



Risk and Equity: Optimizing Pakistan's immunisation supply chain beyond cost and efficiency



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Risk and Equity: Optimizing Pakistan's immunisation supply chain beyond cost and efficiency

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Why do we care about risk and equity?



- Sometimes cost savings are not a lot
- Maintain potency of vaccine, given the investment to procure
 - Pakistan supplies \$151M worth of vaccines annually
- Might be easier or cheaper to design iSC for most accessible population; however, the most under-immunized communities have the most need. Hence, the importance of using an equity lens

Introduction



- Assessing risk:
 - Case study of Punjab: Changing point of entry of vaccines from federal to province
- Assessing equity:
 - Case study of Khyber Pakhtunkhwa (KP): Changing sourcing of districts from provincial store to division store, with divisions skipping provincial level

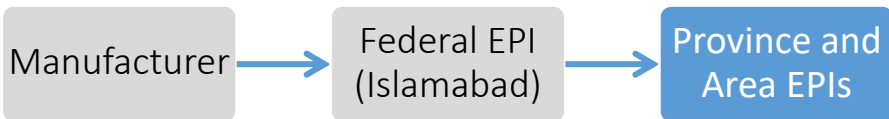
Case study: Punjab

Direct vaccine shipment
from manufacturer

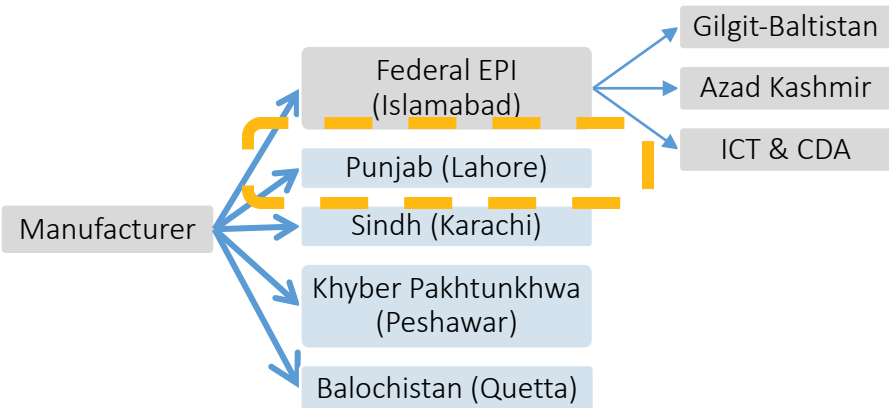


Efficiency gains if manufacturer ships vaccines directly to province Punjab?

