

ASSESSING THE IMPACT OF SWITCHING TO MEASLES 5-DOSE VIALS IN ETHIOPIA

April 2022

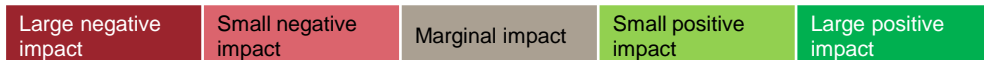
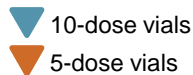
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OVERVIEW AND KEY FINDINGS

TOTAL SYSTEMS EFFECTIVENESS ANALYSIS

- Total Systems Effectiveness (TSE) is a holistic approach used to prioritize or decide between products from a systems perspective, taking into consideration **coverage, equity, programmatic implications, and full systems cost.**
- A data-driven TSE analysis was conducted to articulate the public health value of measles (M) and measles-rubella (MR) 5-dose (5d) vials. This analysis attempts to quantify the programmatic, financial, and logistical trade-offs between 5-dose and 10-dose vials.
- The TSE analysis uses available data to incorporate assumptions on the impact of 5-dose vials on factors such as coverage, wastage, price, programmatic costs, cold chain requirements, and other qualitative considerations.

KEY FINDINGS



Vaccine Characteristics	Outcomes	Impact				Key Takeaways
		Equity impact	Country feasibility	Gavi costs	Long-term market health	
Coverage 	Number of children vaccinated 					<ul style="list-style-type: none"> HCWs are more likely to open 5-dose vials, leading to increased coverage and more children vaccinated Increased RI coverage may lead to reduced need for costly campaigns and improved demand predictability
Wastage 	Total required supply 					<ul style="list-style-type: none"> Since 5-dose vials reduce wastage, countries can vaccinate more children with less TRS
Vaccine price per dose 	Vaccine price per vaccinated child 					<ul style="list-style-type: none"> Although the UNICEF price per dose is higher for 5-dose vials, after adjusting for wastage, the vaccine procurement price per vaccinated child is only slightly higher for 5-dose vials
Incremental non-vaccine costs per vaccinated child 	Total costs per vaccinated child 					<ul style="list-style-type: none"> 5-dose vials are associated with incremental non-vaccine costs such as cold chain, transport, outreach, HR, and wastage disposal compared to 10-dose vials Incremental costs were mostly associated with HR costs in the Zambia study
Cold chain (cm³) per dose 	Net cold chain per vaccinated child (cm³) 					<ul style="list-style-type: none"> Despite the higher cold chain per dose for 5-dose vials, the reduced TRS helps to offset the cold chain requirements The Zambia study found that the difference in net cold chain per immunized child is marginal and 5-dose vials had minimal impact on the cold chain

INPUTS AND ASSUMPTIONS

WASTAGE RATES

- There are various factors that influence wastage, and this analysis used the results from the Zambia study as a proxy for 10-dose vial wastage and 5-dose vial wastage in Ethiopia
- Alternatively, the WHO/UNICEF Fact Sheet estimates 10d vial wastage at 40% and 5d vial wastage at 30%

Source	10d vial wastage	5d vial wastage	Difference
Zambia Study	30.53%	16.18%	14.35%

Source:

[Dose Per Container Partnership: Implementing 5-dose Measles-Rubella Vaccine Vials in Zambia](#)

COVERAGE RATES

- There is little data available on the impact of switching to 5-dose vials on coverage
- The Zambia study found that the 5-dose vial intervention increased MCV1 coverage by 4.9% and MCV2 coverage by 3.5%
- For the baseline coverage assumptions, we used the WUENIC 2021 reported MCV1 and MCV2 coverage for 2020 in Ethiopia
- Note that Ethiopia's baseline MCV1 coverage is 60.0%, compared to 82.1% in Zambia, so *the impact on coverage could be expected to be even greater in Ethiopia*

Vaccine	Baseline coverage	Intervention effect
MCV1	82.1%	+ 4.9%
MCV2	43.0%	+ 3.5%

