Costs of establishing and maintaining delivery of hepatitis B birth dose vaccination in Ethiopia

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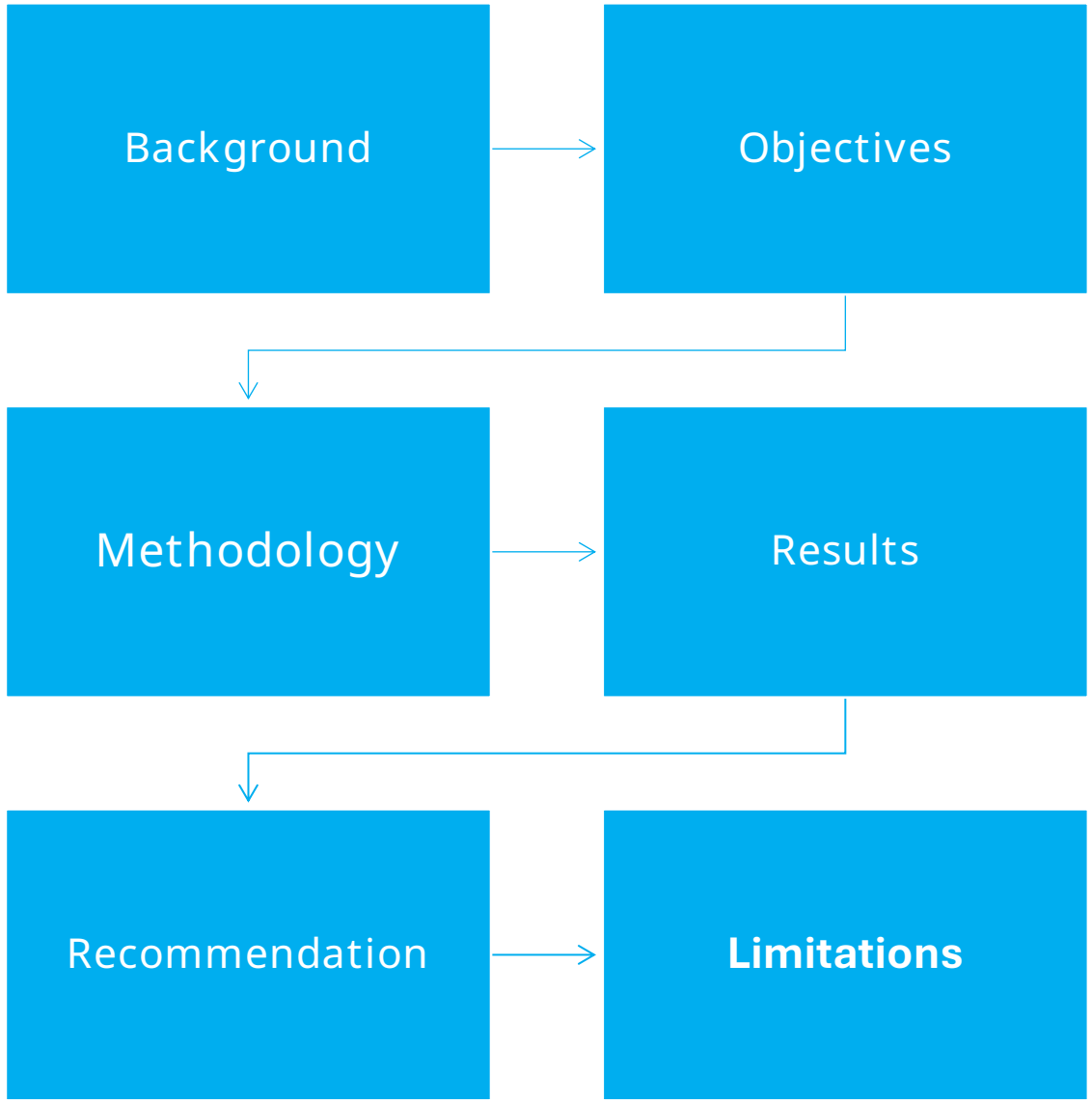
Outline



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Institutions:

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Background

- Hepatitis B virus (HBV) infection is a contributor to high burden of morbidity and mortality in Africa→ HBV virus can lead to cirrhosis and liver cancer
- WHO recommends
  - Introduction of hepatitis B birth dose (HepB BD) vaccination for prevention of mother-to-child HBV transmission
  - The first dose of hepatitis B vaccine should be given to newborns as soon as possible after birth, preferably within 24 hours
  - WHO AFRO RC 2016 adopted a resolution to reduce chronic HBV infection, and to introduce HepB BD in at least 25 countries by the end of 2020 →34 countries not introduced by 2022

- Ethiopia has a high HBV risk with prevalence of:
  - 9.4%→ general population (> 15 years) with significant variation across regions
  - 4.7% →Pregnant women
  - 4.4% → Children less than 5 years
  - Recent estimates from a community-based cross-sectional survey showed a prevalence of 1.48% for children less than 15 years
- Ethiopia's national hepatitis strategic action plan and the NITAG has recommended the introduction and scale up of HepB BD to be delivered within 24 hours of birth

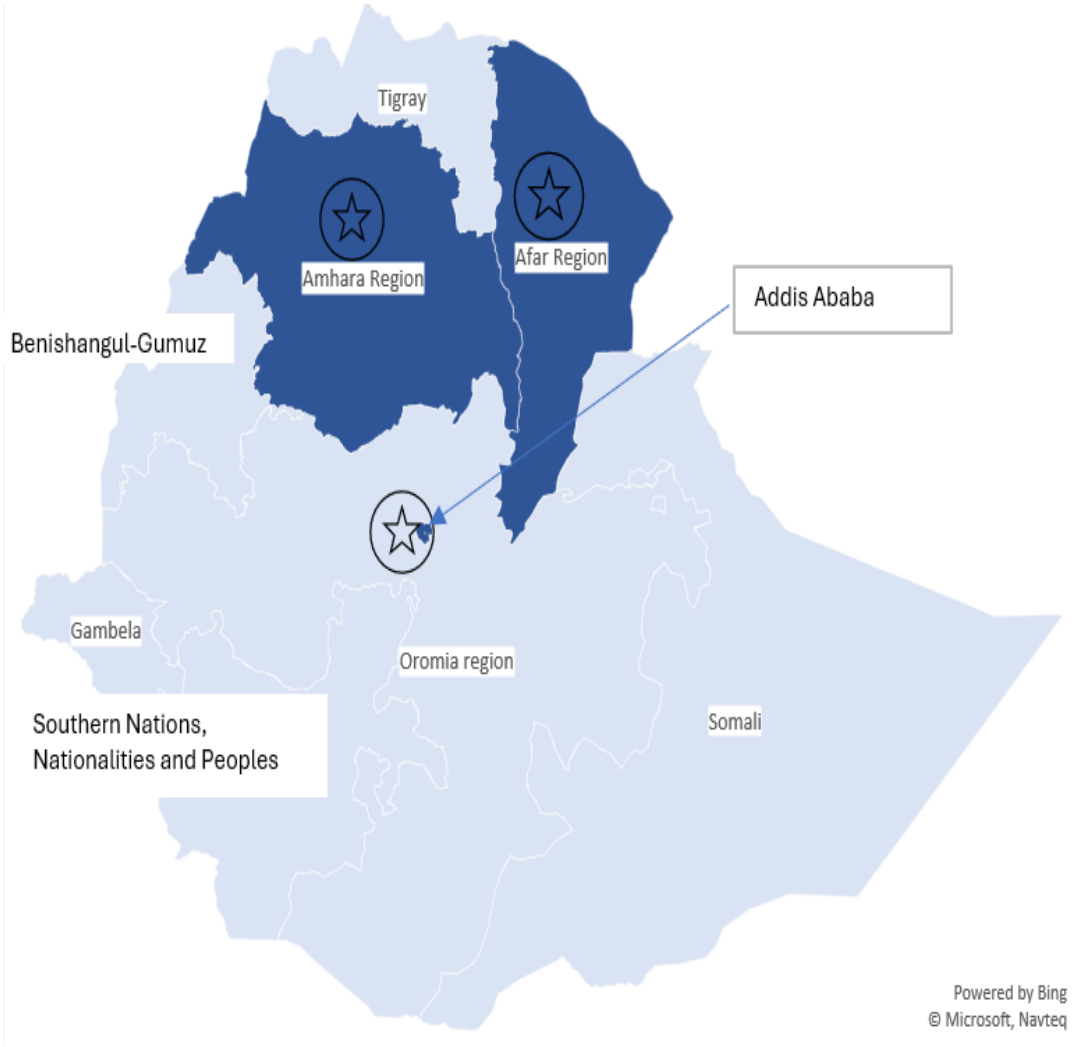
- Need for evidence on the cost of HepB BD vaccine delivery across proposed delivery platforms