Baseline: Current State



Direct Vaccine Shipment to 3 Provinces

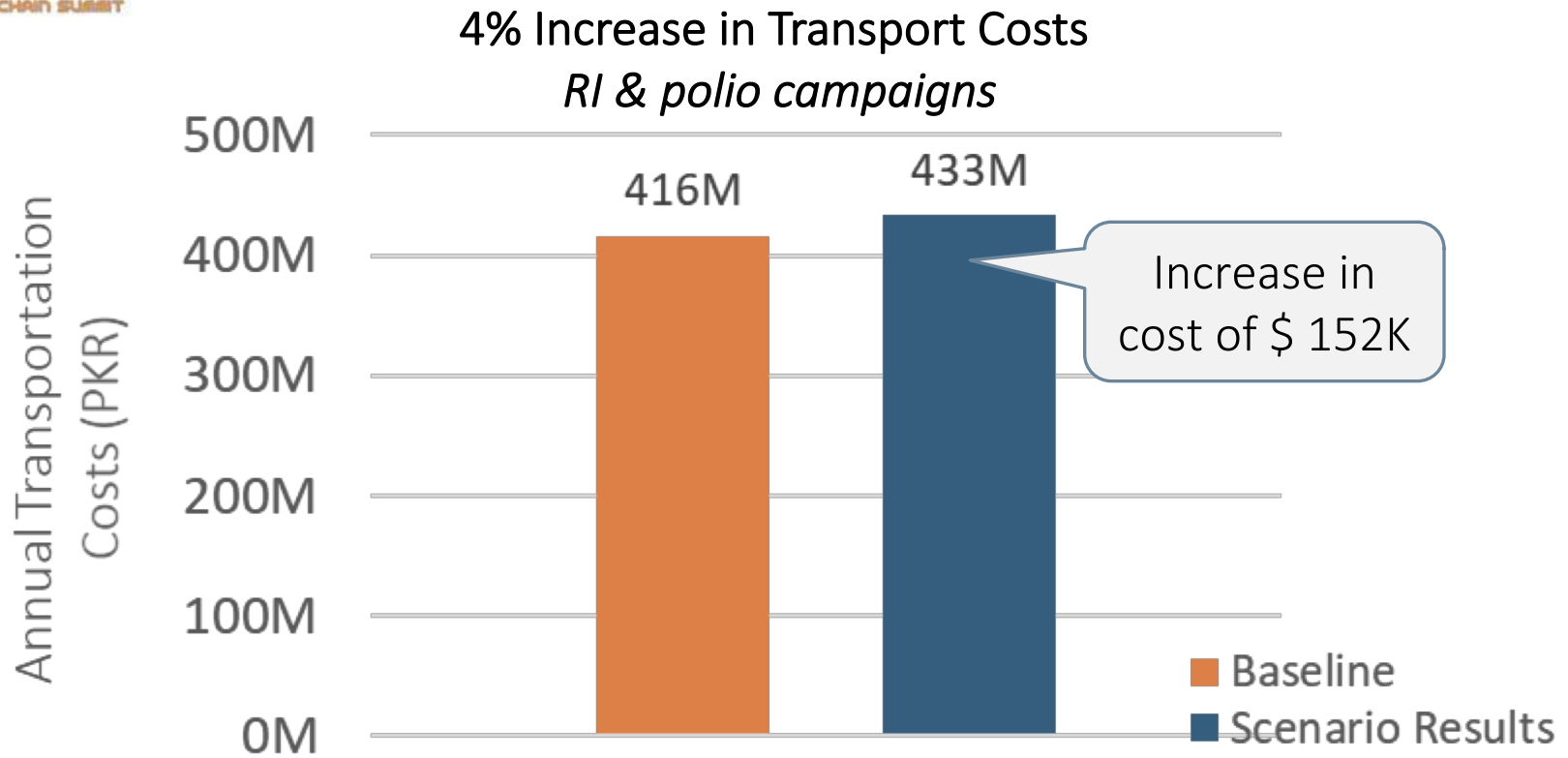


→ Baseline

→ Scenario 1: Direct shipment to provinces and Federal EPI



Cost: 4% increase in transport cost with direct shipment of \$75M vaccines

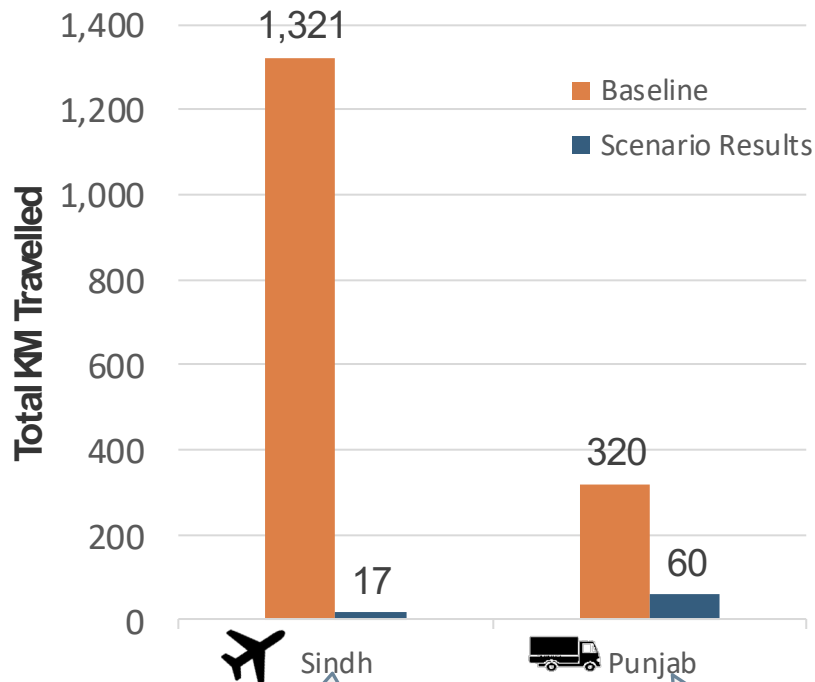




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Risk: reducing in-country transport

Average distance travelled per dose in-country decreases 99% for Sindh, and 81% for Punjab



\$38M worth vaccines (~25% of Pakistan's vaccines)

\$75M worth vaccines (~50% of Pakistan's vaccines)

Assessing Risk:

Temperature excursions are observed during transit from Federal EPI to provinces. The temperature monitoring study found risk using in-country transit:

- Freeze alarm for Punjab: -4°C for six hours
- Heat alarm for Sindh: average 9.8°C for 24hrs transit

Risks with in-country air shipments:

