Cost-effectiveness analysis of routine catch-up and campaign strategies zero-dose measles vaccine in selected conflict affected district of Ethiopia: a modeling study

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Outline

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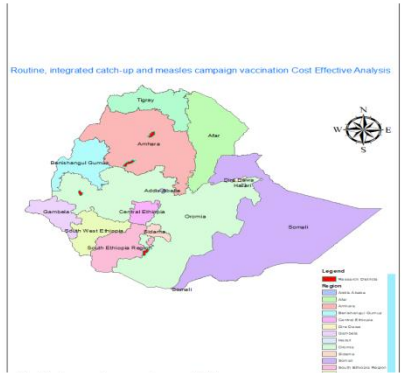
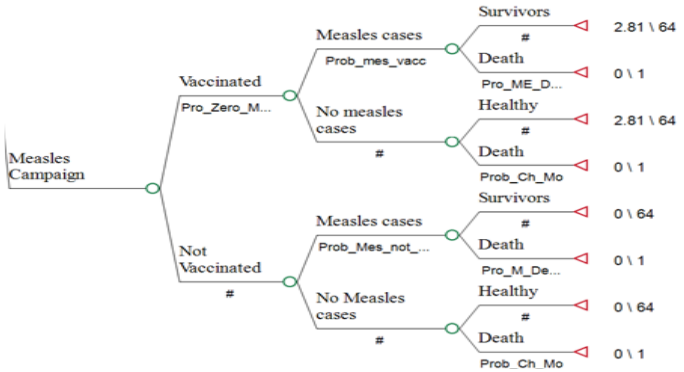
Background

- Addressing "zero doses" is **critical to Global Goals** such as "Leaving no child behind with immunization"
- Vaccination is a highly **cost-effective intervention** that reduces poverty, lowers treatment costs, prevents disability and death, and promotes long-term health and productivity
- **Measles remains a major vaccine-preventable cause of child illness and death**, particularly in low- and middle-income countries like Ethiopia.
- Many children in Ethiopia, especially in remote, conflict-affected, and underserved areas, are "zero-dose"
- There is a recognized **need for economic evidence** to support policy and investment decisions for reaching these children, especially in conflict-affected areas, which this study aims to address

Methods





Four districts most affected by conflict was selected

- A full economic evaluation were applied
- Costing analysis framework from the **provider perspective**

A decision tree model was developed from primary and secondary data source

Comparators : Routine catch-ups :as a routine component of immunization

Measles campaigns: National immunization campaign

Health outcomes measured

- Incremental Cost-Effectiveness Ratios were reported in cost per DALYs averted
- DALYs averted combine Years of Life Lost (YLL) due to premature mortality and Years Lived with Disability (YLD)
- PSA and One-way SS were done

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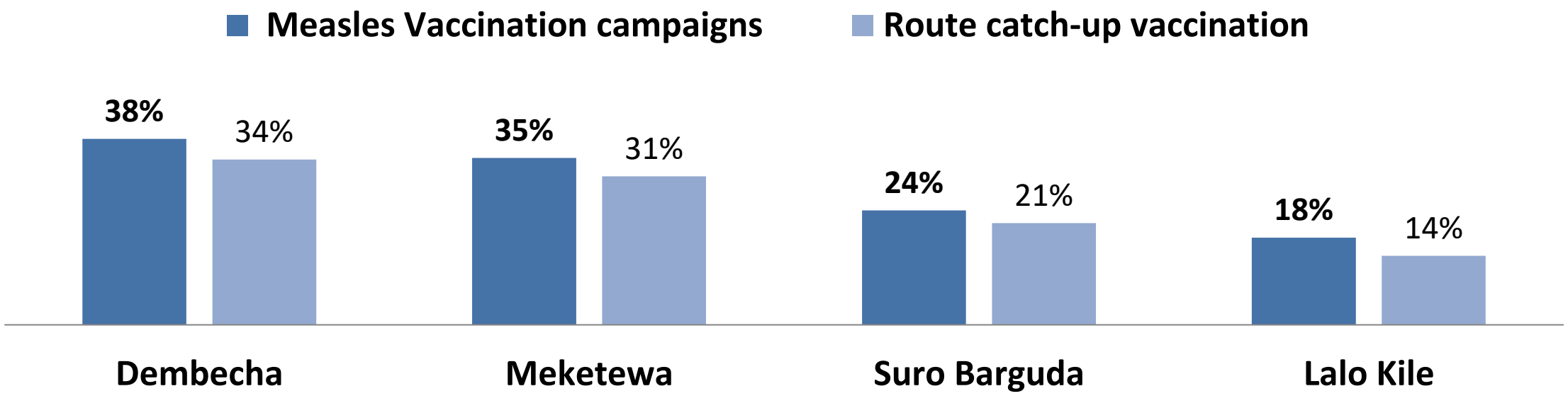
Coverage by strategy in conflict-affected Woredas for zero-dose measles vaccination



- Measles vaccination campaigns reached between 18% and 38% of the target population, which is slightly higher than the coverage achieved through routine catch-up immunization efforts which ranged from 14% to 34%.