Purpose & Objective

- Purpose
  - To estimate financial and economic costs of delivering HepB BD to infants born in health facilities and in homes alongside the HepB BD pilot project implemented in 3 regions in Ethiopia

- Specific objectives
  1. To identify, measure and value the start-up costs and recurrent costs of HepB BD delivery for both health facility and home births.

  2. To estimate the costs per HepB BD vaccine delivered according to birth setting (facility vs home) and across different geographic locations(urban, pastoralist, agrarian)



Region	Addis Ababa	Amhara	Afar
Woreda	Akaki Kaliti sub-city	Goncha Siso Enese	Chifra

Methodology

- **Incremental costing** → additional resource inputs based on new activities or increased use of resources within existing activities that would be required to for the ***delivery*** of HepB BD vaccine as part of the existing routine immunization program (costs of vaccines and supplies were excluded)
- **Costing Perspective** → "What would it cost **[GOVERNMENT]** to deliver HepB BD to infants born in health facilities and in homes?".
- **Ingredients-based approach** → Measure the price and quantity of each resource input used to deliver vaccines in the pilot project (e.g., personnel, supplies).
    - For resources share between HepB BD pilot and other programs; top-down costing approach used to allocate resources to HepB BD delivery based on resource use intensity
- **Cost types : Financial costs**→ direct flows/outlays used to implement the activities for planning and delivery of the HepB BD and **Economic costs –** financial costs + opportunity cost of existing or in-kind resources that could have been used for another activity (these do not have a direct effect on budget, but critical for overall sustainability)
- **Cost centres:** Federal/National, Region, Zone, Woreda, Health facilities

Program activities & resource inputs considered in the costing

Program activities	Description of activity	Resource inputs
Pre-introduction activities	One-off activities–prior to introduction. Include technical preparation and developing social mobilization materials and tools.	▪ Personnel time (planning and technical support, developing communication materials, reporting forms, launch) • Per diem, transport, supplies (printed communication materials and reporting forms), venue hire for workshops
Training	Training of trainers at national & regional levels. Initial training considered a capital cost	• Personnel time, per diem, transport, venue hire for workshops, supplies (printing and stationery)
Vaccine distribution	HepB vaccine was distributed using the routine vaccine delivery	• Personnel time, transport costs
Cold chain storage	Space requirements for HepB BD are opportunity costs and not new space/equipment	• Equipment (refrigeration, cold boxes, and vaccine carrier)
Vaccine administration/delivery	Staff time required to administer the vaccines for health facility and home delivery models.	• Personnel time
Supervision	Support provided by national and regional levels to delivery sites	• Personnel time, per diem, transport costs
Monitoring and evaluation	Post introduction evaluation and design of monitoring and reporting forms for HepB DB roll-out	• Personnel time, per diem, transport, venue hire , supplies (data collection forms)
Program management	Coordination and other administrative activities related to planning and implementation at national, regional, zonal, and woreda levels	• Personnel time, supplies (stationery)

