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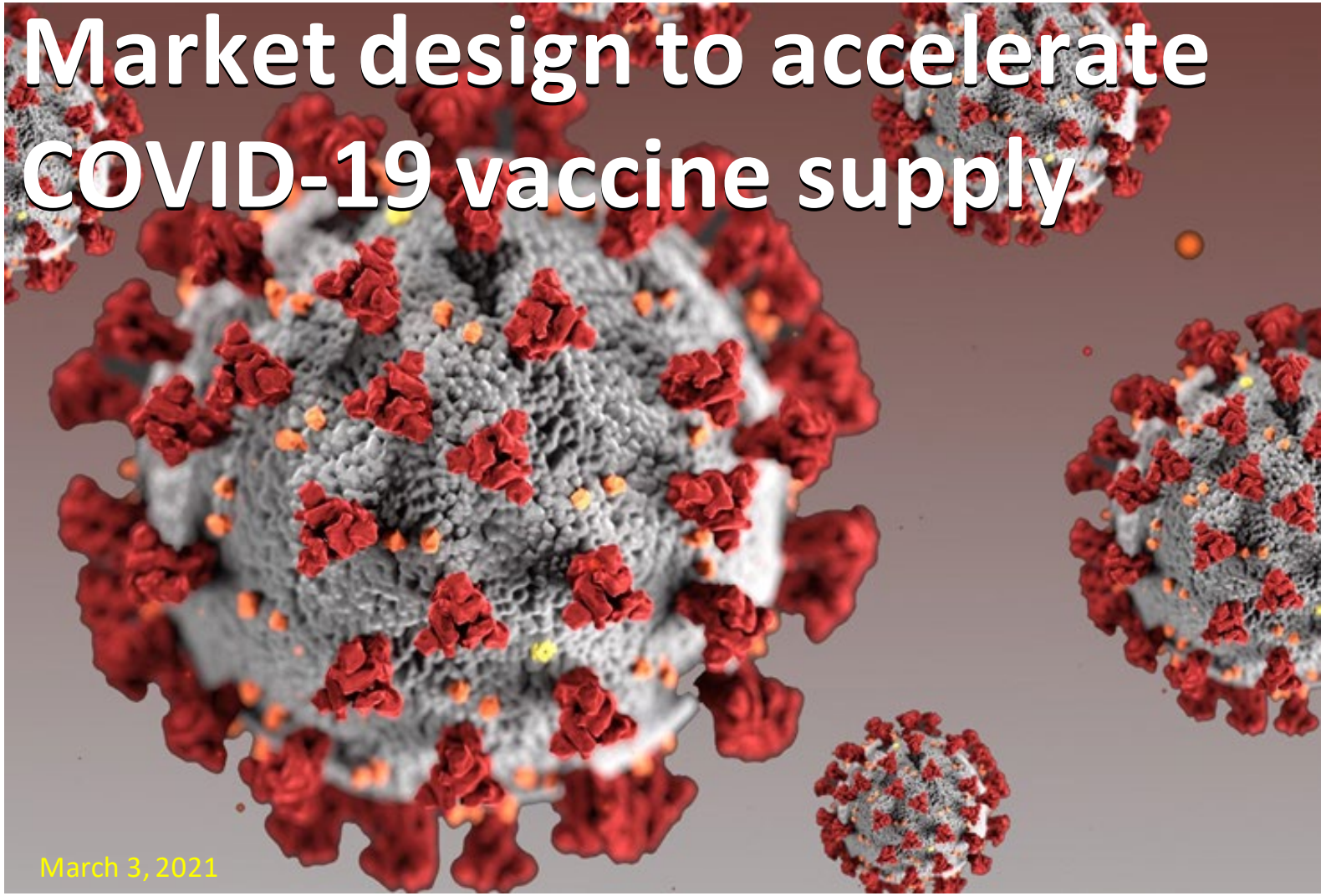
See https://www.acceleratinght.org/home

Market design to accelerate COVID-19 vaccine supply



Castillo et al., 2021, "Market Design to Accelerate COVID-19 Vaccine Supply," *Science*

Ahuja et al., 2021, "Preparing for a pandemic: Accelerating Vaccine Availability," NBER Working Paper 28492

Each month, Covid 19 kills ~300,000 people (as of February 2021) and reduces global GDP by ~$500 billion

- More comprehensive measures of harm are much higher, ~$800 billion per month for US alone (Cutler & Summers).
- Accelerating vaccination could avert these costs faster.
- Large-scale capacity investment and efficient use of existing vaccine capacity is key to accelerating vaccination coverage.

Social value of early and large-scale capacity investment >> private value

- We estimate value of additional vaccine capacity = $600 - $1,000 per course (if available in July or April respectively).
- This dwarfs the $6-$40 price per course observed in deals with vaccine producers.
- Marginal benefit of vaccine capacity >> marginal cost
- This implies a large gap between social and private benefits of producing additional vaccines.

Carefully crafted public intervention is needed to align social and private benefits.

Public investment in vaccine capacity

- The US, India, UK, EU and others made advance deals for billions of courses.
- COVAX AMC covering low income countries.
- World Bank $12bn financing available (can be used for vaccine purchases).

Questions:

- Are these good investments?
- Would further investments now be beneficial?
- How can investments be structured most efficiently?
- How can we use existing capacity more efficiently?

