Welcome to the World Bank's SAR COVID-19 vaccination strategy workshop series

We want to hear from you;
• If you have questions or comments to share during the presentation, please share your thoughts using the Zoom chat feature
• Our team will monitor the questions and share them with the presenters to address immediately or when they get to the appropriate topic

At the end, there will be a short Q&A session where you can raise outstanding questions.

Thank you for your engagement and participation!

Here are some ways to engage with us today
Workshop 2: Supply chain readiness and distribution networks

World Bank SAR COVID-19 Vaccine Strategy Workshop Series
Initial series of five workshops to address critical COVID-19 vaccination topics

1. Feb. 22: Intro & potential vaccination scenarios
3. Mar. 8: Demand management
5. Mar. 22: Procurement and regulatory best practices

Additional topics to be covered in future workshops

Today’s workshop

Feb. 22: Intro & potential vaccination scenarios
Discuss key considerations for Covid-19 supply chains, Emerging challenges and solutions in vaccine supply chain preparedness

Discuss core elements of vaccine distribution networks, including type/number of delivery sites and vaccine allocation across sites

Engage with experts on existing cold chain roll-out efforts, transportation and routing optimization and environmental considerations for Vx rollout
# AGENDA

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<td>2 mins</td>
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<tr>
<td>Ajay Tandon</td>
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<td>Part 1: Session 1 – Covid-19 Vx deployment- Supply chain &amp; op. aspects</td>
<td>10 mins</td>
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<tr>
<td>Prashant Yadav</td>
<td>3 min Q&amp;A</td>
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<td>Part 1: Session 2 – Covid-19 Vaccine readiness, delivery &amp; digitization</td>
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<td>Ken Legins</td>
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<td>Part 2: Distribution network optimization</td>
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<td>Nicholas Sukitsch</td>
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<td>Q&amp;A</td>
<td>5 mins</td>
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<tr>
<td>Ajay Tandon</td>
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<td>Vx supply chain</td>
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<td>Q&amp;A</td>
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<td>Closing Remarks</td>
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<tr>
<td>Gail Richardson</td>
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</table>
Part 1: Session 1
Covid-19 Vx deployment-
Supply chain &
operational aspects

How to Make COVID-19 Vaccination a Success? Policy Priorities and Implementation from Israel and Around the World

Prashant Yadav
Senior Fellow at the Center for Global Development, Affiliate Professor at INSEAD and Lecturer at Harvard Medical School
Healthcare supply chains expert
Successful Large Scale Vaccine Distribution

1. Reducing supply variability at each level in the supply chain
2. Scheduling, pre-registration & other ways to decrease demand variability - digital infrastructure
3. Sequential prioritization-based allocation vs simultaneous nested prioritization. Larger priority tiers
4. Distribution structure/design, Allocation rules, & Pull vs Push
5. PODs= New mass vaccination sites or existing vaccine delivery/PHC sites only

Some heterogeneity in these decisions across countries with early rollouts e.g. US, UK, Spain, Israel, India, Singapore, Indonesia
Multi-level government at structure of routine vaccine distribution

Decision space:

- Who should procure?
- How much to order/allocate each week?
- Choose locations of vaccination sites?
- Scheduling system design and operation?
- Team configuration and service delivery process design?

Should COVID-19 vaccines distribution follow this, or be different?
What about private sector clinics?
Most countries are shifting from tree distribution structures to linear direct for their COVID-19 Vx programs

Key factors

- Better accountability
- Lesser need for information flows
- Cold chain equipment needs become more centralized
Information flows are critical to manage COVID-19 vaccine distribution

Criticality of advance shipping information (~3 weeks out shipping schedule to each stage in the supply chain)

Addition of private sector clinics and new mass vaccination sites creates new nodes to vaccine logistics information system.

Important to integrate into a single data platform- Not always easy
Frequency of distribution and allocation rules

- Initially push allocation based on population. Then switch to pull model when "equilibrium state" achieved. Timing?

- Reserve stock for 2nd dose & its location? Location at Central, State or Clinic Level?

- May also depend on the type of PODs (e.g., drive-through clinics, mass sites, routine clinics)

- Agility in supply chain decision making
Sequential (one at a time) opening of prioritization tiers vs simultaneous opening of more than 1?

