

Lessons from modeling global COVID-19 vaccine delivery cost

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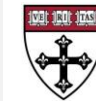
Overview

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- COVID-19 Vaccine Country Readiness and Delivery (CRD) and COVID-19 Vaccine Delivery Partnership (CoVDP) coordination set up a Cost and Financing Working Group
 - Cross-organizational working group that supported **planning, budgeting, fundraising** and **financing** of COVID-19 vaccine delivery
 - Objective was primarily **to estimate delivery costs for COVID-19 vaccines** in 133 Low- and Middle-income Countries, incl. 92 GAVI AMC countries.
- Use cases of global C19 vaccine delivery cost estimates
 - **Predict** resource requirements and evidence-base to **guide** resource mobilization across global actors
 - **Estimate** funding gaps (in combination with resource tracking results)

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HARVARD
SCHOOL OF PUBLIC HEALTH



WORLD BANK GROUP



World Health
Organization



Gavi
The Vaccine Alliance

USAID MEDICINES, TECHNOLOGIES, AND
PHARMACEUTICAL SERVICES (MTaPS) PROGRAM

Improved Access. Improved Services. Better Health Outcomes.

THANK YOU

Methods |

Iterative across 3 main versions of model

16 cost categories/line items in latest iteration of model

Cost structure (variable per dose, Recurrent, Fixed start-up)

Cost Breakdown by Line Item and Cost Category

- Human Resources for Delivery (Surge Only)
- Syringes & safety boxes
- Protective Personal Equipment (PPE) for health care workers
- Hand hygiene
- Per diem for service delivery and supervision
- Transportation for outreach (service delivery and supervision)
- Training
- Planning and coordination
- Social mobilization
- Cold chain
- Technical Assistance
- Waste management
- Vaccination certificates
- Pharmacovigilance
- Ultra Cold Chain
- Last Mile Premium

Estimates available per country; usually reported as aggregate totals of country groups

Methods | Variable per dose cost

assumptions

Cost category	Variable Cost			Notes/Assumptions
	VarDM1	VarDM2	VarDM3	
	Fixed Sites	Outreach	Mass Vax Sites	
Syringes & safety boxes	\$0.098	\$0.098	\$0.098	UNICEF global supplies catalogue; WHO essential supplies forecasting tool
Protective Personal Equipment (PPE) for health care workers	\$0.011	\$0.019	\$0.003	
Hand hygiene				
Sanitizer	\$0.028	\$0.028	\$0.028	
Soap		\$0.011	\$0.011	
Water	0.001	0.001	0.001	
Per diem for service delivery and supervision		\$1.38	\$0.18	Simplified to .0001 per dose
Transportation for outreach (service delivery and supervision)		\$0.45	\$0.08	
Cold chain				Immunization Delivery Cost Catalog (IDCC) and analysis of RI variation
Standard recurrent cost	0.01	0.01	0.01	
Vaccine transport	\$0.02	\$0.02	\$0.02	Schutte et al, 2015
Waste management	\$0.0440	\$0.0440	\$0.0440	
Vaccination certificates	\$0.05	\$0.05	\$0.05	Immunization Delivery Cost Catalog (IDCC) and analysis of RI variation

Methods | Recurrent cost

Cost category	Recurrent Cost per Time Period (6months)			Notes/Assumptions
	Per facility	Per Country		
		Regular	Large/Conflict	
Training	\$20.36			Fraction of fixed start-up costs informed by Immunization Delivery Cost Catalog (IDCC) and RI analysis
Planning and coordination		\$100,000	\$200,000	Fraction of fixed start-up costs informed by analysis of TA for national HPV vaccine across sample of countries
Social mobilization				
Behavioral and social data collection				Country-level assumptions informed by expert opinion, costs to undertake FGDs and deploy HR
Social media listening				Country-level assumptions informed by expert opinion, costs to deploy 1 social scientist and 1-2 M&E officers
Social mobilization (NUVI activities)	\$188			Fraction of fixed start-up costs informed by Immunization Delivery Cost Catalog (IDCC) and RI analysis
Technical Assistance				Country-level assumptions scaled based on income-level, size, fragility, and other factors.
Pharmacovigilance	\$15			Fraction of fixed start-up costs informed by President Malaria Initiative's budget analysis

