Operational Guidance:

Estimating the Costs of Interventions to Reach Zero-Dose Children

Zero-Dose LEARNING HUB

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Gavi Zero-Dose Learning Hub

Funded by Gavi, the Vaccine Alliance, the Zero-Dose Learning Hub (ZDLH) serves as the global learning partner and is led by JSI Research & Training Institute, Inc. (JSI) with two consortium partners, The Geneva Learning Foundation (TGLF) and the International Institute of Health Management Research (IIHMR). Together, the consortium enables sharing and learning across four Country Learning Hubs (CLHs) in Bangladesh, Mali, Nigeria, and Uganda to advance the uptake of evidence by synthesizing and disseminating key learnings. The ZDLH also focuses on improving immunization equity and reducing the number of zero-dose (ZD) and under-immunized children globally by facilitating high-quality evidence generation and uptake.

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The manual aligns with the WHO-led *Consensus Statement on Vaccine Delivery Costing* and supports global efforts to standardize terminology and principles for immunization costing, with the aim of improving the comparability and usefulness of costing studies for decision-making in immunization programs.

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Cover Photo Credit

GaneshAID, Mali

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Acronyms

CLH	Country Learning Hub
DHS	Demographic and Health Surveys
DTP	diphtheria-tetanus-pertussis containing vaccine
eCHIS	Electronic Community Health Information System
EPI	Expanded Programme on Immunization
EPIVAC	Electronic Immunization Vaccination Coverage
HTH	house-to-house
IA2030	Immunization Agenda 2030
ICER	incremental cost-effectiveness ratio
IR	implementation research
LMIC	low- and middle-income countries
LQAS	Lot Quality Assurance Sampling
MEL	measurement, evaluation, and learning
MOH	Ministry of Health
RI	routine immunization
UI	under-immunized
ULY	useful life year
UNEPI	Uganda National Expanded Programme on Immunization
VHT	Village Health Team
WHO	World Health Organization
ZD	zero-dose
ZDLH	Zero-Dose Learning Hub

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Introduction

The Gavi-funded Zero-Dose Learning Hub (ZDLH) is a global project dedicated to generating evidence and learning on strategies for identifying and reaching zero-dose (ZD) and under-immunized (UI) children in low- and middle-income countries (LMICs). Country Learning Hubs (CLH) in four locations (Bangladesh, Mali, Nigeria, and Uganda) are tasked with carrying out implementation research (IR) to assess both the programmatic effectiveness and cost-effectiveness of tailored interventions targeting ZD and UI populations in each country.

Reaching ZD children is central to the World Health Organization (WHO) Immunization Agenda 2030 (IA2030) and Gavi's 5.0 strategy. A ZD child is defined as one who has never received a single dose of any recommended childhood vaccine through immunization services. For measurement purposes, Gavi and the IA2030 operationally define a ZD child as one who has not received the first dose of the diphtheria-tetanus-pertussis-containing vaccine (DTP1) in their first year of life. An UI child is one who has received the initial DTP1 dose but missed the third dose (DTP3), often referred to as a "DTP defaulter."

There is not enough data on the costs associated with identifying and reaching ZD and UI children in LMICs, yet this information is key to optimizing resources for immunization services in resource-constrained settings like the CLH countries. Estimating the costs of interventions to reach ZD children is important for planning and advocacy as well as for evaluating delivery strategies and interventions. Literature reviews (Munk 2019, Ozawa 2018, Yemeke 2021, Levin 2024) on costing of interventions that seek to reduce the number of ZD children or, more generally, increase child vaccination coverage have found relatively few studies. Even when cost estimates were provided, most studies did not report on their methods, highlighting a critical gap in ZD costing studies with well-described, transparent methods.

Box 1. What is implementation research?

Implementation research bridges the gap between what *should* work (based on evidence) and what *does* work in practice. It is "the scientific study of the use of strategies to adopt and integrate evidence-based health interventions into clinical and community settings in order to improve individual outcomes and benefit population health. It seeks to understand what, why, and how interventions work in 'real world' settings and to test approaches to improve them." *(Peters et al., 2013)*

The objective of this guide is to recommend costing methods for implementation research studies focused on reaching ZD children and to provide clear guidance on analyzing and reporting costs. It focuses specifically on **measuring the incremental and total costs (retrospectively and prospectively) of ZD interventions using ingredients costing**. This guide differs from existing resources such as *The Common Approach* (Brenzel 2013) and *How to Cost Immunization Programs* (Resch 2019) as it focuses specifically on costing interventions designed to increase immunization coverage through implementation research, whether through routine systems, campaigns, outreach, or mobile delivery. In contrast, other guidance documents primarily focus on estimating the costs of immunization programs more broadly. See Annex 1 for a comparative overview of available immunization costing guidance.

This guide also provides examples of the steps involved in data collection and analysis. It aligns with the methods described in the WHO-led Consensus Statement on Vaccine Delivery Costing: Process, Methods, and Findings (Levin 2022). The intended audience of this guidance is researchers and monitoring, evaluation, and learning (MEL) staff who are involved in IR focused on ZD and UI children in LMICs. The topics covered in this document include: study design and scope, definitions of costing concepts, data requirements and collection methods, data analysis, and intervention cost estimate use cases.

For the purpose of this guidance, ZD interventions are defined as targeted efforts to identify and reach children who have not received DTP1 as well as the communities where they reside. Recognizing that ZD children often experience multiple and intersecting barriers to immunization, these interventions are typically multifaceted, addressing not only gaps in immunization but also broader health care access challenges, including gender disparities, poverty, geographic barriers, and service experience among others. Beyond initiating immunization, ZD interventions often aim to strengthen linkages of caregivers and communities to primary health care services, ensuring children complete the full vaccination schedule while also addressing broader health needs beyond immunization.

ZD interventions seek to address supply- and demand-side barriers that hinder vaccination uptake.

- Supply-side barriers include geographic challenges such as distance, difficult terrain, and transient or nomadic population movement, as well as health care provider discrimination, lack of provider recommendations, inadequate vaccination infrastructure, conflict, home births, mobility limitations, or legal restrictions (Ozawa 2019). Supply-side interventions focus on improving the availability, accessibility and quality of vaccination services, such as increasing the number and locations of vaccination sessions or improving supervision of providers.
- Demand-side barriers stem from factors such as distrust, religious beliefs, lack of awareness, poverty, time constraints, and gender-based discrimination (Ozawa 2019). Demand-side interventions aim to enhance community engagement and communication, empowering caregivers with knowledge about the benefits of vaccination and how to access services (WHO 2017). Table 1 provides examples of supply- and demand-side ZD interventions.

Table 1. Examples of Interventions that Address Supply and Demand Constraints

Types of Interventions	Example	Authors
Supply-Side	Intervention identified missed children and established temporary outreach sites to vaccinate them in India.	Chatterjee 2021, Health Policy and Planning https://academic.oup.com/heapol/article/36/8/1316/6265953
Demand-Side	Intervention facilitated informed discussions with community groups on vaccination costs and benefits.	Andersson 2009, BMC International Health and Human Rights https://bmcinthealthhumrights.biomedcentral.com/counter/pdf/10.1186/1472-698X-9-S1-S8.pdf
Supply- and Demand-Side	Intervention to improve immunization coverage in India by enhancing supply of infrastructure and providing incentives to villagers.	Banerjee 2010, BMJ https://www.bmj.com/content/340/bmj.c2220

Source: Chatterjee 2021, Andersson 2009, Banerjee 2010.

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Costing Methods: Scope and Study Design

When designing the costing study, the study team should present the objectives of the cost analysis and then describe the scope, study design, and assumptions they plan to use in their cost estimation. The section below discusses the basic scope parameters. The following section (and Table 2) provide recommendations and definitions of key parameters of a costing study design.

Scope

In a costing study aimed at measuring the incremental cost of interventions to reach ZD children, the scope typically includes a detailed examination of the resources required to implement targeted strategies that reach populations not previously served by routine immunization (RI) systems. These studies usually include the following:

Photo Credit: GaneshAID, Mali

1. Geographic and Population Scope

- Target areas: Often underserved, hard-to-reach, or conflict-affected regions
- Population focus: ZD and UI children
- Disaggregation: By age, location, gender, socioeconomic status, or other relevant equity dimensions

2. Intervention Scope

- Specific interventions: Outreach services, mobile clinics, community health worker deployment, demand-generation campaigns, cold chain expansion, social mobilization, etc.
- Delivery platforms: Routine health systems vs. supplementary activities (e.g., campaigns or integrated service packages)
- Incremental components: Focus on **what is *added*** to existing services, **not** total program costs

3. Timeframe

- Short-term (e.g., annual costing) or multi-year studies, depending on the program phase
- Account for both initial setup costs (e.g., training, infrastructure) and recurrent costs (e.g., salaries, fuel, per diem)

4. Outputs

- Cost per ZD child reached/vaccinated
- Cost per dose delivered
- Total incremental cost of reaching target coverage goals
- Possibly cost-effectiveness estimates, if linked to measurable health outcomes

Photo Credit: International Center for Diarrhoeal Disease Research, Bangladesh

An incremental costing study provides essential evidence for planning, budgeting, resource mobilization, and policy advocacy, especially in Gavi-supported or low-resource contexts where efficiency and equity are major concerns.

Study Design

The study team should clearly describe the objectives of the cost analysis, whether to inform budgeting, prioritize interventions, or support decision-making in resource allocation. They also need to specify whether the estimated costs will be used in cost-effectiveness or cost-benefit analyses. Cost-effectiveness analysis compares the cost per immunization outcome achieved through an intervention compared to an alternative intervention or no intervention. Cost-benefit analysis compares the financial costs of an intervention against its monetary/economic benefits such as treatment costs savings, caregiver time saved, and the societal value of lives saved.