Source: [WHO/UNICEF estimates of national immunization coverage](#)

VACCINE PRICE AND COLD CHAIN

Product

- Ethiopia is reportedly using SII Measles 10-dose product and considering switching to SII Measles 5-dose

Price

- Vaccine price per dose information is from UNICEF's vaccines pricing data
- The vaccine price per dose was adjusted for wastage in this analysis to calculate the vaccine procurement price per vaccinated child

Cold Chain

- Cold chain per dose assumptions come from the Gavi detailed product profiles resource
- Cold chain per vaccinated child was calculated to adjust for wastage and coverage

Antigen	Vial Size	Manufacturer	Cold Chain per Dose (CM ³)	Price per Dose
Measles	10-dose	SII	5.25	\$0.423
		Bio Farma	5.83	\$0.270
	5-dose	SII	9.7	\$0.522
MR	10-dose	SII	5.24	\$0.873
		Bio E	3.9	\$0.792
	5-dose	SII	9.71	\$1.090
		BioE	5.92	\$0.918

Source:

Cold chain – [Gavi Detailed Product Profiles \(DPPs\) for WHO prequalified Vaccines](#)

Measles price per dose – [Measles-vaccines-prices-12022021.pdf \(unicef.org\)](#)

MR price per dose – [MR-vaccines-prices-15022021.pdf \(unicef.org\)](#)

INCREMENTAL NON-VACCINE COSTS

- The Zambia study found that the incremental non-vaccine costs per dose administered associated with switching from 10-dose to 5-dose vials is **\$0.11 per dose of vaccine administered**
- The Zambia study took into consideration the following factors:
 - Cold chain costs
 - Transport costs for vaccine collection
 - Outreach costs (excluding human resource costs)
 - Human resource costs
 - Wastage disposal
- Most health facilities reported **no change** in incremental costs, so the interquartile range of costs is \$0.00 – \$0.05
- The upper interquartile (\$0.05) can be considered to account for possible overestimation of human resource costs due to study requirements
- Please refer to the DPCP Zambia report for additional information on non-vaccine costs
- The incremental non-vaccine costs per dose administered were added to the 5-dose vial vaccine procurement price per vaccinated child to calculate the total costs per vaccinated child (including vaccine price and all incremental non-vaccine costs)

RESULTS

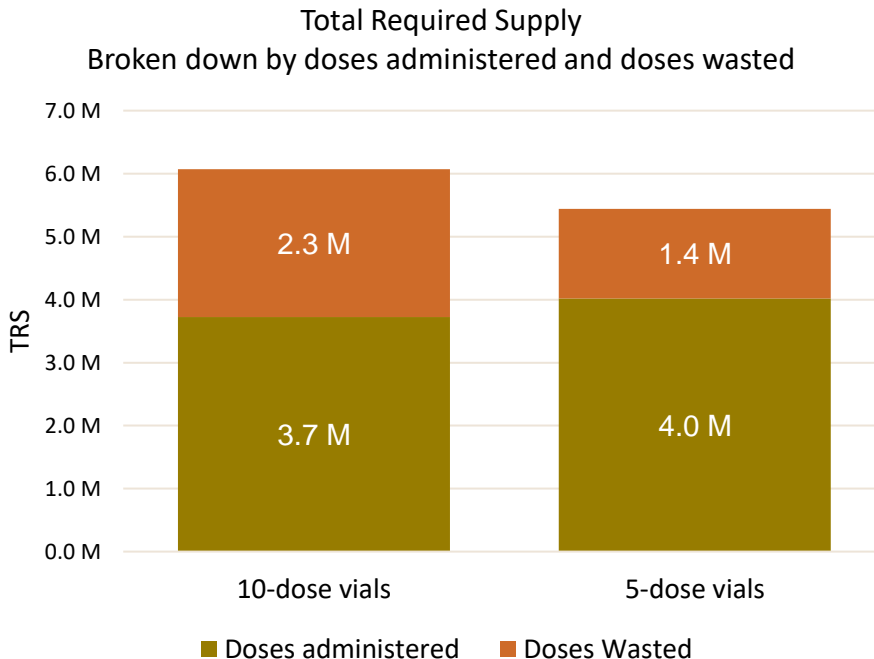
VACCINE DELIVERY

Switching to 5-dose vials results in lower total required supply (TRS), more children vaccinated, and fewer doses wasted than with 10-dose vials