Methods | Fixed start-up cost

assumptions	Fixed Costs			Notes/Assumptions
	Per facility	Per Country		
		Regular	Large/Conflict	
Cost category				
Hand hygiene				
Wash Station	\$20.00			UNICEF handwashing station and supplies for COVID-19
Training	\$81.43			Informed by Immunization Delivery Cost Catalog (IDCC)
Planning and coordination		\$400,000	\$800,000	Informed by analysis of TA for national HPV vaccine across sample of countries
Social mobilization				
Behavioral and social data collection		\$60,000	\$150,000	Estimates based on expert opinion gathered in model review meetings and consultations
Social media listening		\$100,000	\$135,000	
Social mobilization (NUVI activities)	\$750			Informed by Immunization Delivery Cost Catalog (IDCC)
Cold chain				
Capital investment (2-8 degree)				Country-level estimates from PATH, 1-time fixed cost
UCC				Country-level estimates from UNICEF, 1-time fixed cost
Technical Assistance				Country-level assumptions scaled based on country size and complexity
Pharmacovigilance	\$59.83			Informed by President Malaria Initiative's budget analysis

Methods | other parameters and

Parameters	Scenario 1: Constrained	Scenario 2: Unconstrained	Scenario 3: Aspirational
Country scope	133 LMIC		
Target coverage - primary series	National targets		Global targets
Target coverage – first booster	Assumptions based on progress against national targets for primary series		Progress against national targets for primary series + first Booster for all high-risk population
Timeframe	July 2022 – December 2023		
Adjusted for absorption	Yes	No	
Growth rate in vaccination pace	Declines linearly	Constant	
Delivery method	Country specific. Aggregated: 54% fixed site, 20% outreach, and 26% mobile vaccination		
Unit cost multiplier for rapid scale-up	No	Yes	
Last mile premium to reach 100% high risk population	No		Yes
HR reallocation	5% assumption of HR reallocation		
Time criteria	10 minutes per vaccinator, 7 hours per day, 4.5 operating days a week		
Team composition: Mass vaccination and fixed site	2 vaccinators, 3 support staff		
Team composition: Outreach	1 vaccinator, 1 support staff		
Fixed costs	Fixed cost smoothing assumption updated		

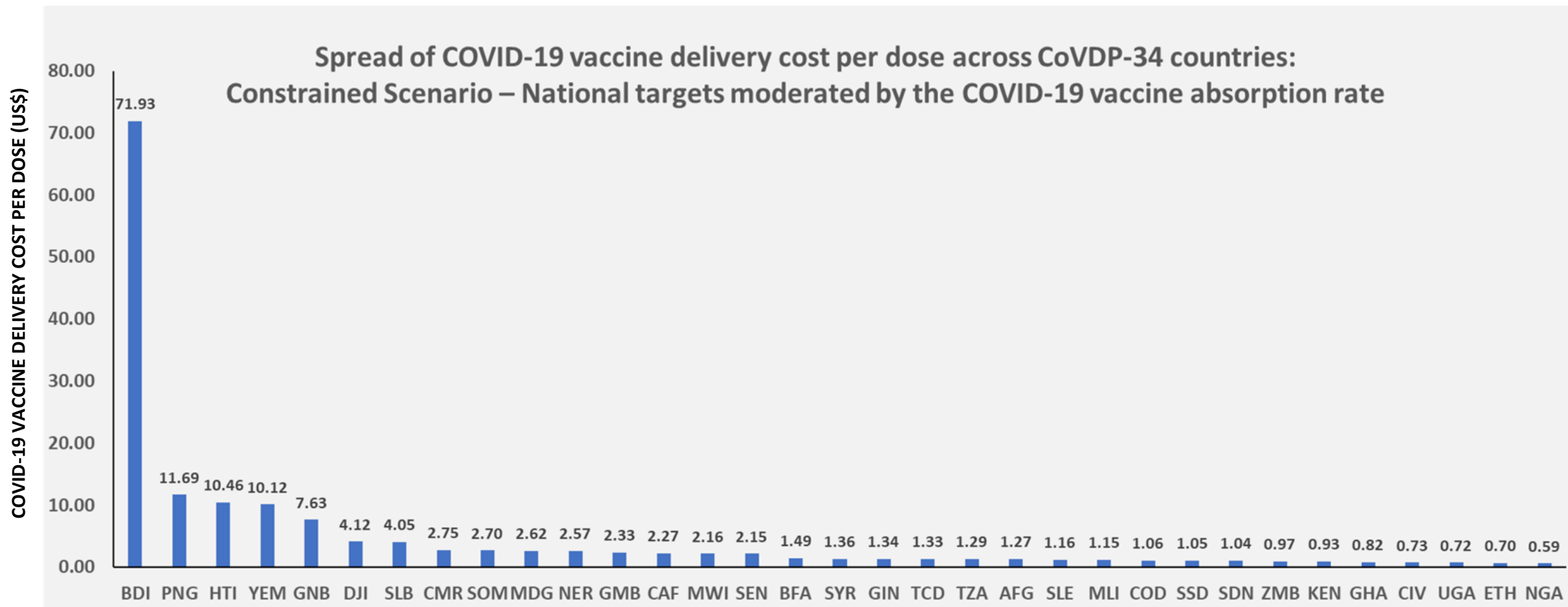
Results | aggregate summaries by country group