Beyond defining the study's objectives, the study team should specify whether the package of ZD interventions addresses supply-side constraints, demand-side constraints, or both. They also need to define the study audience, target populations, and time horizon (as detailed in Table 2). Additionally, the team should indicate whether the study will employ a pre-post design or a comparison evaluation (see Table 2 for definitions).

The study team will need to estimate the following output measures in their analysis (Brenzel 2024):

- **Total cost of each activity or component:** The sum of all resources used for a specific activity.
- **Total cost of the intervention:** The sum of all resources used for the whole intervention.
- **Incremental cost of the ZD intervention per additional DTP1 child reached:**[1] The additional intervention cost divided by the number of additional children vaccinated with DTP1. This measure estimates the cost that is incremental to the existing immunization services and is an indication of cost-effectiveness.
- **Incremental cost per capita:** The additional intervention cost divided by the national population.

Table 2 outlines the key assumptions and methods that should be described in the costing methodology write-up.

[1] Please note: it is unlikely that countries/programs can measure the *incremental cost per additional ZD child reached* because often there are no reliable ways to measure the numbers of ZD children (which means no reliable denominator). Therefore, we use the number of children vaccinated with DTP1 as the proxy for ZD children reached.

Table 2. Summary of Costing Methods for Study Design, Data Collection, and Types of Cost

	Definition/Recommendations	Notes
Study Design		
Study Type	Define the type of study you are going to implement (e.g., costing study, efficiency analysis, economic evaluation, or other).	The study type and objective should be aligned.
Study Objective	Specify the objective of the cost analysis; for example: informing budgeting or prioritizing projects.	All analyses should include an estimation of cost per additional DTP1 dose.
Type of ZD Intervention	Indicate whether the intervention addresses supply-side constraints, demand-side constraints, or both. Also, specify if the intervention is multifaceted with multiple objectives.	
Audience	Identify the intended audience of the analysis (e.g., immunization researchers, health economists, or immunization program managers).	
	Detail how the target audience was engaged during the study conceptualization and how the study's outputs are relevant for policymaking.	
Target Population	Define the target population of the intervention.	Usually includes children under the age of two and is often at the subnational level. However, this may vary depending on the context and intervention.
Time Horizon	Specify the start and end dates of the intervention as well as the duration over which health outcomes and costs are calculated.	
Timing of Data Collection	Indicate the dates of data collection.	
Output Measures	Define the intervention outputs to be measured, such as the **cost per additional DTP1 dose** and **total cost of the intervention**.	These output measures also can be customized to align with a specific intervention being targeted.

	Definition/Recommendations	Notes
Study Design (Continued)		
Perspective	Specify the point of view considered for costs in a costing study (i.e., who incurred the costs). The perspective defines whose costs are being considered in the costing study. • **Payer perspective** includes costs incurred by the disbursing agents. • **Provider/health system perspective** includes costs incurred by health service providers. • **Societal perspective** includes all costs incurred by both providers and clients.	Costing studies are most often from the provider or health system perspective (e.g., Ministry of Health, implementing partners). Studies that consider the societal perspective include community or household costs (e.g., transportation, opportunity cost of time needed to seek vaccination services).
Types of Cost		
Ingredients Costing	Specify the quantity of each resource used in each activity or intervention and multiply the quantity by the price of the input. Ingredients costing is a granular accounting because it includes each resource used.	
Start-up, Recurrent, and Capital Costs	**Start-up** costs are one-time programmatic activities and are treated as capital costs. **Recurrent** costs are the value of resources that last less than one year. **Capital** costs are the value of resources lasting more than one year such as equipment.	
Financial and Economic Costs	**Financial** costs are monetary outlays, with straight-line depreciation for capital goods. **Economic** costs reflect the value of all resources used, regardless of the financing source, including opportunity costs (e.g., existing resources and donated items).	Financial and economic costs are calculated differently. Financial costs only include the costs of resources that are purchased monetarily and reflect the costs incurred by the payer/provider. They do not include salaries of existing personnel or donated items.
Incremental and Full Costs	**Incremental** costs reflect the additional resources required to add a new service/ intervention. **Full** costs include both baseline costs and additional/incremental costs of the new intervention.	

	Definition/Recommendations	Notes
Types of Cost (Continued)		
Cost Components	Identify key additional costs and their definitions, including personnel, vaccines and injection supplies (if part of intervention), transport, social mobilization and sensitization, supervision. If cost categories/components are excluded, a justification needs to be provided.	Salaries of already existing personnel are in economic costs but not financial costs when conducting incremental costing. This is because existing personnel are always receiving salaries. The opportunity cost of their time is included in economic costing.
Data Collection		
Measurement Approach for Costing	Specify the type of costing approaches used in the study (e.g., bottom up/ ingredients approach).	
Sampling	Define the sampling method (e.g., random sampling) in line with the study perspective (payer, provider, or societal perspective) and determine whether the sampling approach is statistically representative. For ZD costing studies, if the study seeks to measure payer or provider costs, the most common sampling unit is the health facility for both intervention and control areas. Other types of sampling units include community districts and provinces/regions. If the study seeks to measure the caregiver's costs of seeking vaccination, then the sampling approach usually involves a household survey and the sampling unit is the household or caregiver. Details of how respondents were selected/ sampled should be described.	If the purposive sampling is used, justify why this approach was taken.
Incremental Prospective or Retrospective, Pre-post, and Pre-post with a Control (Counterfactual)	**Incremental prospective or retrospective costing** involves collecting cost data during or after the intervention but not before it begins. Two types of quasi-experimental designs are commonly used, neither of which use random assignment of participants: **Pre-post studies** involve collecting cost data in the intervention district/areas before (baseline) and after (endline) the intervention has been implemented.	A pre-post design with or without a control group can be used for the costing.

	Definition/Recommendations	Notes
Data Collection (Continued)		
	Pre-post studies with a control group involve collecting baseline and endline cost data in both intervention district/areas and in comparison areas with similar characteristics.	
Prospective vs. Retrospective Data Collection	Indicate whether cost data were collected through direct observation during implementation of ZD intervention (prospective) or obtained retrospectively after implementation.	
Data Sources	Describe the data sources used to estimate costs. Data sources could include: i) Desk/ record review (immunization records, expenditure reports, etc.), ii) interviews, and iii) observation. Methods: structured questionnaires, topic guides, etc.	
Sequenced vs. Simultaneously Implemented Interventions	Indicate whether the intervention is sequenced* (implemented in phases) or conducted simultaneously.	
Costing Assumptions	Costing assumptions: All scenarios and assumptions used for cost projections should be clearly detailed and transparent to ensure that they are understood by the reader and can be replicated in other settings if needed.	
Valuation and Pricing		
Currency	The currency in which the cost data will be collected should be mentioned, including the costing year. Any currency conversions (e.g., to US dollars) should be reported.	
Inflation Rate Used	Inflation rates used, especially for retrospective studies, should be reported.	

Source: Levin et al. (2022).

*Sequenced: a series of consecutive interventions.

Photo Credit: Infectious Disease Research Collaborative, Uganda

ZD Intervention Costing Use Cases

The uses cases for the costs identified by the ZD costing study include cost analysis, cost-effectiveness analysis, and cost-benefit analysis.

Cost analysis focuses on estimating the cost of the ZD intervention as well as the incremental cost of the ZD intervention per incremental ZD child reached. It also provides information on the most influential cost inputs in the intervention and can be used to identify ways to decrease costs of the intervention. Information on total costs can be used to assess the affordability of the intervention and for advocacy for continued funding and planning for scale-up. It can also be used to compare the cost of reaching an additional ZD child through different ZD interventions. This data can also be input into other types of economic evaluation: cost-effectiveness analysis, cost benefit analysis, and cost savings analysis.

Cost-effectiveness analysis estimates the costs and health outcomes of ZD interventions. It involves comparing one intervention to another or to the status quo by estimating the additional cost of a unit of a health outcome, such as a death averted, a disability-adjusted life year averted, or life year gained. The measure used for cost-effectiveness analysis is the incremental cost-effectiveness ratio (ICER). Using the ICER results, the study team can make recommendations on the most cost-effective intervention to policymakers and program managers.

A cost-effectiveness analysis calculates the net cost of a ZD intervention. The costs averted include medical costs from diseases averted from DTP1 vaccination (diphtheria, pertussis, and tetanus) and/or productivity losses.[2] The costs averted are subtracted from the costs of implementation to get net costs.

$$\text{ICER} = \frac{\text{Net Additional Cost of Intervention (Total Cost – Treatment Cost Averted)\#}}{\text{\# Health Outcomes Averted}^{3}}$$

In most cases, we are comparing the ZD intervention to no intervention. The alternative ICER formula shown in the footnote below is useful if comparing the ZD intervention to another existing intervention, such as the RI program.

Cost-benefit analysis compares the costs and benefits of an intervention by estimating monetary units of benefits. Cost-benefit analysis is calculated by subtracting costs from benefits. The benefits of vaccination include medical costs averted, productivity gains, and monetized value of health improvements. The results from this analysis can be used to compare the cost-benefit of ZD interventions.

[2] Productivity losses often include the value of caretaker time spent seeking health care instead of working.