Overview of Economic (including Financial) Costs by inputs for measles vaccination campaign in 2025 USD) at conflict-affected Woredas

Costs by inputs	Financial		Economic	
	Birr	1USD=135Birr	Birr	1USD=135Birr
Labor costs paid and Volunteer labor	2.7	0.02(2%)	98.07	0.73(42%)
Personnel costs	25.65	0.19(18%)	57.3	0.43(24%)
Distribution costs	5.4	0.04(4%)	47.25	0.35(20%)
Transport and fuel	10.8	0.08(7%)	10.13	0.08(4%)
Vaccine, Syringe and safety supplies	72.9	0.54(50%)	10.13	0.08(4%)
PPE & IPC and Social mobilization, communication	9.45	0.07(6%)	3.38	0.001(< 1%)
Workshops and meetings	5.4	0.04(3%)	3.38	0.03(1%)
Vehicle maintenance, incin- erator running costs	13.5	0.10(9%)	3.38	0.03(1%)
Cold chain repairs, energy costs	0.13	0.001(< 1%)	0.32	0.000(< 1%)
Capital costs (Cold chain equipment, other)	0.14	0.001(< 1%)	0	0.001(< 1%)
Total cost per vaccinated zero dose	145.8	**1.08**	**233.20**	**1.73**

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Overview of Economic (including Financial) Costs by inputs for measles routine catch-up vaccination (2025 USD) at conflict-affected Woredas

Costs inputs	Financial		Economic	
	Birr	1USD=135Birr	Birr	1USD=135Birr
Labor costs paid and Volunteer labor	3.24	0.02(3%)	97.37	0.73(40%)
Distribution costs	5.4	0.19(4%)	55.69	0.41(23%)
Personnel costs	2.97	0.022(3%)	57.34	0.43(24%)
Transport and fuel	9.45	0.07(8%)	9.45	0.07(4%)
Vaccine, Syringe and safety supplies	72.9	0.54(61%)	10.13	0.08(4%)
Workshops and meetings	5.4	0.04(4%)	3.38	0.03(1%)
Printing materials, stationery supplies	6.75	0.05(5%)	2.84	0.02(1%)
Vehicle maintenance, incin- erator running costs	13.5	0.10(11%)	3.38	0.03(1%)
Cold chain repairs, energy costs	0.27	0.002(< 1%)	0.32	0.002(< 1%)
Capital costs (Cold chain equipment, other)	0.27	0.002(< 1%)	0.27	0.00(< 1%)
Total Cost per Dose	**119.61**	**0.89**	**240.69**	**1.78**

Cost Breakdown (Financial and Economic) of Zero-Dose Measles Vaccination Strategies) at conflict-affected Woredas

Region	Zone	Distracts affected by conflict	Zero dose Measles vaccination campaigns			Route Catch-up zero dose measles		
			Number of vaccinated	Financial costs	Economic costs	Number of vaccinated	Financial costs	Economic costs
Amhara	West Gojjam	Dembecha	459	$495.67	$ 793.98	465	$ 413.85	$ 224.28
	South Gondor	Meketewa	126	$ 136.08	$ 224.28	126	$ 112.14	$ 827.70
Oromia	West Guji	Suro Barguda	139	$149.69	$ 258.97	123	$ 109.47	$ 218.94
	Kelem Walaga	Lalo Kile	85	$76.06	$ 135.39	76	$ 67.64	$ 135.28
Total			**809**	**$ 873.72**	**1,412.62**	**790**	**$ 703.10**	**$ 1,406.20**

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Incremental cost-effectiveness ratio per DALYs averted

Vaccination Strategy	Cost (USD)	Incremental Cost	Eff (DALYs)	Incremental Eff	ICER
Measles campaign	13.46		61		
Routine catch-up	33.45	19.99	64.09	3.1	6.45

- Routine catch-up strategy averted 64.09 DALYs at a cost of $33.45,offering an additional 3.10 DALYs averted
- The ICER of $6.45 per DALYs averted confirms the cost-effectiveness of the catch-up strategy. indicating that one DALY could be averted at a cost $6.45
- This suggests that the catch-up strategy is relatively cost-effective, falls below the Ethiopia GDP per capita.

