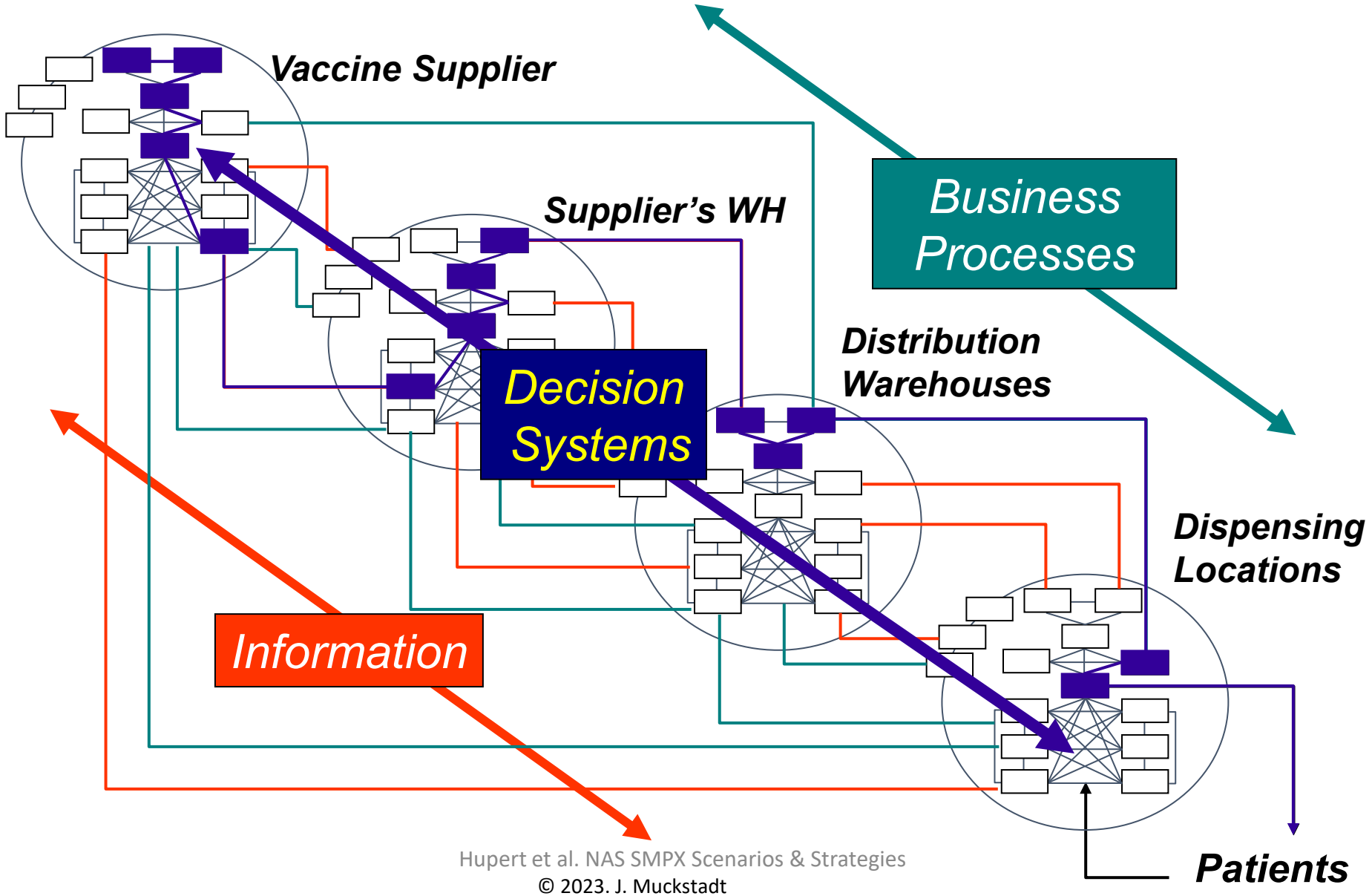
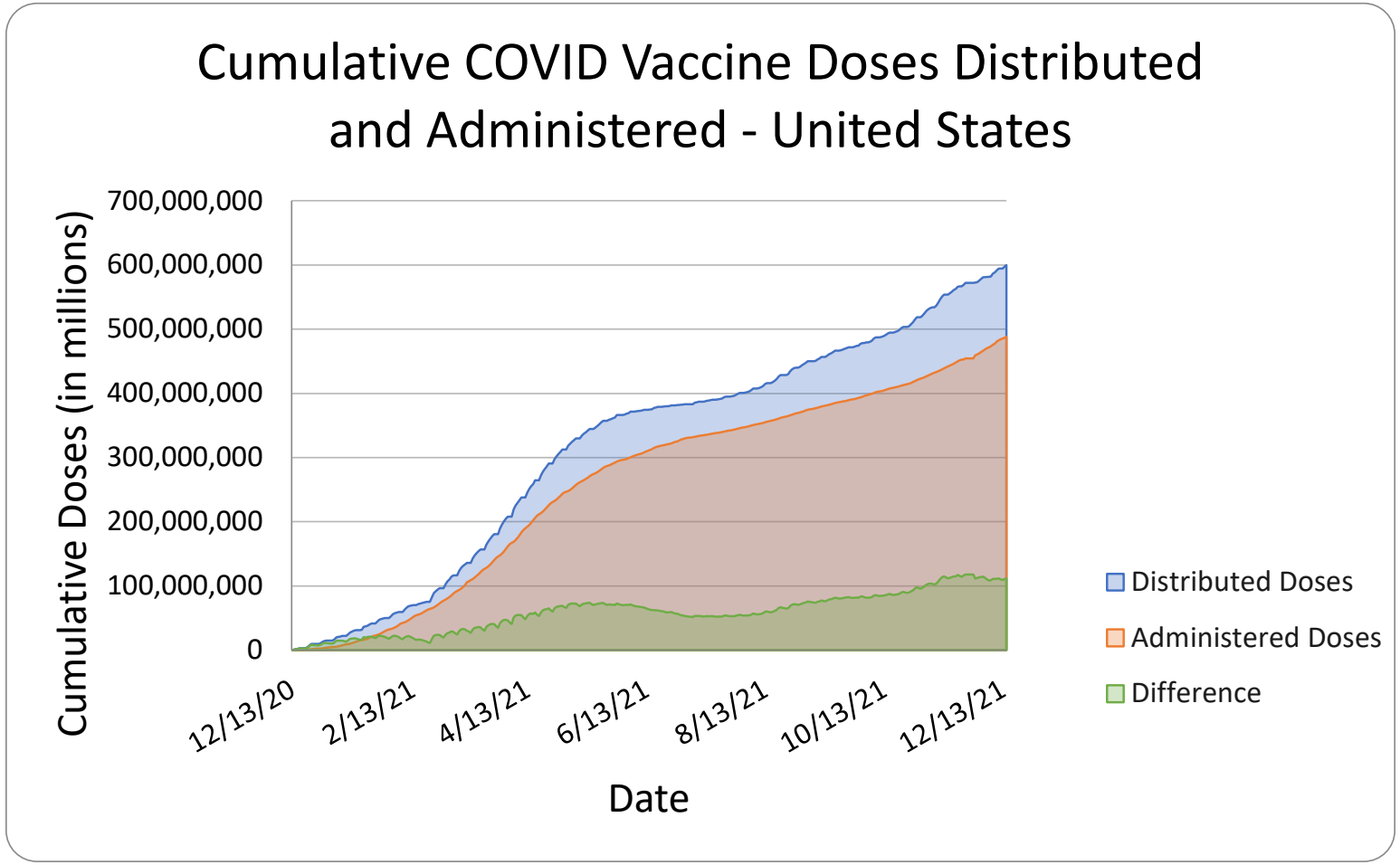
Interdependent Vaccine Supply / Allocation System Components