[3] If the cost-effectiveness of the ZD intervention is being compared to another (existing) intervention, use the following formula: ICER=Cn-Co/En-Eo [Cn=cost of the new intervention, Co=cost of the older intervention, En=# health outcomes averted through new intervention, Eo=# health outcomes averted through older intervention]. Note: the "health outcomes averted through the intervention" is the measure of intervention effectiveness used for the study.

Costing Methods

Ingredients Costing (Micro Costing)

For implementation research focused on ZD interventions, *ingredients costing* is recommended over other methods such as top-down costing.[4] The former method produces more rigorous results because it specifies the quantities and prices for each resource used in the intervention activities. Additionally, specifying the perspective of the ZD intervention is necessary as it determines which intervention resources are included in the analysis.

To conduct ingredients costing, the analyst needs to multiply the quantities of intervention resources by their prices to get the total cost per resource. For example, for vaccines, the price per dose is multiplied by the number of doses per child and then by the size of the target population that was vaccinated.[5] The study team should list all of the activities needed for the ZD interventions, such as conducting one or more training sessions. They then list all the inputs or resources required for these activities. The quantities and prices for each input should then be collected. Please note, because the purpose of this guidance is to measure incremental retrospective costs using ingredients costing, it only focuses on the additional costs related to the ZD intervention, not on all existing RI program costs. In addition, this guidance does not include information on the measurement of externalities (e.g., quantifying the positive and potentially negative impacts of vaccination using methods such as cost-benefit analysis, epidemiological modeling, or fiscal analysis).

In summary, the ingredients-based methodology involves three key stages:

1. **Identifying** all activities and resource inputs, or "ingredients," involved in the implementation of the intervention during the period under consideration.
2. **Quantification/measurement** of ingredients that were identified or used in the intervention implementation for the period under consideration.
3. **Valuation** of ingredients or resource requirements based on the appropriate monetary costs through, for example, using purchase price (including subsidy scenarios), market prices, or shadow pricing, especially for volunteer resources. Donated resources should be valued based on procurement prices, and, where these prices do not exist, an equivalent shadow pricing should be adopted.

Please note that this guidance focuses on the use of bottom-up ingredients costing rather than top-down costing methods since it is a more rigorous method and recommended in the article *'Research principles for studies that estimate the cost of reaching zero-dose children.'* Top-down costing is not recommended for implementation research since it requires making broad assumptions about resource use and has less rigor. In some cases, where data or budgetary resources are limited, top-down costing may be necessary. Additionally, sometimes bottom up and top-down approaches can be used in combination especially in low-income settings where documentation is inadequate.

Table 3 on next page provides some illustrative examples of intervention activities and inputs. It is difficult to suggest a standardized list of components due to the variation in types of ZD interventions. Therefore, the table displays the list of inputs, or ingredients, that are generally included in costing tools for immunization.

[4] Top-down costing involves allocating total costs to cost components rather than estimating their costs individually.

[5] If estimating the number of vaccine doses and injection equipment that were used, a wastage factor should be incorporated.

Table 3. Illustrative Intervention Activities and Inputs

Cost Components	Illustrative Activities	Illustrative Inputs (Ingredients)
Training	• Curriculum development • Training of trainers • Training sessions	• Personnel time/per diem • Stationery and materials • Refreshments • Venue rental • Transport allowance
Planning Meeting	• Implementation planning meetings	• Personnel time/per diem • Stationery and materials • Refreshments
Communications	• Communications strategy development • Implementation of social mobilization activities • Meetings to inform stakeholders about intervention	• Personnel time/per diem • Stationery and materials • Venue rental • Transport allowance • Production and printing of leaflets/posters
Service Delivery	• Implementation of program activities	• Personnel time/per diem • Materials • Transport • Mobile airtime
Monitoring and Supervision	• Development of monitoring materials • Supervision of program activities	• Personnel time/per diem • Materials • Transport • Mobile airtime

Several basic costing tools and approaches can be used to estimate the ingredient costs of interventions to reach ZD children. These tools help break down the intervention into individual cost components (i.e., the ingredients) and quantify them to estimate total costs.

Please note that personnel are essential to the implementation and success of any RI and/or ZD program. They operate at all levels of the health system (national, state, district, ward, community, and facility) and are responsible for executing RI program activities at their respective levels. Therefore, personnel costs need to be systematically collected across all levels. It is also important to include volunteer health workers in cost assessments, even if they are unpaid, as their contributions have opportunity costs and affect program sustainability. Volunteer costs can be estimated using a replacement cost approach, which measures volunteer cost based on how much it would cost to pay a worker to perform the same type of job in that locality, or the opportunity cost approach, which measures volunteer cost based on the average wage rate of a laborer in the locality of the volunteer.

An Excel-based ingredient costing template is the simplest and most widely used tool. These templates can be customized to specific ZD targeting strategies to:

- List inputs (staff time, supplies, transportation, etc.)
- Assign unit costs
- Estimate quantities used
- Multiply unit cost by quantity for each item
- Sum to get total cost

See Annexes 2–4 for example data collection forms and sample Excel templates for ingredients costing of ZD activities.

Photo Credit: GaneshAID, Mali

Costing assumptions: All scenarios and assumptions used for cost projections should be clearly detailed and transparent to ensure that they are understood by the reader and costing can be replicated in other settings if needed.

Photo Credit: African Field Epidemiology Network, Nigeria

Worked Example: Estimating the Costs of ZD Intervention Activities Using Ingredients Costing

There are several steps involved in costing ZD intervention activities. This example walks through the types of data and basic forms needed to estimate the costs of a five-day training workshop. These steps should be followed separately for all activities included in the ZD intervention. Box 2 below summarizes the process for estimating the costs of an illustrative training activity.

Photo Credit: International Center for Diarrhoeal Disease Research, Bangladesh

Box 2. Steps for Estimating the Cost of Training Health Workers to Facilitate a Structured Group Discussion

- **Identify required resources:** List resources (ingredients) required for training: transport, venue rental, facilitator fees, per diems and travel allowances for participants, stationery, and refreshments.
- **Create a cost-tracking spreadsheet:** Design a spreadsheet to record information on prices and quantities of intervention resources (see Table 6 for an example).
- **Collect data:** Gather information on unit prices and quantities of resources used in each training and number of trainings required for the intervention. If it is necessary to estimate economic costs, the team should also collect information on the number of trainees, their job title, and average salaries.
- **Input data into the spreadsheet:** Enter the data systematically to ensure accuracy and completeness.
- **Calculate total costs:** Estimate the grand total cost of conducting the training.

Step 1: Identify all of the resources used for each activity so that all of their costs can be estimated. In other words, the costing team should list every resource/input used for each activity: personnel time, supplies, and materials. Table 4 shows an example of a list of resources used in a generic ZD intervention activity.

Table 4. Illustrative List of Typical Inputs/Resources Needed for a ZD Intervention Activity

Illustrative Resources Used for the Activity	Detail of Costs	Notes
Personnel Time	Salary per unit, time spent on activity (minutes, hours, or days)	To estimate personnel time, questions can be integrated into interviews to capture the time spent on specific intervention activities. These inputs will be used later to estimate the value of time for these resources and inputs during the analysis phase.
Allowances (Travel or per Diem)	Cost per day	If travel allowance, specify whether one-way or round-trip.
Supplies and Materials	Cost per unit, quantity used	

Illustrative Resources Used for the Activity	Detail of Costs	Notes
Venue Rental	Cost per day	
Transport (Fuel and Maintenance)	Cost per unit, quantity used	
Vehicle Purchase (Capital Goods)	Replacement cost, number purchased	Include vehicle purchases only if they were specifically made to support the implementation of the ZD intervention.
For all inputs/resources, specify if it was a financial or economic cost.		

Step 2: Create a cost-tracking spreadsheet (Table 5). In this spreadsheet, the costing team should enter the inputs for each activity (examples in Table 4 above), the cost per unit, and the quantities that will be used so that each cost can be calculated separately for each input.

Table 5. Illustrative Cost-tracking Spreadsheet

Activity Name	Inputs for Each Activity	Cost per Unit (e.g., Salary, Fuel, Per Diem)	Quantities Used per Time Period (Hour, Day, Month, or Year)	Frequency of Activity	Notes
5-Day Training	• Personnel Time • Allowances • Supplies and Materials • Venue Rental • Transport • Capital Goods				
Planning Meeting	• Personnel Time • Allowances • Supplies and Materials				
Next Activity	Continue to List Inputs for All Activities.				

Step 3: Collect data on prices and quantities of the inputs/resources for all intervention activities listed in the cost-tracking spreadsheet. For example, the costing team could collect information on salaries and per diem as well as the amount of time that personnel spend on each activity. This information should be entered into the data collection forms designed for the study. Box 3 below shows a set of example data collection forms for a training activity. The costing team would need to develop similar forms for each type of intervention activity.

Box 3. Examples of Data Collection Forms for Ingredients Costing of a 5-day Training Activity

A. Personnel Time

	# Personnel	# Days	Travel Allowance	Per Diem	Average Salary*	Total Financial Cost	Total Economic Cost
Facilitators	2	5	$20	$25	$100		
Support Personnel	2	5	$20	$25	$40		
Participants	20	5	$20	$25	$50		
Resource Persons	2	5	$20	$25	$60		
Total							

*Data on salaries are gathered for calculation of economic costs since there is an opportunity cost of time spent on the training.