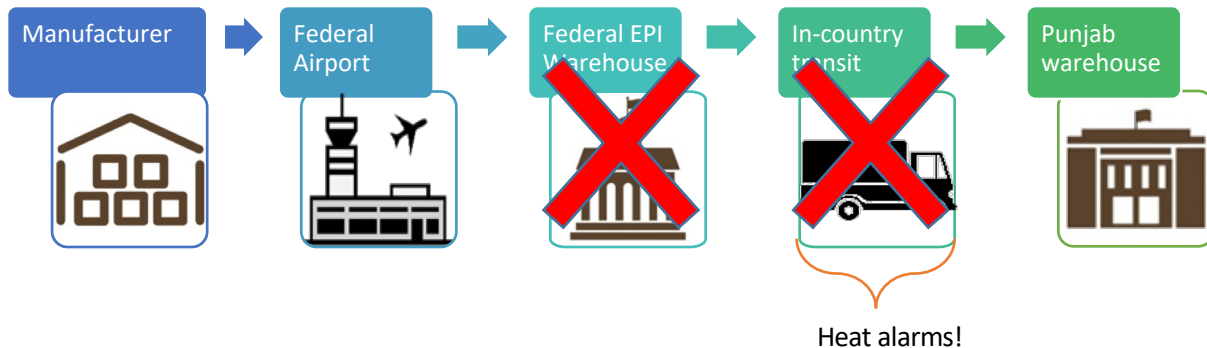
- Flight delays; no cold facility at federal airport
- Vaccines sent on multiple domestic flights even when booked for one
- Logistics provider did not pack vaccines properly

Risk during storage at provincial stores:

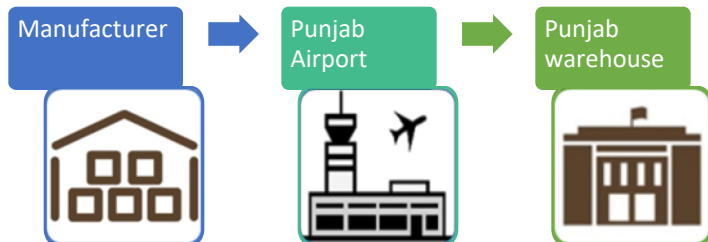
- Freeze alarms in Punjab

Risk: Reduction in handling points reduces risk e.g. temperature excursion

Baseline: Current handling points for vaccines








Direct Vaccine Shipment to Provinces



Risk: Decentralization of vaccine storage can reduce risk of potential mass damage

- By removing provincial stock from the federal store, potential risk is reduced of losing vaccine stock in a single event at the federal warehouse:

Risk	Description	Probability
 Fire	Risk from electricity short-circuit, fuel ignition, attach/terrorism etc.	High
 Temperature Excursion	Risk from heat wave, failure of cooling system, human error etc.	High
 Theft / Pilferage	Risk from activities like break-in, civil commotion or terrorism	Medium
 Natural disasters	Risk from earthquakes as Pakistan is situated on the fault line. Other risks from floods and tsunamis	Medium
 Stock-out at lower levels of supply chain	In the event of stock-out at province store or EPI center, expedited delivery of vaccines and dry goods would have to arranged from Federal EPI	Medium

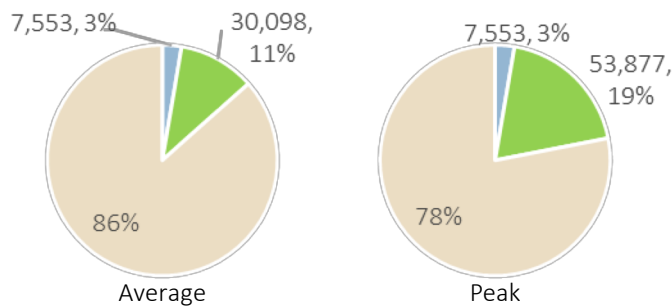


Feasibility: Punjab has enough cold storage to change point-of-entry of vaccines

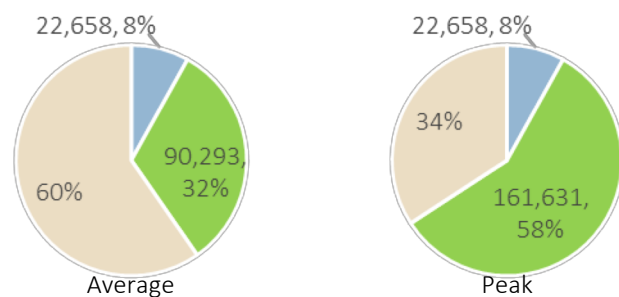
Key Message: There is enough cold storage capacity at the provincial stores

Punjab cold storage

Current State, with 30 days



Direct Vaccines to Punjab, with 90 days supply



- Storage utilization with routine & campaigns (liters)
- Rota (liters)
- Storage available (liters)



Feasibility: Punjab airport has the capability to receive vaccines directly from manufacturer

Key Messages:

- Punjab has the ability to receive international shipments, keep vaccines in cold storage at airport, and use prior release
- Based on UNICEF experience, getting customs clearance in Punjab is very challenging for vaccines