How Well Did the U.S. Distribution System Perform During the COVID-19 Pandemic?

Data Source: U.S. Centers for Disease Control and Prevention (CDC)



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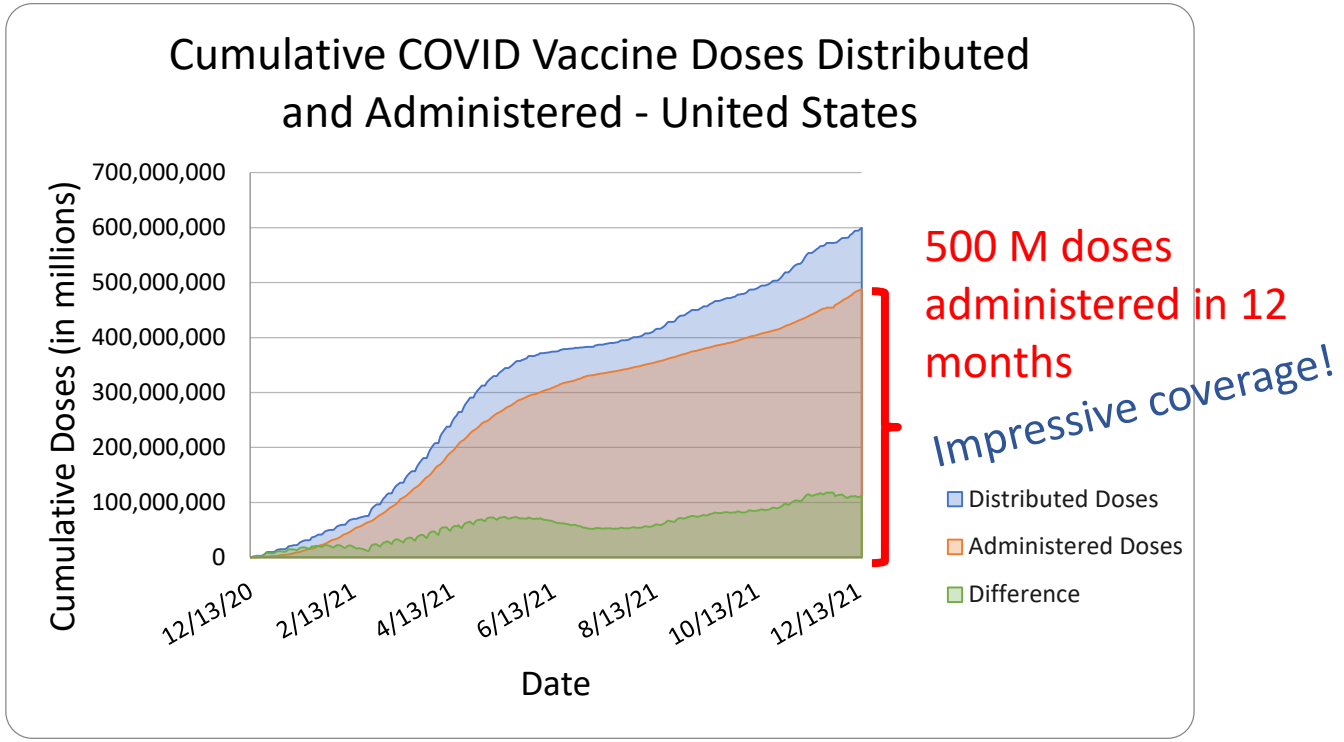