	<u>Constrained</u> : National targets moderated by historical best absorption rates		<u>Unconstrained</u> : National coverage targets fully achieved within 18-month timeframe		<u>Aspirational</u> : 100% (health workers)/100% (at risk pop.)/70% other population coverage	
	Delivery Cost (USD)	Cost per dose (USD)	Delivery Cost (USD)	Cost per dose (USD)	Delivery Cost (USD)	Cost per dose (USD)
All countries (133)	2,497,153,626	0.73	3,409,905,849	0.86	5,558,359,113	1.11
AMC (92)	2,108,003,229	0.75	2,949,977,686	0.89	4,881,613,885	1.15
SFC (41)	389,150,397	0.64	459,928,164	0.72	676,745,229	0.90
CoVDP Priority (34)	551,897,463	1.02	1,186,656,228	1.23	2,428,850,826	1.46
LIC (27)	465,847,200	1.34	890,546,379	1.43	1,734,555,350	1.65
LMIC (55)	1,656,167,019	0.66	2,062,815,499	0.75	3,164,599,604	0.98
UMIC (50)	304,755,644	0.56	440,080,464	0.77	639,176,992	0.92
No income classification (1)	70,383,764	2.40	16,463,508	0.56	20,027,168	0.68
Overall, excluding India (132)	2,005,905,313	0.85	2,875,180,351	0.99	4,771,800,707	1.26
India (1)	491,248,314	0.46	534,725,499	0.50	786,558,407	0.66

Results | large spread of delivery costs per dose across country income groups and model scenarios

	<u>Constrained</u> : National targets moderated by historical best absorption rates	<u>Unconstrained</u> : National coverage targets fully achieved by Dec 2023	<u>Aspirational</u> : 100% (high risk groups) + 70% other population coverage
LIC (27)	\$ 0.70 \$ 71.93	\$ 0.89 \$ 4.53	\$ 0.91 \$ 4.80
LMIC (55)	\$ 0.45 \$ 11.7	\$ 0.50 \$ 24.47	\$ 0.51 \$ 25.72
UMIC (50)	\$ 0.35 \$ 73.72	\$ 0.44 \$ 136.88	\$ 0.45 \$ 175.49