All Supply Chain Planning depends on this decision

Factors influencing decision

- size of each cohort
- scheduling system
Large sites help in better matching of demand and supply

But important to get operational design correct

Benefits of demand and supply matching due to pooling
Part 1: Session 2
Covid-19 Vaccine readiness, delivery & digitization
Content

1. UNICEF COVID-19 vaccine market dashboard
2. Country readiness to receive and manage COVID-19 vaccine
3. UNICEF Global Logistics for COVAX
4. Partnerships to help support surge logistics capacity
5. Digitalization – and Country Opportunities presented by C19 Vaccine Delivery Innovations
6. Discussion
1. UNICEF COVID-19 Vaccine Market Dashboard

An interactive tool for partners, manufacturers, and countries to follow the developments of the COVID-19 vaccine market with up-to-date information.

https://www.unicef.org/supply/covid-19-vaccine-market-dashboard
2. Country readiness Tracking & areas for improvement (data from SAR countries)*

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Abbreviation</th>
<th>Rating</th>
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<tbody>
<tr>
<td>National coordination body exist</td>
<td>Nat. Coord</td>
<td>Yes</td>
</tr>
<tr>
<td>Countries have submitted their vaccine requests to COVAX vaccine</td>
<td>NITAG Rec</td>
<td>Yes</td>
</tr>
<tr>
<td>Vaccine safety system in place</td>
<td>Cold Chain</td>
<td>progressing</td>
</tr>
<tr>
<td>Cold chain capacity not yet fully assessed</td>
<td>Safety</td>
<td>Not yet</td>
</tr>
<tr>
<td>HR Capacity building not planned</td>
<td>Demand</td>
<td>Not yet</td>
</tr>
<tr>
<td>National vaccination and deployment plans not submitted</td>
<td>Training</td>
<td>Not yet</td>
</tr>
<tr>
<td>Demand generation strategy to be finalized</td>
<td>NDVP</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Strategic partnerships including private sector engagement, innovative solutions and sound communication strategy are recommended to speed up country readiness in SAR</td>
<td>VRF</td>
<td>Don't know</td>
</tr>
</tbody>
</table>

3. UNICEF Global Logistics for COVAX

- Logistics routes mapping and modelling completed
- COVAX Supply chain planning tool developed
- Transport Scenario modelling finalized

Global Logistics preparedness strategy

Global logistics operational plan

- Global 3PLs set up ready
- Partnerships with key 16 airlines finalized with COVAX as priority
- Logistics coordination cell UNICEF, PAHO, DHL, K+N, DSV, other partners
- Info Hub for Tracking of COVAX shipments
4. Partnerships to help support surge logistics capacity: WEF Charter

WEF Charter: 18 shipping, airlines and logistics companies

Humanitarian airfreight initiative (16 global carriers) - 5 year timeframe
The first shipments of SII COVID-19 vaccines have started to arrive in shortlisted countries and others are imminent in the coming days/weeks.
COVAX FACILITY GLOBAL SUPPLY FORECAST

BY REGION

COVAX Available Supply, Cumulative, Mn doses, 2021

AFRO  PAHO  EMRO  SEARO  WPRO

Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec  Early 2022
100%  100%  100%  75%  74%  73%  72%  72%  72%  1,945  2,270

Corresponding to supply availability, regulatory
approvals may cause delays to deliveries

% Secured volumes from signed agreements

Further volumes to become available in 2022, subject
to funding availability
6. Digitalization – Opportunities through C19 Vaccine Innovations
Supply and Health System Digitalization at the Center of all Innovations

INFODEMIC MANAGEMENT

CHALLENGE: Vaccine hesitancy is a key driver of under-vaccination

OPPORTUNITY: Novel social listening and engagement tools and platform analytics

SAFETY MONITORING

CHALLENGE: Record COVID-19 vaccine development time, making monitor AEs more critical than ever

OPPORTUNITY: Digital track & trace and community-level digital communication tools for safety monitoring

VACCINATION MONITORING

CHALLENGE: Ensuring targeted populations have been fully reached and no drop outs

OPPORTUNITY: Community-level digital monitoring of doses given

MICRO PLANNING

CHALLENGE: Targeting previously untargeted groups for vaccination

OPPORTUNITY: GIS-based digital mapping

COUNTERFEIT DETECTION

CHALLENGE: Counterfeit vaccines, damaging trust and demand

OPPORTUNITY: Barcode-enabled track and trace and Global Trust Repository for authenticity verification

VACCINATION STATUS

CHALLENGE: Lack of real time, authenticated information on proof of vaccination

OPPORTUNITY: Smart vaccine certificates
6. Supply Chain Digitalization: A foundation for health and broader economic development
6. Digitalization: Traceability at the Center
GS1 Standards to identify, capture & share data
6. Digitalization: Traceability is at the Center
Countries are putting in place the data operations; technologies and people and people/processes to accelerate traceability