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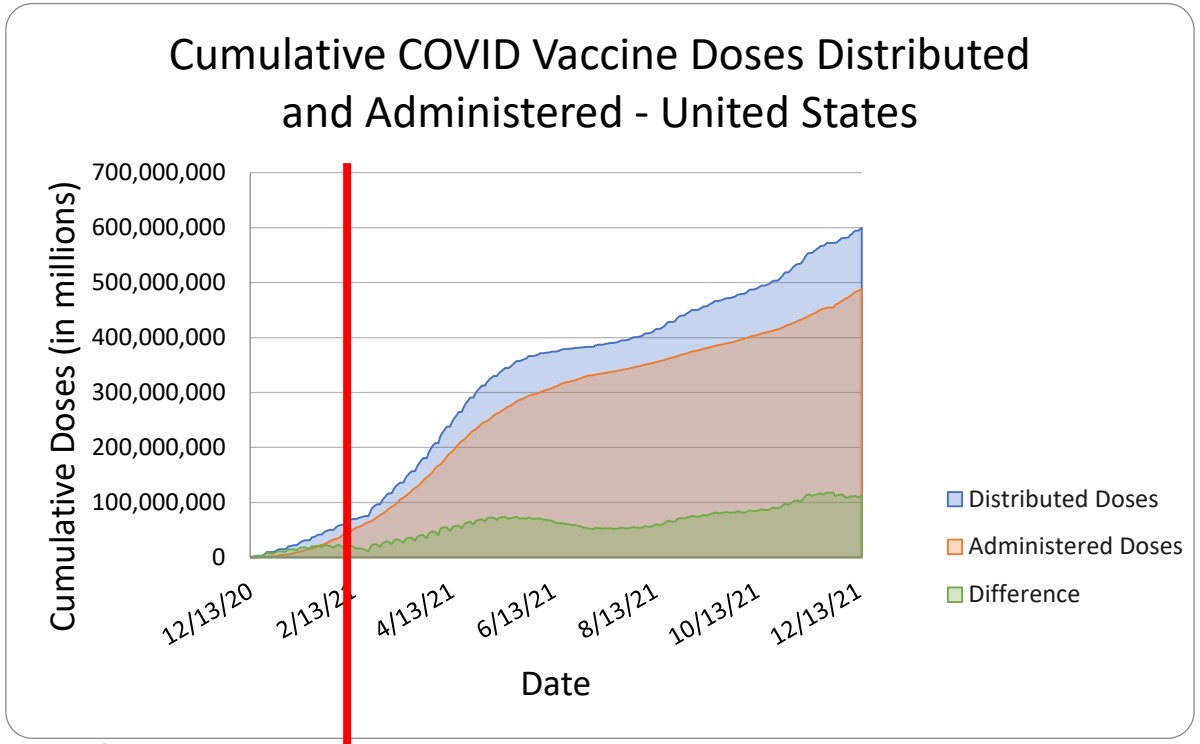

First phase

Targeted populations: first responders, healthcare workers, elderly, fire and police