Source of Data:

B. Meals/Allowances During Training

Type	# Participants	Unit Cost	# Days	Total
Meals	26	$10	5	$1,300
Refreshments	26	$3	5	$390

Source of Data:

C. Supplies and Materials

Type	# Participants	Unit Cost	Frequency	Total
Stationery	26	$10	1	$260

Source of Data:

D. Venue Rental

Item	# Days	Unit Cost	Total
Conference Room for 20 People	5	$100	$500
Total			

Source of Data:

E. Vehicle Rental

Item	# Days	Unit Cost	Total
4x4 Vehicle	N/A		
Total			

Source of Data:

F. Equipment/Capital Goods

Type	# Units	Unit Cost	Total
Printer	1	$100	$100

Source of Data:

Step 4: Input the data (from the forms in Box 3) into the cost-tracking spreadsheet below (Table 6). The example below shows illustrative costs for each of the inputs listed in the spreadsheet.

Table 6. Illustrative Cost-tracking Spreadsheet

Activity Name	Inputs for Each Activity	Cost per Unit (e.g., Salary, Fuel, Per Diem)	Quantities Used per Time Period (Hour, Day, Month, or Year)	Frequency of Activity	Notes
5-Day Training	• Personnel Time • Meals/Allowance • Supplies and Materials • Venue Rental • Transport • Capital Goods	$50/day $20/day $10 $100/day $20/day $150	3 3 1 3 3 1	2	
Planning Meeting	• Personnel Time • Meals/Allowances • Supplies and Materials	50/day $20/day $60	2 2 1	3	
Next Activity	Continue to List Inputs for All Activities.				

Step 5: Calculate the total costs by adding together the individual costs of each activity in the intervention. Table 7 is an illustrative table showing the calculation of the financial and economic costs of a training activity. These calculations would be repeated for each activity in the intervention.

Table 7 shows how the prices are multiplied by the quantity and the frequency of training. It assumes that the participants in the training are employees of the government or a project. As a result, the financial costs include all of the ingredients except for the time (opportunity) cost of the trainees as well as the resource and support personnel. The economic cost includes all the ingredients, including the time cost of participants. Column F shows the total financial costs and Column G shows the total economic costs.

Table 7. Illustrative Summary Table for Entering Ingredients Costs for a Training Activity

A	B	C	D	E	F	G
Ingredients	**# Participants**	**# Days**	**Price per Unit**	**# Trainings**	**Financial Cost (Multiply B x C x D x E)**	**Economic Cost Total (Multiply B x C x E x F)**
Transport or Travel Allowances	26	5	$20	2	$5,200	$5,200
Per Diem	26	5	$15	2	$3,900	$3,900
Trainers' Fees	2	5	$100	2	$2,000	$2,000
Stationery	26	1	$10	2	$520	$520
Venue Rental		5	$100	2	$1,000	$1,000
Meals/Refreshments	26	5	$10	2	$2,600	$2,600
Trainee Time Cost (For Economic Cost Calculation Only)	20	5	$40	2		$8,000
Resource Person Time Cost (For Economic Cost Calculation Only)	2	5	$60	2		$1,200
Support Person Time Cost (For Economic Cost Calculation Only)	2	5	$30	2		$600
Grand Total					$15,220	$25,020

Note: Assumes that resource and support persons were not hired only for this activity.

To evaluate the full value of a training or other activity, it is important to include both financial (Column F) and economic costs (Column G) in the previous table:

- **Financial costs:** Actual monetary expenditures (e.g., money spent on per diem, materials, rentals).
- **Economic costs:** Includes financial costs **plus opportunity costs** of resources already owned (e.g., existing staff time, donated venues, in-kind support).

Economic costs include the value of *non-monetary contributions*, like existing staff time and donated venues. This helps estimate **true resource use**, even if not paid out of pocket.

Photo Credit: African Field Epidemiology Network, Nigeria

Data Requirements and Data Collection

During the data collection, information on the prices per resource and quantities of resources used in intervention activities should be gathered. Table 3 provides an illustrative list of inputs used in interventions.

The design of cost data collection methods should be carefully structured to ensure that the study results are representative and valid. The frequency of cost collection depends on the study design, such as pre-post or pre-post with a counterfactual comparison. In a pre-post design, data is collected in the same locations before the intervention begins and after implementation is completed. Some implementation research studies incorporate a control group, requiring data collection before and after the intervention in both the intervention and comparison areas. This approach involves four data collection points: two in the intervention district/area and two in a comparison area selected based on similar characteristics. Researchers should clearly specify which study design and data collection approach they intend to use.

There are three main ways to collect cost data:

1. **Incremental cost collection:** Collecting incremental (additional) costs incurred after the intervention starts, without a comparison group.
2. **Baseline cost comparison:** Comparing intervention costs against a pre-intervention baseline.
3. **Quasi-experimental design:** Comparing costs between intervention areas/districts and similar non-intervention (comparison) areas.

While the quasi-experimental design provides the most rigorous comparison,[6] it is not always feasible to find suitable comparison areas with matching characteristics. As a result, many studies opt to collect incremental costs without a comparison or compare their results to a baseline.[7]

[6] Quasi-experimental designs are used to evaluate a causal relationship between the intervention and the outcomes and are used in situations where randomization is not possible or not ethical. Two common designs used in implementation research are the simple pre-post design and the pre-post with comparison (control) group. Using a control improves external validity and allows researchers to test whether the outcome is due to factors other than the intervention.

[7] While a pre-post study design with a control area is more rigorous for implementation research, the Gavi ZD costing group recommends a simple pre-post design when funds are insufficient to include a control (Principles Document and Costing Meeting Summary Notes, April 2024).

To ensure high-quality data collection, the study team should hire and train interviewers to conduct data collection as well as provide interviewers with data collection forms. The forms can be paper-based, on tablets, or computer-based spreadsheets. Proper training and standardized tools will enhance data accuracy and reliability throughout the study.

Sampling

The study team must determine whether sampling is necessary to obtain health facility cost data. In interventions delivered through health facilities or outreach programs, sampling is typically required. Chatterjee et al. (2021), for example, estimated the costs of the Intensified Mission Indrahanush in India by sampling health facilities from a subset of 173 lower-coverage districts included in the intervention. For interventions implemented in a limited number of locations, such as those relying on mobile phone-based contact, sampling may not be necessary if cost data can be collected from all sites.

Three common sampling methods for collecting health facility cost data include:

1. **Random sampling:** Facilities are selected randomly from the full list of eligible sites.
2. **Stratified random sampling:** Facilities are grouped into strata based on characteristics likely to affect costs (e.g., urban vs. rural location; by locality, such as state or district), and a random sample is then drawn from each stratum.
3. **Proportional-to-volume sampling:** Facilities are selected based on average volume of service delivery, ensuring that higher-volume sites have a greater probability of inclusion.

Whether interventions will be implemented sequentially or simultaneously affects the timing of data collection for costing. For example, an intervention may conduct certain activities one year and then add other activities the following year. In this case, the intervention is implemented sequentially, and costing is required whenever a new activity is added.

For studies interested in understanding household-level costs, another method of data collection involves household surveys, which are commonly used to gather data immunization coverage and on caregivers' costs associated with seeking vaccination services transport, lost income, or informal fees. The most common sampling approaches include cluster sampling or lot quality assurance sampling (LQAS). In either case, the sampling unit is the household or caregiver living in the catchment area of a given health facility. The Demographic and Health Survey (DHS) Out-of-Pocket Health Expenditures Module collects information on costs to caregivers for all outpatient services (ICF 2019). Box 4 shows an example of how these questions can be adapted for costing caregiver expenses related to seeking vaccination services for an immunization household survey.

Box 4. Example survey questions for estimating caregiver out-of-pocket expenses for seeking vaccination services

Cost Component / Sample Question (Adapted)

Travel costs: "How much money did you pay to travel to the place where your child received their most recent vaccination? Was this a health facility or outreach location?"

Informal/Service fees: "Did you pay any fees for the vaccine, vaccination card, consultation or related services? If yes, how much?"

Lost time/income: "Did you miss work, school, or usual chores to bring your child for this vaccination visit? If yes, estimate the amount of wages or income lost."

Visit frequency: "In the past four weeks, how many times did you take your child for a vaccination visit? Of these, how many times did you or someone in your household spend money out-of-pocket?"

Data Sources

Sources of data for estimating costs of ZD interventions include the following:

1. Interviews with intervention staff to document the responsibilities of staff, time spent on activities, and use of resources.
2. Financial reports, e.g., transport, communication (e.g., posters, media coverage), printing waste management, and supervision.
3. Administrative records on the number of services provided.
4. Observation of program staff time use (optimal) for information on time spent on activities.
5. Household survey to document household-level expenses of seeking vaccination services.

Conducting interviews with intervention staff provides information on how the intervention is organized, i.e., the roles of different staff in the intervention. They can also provide an estimate of the time spent on different activities, e.g., time spent on planning meetings or service provision. They can also identify the resources that are used in the project.

The team can also consult financial reports to find out how much is being spent on different resources used in the intervention. For example, they could gather information on spending supplies and materials or equipment.

Administrative records such as registers or computer spreadsheets can be used to determine how many services or support were provided.

Box 5. Example of Data Sources Used in a ZD Study

Chatterjee (2021) estimated the incremental cost of improving immunization coverage through the Intensified Mission Indradhanush (IMI) program in India. This intervention identified missed children and vaccinated them in temporary outreach sites. They conducted stratified random sampling in 40 IMI districts and their final sample was 239 sub-centres and 50 auxiliary nurse midwives (ANMs).

The study team collected data from three sources:

- Interviews with ANMs to learn about time spent during IMI implementation.
- Financial reports of each sampled district for information on costs of vaccine transport, communication activities, training, meetings, mobility support, payment for alternative vaccine delivery, incentives, printing, waste management, supervision, microplanning, and mobile teams.
- Administrative records (e.g., program registers, supervision and microplans) to learn about the number of activities conducted and number of services provided.