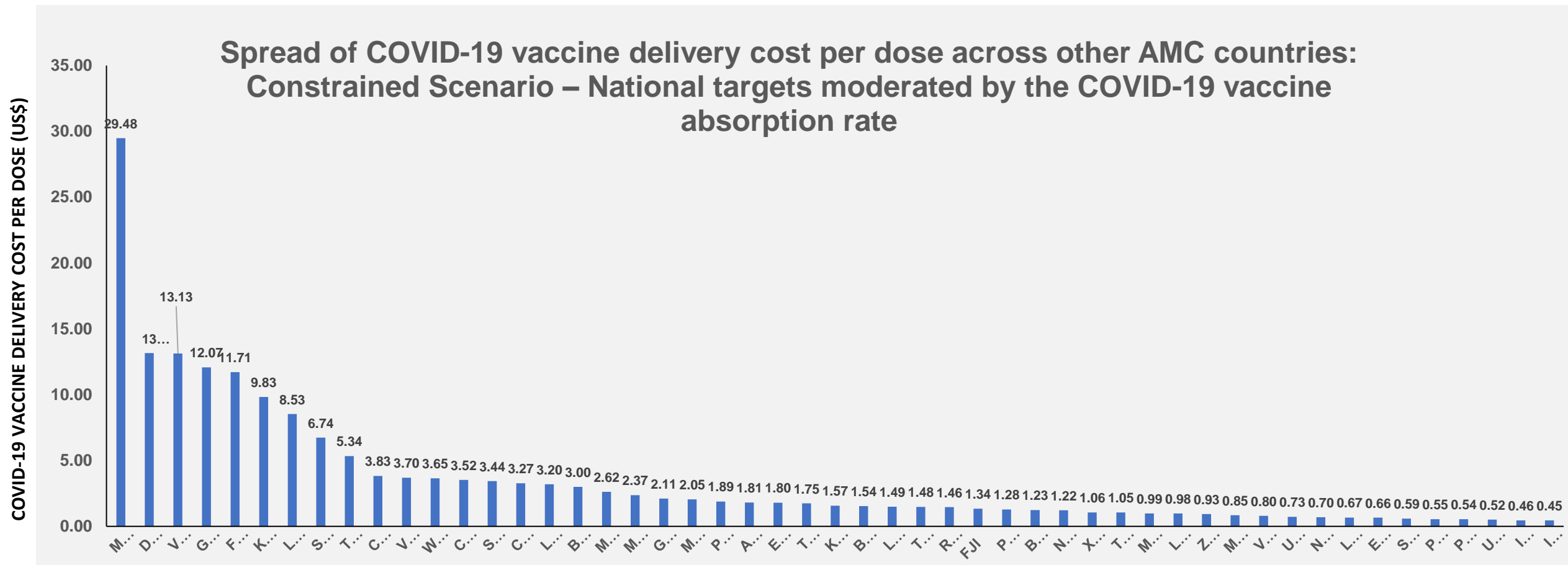
Results | spread of delivery cost per dose in CoVDP priority countries



Results | spread of delivery cost per dose – other AMCs



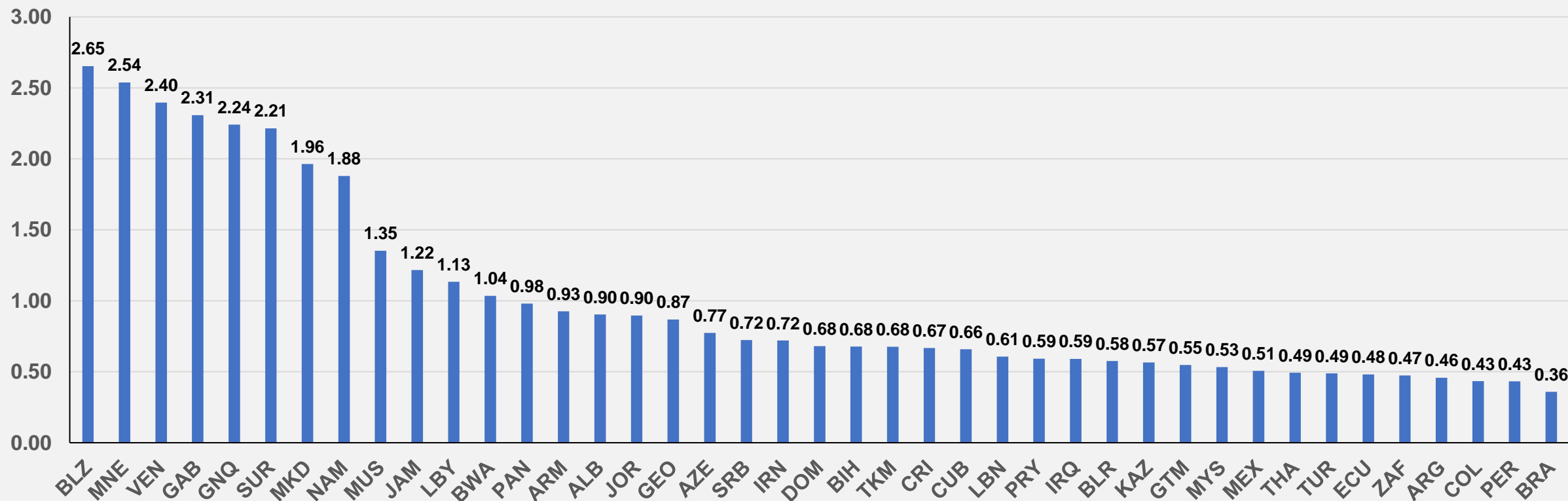
Spread of COVID-19 vaccine delivery cost per dose across other AMC countries:
Constrained Scenario – National targets moderated by the COVID-19 vaccine absorption rate



