Overview of COVID-19 vaccine and diagnostics value chains

Current as of January 8, 2021

This content is provided “as is” solely for informational purposes. It reflects general insight and may present potential options for consideration based on currently available information, which is inherently uncertain and subject to change, but does not contain all of the information needed to determine a future course of action. It is not legal, health, or safety advice. Organizations should engage their own experts to ensure any adopted measures are compliant with applicable laws and standards in their jurisdictions. References to public policies do not constitute any endorsement or recommendation. The content is current as of the date indicated and may not incorporate the most recently available data.
COVID-19 is, first and foremost, a global humanitarian challenge.

Thousands of health professionals are heroically battling the virus, putting their own lives at risk. Governments and industry are working together to understand and address the challenge, support victims and their families and communities, and search for treatments and a vaccine.

This document is meant to help senior leaders understand the value chains for COVID-19 vaccines and diagnostics, and where challenges may arise.

Read more on McKinsey.com
This document reflects market research on the structure of the value chains for COVID-19 vaccines and diagnostics.

This document is meant to give a visual representation of the elements of the value chains and show where potential challenges could exist.

This document does not represent vetted McKinsey recommendations or guidance on best practices.

Because of the speed of development of the COVID-19 response, the information included is subject to change.

Organizations should consider all local regulations and country-specific circumstances before implementing specific interventions.
## Vaccines

### A. Control tower
A coordinated effort can inform how to best direct and resource agencies of the federal government. This structure can illuminate how end-to-end vaccination capacity is created and utilized.

The control tower’s north star could be a clear vaccine strategy—the right vaccine of the right types in the right location in the right quantities at the right times.

The control tower can also serve as a central hub or clearinghouse for communication and education plans for diverse sets of stakeholders.

### B. Develop

**Manufacturing vaccines at scale**

<table>
<thead>
<tr>
<th>Selected potential issues</th>
<th>Selected potential actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Raw materials (e.g., glass vials, stoppers)</td>
<td>1. Partner with manufacturers, regulatory agencies, and others to maintain latest view of supply that is coming online</td>
</tr>
<tr>
<td>2. Capacity (e.g., fill-finish)</td>
<td>2. Consider levers to increase capacity of selected supplies and/or bottlenecks (e.g., Drug Policy Alliance for vials)</td>
</tr>
<tr>
<td>3. Partner with manufacturers, regulatory agencies, and others to maintain latest view of supply that is coming online</td>
<td>3. Consider industry-wide pooling of resources</td>
</tr>
<tr>
<td>4. Order sufficient amounts</td>
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</tr>
</tbody>
</table>

### C. Distribute

**Efficiently getting vaccines to where they are needed**

<table>
<thead>
<tr>
<th>Selected potential issues</th>
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</thead>
<tbody>
<tr>
<td>1. Predictability for downstream partners</td>
<td>1. Increase real-time transparency of where supply is needed most</td>
</tr>
<tr>
<td>2. Clarity of allocation when moving past phases 1a and 1b</td>
<td>2. Build resilience in distribution channels, defending against attacks (e.g., cyber, theft) and attempted fraud</td>
</tr>
<tr>
<td>3. Resilience of distribution channels when more supply comes online (e.g., cold chain: dry ice, freezers)</td>
<td>3. Build resilience in distribution channels, defending against attacks (e.g., cyber, theft) and attempted fraud</td>
</tr>
</tbody>
</table>

### D. Deliver

**“Getting vaccines into arms”**

<table>
<thead>
<tr>
<th>Selected potential issues</th>
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<tbody>
<tr>
<td>1. Sites (e.g., shortage, mass vaccination)</td>
<td>1. Consider direct payments to sites (e.g., via Medicare)</td>
</tr>
<tr>
<td>2. Health-systems incentives (e.g., payment)</td>
<td>2. Direct delivery/support of select sites (e.g., those requiring 1b retail pharmacy)</td>
</tr>
<tr>
<td>3. Workforce shortages</td>
<td>3. Pay for or provide temp staffing</td>
</tr>
<tr>
<td>4. Spoliation at point of care</td>
<td>4. Leverage digital to increase throughput (e.g., scheduling software)</td>
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</tbody>
</table>

### E. Demand

**Matching capacity generated to needs, to achieve efficient and effective utilization**

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<td>1. Conviction—skepticism among all segments of population, including healthcare professionals</td>
<td>1. Launch wide-ranging communications effort</td>
</tr>
<tr>
<td>2. Convenience as a barrier, including (a) intrusiveness of questions and (b) time to get vaccinated</td>
<td>2. Simplify and streamline steps for administering vaccine</td>
</tr>
<tr>
<td>3. Cost as a potential barrier</td>
<td>3. Remove cost barriers at all levels</td>
</tr>
</tbody>
</table>

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McKinsey & Company
Vaccines: The common operating picture

Source: Cormac O’Sullivan, Paul Rutten, and Caspar Schatz, “Why tech transfer may be critical to beating COVID-19,” July 2020, McKinsey.com; National Academies of Sciences, Engineering, and Medicine, Committee on Equitable Allocation of Vaccine for Novel Coronavirus sessions; Centers for Disease Control and Prevention, “COVID-19 Vaccination Program Interim Playbook”; Office of Workforce Security; expert interviews; McKinsey analysis

Note: There are a number of additional steps that need to occur but are already addressed and/or less critical; these include, but are not limited to, reimbursement/coverage and stockpiling.