Data Analysis

After data has been collected and data entry completed, the data need to be analyzed. The following sections describe the types of analyses that should be conducted.

Categorizing Data into Recurrent, Capital, and Startup Costs

The analyst should designate cost components as recurrent, capital, or start-up costs so that these can be depreciated appropriately. Recurrent costs last less than a year, e.g., salaries and supplies. Capital costs last longer than a year and include such commodities as equipment and buildings. Startup costs are one-time activities such as trainings and sensitization and are treated as capital costs if their impact lasts longer than one year. Table 8 shows examples of each type of cost and the depreciation associated with it.

Table 8. Categorization of Costs

	Definition	Examples	Depreciation
Recurrent Costs	Last less than one year	Salaries, per diem, supplies, commodities, bus fare, injection supplies	Not necessary
Capital Costs	Last more than one year	Equipment, computers, buildings	Straight line depreciation for financial costs; amortization and discounting for economic costs
Startup Costs	One-time programmatic activities	Planning meetings, training, social mobilization and sensitization	Straight line depreciation for financial costs; amortization and discounting for economic costs
Financial and Economic Costs			
Financial Costs	Monetary outlays without opportunity costs	Costs to intervention payer	Straight-line depreciation
Economic Costs	The value of all resources allocated, including opportunity costs	All costs to payer plus in-kind costs such as existing personnel time and donated items/time	Annualized and discounted

Source: Levin 2022.

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Capital and start-up costs last more than one year and their duration of effectiveness is measured in useful life years (ULYs) (see Walker 2002 for an in-depth discussion of annualization and discounting). For example, the information gained from initial training is often expected to last three to five years. The costs of these goods and services are annualized (divided by ULYs, also known as straight line depreciation) so that the cost is spread over the life of a good or service. For economic costs, discounting is conducted as well. This type of analysis takes into account the opportunity cost of financing in present and future periods. Discounting is used to adjust for people's preference to delay spending to the future. The default discount rate for health care is three percent. However, LMIC researchers sometimes use the rate at which the national government can borrow funds on the international market.

Calculation of Financial and Economic Costs

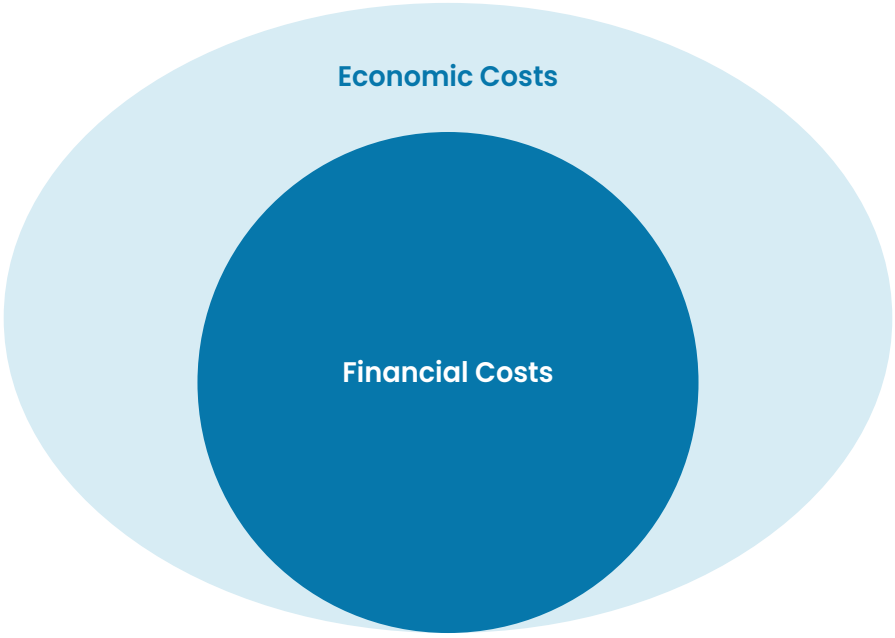
The input costs should be analyzed as financial and economic costs (see Figure 1). Financial costs are monetary outlays or accounting costs. These include the costs to the payer (i.e., government, health system, or other implementing entity) and do not include opportunity costs, such as resources that have already been purchased (e.g., government personnel salaries) or donated (e.g., volunteer time, donated equipment). Financial costs can be used to measure how much the payer is contributing to the intervention. An example of a financial cost is a drug or supply that is purchased by the government or other payer for the intervention.

Economic costs include all costs incurred, regardless of the source of financing. These costs include opportunity costs such as in-kind costs, donated goods, and personnel salaries. Some examples are volunteer time and vehicles donated by external agencies. Including opportunity costs in the analysis captures the trade-offs involved when allocating resources to one activity over another. For example, if a health worker attends a training on a ZD intervention, they may have less time to provide routine vaccination services.

Economic costs are useful to ascertain the total costs of an intervention to society and provide insights into the sources of financing for the intervention. Economic costs should be used for cost-effectiveness and cost-benefit analyses.

Photo Credit: African Field Epidemiology Network, Nigeria

Figure 1. Financial and Economic Costs



Capital costs are annualized differently for financial and economic costs. Financial costs use straight-line depreciation for annualization, i.e., the cost of the capital good is spread over time by dividing it by the ULY and allocating this amount to each year. Economic costs, on the other hand, are amortized and discounted. To do this, the cost of the capital good is divided by an annualization factor that considers the ULYs and the discount rate (see the table on annualization factors in Annex 5).

Economic costs will always be greater than financial costs because they comprise the financial costs plus opportunity costs. Financial costs include what was paid for with cash (financial outlays) whereas opportunity costs include in-kind costs, donated items, and anything not paid for with cash, including voluntary time. Voluntary time is not purchased or paid but still has value. Personnel (government) salaries would be paid whether or not there is a new vaccine or new ZD intervention, so these are considered to be sunk costs/economic costs if determining the incremental ZD costing but considered a financial cost if estimating the total cost of routine immunization.

Table 9. Definitions Recap

Cost Type	Description
Financial Cost	Actual money spent by the program or government—invoices, salaries, purchases—for goods and services such as vaccines, personnel, transportation, training, and supplies.
Economic Cost	Full value of all resources used, regardless of who paid or if payment occurred. This includes *financial costs plus the value of all non-financial resources* such as donated goods, use of facility infrastructure, existing government staff time, volunteer labor, depreciation of capital, and opportunity costs.

Table 10 provides examples of resources included in financial and economic costs. Financial costs refer to monetary expenditures on resources that were directly purchased. Economic costs include all financial costs plus in-kind contributions with an opportunity cost, such as the time of volunteers or trainees and salaries of health workers already funded by the government or other entities. It is important to note that for incremental costing, the salaries of health workers already paid for are excluded from financial costs but are included in total costing. A discount rate of three percent per year or the applicable local discount rate should be used for cost adjustments (GHCC Reference Case 2017).

Table 10. Examples of Financial and Economic Costs for Incremental Costing

	Financial Costs	Economic Costs
Training	• Per diem for participants • Travel allowances • Supplies and materials • Venue rental	• Per diem for participants • Travel allowances • Supplies and materials • Venue rental • Salaries of government or project workers • Time cost of participants
Supervision	• Travel allowances • Supplies and materials	• Travel allowances • Supplies and materials • Salaries of government or project workers

Please note: Economic costs are often calculated incorrectly since these should include all costs, regardless of the source of financing. These should include both financial costs and opportunity costs added together. Economic costs should always be greater than financial costs.

Proper economic costing ensures the full valuation of resources, including donated items, volunteer labor, and facility use, which is critical for evaluating sustainability and cost-effectiveness. A common error in costing happens when researchers **incorrectly equate economic cost with financial cost**, failing to account for non-monetary resources like donated goods and volunteer time. This leads to an underestimation of the true cost of delivering services, especially in contexts where donated inputs and unpaid resources are significant. The example below shows a common error in calculating economic vs. financial costs, along with the corrected approach.

Photo Credit: International Center for Diarrhoeal Disease Research, Bangladesh

Box 6. Illustrative Example: Common Error of Misreported Economic vs. Financial Costs for an Immunization Program

Scenario: A research team is costing a routine immunization program in a rural district. The program uses the following resources each year:

- Paid staff (salaries paid by MOH)
- Cold chain equipment donated by UNICEF
- Volunteers for outreach sessions
- Health facility space used for vaccine delivery (no rent paid)
- Vehicles for outreach services and supervision activities

Costs that were recorded by the research team include:

- Staff salaries: $15,000/year
- Vaccine purchases: $10,000/year
- Transport fuel and per diem: $5,000/year

Total Financial Cost: $30,000/year

Why is this example an incomplete estimate for economic costing? The team only reported **financial costs**: the actual cash expenditures made by the program or government. They left out several key **economic cost** components which account for the full value of all resources used, whether or not they involve a direct payment.

As a result, the research team **underreported the true resource** use of the program by excluding non-monetary contributions. For a full economic cost estimate, all resources used by the program, including those donated or provided in-kind, must be included and valued appropriately. In this example, reporting the economic cost as equivalent to financial cost would lead to a $7,000 underestimation of true costs. See tables 11 and 12 below.