Global Regulations – Overview

[key]
- Operational Track and Trace With Serialization
- Phased Requirements Track and Trace With Serialization
- Product Authentication and/or Verification With Serialization
- Operational Batch Coding and/or Bar Coding Only
- Regulations – In Planning and/or Preliminary Draft Phases (Including batch coding, product authentication, track and trace, and serialization)
- No Legislation and/or Data

SOURCE: GARTNER

- India: Verification/Track & Trace using a National System
- Pakistan, Afghanistan, Bhutan, Nepal, Bangladesh, Sri Lanka, Maldives: Verification using a Global Trust Repository
Part 2: Distribution Network Optimization
Optimizing your distribution network: Determining how and where to distribute vaccines

A. What is the optimal network of delivery sites?

B. How should vaccine doses be allocated across sites?
Optimizing your distribution network: Determining how and where to distribute vaccines

A

What is the optimal network of delivery sites?

B

How should vaccine doses be allocated across sites?
Two questions to address to optimize vaccine delivery sites

How much vaccination capacity is needed to meet your goals?

Set population coverage goal

Define target timeline to achieve this goal

Impute required capacity to achieve these goals and translate to weekly required throughput

Determine how to augment capacity to meet this requirement

- Increase throughput across existing infrastructure
- Add additional sites & plan Vx supplies
  - Mass sites, health centers, mobile sites etc.
  - Vx supply plans e.g., In US, Pfizer(UCC) supplied in big sites to urban hospitals while Moderna supplied to smaller sites & rural areas

What type of vaccine delivery sites will you use?

<table>
<thead>
<tr>
<th>Type</th>
<th>Throughput per day (patients)</th>
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<tbody>
<tr>
<td>Mass vaccination sites</td>
<td>&gt; 1,000</td>
</tr>
<tr>
<td>e.g., Arenas, stadiums,</td>
<td></td>
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<tr>
<td>schools, places of worship</td>
<td></td>
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<tr>
<td>Large hospitals</td>
<td>500 to 1,000</td>
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<tr>
<td>Health/comm. centers</td>
<td>100 to 500</td>
</tr>
<tr>
<td>e.g., small hospitals,</td>
<td></td>
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<tr>
<td>health clinics, community centers, pharmacies</td>
<td></td>
</tr>
<tr>
<td>Micro or mobile site</td>
<td>&lt; 100</td>
</tr>
<tr>
<td>e.g., home visits</td>
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</table>
Critical to determine required throughput requirements based on vaccination goals and supply availability

Illustrative inputs

<table>
<thead>
<tr>
<th>Population</th>
<th>100M</th>
</tr>
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<tbody>
<tr>
<td>Goal Population Coverage</td>
<td>60%</td>
</tr>
<tr>
<td>Expected Vaccination Launch</td>
<td>Q2 2021</td>
</tr>
<tr>
<td>Goal Vaccination Completion</td>
<td>Q4 2022</td>
</tr>
<tr>
<td>Required National Capacity</td>
<td>120M doses/1.5 years or 220K doses/day$^1$</td>
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</tbody>
</table>

Vaccinating against COVID-19 is expected to require $^2$2x increase in vaccines administered per year in SAR countries

Next Step
Based on required capacity, dive into determining which mix of delivery sites best meet needs

1. Population x Coverage x 2 doses per person / 1.5 years / 365 days; 2. Based on countries vaccine procurement in 2016 and a 10% waste factor Assumes reaching 60% of the population vaccinated within one year (with a 2-dose vaccine) Note: If relevant, consider availability of vaccines, e.g., will only a certain number of doses be available for first months? Source: WHO-UNICEF Joint Reporting Form data, BCG analysis
Next, assess how to achieve required throughput both by maximizing capacity at existing sites and building new sites.

<table>
<thead>
<tr>
<th>Levers</th>
<th>Benefits</th>
<th>Watch-Outs</th>
</tr>
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</table>
| **Fully utilize existing health infrastructure** | • Increase labor & operating hours  
• Streamline operations  
• Dedicate other departments within hospitals to vaccination | • Potentially slower & more expensive  
• Locations may not represent rural areas, slums & minorities  
• May divert capacity from other critical health services |
| **Establish new vaccination sites** | • Leverage low-cost public spaces  
• Rent large private sites through partnerships  
• Supplement with small or mobile sites to ensure equity of distribution | • Could waste resources in long-term  
• Requires incremental labor  
• Unfamiliarity with health regulations |

| How much vaccination capacity is needed to meet your goals? |
Key considerations across vaccination site types

- Daily throughput
- Staffing
- Familiarity with vaccines
- Infrastructure
- Speed
- Costs
- Equity
- Wastage

