The cost of delivering COVID-19 vaccines in four districts in Malawi

Anika Ruisch, Technical Advisor, MSH/USAID MTaPS

Supported by MSH/USAID MTaPS team and Malawi Consultants:
Dr. Damian Walker, Dr. Christian Suharlim, Ishani Mathur, Karina Noyes, Maeve Conlin
Dr. Simon Ntopi, Allison Zakaliya, Maria Moyo

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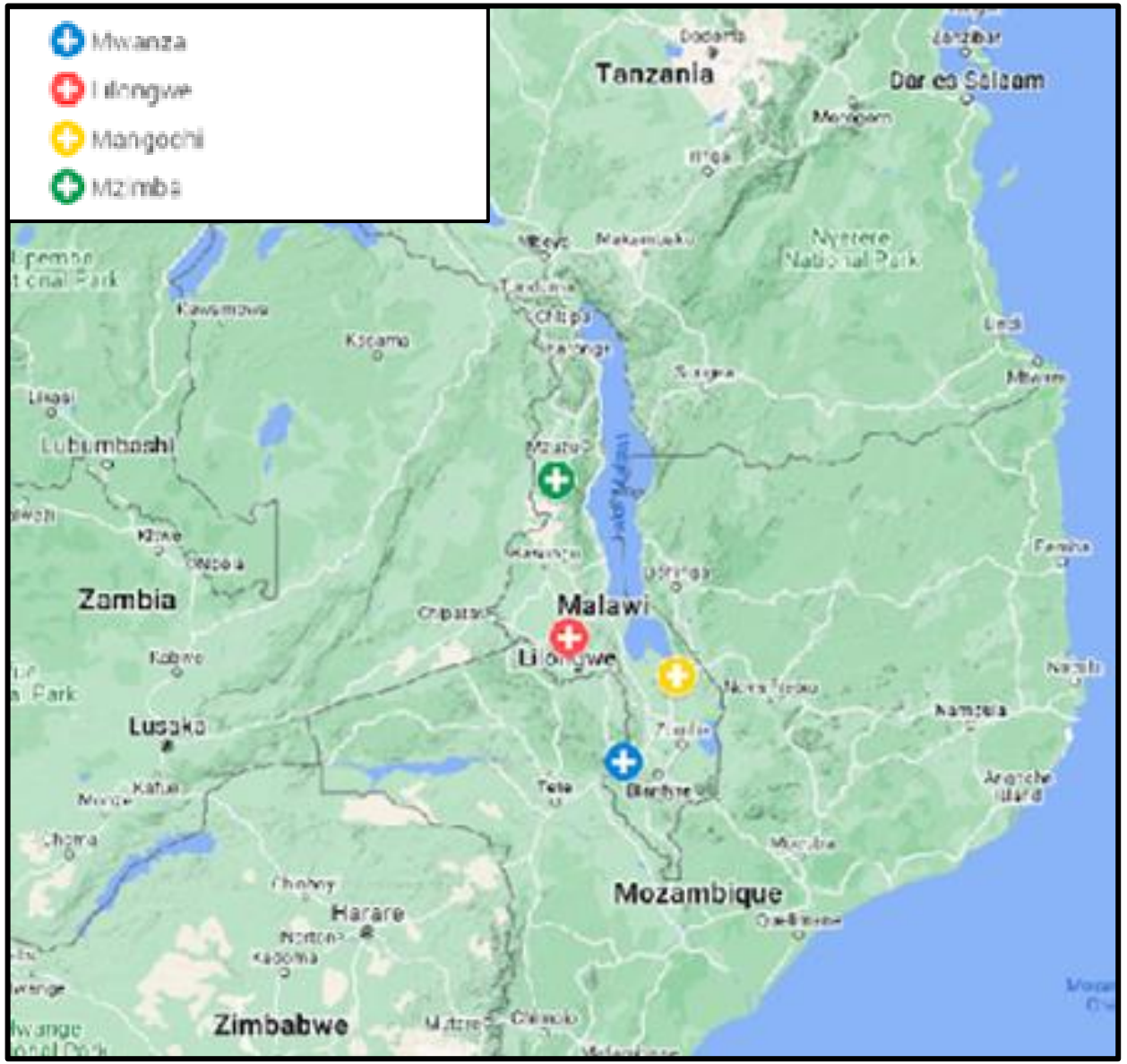
Malawi's COVID-19 vaccination approach