Sensitivity analysis

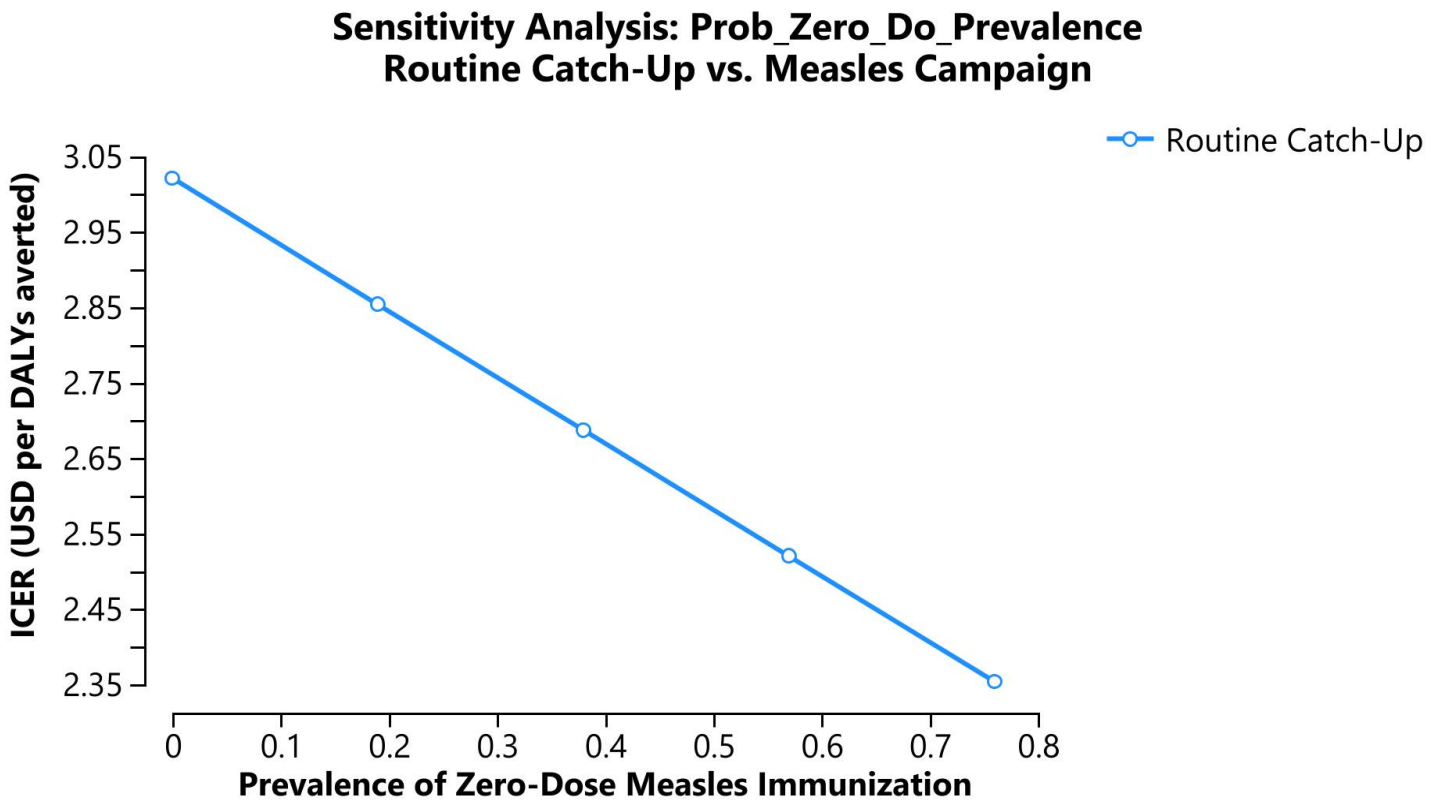

Figure 1 Prevalence of Measles zero dose

- An investment of just $3.05 for routine catch-up we averted approximately 77% of zero-dose measles prevalence.
  - Demonstrating that targeted, low-cost interventions can yield substantial impact (Figure 1)