Table 11. Resources Included as Economic Costs

Resource	Should Be Included in Economic Cost?	Typical Valuation Approach
Donated Cold Chain Equipment	Yes—value should be amortized	Estimate useful life, apply depreciation
Volunteer Labor	Yes—valued at market wage or shadow price	Local daily wage × days worked
Facility Space	Yes—opportunity cost of space used	Estimate rental equivalent per year

Illustrative Example, continued

Table 12. Correct Reporting of Financial vs. Economic Costs for an Immunization Program

Cost Component	Financial Cost (USD)	Economic Cost (USD)	Notes
Salaries of Paid Health Staff	$15,000	$15,000	Paid directly by the MOH
Vaccines and Injection Supplies	$10,000	$10,000	Purchased by government
Transport (fuel, per diem)	$5,000	$5,000	Direct program expenditure
Donated Cold Chain Equipment	—	$4,000	Annualized value based on useful life
Volunteer Labor for Outreach	—	$1,000	Valued at $10/day × 100 days
Health Facility Space Used for RI	—	$2,000	Estimated rental equivalent or opportunity cost
Total	**$30,000**	**$37,000**	**Economic cost includes all resources used, not just cash expenditures**

Key takeaway: Financial costs reflect what is paid, while economic costs reflect what is used. Failing to include donated or in-kind resources underestimates the true cost of delivering vaccination services and can lead to misleading cost-effectiveness analysis and planning.

Please note: when estimating the ***incremental costs of ZD interventions***, salaries of existing government staff are not typically included in financial costs since they represent non-incremental expenditures to the payer. In other words, these salaries would already be paid regardless of the ZD activities. However, if new staff are hired specifically for the ZD intervention, their salaries should be included in the incremental financial and economic costs.

In all cases, economic cost estimates should include the value of all resources used, including the proportional time of existing staff (even if this is not an additional financial cost), by assigning a value based on their salary or market wage.

Table 13. Correct Reporting of Staff Salaries for Incremental Costing

Type of Staff	Included in Financial Cost?	Included in Economic Cost?	Notes
Existing Government Staff Time	No (if already salaried)	Yes	Value their time proportionally to the time spent on ZD work
New Staff Hired for ZD Intervention	Yes	Yes	Both cost categories capture new resource use and payment
Volunteer Staff	No	Yes	Valued at shadow wage or market equivalent

Photo Credit: International Center for Diarrhoeal Disease Research, Bangladesh

Treatment of Financial and Economic Costs in Immunization Program Costing

When estimating the total cost of an immunization program, financial and economic costs should not be added together because doing so would result in double counting.

- Economic costs already include financial costs, plus the value of other non-cash resources (e.g., donated goods, existing government staff time, volunteer hours, or facility space).
- Adding them together would count the financial costs twice, once directly and again as part of the economic cost.

Therefore, financial and economic costs must be reported separately, depending on the purpose of the analysis. For example:

- Use **financial cost** estimates for budgeting, financial planning, and assessing funding needs.
- Use **economic cost** estimates for evaluating cost-effectiveness, assessing resource use from a societal perspective, and comparing alternative delivery strategies.

Example:

Suppose an immunization program:

- Spends **$100,000** on vaccines, staff, and transport (financial cost).
- Uses **$50,000 worth** of donated cold chain equipment and volunteer labor (non-financial resources).

Table 14. Example of Calculating a Total Economic Cost

Cost Component	Value (USD)
Financial Costs	$100,000
Non-Financial (Economic Only) Costs	$50,000
Total Economic Cost	**$150,000**

Allocation of Shared Costs to the Intervention

Resources used in ZD interventions are often shared with other interventions or services. For example, health workers who vaccinate children often also provide other health services such as curative care or maternal health care. Additionally, other activities such as transport of materials and goods are often shared among services. There are different ways to allocate shared costs to each of the services. Usually, personnel time for vaccination or supervision is allocated by the percent of total time spent on each activity. For other cost components such as transport or storage, the cost is usually allocated by the proportion of total space in the transport or storage employed for each service.

Adjustment for Inflation

When comparing costs over time or across interventions from different years, it is essential to adjust for inflation. To do so, the analyst can either use gross domestic product deflators (measures inflation in locally produced goods rather than locally consumed goods) or the Consumer Price Index.

Characterization of Data Uncertainty

The values of some inputs in the cost analysis are often somewhat uncertain, i.e., the value is estimated but the exact value is unknown. For example, immunization coverage is often estimated because of uncertainty about the size of the target population. Additionally, the percentage of total time health workers spend on immunization is often difficult to estimate. To account for this uncertainty, cost researchers conduct sensitivity analysis, a series of analyses to assess whether alternating any of the assumptions made lead to significant changes in the total cost (Thabane 2013). The types of sensitivity analysis that are usually conducted include: 1) one-way (deterministic) sensitivity analysis or 2) probabilistic sensitivity analysis. Conducting sensitivity analysis can be conducted in Excel spreadsheets or with software add-ons such as @Risk, Crystal, or Ersatz.

To conduct a sensitivity analysis, it is necessary to vary the assumptions that have some uncertainty in the costing analysis. In one-way (deterministic) sensitivity analysis, selected parameters with uncertainty are varied by a percentage to determine the impact on the total cost. For example, the price of commodities or the cost of personnel or the cost of social mobilization can be varied by 20 or 30 percent to estimate the impact of a change on total cost. In probabilistic sensitivity analysis, the user evaluates the model over a distribution of the parameters with a software package.

Estimation of Total and Unit Program Costs

The analysts should calculate total and additional or incremental cost per additional ZD child vaccinated. Total costs are the sum of all the costs of activities in the intervention.

$$\text{Total Cost} = \Sigma C_i$$

The additional or incremental cost of the ZD intervention per incremental ZD child reached is the incremental cost of the ZD intervention divided by the number of incremental ZD children reached.

Reporting of Costing Results

There are several steps involved in presenting the results of the cost estimation of ZD interventions.

1. Present the objective of the cost analysis.

The objective of the cost analysis should be introduced in the introduction/background.

2. The study team should describe the intervention, its design, and scope.

Describe the intervention characteristics so that it is clear what cost components should be estimated. Also specify the costing study design and scope.

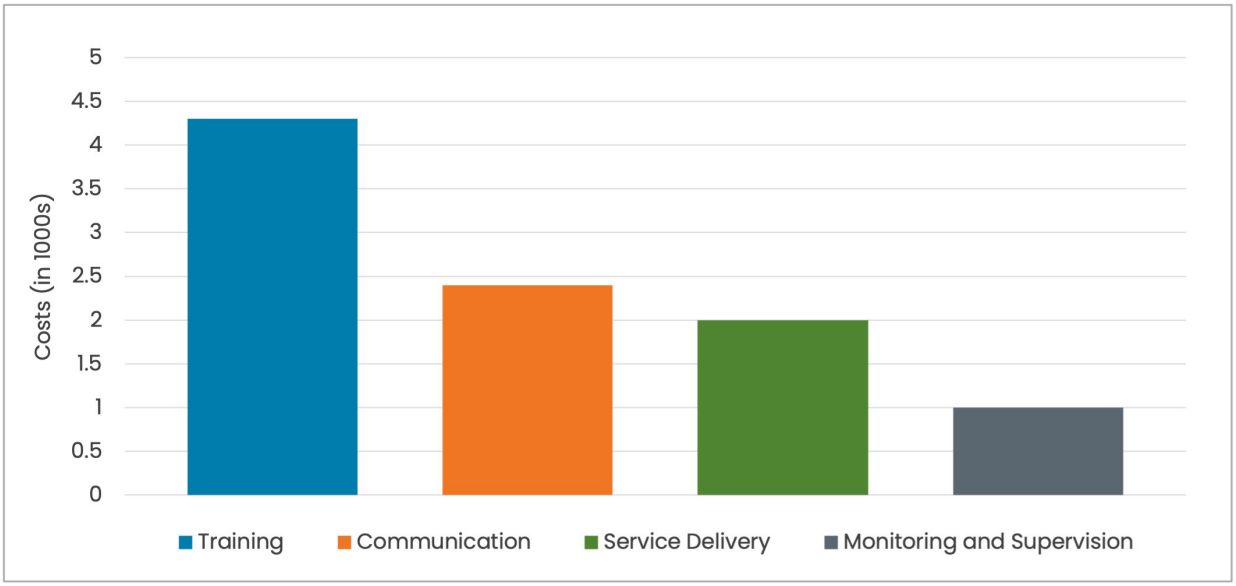
3. Describe the costing methodology.

The costing methodology and assumptions made should be clearly laid out in the report/paper so that these can be evaluated and available for comparison with other studies.

4. Present the results clearly.

The study team should present the results in tables and/or figures so that the cost drivers can be identified. It is also helpful to present the results by year to better understand how costs change over time. Figure 2 is an example of a graph that can be used to show the results.

Figure 2. Illustrative Graph Showing Cost Results



5. Include a section on interpretation/discussion of the results, limitations to the costing methodologies used, and conclusions.

The study team should interpret the findings taking into account the local context. They should also compare the findings to those of other studies to determine whether their results are comparable. It is also useful to comment on the broader implications of the findings, particularly on whether the intervention could be replicated and scaled up.

Estimation of Results

The study team should estimate the costs by adding up the costs for each activity (see Table 6 for illustrative example) and then totaling these together. This analysis will provide total costs with and without the ZD intervention. Column 4 is for the additional costs of the ZD intervention, i.e., Column 3 – Column 2. To estimate the cost per health output, the additional costs are divided by the additional children vaccinated with DTP1 due to the intervention. This equation calculates the cost per additional child vaccinated.

Limitations

The study report should detail potential sources of bias and limitations within the study design and data analysis. This includes challenges related to data collection, analytical techniques that may influence the results, and conclusions, as well as other cost estimates. Additionally, the report should describe how these limitations were addressed and provide guidance on interpreting the results.