- Malawi first reported C-19 cases in March 2020. The country faced a rapid increase in the number of cases and deaths during January and February 2021 and again in July and August of that year.
- Malawi's C-19 response was channeled through the government and existing Expanded Programme on Immunization (EPI) infrastructure
- Malawi experienced Polio and Cholera outbreaks throughout the C-19 response

Malawi - Study sample

- Actual cost of the COVID-19 vaccination
- Retrospective, bottom up data collection 18-month period between Apr ‘21 to Oct ’22
- Convenience Sample
  - 4 Districts
  - 20 Health Facilities
    - Mix of district hospitals, health centers, and health posts



Costing Methods

Included:

Focus on **paid** and **volunteer labor*** (incl time allocation to calculate opportunity costs)	Other categories: **vehicles**, **per diem**, **training**, **meetings** (financial)	We captured the number of C-19 **doses delivered** from facility registries

Excluded:

Cold chain equipment, waste, supplies (masks, gloves, etc.)

**Portnoy, A. (2021, July 26). Restricting the Scope of Costing Studies to Improve the Efficiency of Data Collection: An Example from Routine Immunization. https://immunizationeconomics.org/combined-abstracts/2021/8/12/restricting-the-scope-of-costing-studies-to-improve-the-efficiency-of-data-collection-an-example-from-routine-immunization*

Results: comparing the cost per dose with the COVAX model results

	COST PER DOSE (USD)			
# doses delivered	147,563			
	ALL Sampled sites (n=20 sites)		MALAWI per COVAX MODEL	GLOBAL per COVAX MODEL
New staff and volunteer stipends	$ 0.40			
Transportation	$ 2.12			
Annualized cost of donated vehicles (specifically for C-19 delivery)	*$ 0.62*			
Use of owned vehicles (fuel + maintenance)	*$ 1.00*			
Per Diems	*$ 0.50*			
Training (incl staff salary)	$ 0.45			
Staff salary	*$ 0.21*			
Recurring meetings (incl staff salary)	$ 0.35			
Staff salary	*$ 0.22*			
Total cost per dose	**$ 3.32**		**$2.40***	**$0.73****

**Estimates from HSR2022 Bogota presentation, unconstrained scenario
Available at https://immunizationeconomics.org/unicef-at-hsr2022
*Estimates from recreated model, for Malawi

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Cost rises dramatically when including the cost of staff reallocation

	COST PER DOSE (USD)		
# doses delivered	147,563		
	ALL Sampled sites (n=20 sites)	MALAWI per COVAX MODEL	GLOBAL per COVAX MODEL
Staff	$ 7.73		
Regular staff (reallocation of labor)	*$ 7.31*		
New staff and volunteer stipends	*$ 0.40*		
Transportation	$ 2.12		
Annualized cost of donated vehicles (specifically for C-19 delivery)	*$ 0.62*		
Use of owned vehicles (fuel + maintenance)	*$ 1.00*		
Per Diems	*$ 0.50*		
Training (incl staff salary)	$ 0.45		
Staff salary	*$ 0.21*		
Recurring meetings (incl staff salary)	$ 0.35		
Staff salary	*$ 0.22*		
Total cost per dose (all staff)	**$ 10.65**	**$2.86***	**$2.67****

**Estimates from HSR2022 Bogota presentation, unconstrained scenario
Available at https://immunizationeconomics.org/unicef-at-hsr2022
*Estimates from recreated model, for Malawi

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In our sample, which healthcare workers carried out the C-19 vaccine delivery work?