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Sensitivity analysis

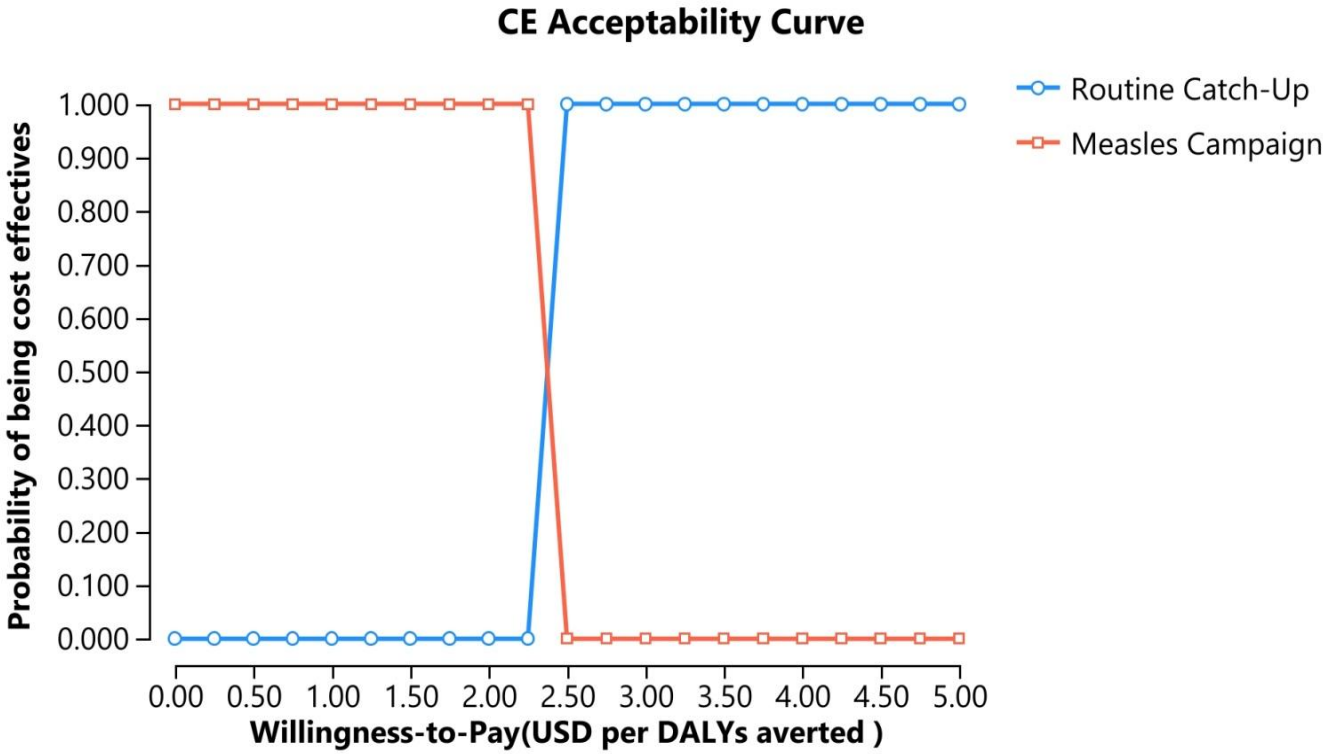

Figure 2 Cost-effectiveness acceptability curve for zero dose measles vaccination strategy

- At **$2.50 WTP**, there's a **50% chance** either strategy (routine catch-up and measles campaign.) is cost-effective indicating equal likelihood.
- **Above $2.50**, the measles campaign becomes **less cost-effective** compared to the **routine catch-up strategy**.
- The **catch-up strategy achieves** a **100% probability** of being cost-effective at a **$5 WTP**, making it the preferred option at more investment levels

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Conclusion

- Ethiopia continues to face a high burden of zero-dose measles, especially in conflict-affected areas
- Routine catch-up vaccination is a cost-effective strategy, delivering better health outcomes at a lower cost than mass campaigns
- The cost per DALYs averted was below Ethiopia's GDP per capita, indicating strong value for money
- Additional studies are needed to capture client-side direct and indirect costs such as transportation, time, and income loss across different settings to better inform program design and resource allocation.
- Future evaluations should include underserved populations such as internally displaced , refugees, and pastoralist communities to improve the equity and comprehensiveness of cost-effectiveness analyses.

Collaborators

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Thank you

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