Table 15. Example Format for Organizing Costing Results

	(1) **Activities**	(2) **Costs Pre-Intervention or Status Quo**	(3) **ZD Intervention Costs**	(4) **Additional Costs of ZD Intervention**
Training				
Intervention Planning				
Social Mobilization and Sensitization				
Intervention Delivery				
Monitoring and Supervision				
Total				

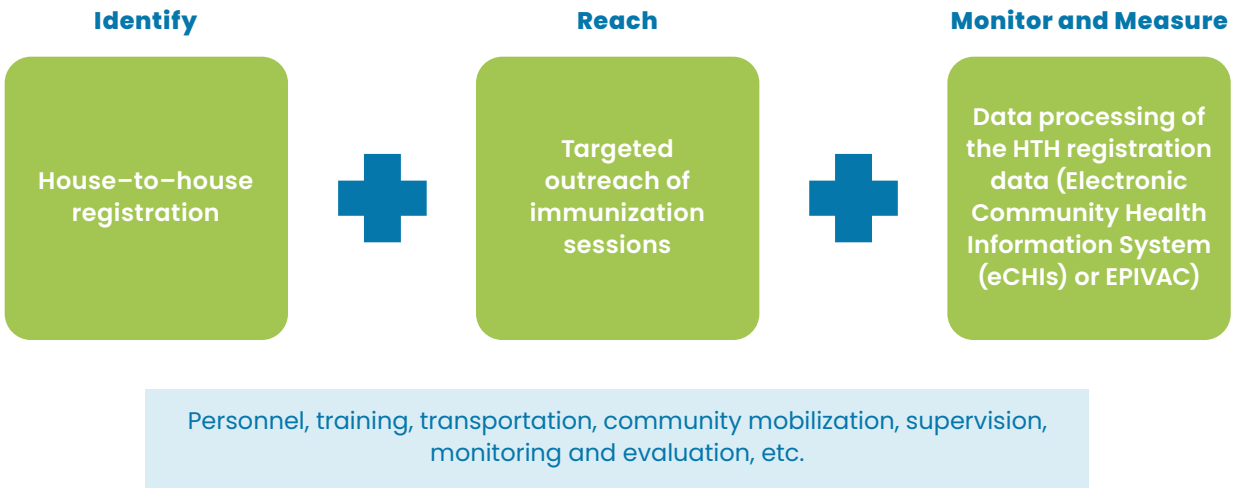
Photo Credit: GaneshAID, Mali

Case Study: Uganda CLH

The Uganda CLH carried out a retrospective costing study in three districts from February to April 2025. The costing study analyzed the nationwide Big Catch-Up campaign conducted in Uganda in November 2024 to reach ZD and UI children to estimate the resources used to implement the campaign interventions and activities. While the campaign comprised several interventions, the costing study focused on the key interventions (Figure 3):

1. **House-to-house (HTH) registration of children:** This activity identified the ZD and UI children eligible for vaccination. Village Health Teams (VHTs) visited each house and registered children under five years in their respective villages. These lists were subsequently used to update the health facility microplans and map hotspots for outreaches.
2. **Data processing:** Once registration was completed, the information captured on paper-based tools was compiled into line lists and child health registers at the health facility level and subsequently entered by the district biostatistician into Uganda's Electronic Immunization Vaccination Coverage (EPIVAC) system, the country's online platform for immunization data capture and reporting.
3. **Targeted outreach/immunization sessions to reach/vaccinate children:** After registration, outreach sessions were conducted in identified hotspots where ZD children were located, specifically to reach the children in these areas with immunization services.

Figure 3: Types of Interventions Costed



Box 7. Case Example of a ZD Costing Study in Uganda

Background: Uganda has significantly improved immunization coverage through the Uganda National Expanded Program on Immunization (UNEPI), achieving over 90 percent coverage for most routine antigens. Despite this, outbreaks of measles and polio have persisted, especially since 2020. The Uganda Ministry of Health (MOH) projected an increase in ZD and UI children in 2024 over previous years. In response, MOH/UNEPI launched the Big Catch-Up campaign in November 2024, targeting 297,687 ZD and 676,712 UI children.

Existing costing studies in Uganda mainly focused on estimating the costs of routine immunization and mapping financing flows for routine immunization. This costing study is focused on selected interventions carried out through the Big Catch-Up in Uganda:

- House-to-house registration as a mechanism to identify the ZD and UI children.
- Data processing to monitor and measure progress in vaccinating ZD children.
- Targeted immunization sessions to reach the ZD and UI.

Information on the total and incremental costs will be used to assess the affordability of the intervention and inform scale-up.

Study type and objective: Costing study aimed at estimating the incremental cost of reaching ZD and UI children through selected interventions implemented during the Big Catch-Up campaign in Uganda in November 2024.

Study population: Children less than five years of age, the target age group of the campaign.

Study sites: The costing activity was carried out over three months in three Learning Hub districts (Mubende, Wakiso, and Kasese). In each district, the Learning Hub purposively selected two to three sub-counties that had been the focus of a previous process evaluation led by the Uganda Learning Hub to assess implementation of the Big Catch-Up campaign. For each of the selected sub-counties, health facilities that participated in the campaign were purposively selected to ensure representation across all levels of health centres. Data was collected at district and health facility levels.

Costing perspective: Payer perspective (MOH/UNEPI). The payer/provider perspective focuses on the costs of delivering the intervention to the government but does not include costs to the vaccination beneficiaries.

Time horizon: The study time horizon was three months, corresponding to the start and end of the Big Catch-Up intervention.

Primary outcome: Cost per ZD/UI child vaccinated/reached with DTP1.

Secondary outcomes: Cost per ZD identified (drawn from the house-to-house registration), cost per child identified/registered (includes all children registered), and cost per child vaccinated (all children vaccinated with other antigens).

Data sources for measuring the outcome:

- *Denominator*: Number of registered children from registration books (VHTs).
- *Numerator*: Number of vaccinated children (ZD or UI) identified through tally sheets/DHIS2, EPIVAC, and verified through expert opinion/key informant interviews (with EPI focal persons, Assistant District Health Officers - Maternal and Child Health, VHTs).

Costing methodology: retrospective approach to estimate the incremental/additional costs of vaccinating ZD children after the intervention has been conducted. It is a post-intervention costing study without a comparison group. The retrospective approach will help the Learning Hub determine how many children were reached with DTP1 through the intervention. While data will be collected after the intervention is completed, the intent is to estimate the incremental cost of the intervention by comparing the outcome before and after the intervention.

A combination of bottom-up and activity-based approaches was used to identify, quantify, and value (in monetary terms) the activities and corresponding inputs used to implement activities at each phase of implementation. Both financial and economic costs were captured.

Financial costs are defined as direct monetary or accounting costs received from the funder that were used in the implementation of the interventions. Economic costs include real-time value for voluntary effort expended in the implementation (for example VHTs), in-kind contributions of inputs, and other assets, etc. All inputs were valued in 2024 Uganda shillings before being converted to U.S. dollars using the November 2024 exchange rate.

Data collection: Cost data were collected through field observations, key informant interviews, and review of relevant documents (budgets and field reports). Data on the number and proportion of ZD and UI children identified and reached were gathered from district registers, VHT registers, or line lists.

Photo Credit: Infectious Disease Research Collaborative, Uganda

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Appendix

Annex 1. List of Guidance Documents on Immunization Costing

Developer	Guidelines	Publication Year	Target Intervention	Purposes	How this Guidance Differs from the Current Operational Guidance for ZD Interventions
EPIC Immunization Costing Project	Common Approach for the Costing and Financing Analyses of Routine Immunization and New Vaccine Introduction costs	2013	Existing and new vaccine programs	Methods for data collection for routine immunization programs and new vaccine introduction (including delivery costs) and financial flows	Focuses on costing of routine vaccination services at health facility level
EPIC Immunization Costing Project	How to Cost Immunization Programs - A practical guide on primary data collection and analysis	2020	Existing and new vaccine programs	Practical guidance on how to conduct a facility-based exercise on immunization program costs, including sampling and analytical techniques	Focuses on costing of vaccination services at the health facility level
Global Health Cost Consortium (GHCC)	GHCC Reference Case	2017	Health interventions in general	Improve quality of cost estimates	Focuses on terminology and methods of costing health services
Immunization Costing Action Network (ICAN)	Methodology note for systematic review, cost catalogue, and analytics	2019	Immunization delivery costs	Designed for users of data, including national and sub-national planners and policymakers, researchers, and international global health partners	Focuses on methods used in the Immunization Cost Catalogue

Developer	Guidelines	Publication Year	Target Intervention	Purposes	How this Guidance Differs from the Current Operational Guidance for ZD Interventions
Thinkwell/ICAN	How to cost an immunization campaign?	2021	Immunization campaigns	Provides methodological advice for field researchers, country practitioners, and academics worldwide on how to cost an immunization campaign	Focuses on methods used in costing of immunization campaigns
WHO	Guidelines for estimating costs of introducing new vaccines into the national immunization system	2002	New vaccine programs	Assist countries in planning for introduction of new vaccines	Focuses on costing of introduction of new vaccines into national immunization programs
WHO	WHO-led consensus statement on vaccine delivery costing: process, methods and findings	2022	Vaccine delivery costing	Develop a consensus statement harmonizing terminology and principles and formulate recommendations for vaccine delivery costing for decision making	Focuses on presenting terminology and principles for vaccine delivery costing for decision-making

Annex 2. Example Data Collection Forms for Ingredients Costing of a Training Activity

A. Training Personnel

	# Personnel	# Days	Travel Allowance	Per Diem	Average Salary	Total (Financial)*	Total (Economic)**
Facilitators							
Support Personnel							
Participants							
Resource Persons							
Total							

*Salaries are included in financial costs if the employees have been hired for the intervention; otherwise, employees already paid for by an organization or government are not included.