**Critical supplies**
- Upstream proc. mat.
- Downstream proc. mat.
- Fill finish pack. materials

**Regulatory**
- EUA approval
- Manuf. recertif. *
- Inventory mgmt., incl. fraud prevention

**Manufacturing**
- Vaccines manuf., Drug substance and product
- Quality clearance

**Supplies**
- Dedicated supplies
  - Upstream proc. mat.
  - Downstream proc. mat.
  - Fill finish pack. materials

**Logistics**
- Pending vaccine modality
- Dry ice
- Ancillary supplies

**Transport to admin. site or local warehouse**

**Central storage**

**Pending vaccine modality**

**Last-mile logistics**
- Local storage
- Transport to final site (if <100 doses)

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**Vaccine**

**Vaccine administrator assign. or recruit.**

**Onboarding/upskilling**

**Point-of-care operations**
- Capacity assessment, incl. cold chain, HR
- Training dev.
- Vaccine administrator assign. or recruit.
- IIS and VAMS registration*
- Vaccine need estimation
- Patient scheduling

**Order entered in IIS or VTrckS**

**IT implication**
- High emergent-threat level
- Potential timing variability

**Population prioritization**

**Ordering forecasting**

**Site selection**

**Patient location and sizing**

**Real-time data tracking**

**IIS record**

**Out-of-state record sync— IIS and IZ Gateway**

**2nd dose scheduled**

**Adverse events recorded in VAERS**

**Order approved by state**

**IIS record into VTrckS**

**VTrckS/VAMS system**

**Site onboarding**

**Vaccine imports**

**Allocation among states**

**Allocation among sites**

**Transport to admin. site or local warehouse**

**Last-mile logistics**
- Local storage
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Diagnostics

A. Control tower
A coordinated effort can inform how to best direct and resource agencies of the US federal government (e.g., HHS, FEMA, DOD, SCAG, CDC, FDA, NIH). This structure can illuminate how end-to-vaccination capacity is created and utilized.

The control tower’s north star could be a diagnostics strategy that identifies infected asymptomatic and symptomatic individuals using a combination of surveillance testing, individual screening, and individual testing and applying the right diagnostics options in the right use cases at the right frequency.

The control tower can also serve as a central hub or clearinghouse for communication and education plans for diverse sets of stakeholders, on topics such as how testing should be applied and what a test result means.

B. Develop
Manufacturing diagnostics machines and supplies at scale

Selected potential issues:
1. Debate over federal role in the response
2. Continued persistent shortages of consumables and test kits

Selected potential actions:
1. Consider levers to increase capacity of select supplies and/or bottlenecks (e.g., DPA swabs, reagents, manufacturing equipment).
2. Rapidly ramp up (20–50x) FDA-approved novel point-of-care or in-home technologies.

C. Distribute
Efficiently getting platforms and supplies to where they need to be

Selected potential issues:
1. Debate over formal federal role in the response
2. Absence of a common data platform to understand where supply exists

Selected potential actions:
1. Establish allocation methodologies and build broad understanding.
2. Increase real-time transparency of where supply is needed most.
3. Build resilience in distribution channels against cyber, fraud, etc.

D. Deliver
Conducting the tests at scale and reporting results efficiently

Selected potential issues:
1. Debate over formal federal role in the response

Selected potential actions:
1. Increase convenience of sites via number or proximity to workplace (e.g., sufficient coverage of population).
2. Provide guidance on ops excellence (e.g., optimizing lab capacity, providing prompt notification of results).
3. Fund initiatives to address training/workforce shortages.

E. Demand
Matching capacity generated to needs, to achieve efficient and effective utilization

Selected potential issues:
1. Debate over formal federal role in the response

Selected potential actions:
1. Articulate and promote benefits of frequent testing.
2. Provide clear guidance on the testing regimens required to resume certain societal activities.
Illustrative representation of diagnostic-testing supply chain

Degree of supply-chain constraint (e.g., capacity limitations, small number of suppliers)

- Less constrained
- More constrained

Level of vertical integration varies based on OEM, technology, and platform

<table>
<thead>
<tr>
<th>Subtier supply chain</th>
<th>Analyzer production</th>
<th>Test/kit production</th>
<th>Sample processing</th>
<th>Sample collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assay consumables</td>
<td>Reagents</td>
<td>High-throughput analyzers</td>
<td>Assay kits</td>
<td>Labs</td>
</tr>
<tr>
<td>Analyzer components</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing equipment/integration</td>
<td></td>
<td></td>
<td>Labs</td>
<td>Testing sites</td>
</tr>
<tr>
<td>Cartridge components</td>
<td></td>
<td></td>
<td>Aktive cartridges</td>
<td></td>
</tr>
<tr>
<td>Collection consumables</td>
<td></td>
<td></td>
<td>Home-cartridges</td>
<td>Home/personal</td>
</tr>
</tbody>
</table>

Note: Map reflects 108 known supplier-vendor relationships, focused on US supply chain for COVID-19 testing and diagnostic equipment; includes international vendors.

Source: Source4Growth, 25 supplier discussions, 3 industry-expert interviews