Opportunity costs:

- 58% of the C-19 campaign activities were carried out by **HSAs and senior HSAs**, mostly taking care of the vaccinations
- 31% of the staff involved in the C-19 campaign were **volunteers**, tasked with social mobilization and crowd control

In Malawi, community health workers are called **health surveillance assistants** (HSAs)

Financial costs:

- 97% of the cost of **new staff** was made up of **volunteer stipends**
- Malawi pays their volunteers (note that stipends are but a fraction of a health workers salary ~$10 USD vs ~$300 USD per month)

In our sample, the cost per dose was most expensive in Mzimba district, which is the least densely populated

	COST PER DOSE (USD)			
# doses delivered	53,180	32,993	43,610	17,780
	Lilongwe (n=6 sites)	**Mangochi (n=5 sites)**	**Mwanza (n=3 sites)**	**Mzimba (n=6 sites)**
Staff	$ 4.10	$ 11.29	$ 7.00	$ 13.77
Regular staff (reallocation of labor)	*$ 4.02*	*$ 9.85*	*$ 6.83*	*$ 13.61*
New staff and volunteer stipends	*$ 0.05*	*$ 1.44*	*$ 0.17*	*$ 0.08*
Transportation	$ 1.27	$ 1.88	$ 3.07	$ 2.74
Annualized cost of donated vehicles (specifically for C-19 delivery)	*$ 0.82*	*$ 0.36*	*$ 0.37*	*$ 1.12*
Use of owned vehicles (fuel + maintenance)	*$ 0.35*	*$ 0.97*	*$ 1.77*	*$ 1.10*
Per Diems	*$ 0.10*	*$ 0.55*	*$ 0.93*	*$ 0.51*
Training (incl staff salary)	$ 0.29	$ 0.42	$ 0.46	$ 0.94
Staff salary	*$ 0.15*	*$ 0.22*	*$ 0.20*	*$ 0.42*
Recurring meetings (incl staff salary)	$ 0.77	$ 0.05	$ 0.11	$ 0.26
Staff salary	*$ 0.51*	*$ 0.05*	*$ 0.03*	*$ 0.17*
Total cost per dose (all staff)	**$ 6.44**	**$ 13.64**	**$ 10.64**	**$ 17.70**