Results | spread of delivery cost per dose – SFCs

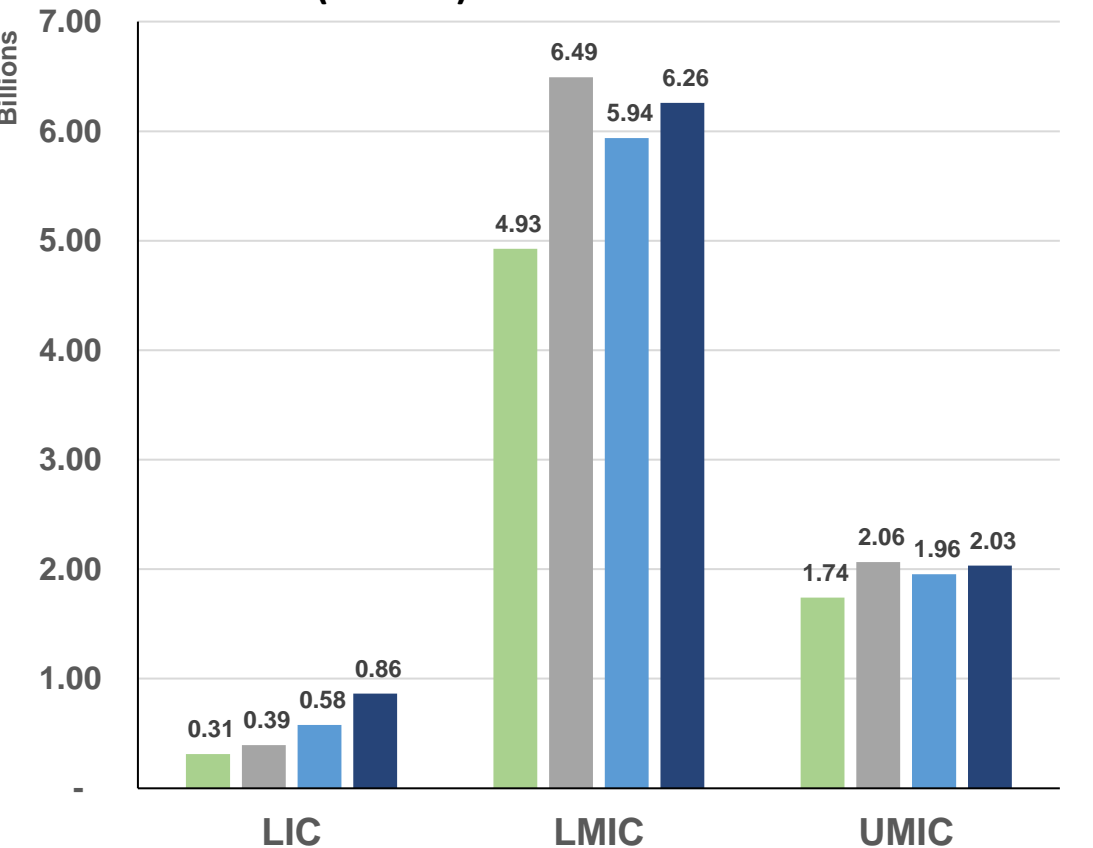
Spread of COVID-19 vaccine delivery cost per dose across SFC countries:
Constrained Scenario – National targets moderated by the COVID-19 vaccine
absorption rate

COVID-19 VACCINE DELIVERY COST PER DOSE (US\$)