Province	Cold Storage available (2°C - 8°C)	Clearance lead time (Working Days)	Prior Release Facility	Clearance Lead time on Prior Release	Major Airlines
Punjab	Yes	2 - 3	Yes	Same Day	EK, TK, GF, QR, PK, SV

Customs clearance challenges:

- Punjab airport required 75% shelf-life of vaccines, compared to 50-60% at federal airport
- Provincial govt lacked experience in importing vaccines leading to shipments held at the airport for a long time
- Additional documents required for customs clearance at Punjab airport

Conclusion



- Despite about 4% transport cost increase, there is value in Punjab receiving direct shipments of vaccines from manufacturer (instead of through federal EPI) since this reduces potential risks (handling points, distance travelled etc.) on \$75M worth of vaccines annually
- However, need to ensure proper storage at provincial warehouse with no freeze alarms
- However, delays in customs clearance at the airport should be resolved by:
 - Ensuring drugs/vaccines are registered beforehand with the Regulatory Authority
 - Government to either work with UNICEF to ensure shelf-life requirements are met for procurement or have exemption paperwork (from federal EPI)

Case study: Khyber Pakhtunkhwa (KP)

Districts sourcing from
division, bypassing province



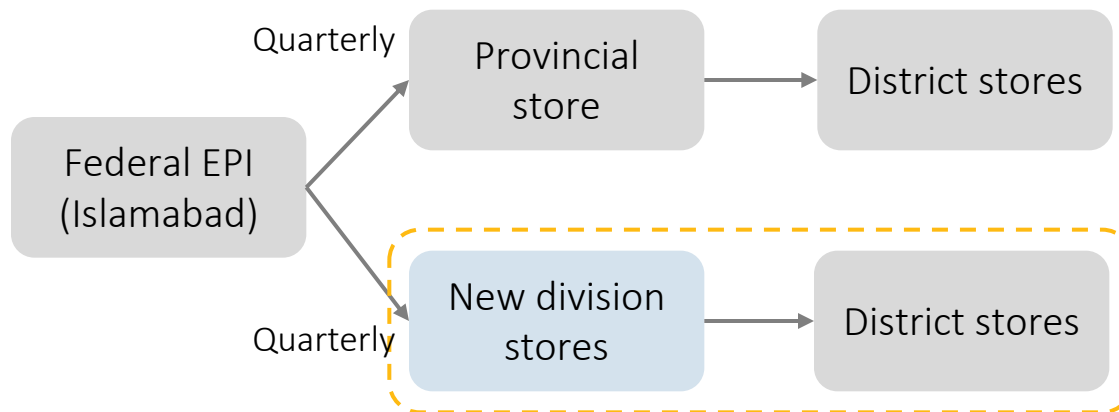


Which divisions should districts pick up stock from?

Baseline: Provincial store gives stock to districts



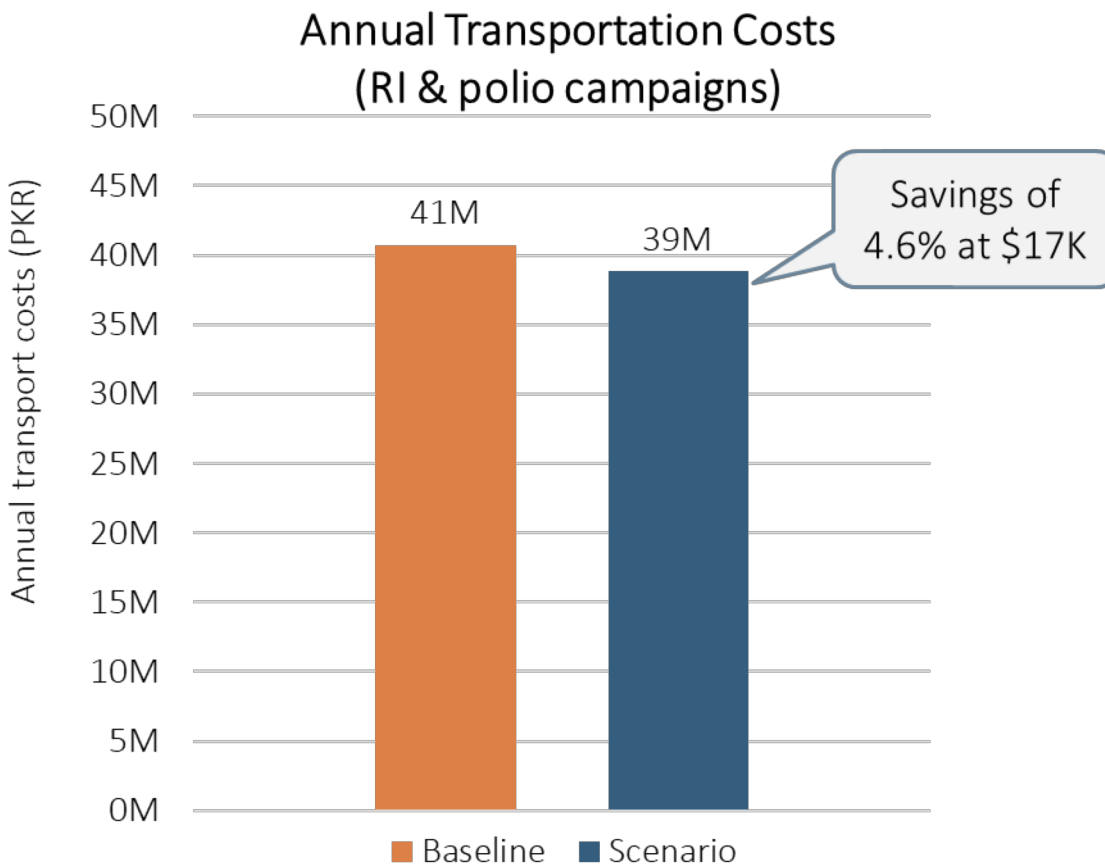
Scenario: New division stores pick up from Federal EPI and give to districts