Mass vaccination sites

Pros
- Efficient staff-to-patient ratio
- Lower costs
- Higher throughput ratio
- Less wastage

Cons
- Biases toward urban populations
- Increases travel time for rural populations
- May decrease equity
- Prep needed to meet DOH requirements
- Space rental may be higher cost

Optimal during early stages of vaccination, when supply is most limited, to control supply & communication across sites

Other smaller scale sites

Pros
- Less complex infrastructure per site
- Vital for equitable distribution
- Decreases travel time for rural populations

Cons
- More staff required to reach substantial throughput/day
- More coordination required to organize vaccine delivery and allocation

Critical to reach broader populations, ensure equity of distribution, and roll-out quickly

To combat these challenges, supplement mass vaccination centers with smaller locations and consider transport options for beneficiaries with limited access
Examples | Learnings from distribution network considerations across the globe

UK deploys hybrid delivery model

Hybrid delivery model:

- **Mass vaccination sites:** ~5k people / day
- ~1,560 **community-based centers:** 200-500 people /day
- **Small scale locations** reach hard to access populations, e.g., with **mobile vans** to homes and prisons

All venues held to same quality standards, e.g., temp. checks, social distancing, & monitoring

**Key Learning:** Hybrid approach across three types of vaccination sites balances efficiency and capacity with equity of distribution

Source: Guardian, Pfizer, Time, Los Angeles Times, Court House News, BCG expertise

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Texas rapidly adapts delivery model

Initially, leveraged a hybrid of hundreds of delivery sites; quickly found it inefficient

Quickly adapted to centralized system, delivering to ~20 hub sites across the state:

- **Increased efficiency** due to scale
- **Ability to reallocate** vaccines in real time, due to ease of communication and tracking

Yet there are **concerns with equity of distribution** given many locations within urban centers & inclement weather delaying Vx deployment

**Key Learning:** Adaptation is imperative, but can only be done with clear tracking and communication, planning for possible scenarios (inclement weather etc.)
### Examples | Learnings from distribution network considerations within SAR region

**India is expanding sites through Private sector to ramp up Phase 2 population coverage**

Targeted 22% population by August 2020.
- Phase 1 (HCWs + FLWs)
- Phase 2 (>60 yrs and >45 yrs for those with co-morbidity)

Conducting **10k sessions** per day, with 20% sessions being conducted through Pvt. Sector partners.

As India moves towards Phase 2 vaccination, the Government aims a **5X increase in sessions** - 50k sessions each day, with 40-50% of total sessions organized in private hospitals.

**Key Learning:** Enlist Pvt. Sector resources and capabilities to ramp up the number of delivery sites and increase throughput

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**Nepal rapidly adapts delivery model**

First Vx drive rolled out through 201 vaccination booths across 77 districts - largely centralized

Realized that there was a delay in vaccine administration to rural populations that are at high risk – FCHV\(^1\) of remote villages and HCWs in rural areas unable to reach Vx centres as they were not distributed evenly between urban and rural regions.

Addressed this challenge by rapidly setting up local vaccination sites at primary health centres and immunization booths. Vx of high-risk population is important than just sheer number of vaccination

**Key Learning:** Adaptation is imperative – Nepal is rapidly supplementing centralized sites with local centers in rural areas to ensure equitable distribution

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1. Female Community Health Volunteers
Optimizing your distribution network:
Determining how and where to distribute vaccines

A

What is the optimal network of delivery sites?

B

How should vaccine doses be allocated across sites?
Three key inputs to determine how to allocate vaccines across delivery sites

**Coverage levels**
- What is the maximum number of people each site could reach?
- How well does each site reach target populations?
- How equitable is the coverage?

**Pipeline of supply**
- How much, which brands, when, and from where?
- Flexibility is key, given significant uncertainty:
  - Minimal visibility on when supply will arrive
  - Supply quantities may vary from original plan

**Site performance**
- How does each site perform across the following criteria?
  - Throughput capacity
  - Wastage or deficiencies in supply
Examples | Learnings from optimization of supply allocation for US states

US state-level vaccine allocation planning

Today, many states and cities are facing challenges allocating supply to their provider networks and there is significant variability in supply from the federal government.

Given the complexity of variables to consider, many current allocation plans are not achieving the goals of allocation:

- Optimize utilization of site capacity
- Limit wastage
- Ensure access to meet demand of priority populations

This is leading to excess doses at some sites and shortages at others within the same network. Ultimately, this is slowing vaccine administration and causing wastage of critically limited supply.

Some states are beginning to shift from manual calculations to more advanced, data-driven optimization approach to dynamically reallocate supply based on real-time inputs.