Number & timeliness of vaccine doses administered

	Addis Ababa	Amhara	Afar	Total
Woreda	Akaki Kaliti sub-city	Goncha Siso Enese	Chifra	
Baseline data				
Annual live births (2007 census)	4,500	6,870	3,209	14,579
Number of months of pilot	16	17	12	
Number of births expected during pilot	6,000	9,741	3,204	18,945
Pilot project results				
Number of facility births identified	9,529	7,484	583	17,596
Number of home births identified	0	310	187	497
Total number of births identified	9,529	7,794	770	18,093
Number of doses administered in facilities	**7,013**	**7,477**	**583**	**15,073**
Number of doses administered in homes	**0**	**310**	**187**	**497**
Total number of doses administered	**7,013**	**7,787**	**770**	**15,570**
Number of vaccine doses administered in facilities within 24 hours of birth	6,959	7,454	583	14,996
Number of vaccine doses administered in homes within 24 hours of birth	0	82	156	238
Total number of doses administered within 24 hours of birth	6,959	7,536	739	15,234
Proportion of identified facility births vaccinated within 24 hours	99.2%	99.7%	100%	99.5%
Proportion of identified home births vaccinated within 24 hours	NA	27%	83%	48%

Base case, cost of facility based and home-based and cost structure of of HepB Birth dose delivery

	Financial (ETH)		Economic (ETH)	
	Health facility	Home based	Health facility	Home based
Total Cost (ETH)	3,155,778	302,453	5,674,354	2,768,659
Total Cost (US$)	69,043	6,617	124,145	60,573
Number of children vaccinated	15,079	497	15,079	497
Cost per child vaccinated (ETH)	**209**	**609**	**376**	**5571**
Cost per child vaccinated (US$)	**4.58**	**13.31**	**8.23**	**121.74**

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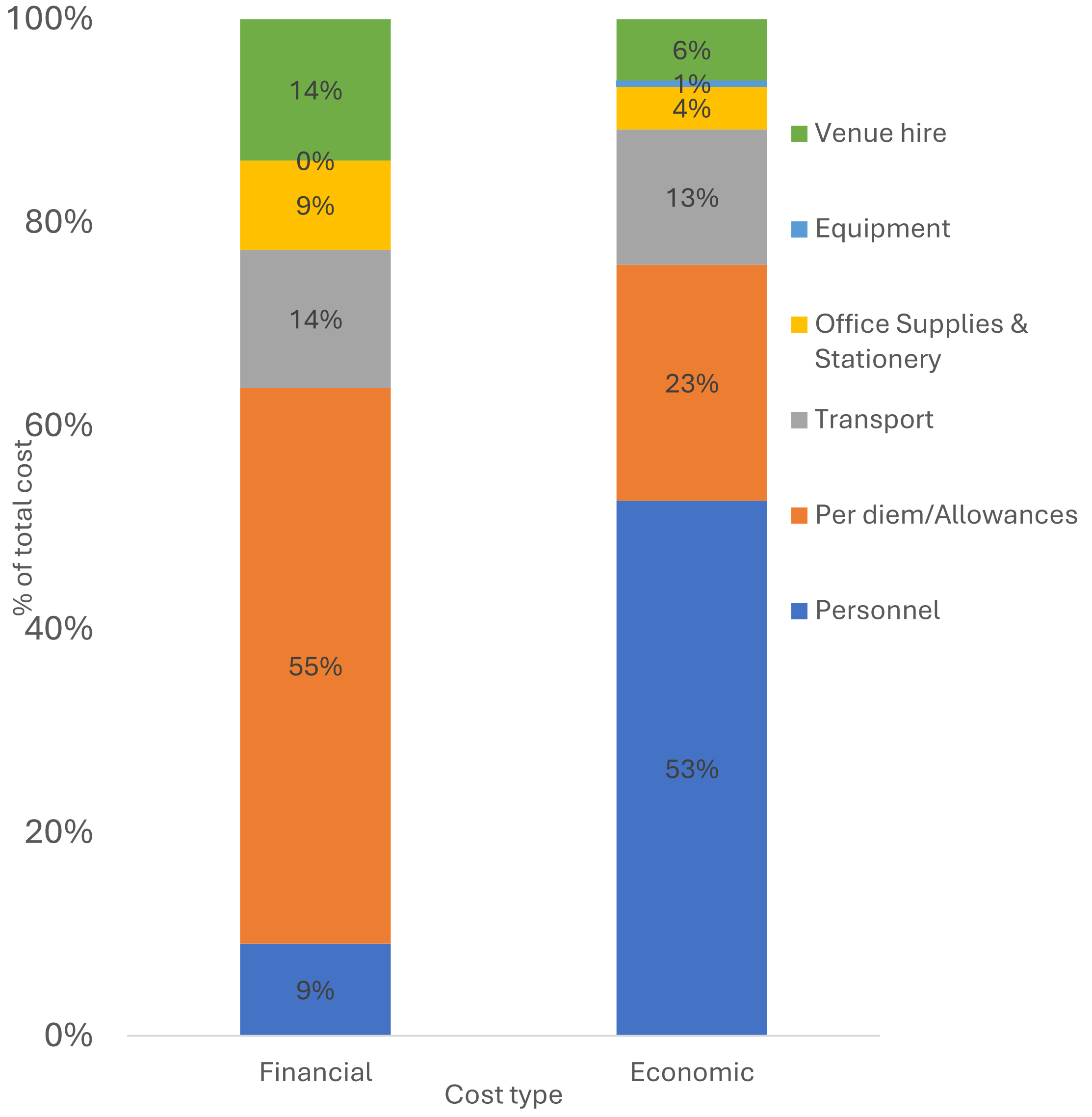