Cost: Savings in transport cost of ~5%

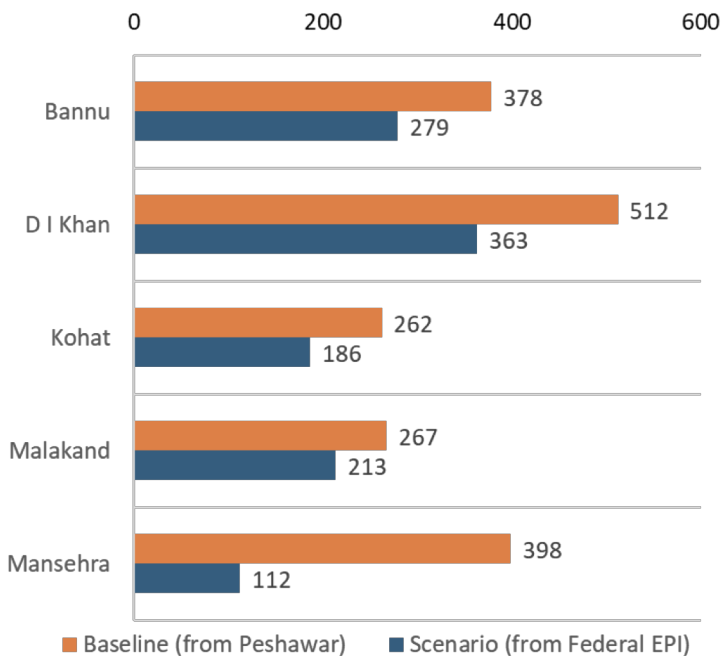
Key Message: Savings due to consolidated shipment from Federal EPI to division stores (skipping the provincial store)



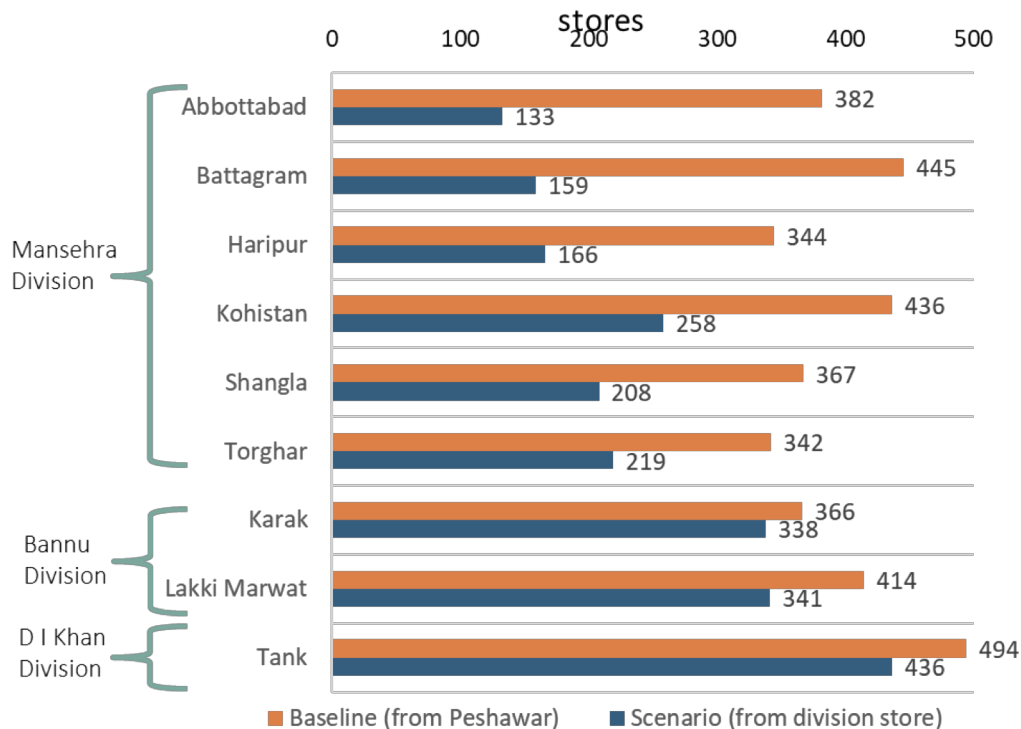


Risk: Total distances traveled for vaccines decreases for 9 districts, reducing risk in transit