This new approach helps states optimize for:

- Site network and throughput capacity
- Population density and demographics
- Product characteristics (i.e. pack size)
- Supply chain and logistical parameters (i.e. cold chain capabilities, storage needs)

Supply allocation optimization suggests different distribution for vaccine type:

Optimal distribution for Moderna is higher volume and dispersed vs. concentrated for Pfizer due to supply chain and logistical factors.
Conclusions

1. Establish coverage and timing goals and translate to capacity requirements.
2. Maximize existing site throughput and consider adding new sites where needed (Leverage mix of mass distribution sites and smaller sites to balance efficiency and equity).
3. Adopt an agile and dynamic approach & develop various scenarios and plans for worse case scenario.
4. Make evidence-based decisions on real time data; Continually optimize vaccine allocation across site.
Q & A
Part 1 & Part 2
Part 3: Leadership panel
Strengthening country readiness for COVID-19 vaccine supply chains
Introducing our esteemed panelists and moderator

Ken Legins
Chief, Supply Chain Strengthening Centre, Supply Division at UNICEF

Muneeza Mehmood Alam
Economist, Transport Global Practice, World Bank

Ashok Sarkar
Senior Energy Specialist Team Leader, World Bank

Dr Susie Perera
Deputy Director General, Public Health Services, Ministry of Health, Sri Lanka

Moderated By:

Micky Chopra
Global Solutions Lead, Service Delivery, Health Nutrition and Population global practice, World Bank
Four key topics for discussion today

1. Global learnings from existing roll-out efforts and innovations in cold chain systems

2. Transportation and routing optimization for Covid-19 vaccine delivery

3. Country perspectives from Sri Lanka on vaccine supply chain and existing roll-out efforts

4. Considering climate and environment in vaccine rollout
Q & A
Closing Remarks

E Gail Richardson
Practice Manager, Health, Nutrition and Population, South Asia Region, World Bank
Thank you for joining the second workshop in our World Bank SAR COVID-19 Vaccine Strategy Workshop Series.

The next workshop will take place on Monday Mar 8 at the same time. Key topics:

- Understand approaches to measure vaccine hesitancy and key implications on vaccine communications
- Understand key moments in the beneficiary journey and key challenges in each step of the journey

If you have not already, please RSVP at https://www.113.vovici.net/se/13B2588B3F19B167
## Workshop 2: Supply chain readiness and distribution networks

**Objective:** Understand key supply chain challenges, planning for volatility and distribution network optimization

March 1, 2021

<table>
<thead>
<tr>
<th>Time (EST)</th>
<th>Topic</th>
<th>Presenter</th>
<th>Objectives</th>
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<tbody>
<tr>
<td>7:00-7:02am</td>
<td>Welcome remarks &amp; objectives</td>
<td>Ajay Tandon</td>
<td>• Outline objectives for this session</td>
</tr>
</tbody>
</table>
| 7:02-7:15am | Part 1: Session 1: C-19 Vx deployment: Supply chain & operational aspects | Prashant Yadav, Prof. Insead | • Covid-19 Supply chain operational levers and key decision choices  
• Learning from some countries who have ramped up throughput quickly  
• Q&A from chat |
| 7:15-7:25am | Part 1: Session 2: C-19 Vx readiness, delivery & digitalization | Ken Legins, UNICEF | • Overview of COVID 19 Vaccine Readiness efforts incl. Covax & country readiness  
• Delivery planning and Supply chain digitalization and traceability |
| 7:25-7:40am | Part 2: Distribution network optimization | Nicholas Sukitsch, BCG | • Planning optimal network of delivery sites  
• Consider vaccine dose allocation across sites |
| 7:40-7:45am | Combined Q&A Part 1 & Part 2 | Ajay Tandon | • Address curated questions received throughout the chat |
| 7:45-8:15am | Part 3: Leadership Panel: Strengthening country readiness for COVID Vx supply chain | Ken Legins, UNICEF  
Muneeza Mehmood Alam, World Bank  
Dr. Susie Perera, Sri Lanka  
Ashok Sarkar, World Bank  
Micky Chopra, Moderator | • Global learnings from existing roll-out efforts, key innovations in cold chain  
• Transportation and routing optimization for Covid-19 vaccine delivery  
• Climate and environment considerations in vaccine rollout planning  
• Country perspectives (Sri Lanka) on vaccine supply chain and existing roll-out efforts |
| 8:15-8:25am | Q&A | Mickey Chopra | • Address curated questions received throughout the chat |
| 8:25-8:30am | Closing Remarks | Gail Richardson | • Provide closing thoughts and share upcoming topics |