Roadmap

- The value of vaccine capacity
- Expanding vaccine capacity
- Using existing capacity efficiently
  - Lower doses and “first doses first”
  - Trading off speed for efficacy
  - Trials
  - Cross Country Vaccine Exchange

The value of vaccine capacity

Value of existing vaccine capacity

GLOBAL CAPACITY (BILLION COURSES)	GLOBAL BENEFIT (TRILLION $)		TIME TO 70% VACCINATION (MONTHS)	
	GDP ALONE	COMPREHENSIVE	HIGH-INCOME COUNTRIES	WORLD
1	5.3	10.5	31.5	66.0
2	7.5	15.0	16.5	33.7
3	8.7	17.4	11.5	23.0
4	9.4	18.8	9.0	17.6
5	9.8	19.7	7.5	14.4

Castillo et al, 2021

Global value of additional 1 billion courses annual capacity

SCENARIO		ADDITIONAL GLOBAL BENEFIT (BILLION $)		SPEED-UP TO 70% VACCINATION (MONTHS)	
ADDITIONAL CAPACITY ONLINE	BASELINE CAPACITY (BILLION COURSES)	GDP ALONE	COMPREHENSIVE	HIGH-INCOME COUNTRIES	WORLD
April 2021	2	970	1940	4.5	10.2
	3	495	989	2.1	5.0
	4	270	540	1.2	2.9
July 2021	2	636	1273	3.5	9.2
	3	288	576	1.4	4.3
	4	129	257	0.6	2.3

Castillo et al, 2021

Expanding vaccine capacity

Soliciting Bids

- There is debate over whether all feasibly available capacity is being used
- There could be opportunities to install new factories, repurpose existing ones, or finding new ways to increase yield.

Governments and international organizations could solicit bids from firms for capacity expansion to identify possible investments.

Contract Design

- If contracts specify number of doses, without delivery dates, producers may just add countries to the back of the queue.
  - Firms' incentives to fulfill orders more quickly << social benefit.
- Aligning private and social incentives through penalty/bonus clauses for speed would require very high-powered incentives,
  - Unacceptable level of risk, potential unintended consequences

Suggests including provisions for capacity expansion in contract.

Supply chains

If prices of intermediate inputs are constrained, high final demand may not generate sufficient supply of inputs:

- Large expansion of vaccine capacity creates a spike in demand for inputs.
- Meeting this requires large-scale increase in manufacturing capacity.
- If demand is temporary, there is a risk capacity will be idle in the long run.
- Hard to justify investment commercially if output price is fixed.

Public investment in intermediate input capacity is likely critical.

To enable rapid capacity expansion for future pandemics, advance investment in supply chains is key (Ahuja et al. 2021)

Using existing capacity efficiently

First doses first

Giving 2nd doses after 12 (rather than 4) weeks allows more people to receive a 1st dose sooner. Seems likely 1st dose conveys a lot of the overall protection.

- This is likely to reduce mortality and infections
- Data from the UK (which adopted this strategy) supports this
- Giving second doses faster to at-risk populations and delaying them for others may produce even better results?
- Consider providing only one dose to those previously infected? (Recommended by HAS, France's health authority)

Lowering doses could stretch existing capacity further

- We do not know the optimal dosage for vaccines.
- Firms may not have strong incentives to optimise doses to maximise social benefits.
- E.g. trial results from AstraZeneca suggested a half-dose followed by a full dose may be more effective.
- Could increase vaccine capacity substantially.

Using all available vaccines

- Some vaccines may have lower efficacy than others. vaccines have many other characteristics (storage, # doses, efficacy against different variants)
- Using all doses as soon as they are available provides most benefit to society, due to need for speed (Castillo et al 2021).
  - Suppose country can access a 70% effective vaccine now, or a 95% effective one in 3 months.
  - Higher benefits from starting with immediately available vaccine.

Additional Vaccine Trials

Additional trials could test lower or delayed doses or efficacy against new strains.

- Could be conducted head-to-head, with no need for control groups.
- Could be embedded in vaccine rollouts, no need to delay delivery.
- Low risk, as safety already tested.
- Very large option-value.

Cross Country Vaccine Exchange

Some countries may end up with vaccine allocations that are not optimally matched to their needs.

- Countries may be willing to make trade offs in efficacy for increases in quantity and vice versa.
- A vaccine exchange mechanism in COVAX would enable countries to engage in mutually beneficial trades.

Conclusion

- Value of investing to expand vaccine capacity is still very large
  - Governments could solicit bids from firms to identify opportunities.
  - Contracts should include provision for capacity
  - Supply chain constraints
- Use existing capacity efficiently
  - Trading off speed for efficacy
  - “First doses first”
  - Trials
  - Cross country vaccine xchange

Implications for South Asia

Purchasing vaccines for South Asia

- Vaccines are a good investment, including for LMICs
- Delay is costly: may be better to pay for vaccines now than get them for free later.

Producing vaccines for the world

- The region has high % of global vaccine capacity: well placed to bid for expansion.
- Worth boosting confidence that vaccines will be exported promptly.
  - Ensure candidates & sites tested to global standards quickly, even if expensive.
  - Any trade restrictions very costly in the long term.

End