If Ethiopia switches to 5-dose vials, it is expected that:

- An additional 295,233 doses will be administered each year (including MCV1 and MCV2 doses)
- The total required supply will reduce by 628,452 doses
- The number of doses wasted will decrease by 923,685 doses

*Assuming target population is Ethiopia's birth cohort (3,514,676 children, [UNPD 2019 Revision](#))



TOTAL SYSTEMS COSTS

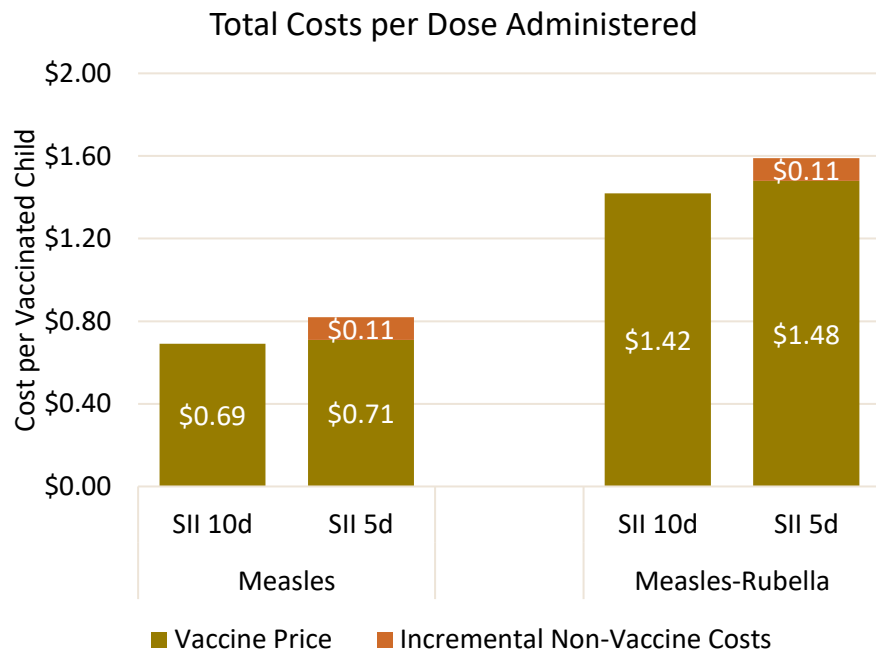
After adjusting for wastage, the vaccine procurement price per vaccinated child is marginally higher for 5-dose vials

The 5-dose vials have higher total costs per vaccinated child—mostly attributable to incremental non-vaccine costs.

- The total costs per vaccinated child include the vaccine price and all incremental non-vaccine costs associated with switching to 5-dose vials
- If Ethiopia switches from SII's Measles 10d to 5d vials, the vaccine is expected to only cost an additional \$0.02 per dose administered, plus ~\$0.11 in incremental non-vaccine costs
- If Ethiopia plans on also switching to MR, a comparison of SII's MR 10d and 5d vials is also provided (reference the appendix for a comparison of all products)

Improving RI coverage could reduce the need for campaigns and associated costs.