**Salaries are included in economic costs since these are considered opportunity costs.

Source of Data:

B. Meals/Allowances During Training

Item	# Participants	# Days	Total
Total			

Source of Data:

C. Materials and Supplies

Item	# Participants	Unit Cost	Total
Total			

Source of Data:

D. Venue Rental

Item	# Days	Unit Cost	Total
Total			

Source of Data:

E. Vehicle Rental

Item	# Days	Unit Cost	Total
Total			

Source of Data:

F. Equipment/Capital Good

Item	# Units	Unit Cost	Total
Total			

Source of Data:

G. Other Direct Costs

List in the table below all additional recurrent costs per dose administered:

Other Recurrent Cost Item	# Participants	Unit Cost	Total
Total			

Source of Data:

Annex 3. Sample Excel Template for Ingredients Costing for an Illustrative ZD Outreach Activity

1	Cost Category (Ingredient)	Description	Unit	Quantity	Unit Cost (USD)	Total Cost (USD)
2	**A**	**B**	**C**	**D**	**E**	**F**
3	**Human Resources**					
4	Vaccinator per Diem	Daily allowance for outreach vaccinators	Person-day	30	$25.00	=C4*D4
5	Supervisor per Diem	Outreach team supervisor	Person-day	10	$30.00	=C5*D5
6	Community Mobilizer	Local guide/ mobilizer	Person-day	20	$15.00	=C6*D6
7						
8	**Transportation**					
9	Vehicle Rental	4x4 vehicle for outreach	Day	10	$100.00	=C9*D9
10	Fuel	Fuel for vehicles	Liters	150	$1.25	=C10*D10
11						
12	**Supplies & Cold Chain**					
13	Vaccine Carriers	Cold boxes for vaccine transport	Each	5	$40.00	=C13*D13
14	Ice Packs	For cold boxes	Each	20	$2.00	=C14*D14
15	Thermometer Stickers	Monitor vaccine temperatures	Box	60	$2.50	=C15*D15
16						
17	**Social Mobilization**					
18	Radio Announcements	Local language messages	Spot	20	$5.00	=C18*D18
19	Community Meetings	Planning meetings with leaders	Meeting	5	$50.00	=C19*D19

1	Cost Category (Ingredient)	Description	Unit	Quantity	Unit Cost (USD)	Total Cost (USD)
2	**A**	**B**	**C**	**D**	**E**	**F**
20	Flyers/Posters	Information, education, and communication materials	Set	100	$0.50	=C20*D20
21						
22	**Other Costs**					
23	Data Collection & Tools	Forms, tablets, pens	Set	1	$150.00	=C23*D23
24	Supervision Visits	Spot checks by supervisors	Visit	3	$75.00	=C24*D24
25						
		Total Estimated Cost				**=SUM(F4:F24)**

Cost Summary from the Excel Template

Cost Category	Total Cost (USD)
Human Resources	$1,350
Transportation	$1,375
Supplies & Cold Chain	$550
Social Mobilization	$475
Other Costs	$375
Total	**$4,125**

Annex 4. Sample Excel Template for Ingredients Costing of a Training Activity with Financial and Economic Costs

Category	Description	Unit	Quantity	Unit Cost (USD)	Financial Cost (USD)	Economic Cost (USD)
A	**B**	**C**	**D**	**E**	**F**	**G**
1. Training Preparation						
Training Materials	Manuals, guides, flipbooks	Set	50	10.00	$500.00	$500.00
Printing Costs	Handouts, certificates	Page	1,000	0.05	$50.00	$50.00
Stationery	Pens, folders, notepads	Set	50	2.00	$100.00	$100.00
2. Personnel						
Trainer Fees	Paid external facilitators	Person-day	4	100.00	$400.00	$400.00
Support Staff	Admin/logistics personnel	Person-day	2	50.00	$100.00	$200.00 *(includes opportunity cost)*
Per Diem for Trainees	Allowance paid to participants	Person-day	50	20.00	$1,000.00	$1,000.00
3. Venue and Logistics						
Venue Rental	Paid rental	Day	2	200.00	$400.00	$400.00
Meals/Snacks	Paid meals	Person-day	100	10.00	$1,000.00	$1,000.00
Accommodation	Hotel/lodging for participants	Person-night	20	40.00	$800.00	$800.00
Transport Reimbursement	Travel from remote sites	Person	20	15.00	$300.00	$300.00

Category	Description	Unit	Quantity	Unit Cost (USD)	Financial Cost (USD)	Economic Cost (USD)
A	**B**	**C**	**D**	**E**	**F**	**G**
4. Other Costs						
Personal Protective Equipment for Training	Sanitizer, masks	Lump sum	1	100.00	$100.00	$100.00
Monitoring & Supervision	Supervisory visits	Visit	2	75.00	$150.00	$150.00
Use of Existing Staff Time	Opportunity cost only	Person-day	5	50.00	—	$250.00 *(economic only)*
Donated Venue (alternative scenario)	No payment made, value estimated	Day	2	200.00	—	$400.00 *(economic only)*
	Total Estimate Cost				**$4,900.00**	**$6,100.00**

Annex 5. Table of Annualization Factors

Annualization Factors for Determining Annual Cost of Capital Items

Year	1%	3%	5%	6%	8%	10%	12%	14%	15%	16%	18%	20%
	0.990	0.971	0.952	0.943	0.926	0.909	0.893	0.877	0.870	0.862	0.847	0.833
2	l.970	l.913	l.859	l.833	l.783	l.736	l.690	l.647	l.626	l.605	l.566	l.528
3	2.941	2.829	2.723	2.673	2.577	2.487	2.402	2.322	2.283	2.246	2.174	2.106
4	3.902	3.717	3.546	3.465	3.312	3.170	3.037	2.914	2.855	2.798	2.690	2.589
5	4.853	4.580	4.329	4.212	3.993	3.791	3.605	3.433	3.352	3.274	3.127	2.991
6	5.795	5.417	5.076	4.917	4.623	4.355	4.111	3.889	3.784	3.685	3.498	3.326
7	6.728	6.230	5.786	5.582	5.206	4.868	4.564	4.288	4.160	4.039	3.812	3.605
8	7.652	7.020	6.463	6.210	5.747	5.335	4.968	4.639	4.487	4.344	4.078	3.837
9	8.566	7.786	7.108	6.802	6.247	5.759	5.328	4.946	4.772	4.607	4.303	4.031
10	9.471	8.530	7.722	7.360	6.710	6.145	5.640	5.216	5.019	4.833	4.494	4.192
11	10.368	9.253	8.306	7.887	7.139	6.495	5.938	5.453	5.234	5.029	4.656	4.327
12	11.255	9.954	8.863	8.384	7.536	6.814	6.194	5.660	5.421	5.197	4.793	4.439
13	12.134	10.635	9.394	8.853	7.904	7.103	6.424	5.842	5.583	5.342	4.910	4.533
14	13.004	11.296	9.899	9.295	8.244	7.367	6.628	6.002	5.724	5.468	5.008	4.611
15	13.865	11.938	10.380	9.712	8.559	7.606	6.811	6.142	5.847	5.575	5.092	4.675
16	14.718	12.561	10.838	10.106	8.851	7.824	6.974	6.265	5.954	5.668	5.162	4.730
17	15.562	13.166	11.274	10.477	9.122	8.022	7.120	6.373	6.047	5.749	5.222	4.775
18	16.398	13.754	11.690	10.828	9.372	8.201	7.250	6.467	6.128	5.818	5.273	4.812
19	17.226	14.324	12.085	11.158	9.604	8.365	7.366	6.550	6.198	5.877	5.316	4.843
20	18.046	14.877	12.462	11.470	9.818	8.514	7.469	6.623	6.259	5.929	5.353	4.870
21	18.857	15.415	12.821	11.764	10.017	8.649	7.562	6.687	6.312	5.973	5.384	4.891
22	19.660	15.937	13.163	12.042	10.201	8.772	7.645	6.743	6.359	6.011	5.410	4.909
23	20.456	16.444	13.489	12.303	10.371	8.883	7.718	6.792	6.399	6.044	5.432	4.925
24	21.243	16.936	13.799	12.550	10.529	8.985	7.784	6.835	6.434	6.073	5.451	4.937
25	22.023	17.413	14.094	12.783	10.675	9.077	7.843	6.873	6.464	6.097	5.467	4.948
26	22.795	17.877	14.375	13.003	10.810	9.161	7.896	6.906	6.491	6.118	5.480	4.956
27	23.560	18.327	14.643	13.211	10.935	9.237	7.943	6.935	6.514	6.136	5.492	4.964
28	24.316	18.764	14.898	13.406	11.051	9.307	7.984	6.961	6.534	6.152	5.502	4.970
29	25.066	19.188	15.141	13.591	11.158	9.370	8.022	6.983	6.551	6.166	5.510	4.975
30	25.808	19.600	15.372	13.765	11.258	9.427	8.055	7.003	6.566	6.177	5.517	4.979

Annex 6. Recommended Costing Guidance Documents

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Gavi
The Vaccine Alliance

JSI

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DELHI

The Geneva
Learning
Foundation