Unit cost per HepB Birth dose delivered, By Geographical Setting

Delivery Platform	Cost Type	Cost per dose for vaccine delivery			
		Average	Addis Ababa* (Urban)	Amhara (Agrarian)	Afar (Pastoralist)
Health facility (US$)	Financial	**4.58**	2.74	4.48	27.95
	Economic	**8.23**	6.12	6.9	50.7
Home delivery (US$)	Financial	**13.31**	-	4.48	27.95
	Economic	**121.74**	-	115.74	131.7

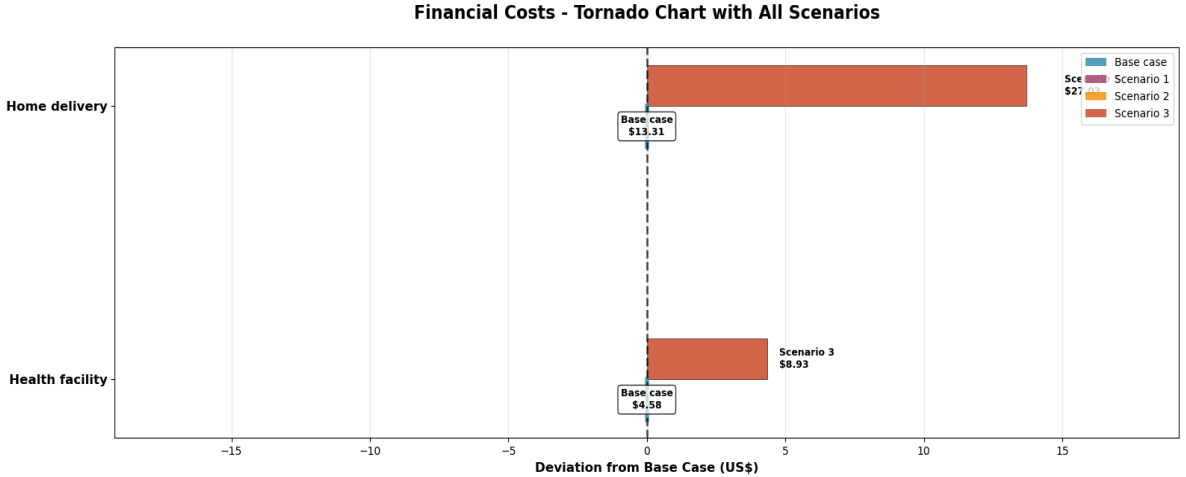
**No home doses were delivered in Addis Ababa*