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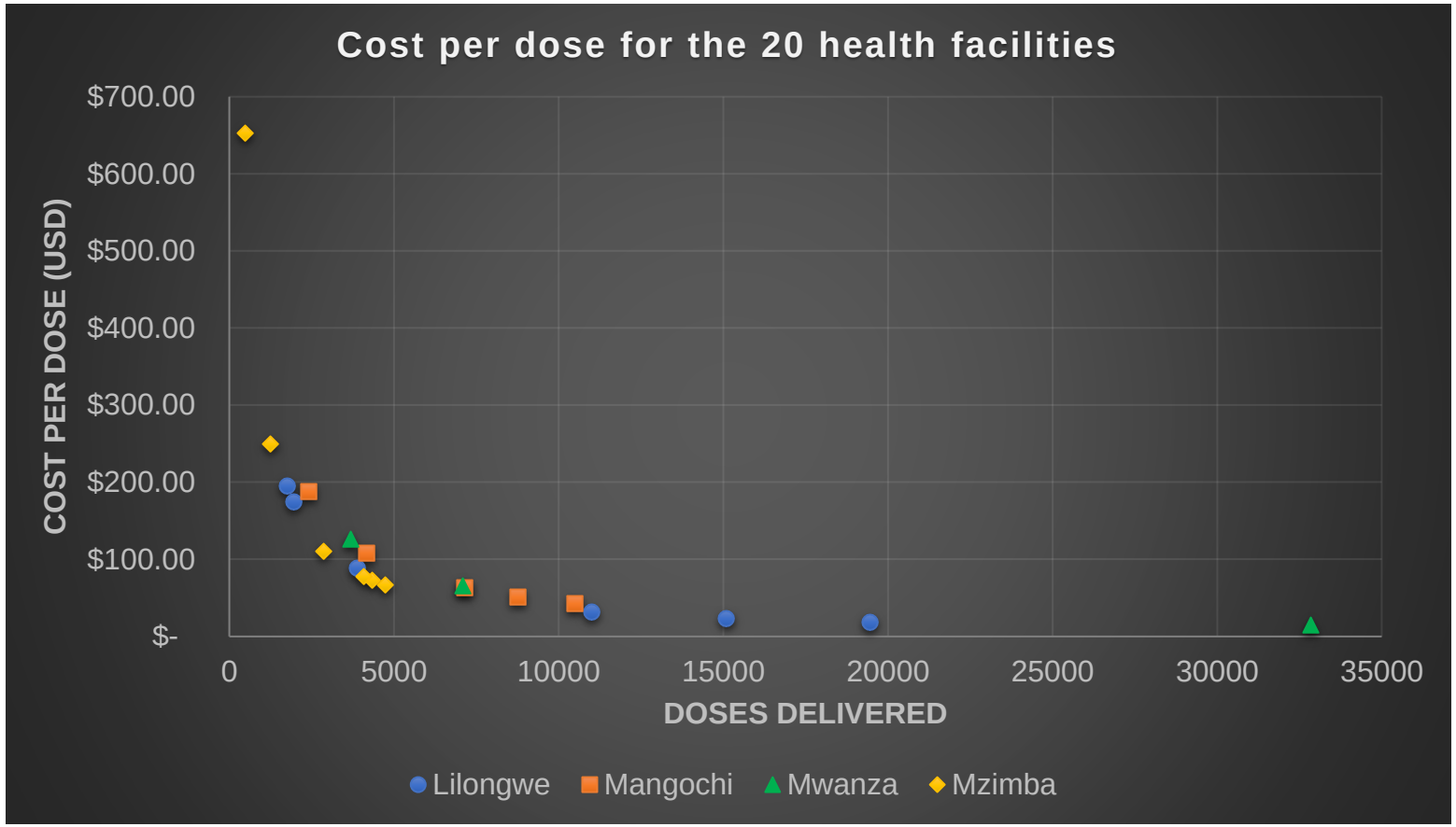
Cost per dose varies from $14.12 to $653.01 across the facilities



In our sample, the delivery of vaccines at health posts is more expensive

Facility type	Count of Facility type	Doses delivered by facility type	Doses delivered % total delivered	Cost per dose (USD) by facility type	Cost per dose % total cost
Health center	10	67,380	45.7%	$ 930.11	38.5%
Health post	3	3,710	2.5%	$ 1,076.81	44.6%
Hospital	6	72,301	49.0%	$ 300.46	12.4%
Dispensary	1	4,172	2.8%	$ 107.88	4.5%
Total	**20**	**147563**	**100.0%**	**$ 2,415.26**	**100.0%**

Difference because of the small number of people vaccinated, access, or quality of care? Our sample is small/this goes beyond the scope of our study not possible to draw conclusions

Discussion

Cost of C-19 campaign

- The cost of vaccine delivery in the 4 districts of Malawi is within the modelled range
  - Including the reallocation of labor, the cost rises by more than ~3.7x

Malawi context

- Only ~26.19% of the population has received at least one dose (June 18, 2023, Our World in Data)
- It appears that it is costly to reach population in remote areas (less densely populated districts / health posts)
- Organizing the campaign through EPI may have complicated the campaign:
  - EPI is focused on a fraction of the total population
  - Competing priorities – cholera, polio outbreaks at the same time

– what can we learn from the approaches of other countries?

Wrap up

- **Strengths**
  - Facility level data collection – supplementing/enriching the secondary data from national records
  - Focus of our survey was on major cost drivers
  - Talented, well-connected data collection team
- **Limitations**
  - Sample size – convenience sample N=20 facilities
  - Actual cost will be higher as we did not include several categories (e.g., waste, cold chain)
  - Realities of costing analysis during a pandemic (approval process, MoH had competing priorities, colleagues stretched thin)

Thank you

aruisch@msh.org

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