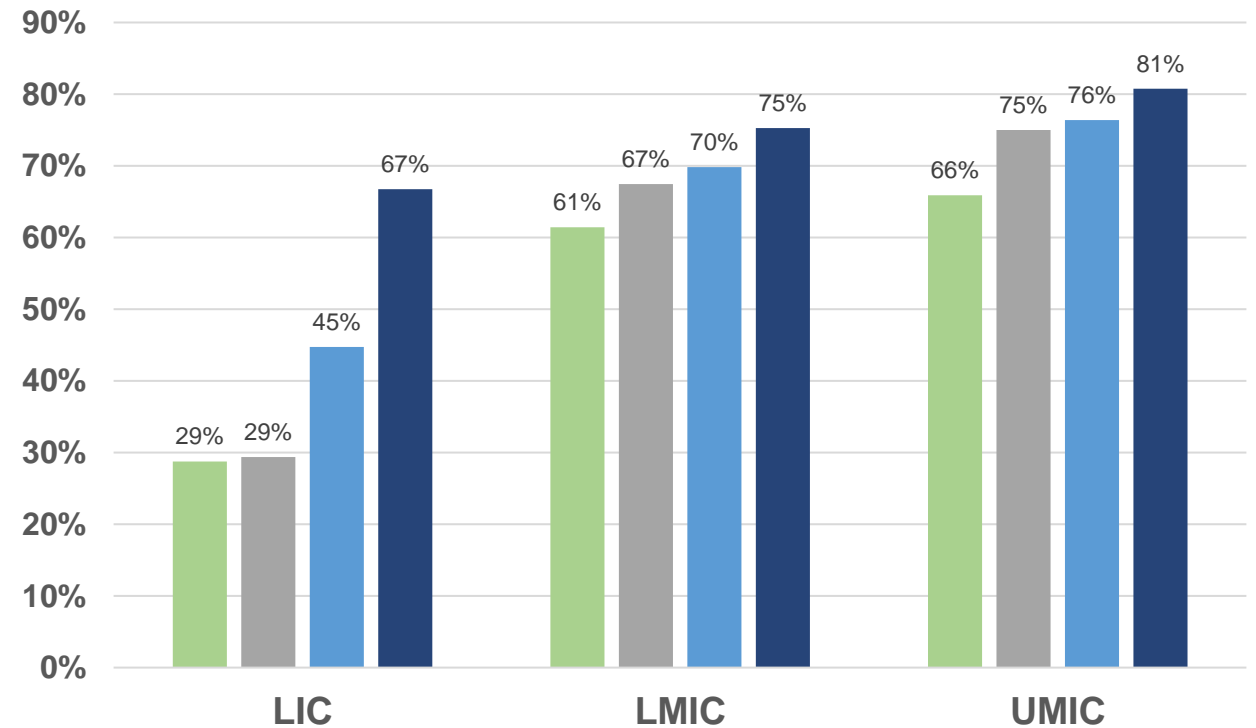


Comparing model parameters to reality | doses administered and primary series coverage

Total Doses Administered (billions)



COVID-19 Vaccine Primary Series (CPS) Coverage (% of total population)



■ Actual doses administered
 ■ Predicted doses_constrained scenario
■ Predicted doses_unconstrained scenario
 ■ Predicted doses_aspirational scenario

■ Actual CPS Coverage
■ Predicted CPS Coverage-Constrained Scenario
■ Predicted CPS Coverage-Unconstrained Scenario
■ Predicted CPS Coverage-Aspirational Scenario

Comparing model outputs to reality| delivery costs per dose

- From anecdotal evidence – higher or lower country delivery cost per dose when compared to results of the global model

- Next steps - assess contributory factors to variation such as:
 - HR parameters – difficult to predict; greater or lower than global model assumptions
 - Inefficiencies in input mix and production costs compared to global model parameters (e.g., coordination of external financing; deployment of HR teams etc.)
 - Financial management issues – delayed payments leading to under-resourced implementation teams; lower recorded expenditures

Conclusion| implications for future multi-country cost modeling in a pandemic

- Modeling based on best available information was the best option
 - Absence of real country cost data
 - Urgent need for credible evidence to predict global resource needs and swiftly
- Limitations to use of global models
 - Huge range of country cost per dose estimates – not feasible for use as single point estimate
 - Not evidence for country planning, budgeting or resource allocation
- Retrospective cost studies are useful; however, time consuming, difficult and resource intensive.

A group of approximately ten children of African descent are gathered outdoors in front of a building with a blue window shutter. They are all smiling and giving thumbs up. The children are dressed in colorful, patterned clothing. One child in the foreground wears a blue headscarf and a green patterned dress. Another child wears a blue and white striped shirt with '2020' printed on it. A child in the middle wears a purple patterned shirt, and another wears a blue shirt with a 'HYUNDAI' logo. The background shows a textured wall and a blue window shutter.

Thank you.