- It was out of the scope of this analysis to quantify, but theoretically, the increased RI measles coverage could reduce the need for costly campaigns and improve demand predictability



COLD CHAIN REQUIREMENTS

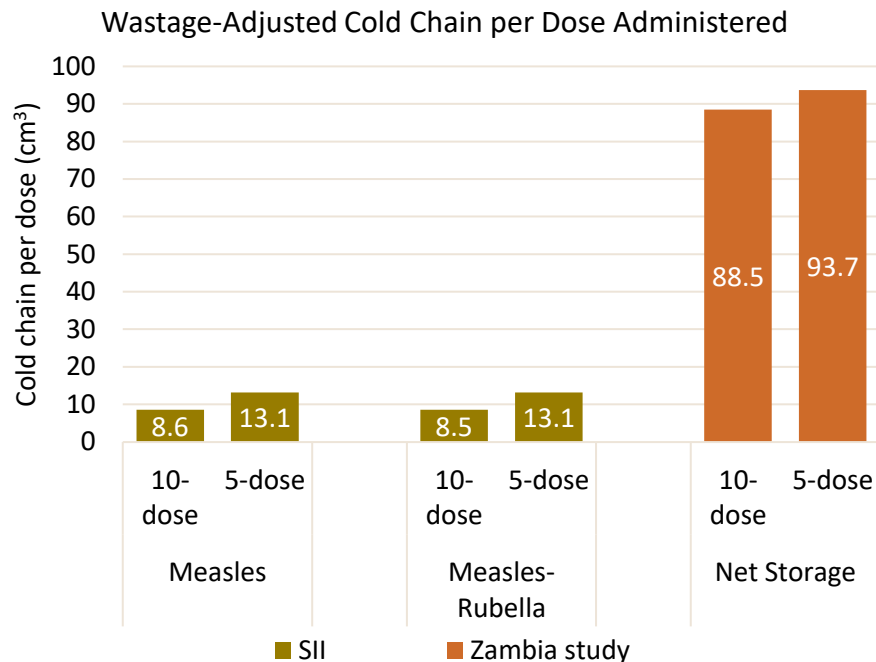
While 5-dose vials take up more cold chain space per dose, this is offset by the lower total required supply, and all health facilities in the Zambia study had sufficient cold chain space.

The lower wastage rates and total required supply of 5-dose vials helps to offset the discrepancy in cold chain requirements, because healthcare facilities need to store fewer doses.

- M and MR 5-dose vials take up more space per dose than 10-dose vials
- Reference the appendix for comparison of all products

Switching to 5-dose vials is not expected to impact total net storage requirements in Ethiopia.

- The Zambia study found that the difference in total net storage requirement per fully immunized child, including the vaccine, was marginal
- The Zambia study looked at the net storage required per fully immunized child, considering cold boxes, vaccine carriers, and refrigerators
- All health facilities in the intervention arm had sufficient cold chain space for the increase in volume required for introducing MR 5-dose vials



ADDITIONAL CONSIDERATIONS

Equity

- MR 5-dose is a delivery-based innovation that can help reach un-/under-immunized children, especially in rural and remote areas where session sizes tend to be small
- Minimizing missed opportunities for vaccination will help drive progress towards achieving equity goals in immunization

Healthcare Worker Behavior

- Despite open vial policies that promote 'one vial one child,' healthcare worker reluctance to open vials remains a challenge in routine immunization
- MR 5-dose will reduce healthcare worker hesitancy to open a vial due to fear of wastage and/or stockouts
- Use of 5-dose will improve timely coverage and reduce missed opportunities for vaccination, while also reducing wastage

Safety

- Increasing the doses per container increases the opportunity for user error, which may raise the likelihood of non-sterile injections and injections with expired vaccine. MR 5-dose could help reduce this risk

Market Health

- MR 5-dose is an intervention that would improve routine immunization coverage, thus hopefully reducing Ethiopia's reliance on campaigns and minimizing the unpredictability of demand year-over-year

LIMITATIONS

Wastage

- Limited data is available on the impact of MR 5-dose vials on wastage rates
- Many factors can influence wastage, and the context of each country should be taken into consideration

Coverage

- Limited data is available to understand the impact of 5-dose vials on coverage in different settings, such as health facilities with varying catchment population sizes

Total Costs

- While the Zambia study found minimal increase in costs (with many facilities reporting no increase), there is uncertainty around the incremental programmatic costs associated with switching to 5-dose vials, and costs will vary in different contexts