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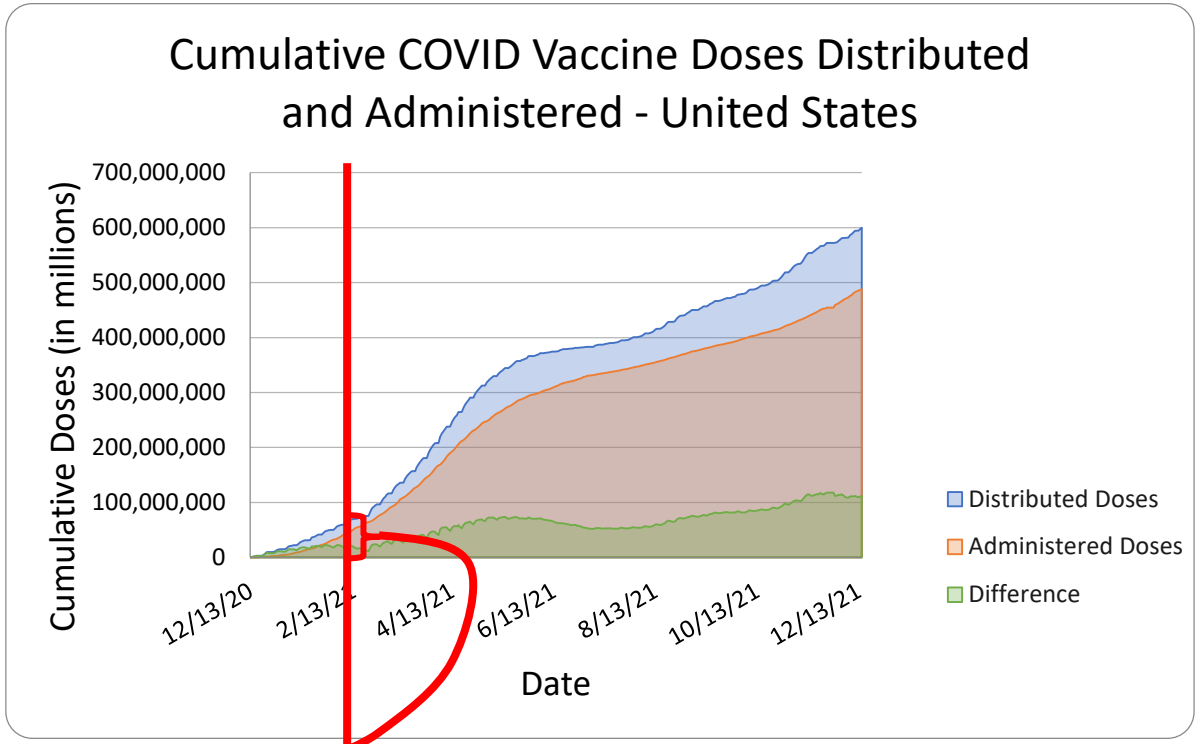
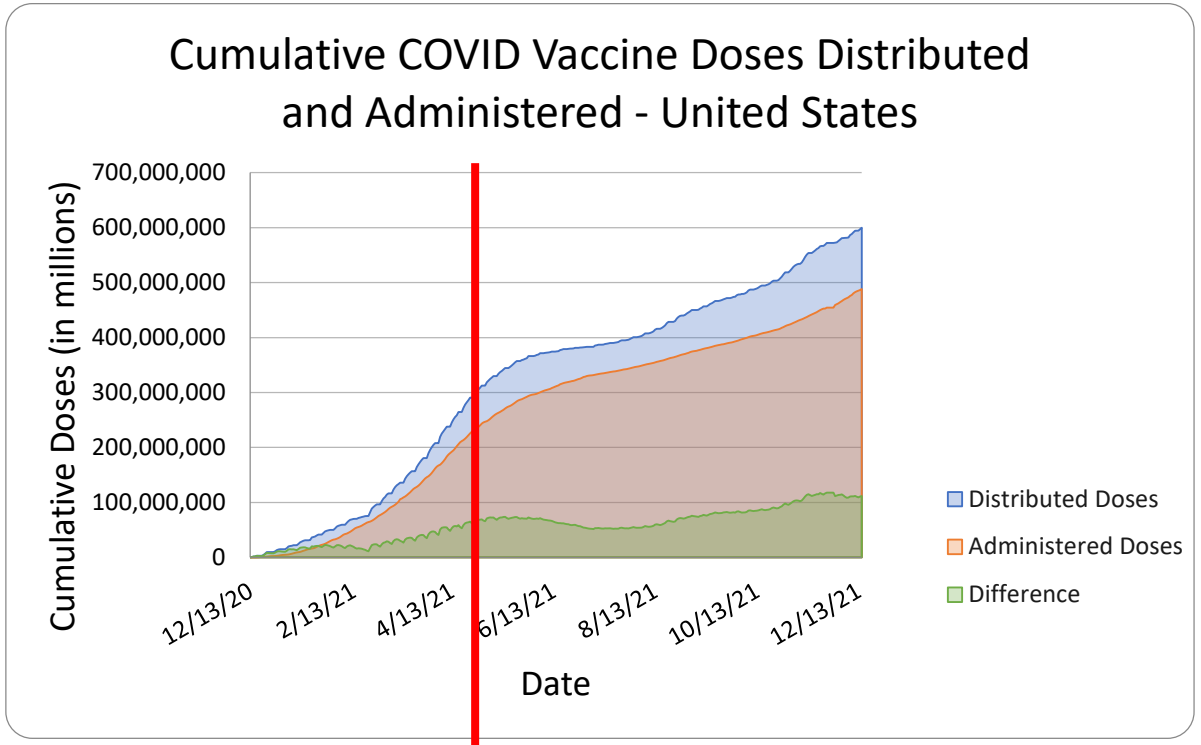