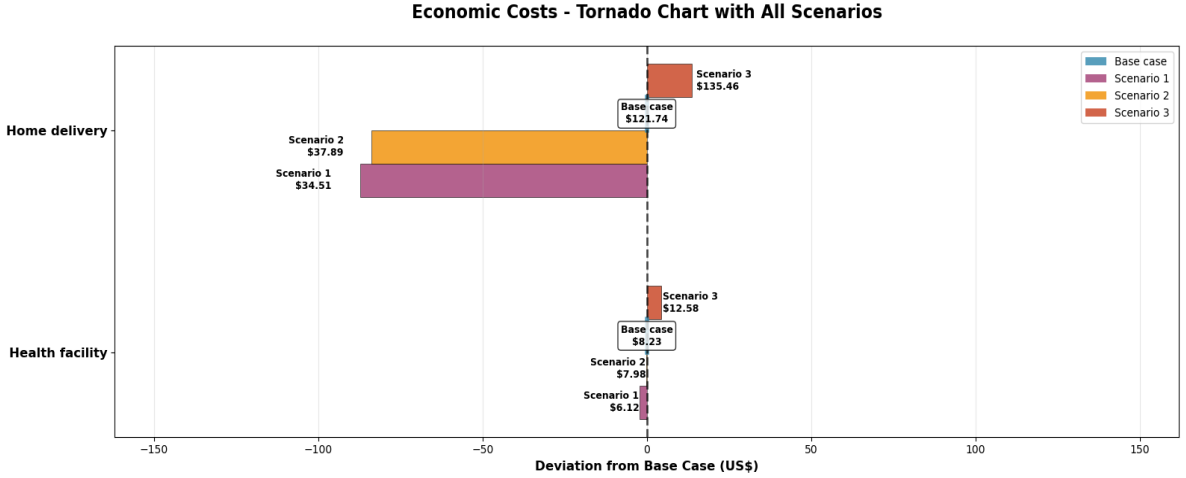
- Variation across settings
  - Health facility→ Addis Ababa< Amhara< Afar
  - Home delivery→ Amhara<Afar

- Variation in costs mostly influenced by number of doses administered (in addition to resource use intensity)

Univariate sensitivity analysis scenarios- Personnel cost

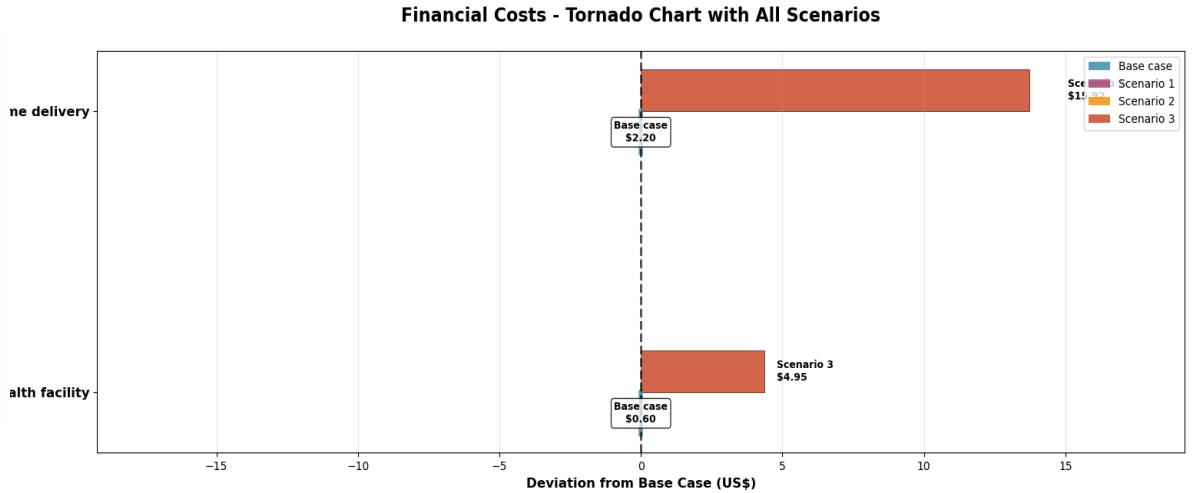
Total cost (start up + recurrent)