Total distance traveled (km) by vaccines to division stores



Total distance traveled (km) by vaccines to district stores

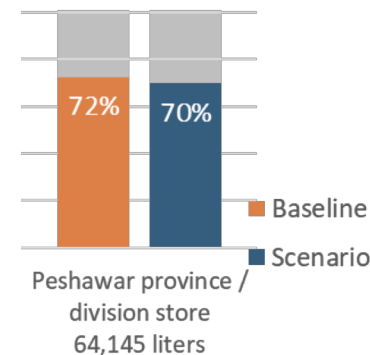
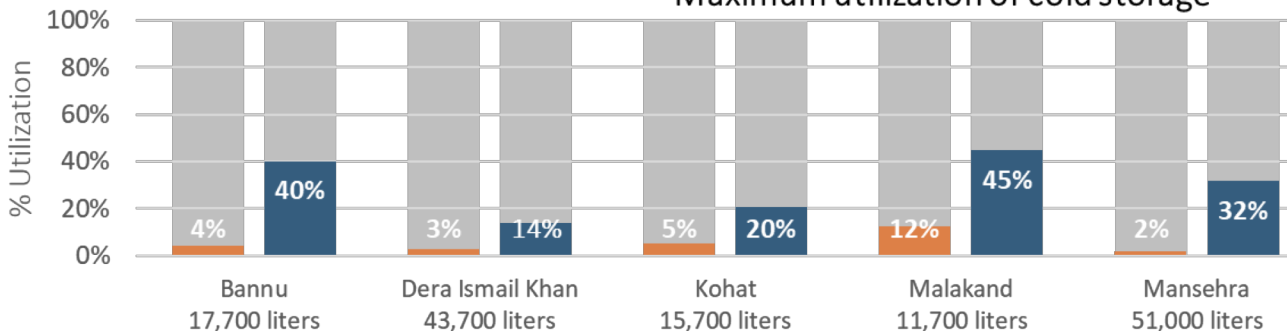




Feasibility: Division stores have enough cold chain capacity

Key Message: Divisions stores have sufficient capacity for quarterly shipments from Federal EPI and to hold 90 day buffer stock

Maximum utilization of cold storage





Equity: Assessing equity through supply chain metrics

Cold chain coverage

Definition

Net cold chain volume for the district divided by surviving infants in the district

Benchmark

0.06 liters (vaccine volume required per fully immunized child (FIC) at district level and below (1 month cycle stock, 1 month buffer stock))

Visualization



Greater than 0.09
liters/surviving child



0.06 to 0.09
liters/surviving child



Less than 0.06
liters/surviving child

Inbound resupply distance of vaccines to district store

Definition

Distance from the resupply point (provincial or division store) to the district store

Benchmark

120 km (average distance that can be traveled in four hours)

Visualization



Less than 90 km



90 km to 120 km



Greater than 120 km

Average resupply distance of vaccines to EPI Centers

Definition

Kilometers traveled by each dose to EPI centers from district store divided by total number of doses allocated to the district

Benchmark

60 km (average distance that can be traveled in four hours)

Visualization



Less than 45 km



45 km to 60 km



Greater than 60 km



Equity: Immunization coverage and socioeconomic indicators at the district level

Category	Indicator	Measurement	Groups		
Immunization Coverage Indicators	DPT3 coverage (%)	Range from 100% to 6%. <ul style="list-style-type: none"> 90th percentile = 91% 70th percentile = 72% 	91% - 100%	73% - 90%	6% - 72%
	Disparity in DPT3 coverage (% difference in urban vs. rural)	Range from 0 to 74 percentage points : <ul style="list-style-type: none"> 90th percentile = 7 percentage points 70th percentile = 22 percentage points 	0 - 7 points	8 - 21 points	22 - 74 points
Socio-economic Indicator	Women's primary school attainment (%)*	Range from 73% to 3%: <ul style="list-style-type: none"> 90th percentile = 66% 70th percentile = 52% 	66% - 73%	53% - 65%	3% - 52%



Equity: Changing sourcing would reduce resupply distance

Good supply chain indicators
 High immunization coverage and small urban-rural gap
 Good socio-economic indicator