Cold Chain

- While the impact on net storage is expected to be marginal, the impact of switching to 5-dose vials on the cold chain is uncertain and will vary for each health facility

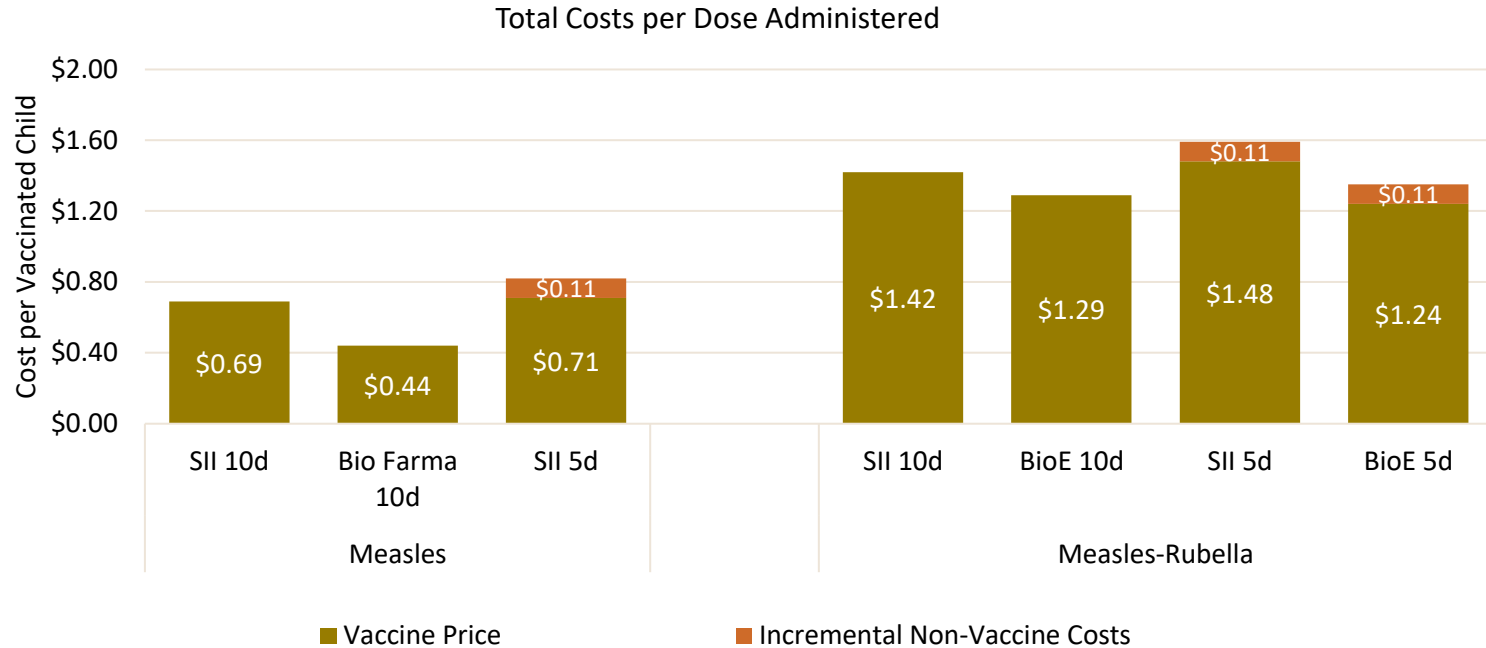
Zambia Study

- The Zambia study was used to inform assumptions on wastage, coverage, incremental costs, and cold chain
- Please reference the Zambia study for a complete description of study limitations

APPENDIX

TOTAL SYSTEMS COSTS

Vaccine procurement price per vaccinated child for all measles and MR 5- and 10-dose vial products



COLD CHAIN REQUIREMENTS

Cold chain volume per dose administered for all measles and MR 5- and 10-dose vial products