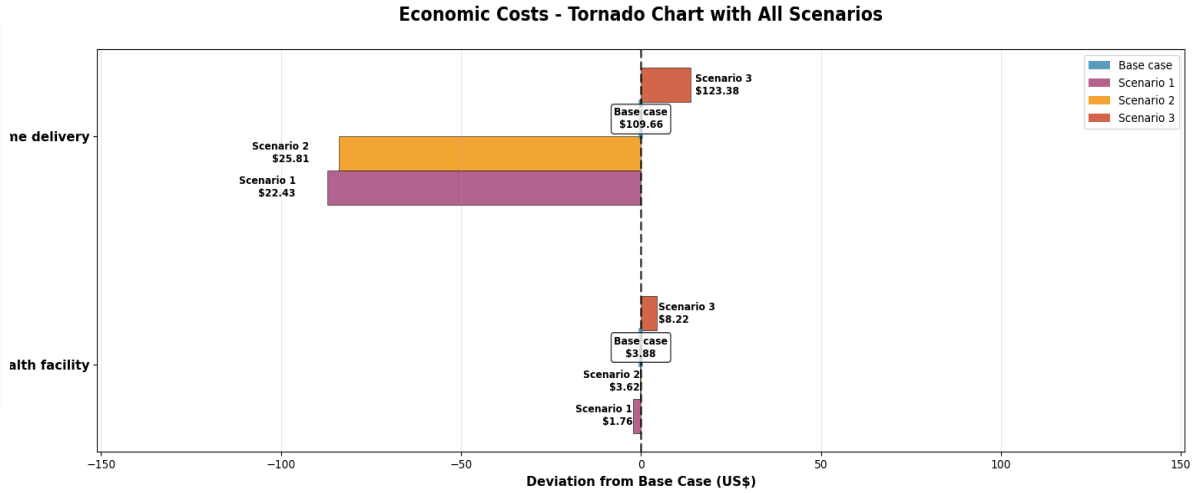




- **Base case:** Reported personnel time allocation, MOH salary for project/data manager
- **Scenario 1**: Limiting staff time to 5 minutes at health facility and 3 hours at for home delivery per vaccine delivered
- **Scenario 2:** Limiting staff time to 8 hour per vaccine delivered
- **Scenario 3**: Using consultant's salary instead of MOH equivalent for

Recurrent costs ONLY





- Costs sensitive to scenario changes in personnel cost estimation approach
- Opportunities for cost efficiency depending level of personnel costs (Scenario 3 indicates extreme variability –potential risk to sustainability)

Recommendations

1. Optimize resources use for the key resource inputs required for roll out of HepB BD → more efficient and effective approaches to identify and vaccinate home births
    - ✓ Strengthening systems for identifying and reaching women who don't deliver in health facilities including linkages with the community health platform + integration in routine maternal and child health (MCH) program
    - ✓ Promoting and facilitating facility deliveries and/or attendance by skilled birth attendants→ This will be best way to reduce costs/increase reach of HepB BD

2. Need for a disproportionately more resources for pastoralists regions
    - ✓ Variability in unit costs for delivery of the HepB BD across different settings has equity and programming implications hence need for tailored approach –pastoral regions
3. Approach to implementation of home-based delivery (where it is needed)
    - ✓ Allocate resources for health workers to travel for home visits within the design of the national roll out–link resources allocation with accountability in terms of personnel time
4. Regions should be supported to fully own the roll-out and implementation of HepB BD vaccination within their facilities
5. Personnel time/staff time allocation important for long term sustainability –-consider other methods for estimation (as per sensitivity analysis)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Thank you.
Financial support for the implementation of the pilot and study was provided by US CDC

Additional slides

Approach to cost estimation , allocation, and weighting

Resource inputs	Approach to cost estimation
Personnel	• Personnel time spent on all pilot activities as proportional of total work time • Valuation based on wages of staff involved
Per diem/ allowances	• Based on number of days for the activity • Valuation used standard government rates of per diem and allowances.
Transport	• Transport for activities obtained from interviews – number of trips and amounts used • Vaccine distribution costs based on expert opinion (7% of the costs)
Equipment	• Estimated based on the available cold chain equipment at the health centers
Stationery and printing	• Based on reported use at national and regional level for the pilot activities