Doses distributed: 80,000,000
Doses administered: 58,200,000
Doses unused: 21,800,000

27% of production still in distribution

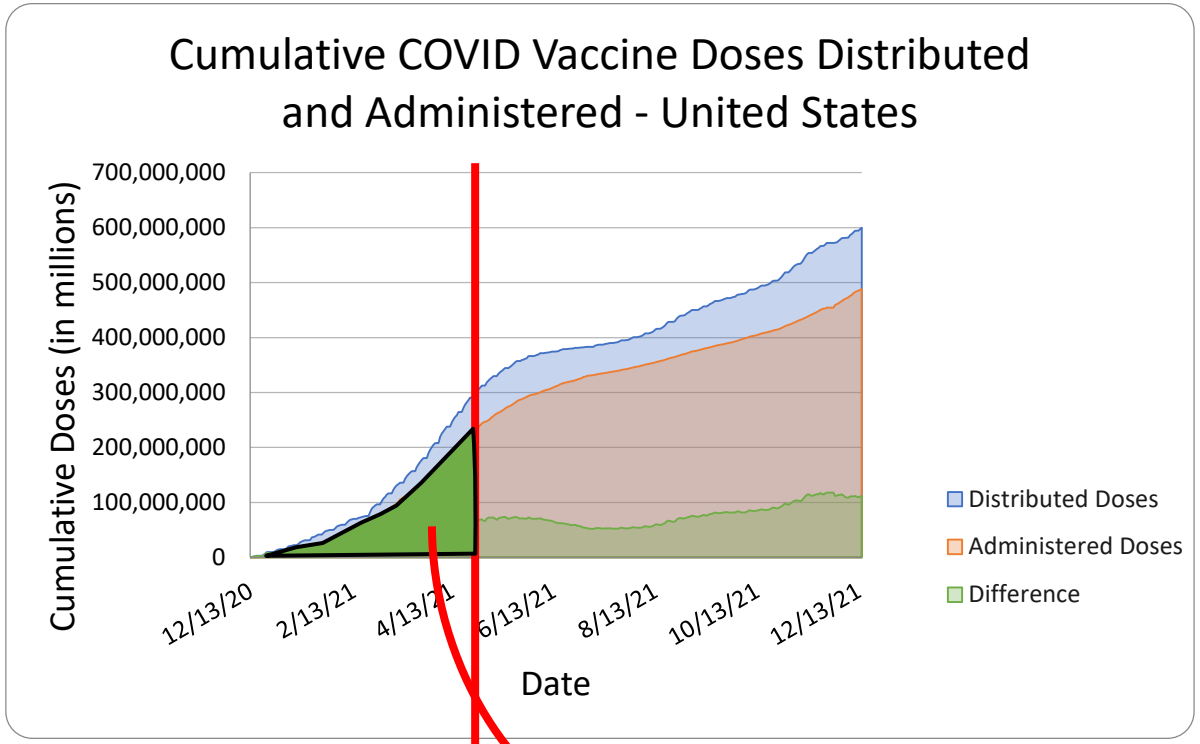
How Well Did the U.S. Distribution System Perform During the COVID-19 Pandemic?