Poor supply chain indicators
 Low immunization coverage and large urban-rural gap
 Poor socio-economic indicator

Indicators	Karak (Bannu)		Lakki Marwat (Bannu)		Tank (DI Khan)	
	Baseline (Peshawar)	Scenario (Bannu)	Baseline (Peshawar)	Scenario (Bannu)	Baseline (Peshawar)	Scenario (DI Khan)
Cold chain/ surviving infant (liters, including CCEOP & non-CCEOP)	0.40	No change	0.35	No change	0.24	No change

Key Messages:

- Reducing re-supply distance for districts, increases responsiveness to emergencies and outbreaks
- These districts have very low immunization coverage in spite of adequate cold chain coverage
- Women’s educational attainment is low, indicating that there are socio-economic barriers to accessing social services in these districts

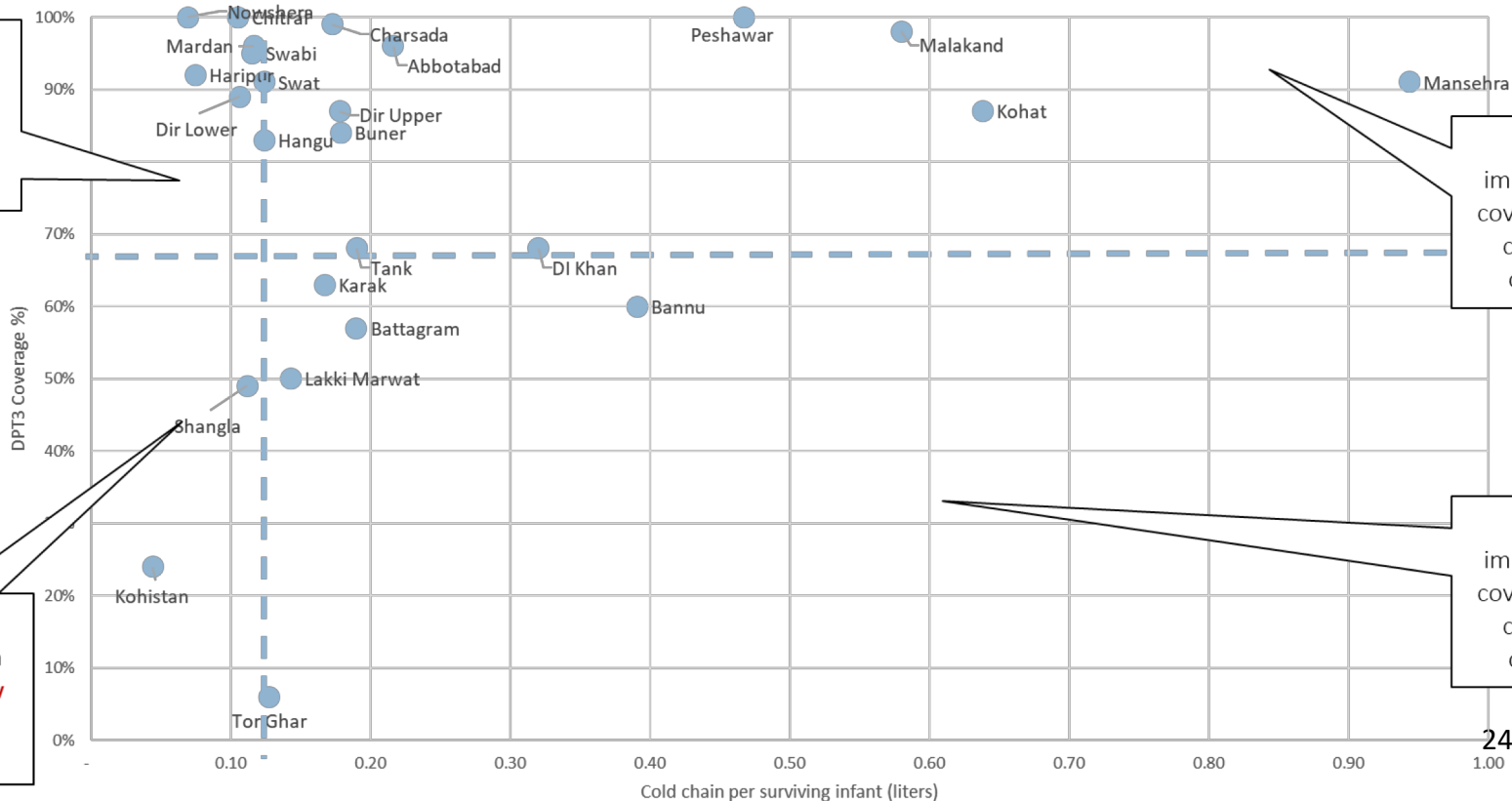


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Equity: More cold chain does not always lead to higher immunization coverage

Key Messages:

- Districts have high immunization coverage even if they have low cold chain coverage. And many districts which high cold chain coverage have low immunization
- For new cold chain deployment, coverage should be considered to meet the benchmark. But above the benchmark, factors other than coverage should be considered



High immunization coverage, low cold chain coverage

High immunization coverage, high cold chain coverage

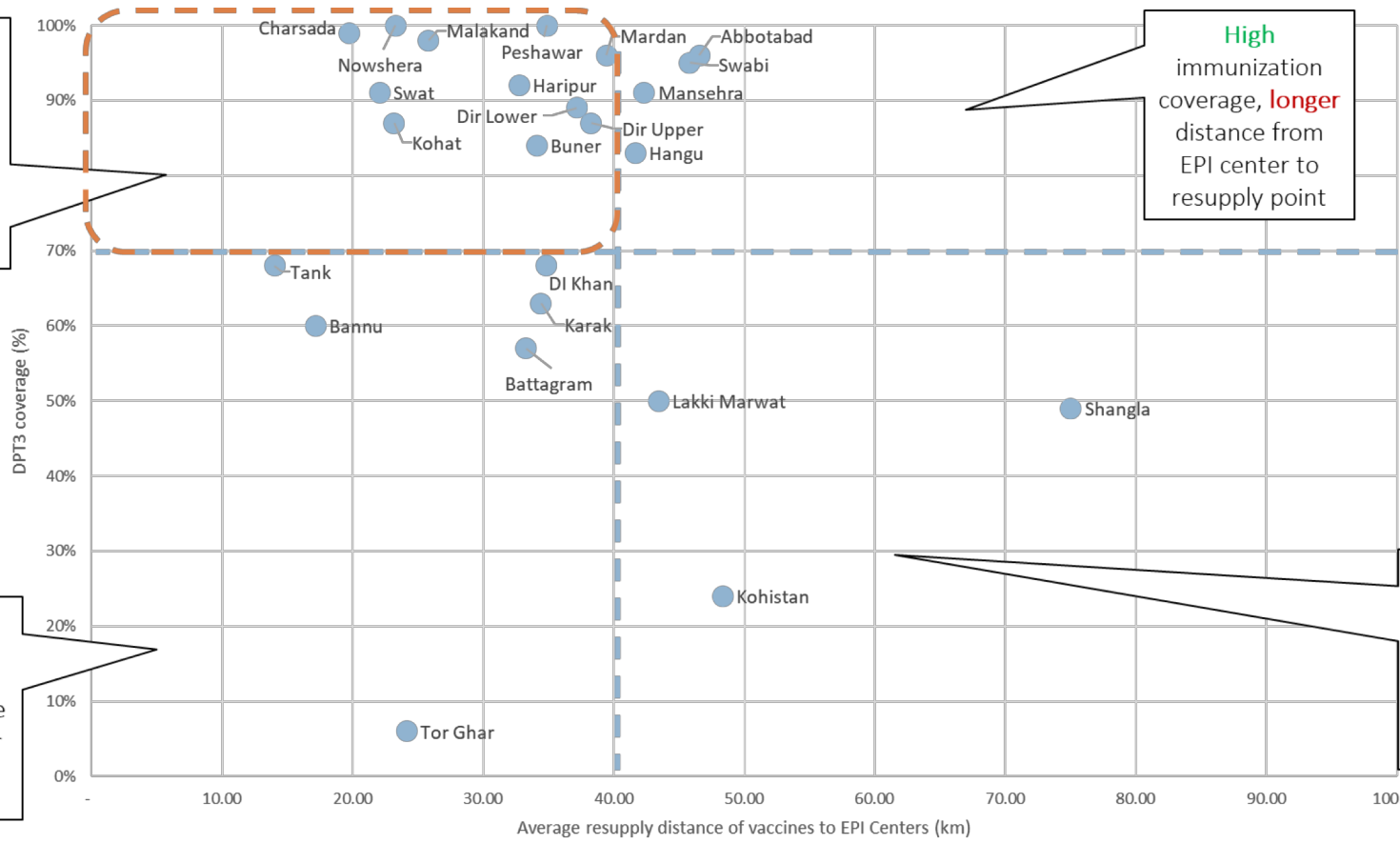
Low immunization coverage, low cold chain coverage

Low immunization coverage, high cold chain coverage



Most districts with EPI centers closer to resupply have high immunization coverage

High immunization coverage, shorter distance from EPI center to resupply point



High immunization coverage, longer distance from EPI center to resupply point

Low immunization coverage, shorter distance from EPI center to resupply point

Low immunization coverage, longer distance from EPI center to resupply point

Conclusion



- Improvements in supply chain from an equity lens can improve routine immunization and ensure availability of supply
- Availability of potent product is critical to improving equity in coverage by linking with other building blocks of the health system



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Thank you!

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