Data sources for resource inputs costed

- Interviews at national and regional level
- Health facility survey

Allocation of costs across regions, and delivery settings

- **Costs incurred at national level** were allocated equal across all the regions involved in the pilot and then and then proportionally across delivery settings-based vaccination volumes consumed.
- **Regional level costs** were only considered for the regions in which they were incurred→ also distributed equally within the region
- The allocation to delivery settings (health facility versus home) was based on resource use intensity determined by number of vaccine volumes delivered within the region

Total cost of pilot

- Average cost per sampled delivery site multiplied by all similar facilities within the pilot location

Base case, costs of pilot delivery of HepB birth dose –by program activities

	US$	
Program activities	Financial	Economic
Start-up/Investment costs		
Pre-introduction activities	1,144	1,940
Training	30,998	32,687
Monitoring and evaluation (including PIE)	33,392	37,085
Sub-Total	**65,534**	**71,711**
Recurrent-annual		
Cold chain storage		1,086
Vaccine distribution	410	4,994
Vaccine delivery	-	91,199
Support supervision	7,354	11,997
Program management*	2,363	3,730
Sub-Total	**10,126**	**113,007**
Total	**75,660**	**184,718**

Base case, cost of pilot delivery of HepB BD –by resource inputs

	US$	
Resource Inputs	Financial	Economic
Start-up/Investment costs		
Personnel	4,500	6,935
Per diem/Allowances	34,737	36,274
Transport	9,135	9,746
Office Supplies & Stationery	6,646	7,637
Equipment	-	-
Venue (Meetings and Workshops)	10,515	11,119
Sub-total	**65,534**	**71,711**
Recurrent/Annual costs		
Personnel*	2,363	90,267
Per diem/Allowances	6,615	6,615
Transport	1,140	14,831
Office Supplies & Stationery	8	207
Equipment	-	1,086
Venue (Meetings and Workshops)	-	-
Sub-total	**10,126**	**113,007**
Total	**75,660**	**184,718**

Base case, financial costs-by administrative levels

Program activities	Central (n=1)	Regional (n=3)	Facility (n=14)	Total (ETB)
Start-up/Investment costs				
Pre-introduction activities	41,283	11,025	-	52,308
Training	994,596	422,227	-	1,416,823
Monitoring and evaluation	685,613	840,642	-	1,526,255
Sub-total	1,721,492	1,273,894	-	2,995,386
Recurrent/Annual costs				
Cold chain storage	-	-	-	-
Vaccine distribution	18,721	-	-	18,721
Vaccine delivery	-	-	-	-
Support supervision	-	336,126	-	336,126
Program management*	108,000	-	-	108,000
Sub-total	126,721	336,126	-	462,847
Total (ETH)	1,848,213	1,610,020	-	3,458,233
Total (US$)	40,436	35,224	-	75,660
% Composition	**53%**	**47%**	**0%**	

Base case, economic costs- by administrative levels

Program activities	Central (n=1)	Regional (n=3)	Facility (n=14)	Total (ETB)
Start-up/Investment costs				
Pre-introduction activities	66,477	22,180	-	88,657
Training	1,052,603	441,429	-	1,494,032
Monitoring and evaluation	765,186	929,869	-	1,695,054
Sub-total	1,884,266	1,393,478	-	3,277,743
Recurrent/Annual costs				
Cold chain storage	-	-	49,647	49,647
Vaccine distribution	181,205	47,077	-	228,282
Vaccine delivery		-	4,168,487	4,168,487
Support supervision	-	548,376	-	548,376
Program management*	108,000	62,478	-	170,478
Sub-total	289,205	657,931	4,218,134	5,165,270
Total (ETH)	2,173,471	2,051,408	4,218,134	8,443,013
Total (US$)	47,552	44,881	92,285	184,718
% Composition	**26%**	**24%**	**50%**	

*HepB BD pilot program manager's salary based on equivalent from a staff from the FMOH