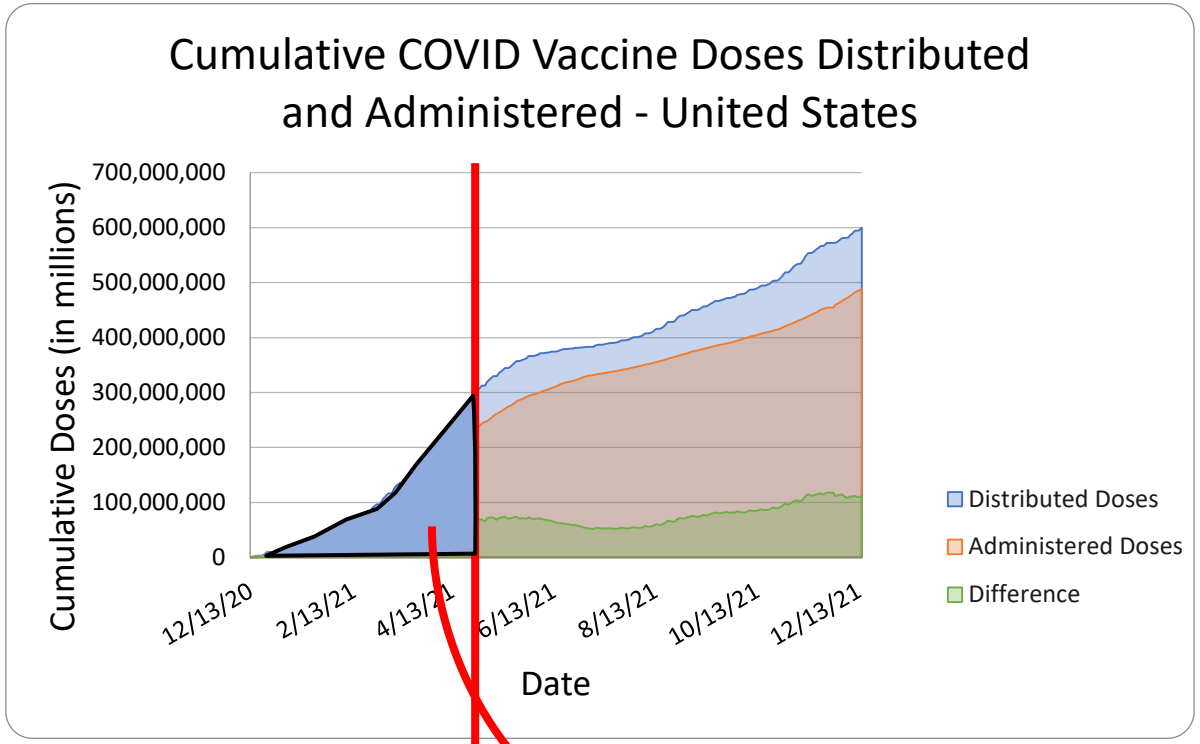
Peak supply rate reached

Supplies were no longer a constraint

How Well Did the U.S. Distribution System Perform During the COVID-19 Pandemic?

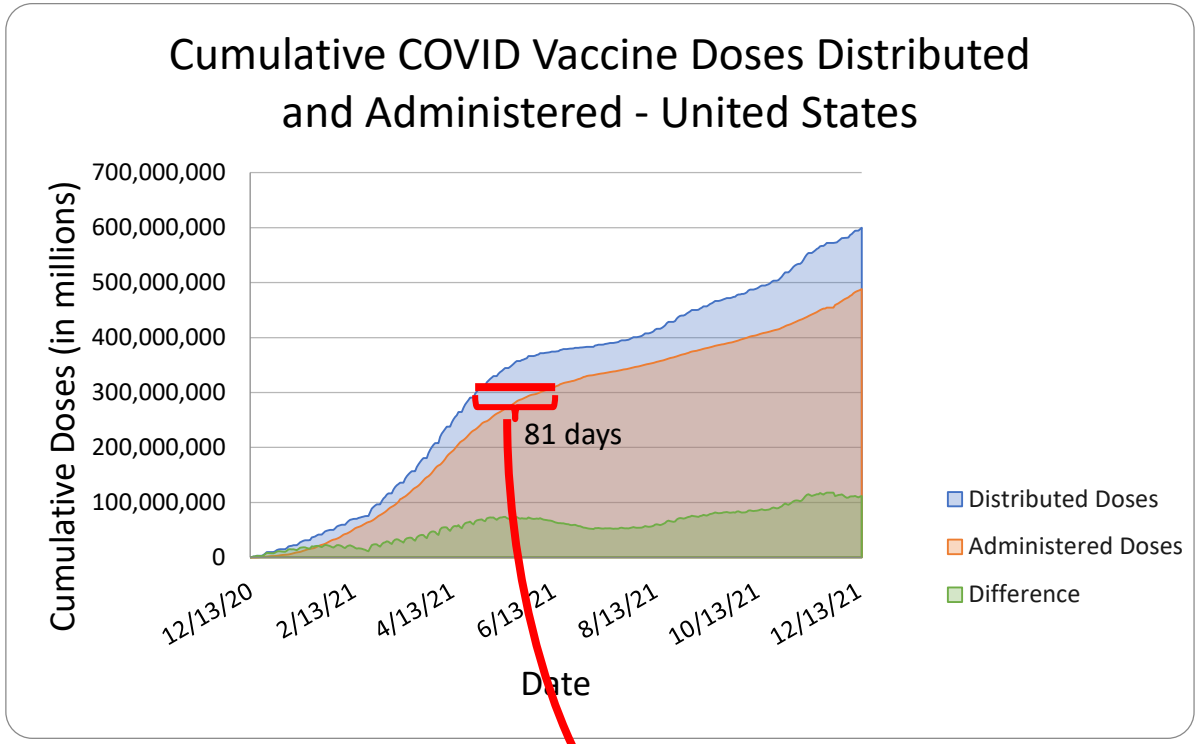


Vaccination person days achieved = area in green ≈11.4 billion vpd's



~18% increase in vpd available from more effective distribution system

Vaccination person days possible = area in blue ≈13.5 billion vpd's (with allowance for 6 –day lead time)



After peak supply rate is reached, days in distribution increases from starting point of **81 days "on the shelf"**

Supply received by May 20 is not consumed until Aug. 9: **81 days**

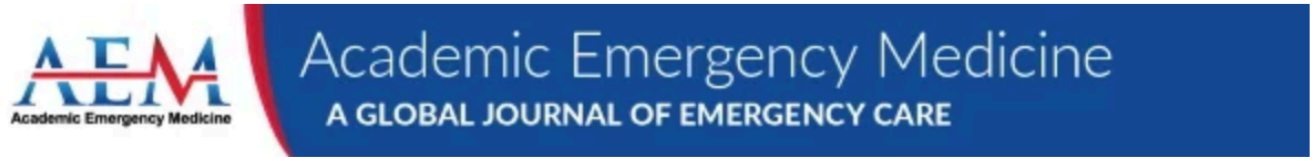
How Well Did the U.S. Distribution System Perform During the COVID-19 Pandemic?

- By the middle of October 2022, approximately 883 million doses had been distributed to states but only 633 million had been administered. That is, about 71% of the available supply had been administered nationally.
  - The excess supply would more than doubly vaccinate the entire populations of Canada and the UK

- For NY state, 872 million VPDs were missed, which was about 50 lost VPDs for each of the 17.2 million persons who were vaccinated in the state. About 77% of the supply was administered.

Particular Concerns with Smallpox Response

- Combined public health and national security emergency
- Concerns about disease (lethality, contagion)
- Rise of anti-vax sentiment (modeling project: moth-eaten ring vax)
- Concerns about vaccine (esp. side effect profile of prior generation)



Free Access

Anticipating Demand for Emergency Health Services due to Medication-related Adverse Events after Rapid Mass Prophylaxis Campaigns

Nathaniel Hupert MD, MPH, Daniel Wattson BS, Jason Cuomo MPH, Samuel Benson BA, AEMT-P

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Summary and Conclusion

- There is a difference between who should be vaccinated and how the supply chain architecture should be designed.
- Focus on maximizing vaccinated person-days – earlier is better
- Therefore: aim for fewer and larger scale dispensing locations
- Create the dispensing system before the event, and exercise it
- Optimization models and associated algorithms are not the goal but a means to an end:

  To allocate vaccines throughout the supply chain so as to ensure fairness and effectiveness.