



# How to cost an immunization campaign?

**METHODOLOGICAL GUIDANCE**

September 2021



## ABOUT ICAN

**This guide has been developed by the Immunization Costing Action Network (ICAN), which was implemented by Health Systems Insight with support from the Bill & Melinda Gates Foundation (BMGF).** ICAN was a research and learning network working to increase the visibility, availability, understanding, and use of immunization delivery cost information. ICAN built country capacity to generate cost evidence that is policy-relevant and a priority for the immunization program. ICAN also worked with countries to improve interpretation and translation of the evidence so that it is used in country decision-making processes and informs routine planning and budgeting. ICAN believed that when equipped with relevant and user-friendly cost evidence, immunization managers, program planners, and policymakers will be empowered in fundraising and advocacy efforts and will make better resource allocation decisions, improving the efficiency and equity of immunization programs, including campaigns.

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# Acronyms

**AEFI**

adverse events following immunization

**BMGF**

Bill & Melinda Gates Foundation

**CPI**

consumer price index

**EPI**

Expanded Program on Immunization

**EPIC**

Expanded Program on Immunization  
Costing and Financing

**EPP**

evidence to policy and practice

**HMIS**

health management information system

**HSPH**

Harvard T.H. Chan School of Public Health

**ICAN**

Immunization Costing Action Network

**IDCC**

Immunization Delivery Cost Catalogue

**IEC**

information, education and communication

**LMIC**

low and middle income countries

**MenA**

meningitis A

**MOH**

ministry of health

**MR**

measles-rubella

**NITAG**

National Immunization Technical Advisory Group

**OCV**

oral cholera vaccine

**OPV**

oral polio vaccine

**PIRI**

periodic intensification of routine immunization

**SIA**

supplemental immunization activity

**YF**

yellow fever

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# SECTION I. Introduction

# Introduction

## WHY ANOTHER GUIDE

**Immunization campaigns are an important delivery strategy used to improve coverage and decrease morbidity and mortality from vaccine-preventable diseases.** Campaigns are used more frequently to administer a greater variety of vaccines and reach a wider range of target populations, and as an integral part of the immunization program. Over the coming years, campaigns are likely to be used more and more often for a greater range of vaccines, and delivery strategies will increasingly be tailored and targeted. The COVID-19 pandemic has also elevated the need for integrated delivery of health services, and more often, campaigns will deliver more than one vaccine or co-deliver vaccines with other health services and commodities to achieve efficiencies.

**It is crucial that the costs of different types of immunization campaigns, including those that are integrated with the delivery of other health interventions, are accurately estimated to inform planning, budgeting and resource mobilization.** A vaccination campaign requires significant resources over a short period of time. Unlike with routine immunization programs, where resource allocations can be fine-tuned over time, a campaign is a one-off opportunity to make an impact. Inadequate funding or late disbursements can derail a campaign completely, and a low-impact campaign may be a considerable waste of resources.

**Global evidence on what it costs to conduct a campaign is limited, varies greatly and is hard to compare.** ICAN has conducted a review of the global evidence on the cost of delivering vaccines across different low- and middle-income countries (LMIC) and through a variety of delivery strategies. Out of over 660 **unit costs** compiled in the Immunization Delivery Cost Catalogue (IDCC), only 33 are for campaigns and outbreak responses. The estimates vary widely, and the extent to which cost variation is driven by differences in costing study methodologies or campaign operations is not clear, making the evidence hard to compare. Without a clear understanding of the methodological differences between the studies, it is difficult to use such results to budget and plan future campaigns.

**To address these issues, and to complement existing guidance on immunization costing, we have developed this guide to help standardize immunization campaign costing methods.** Although various guidance documents cover the costing of health interventions and the costing of routine immunization programs specifically, none discuss the specifics of costing immunization campaigns. This guide complements the literature on guidance for costing studies with specific methodological considerations for immunization campaigns, clear instructions fitting potential scenarios, and concrete examples. ICAN has developed this guide and its accompanying tools following a comprehensive review of existing costing guidelines and costing tools, to ensure this guide is aligned to methodological consensus and best practices wherever possible. Annex A shows the key references to existing guides for each of the sections of this guide.



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### **Delivery strategy**

Alternative ways of delivering immunization services, often requiring different complements of staff, supplies, equipment, and vehicles, to different target populations.

### **Unit cost**

The cost of delivery of a single unit of immunization outcome, such as the cost per dose or cost per child.<sup>24</sup>

## HOW THIS GUIDE WAS DEVELOPED

**This guide is the result of extensive consultations with costing and campaign experts, an iterative learning process around three consecutive campaign costing studies, and reviews and convenings of an advisory group to reach agreement on the proposed methods.** This guide was developed as part of ICAN's campaign costing project, which took place from December 2018 until July 2021. In early 2019, Health Systems Insight held 17 interviews with individuals with expertise on costing (see [Annex A](#)), campaign implementation or an interest in the use of campaign costing data. These interviews resulted in rich insights for the methodological guidance document, and helped to determine the range of perspectives and most recommended scope for the campaign costing studies. Two immunization campaigns were selected to reflect various settings in terms of vaccines, geographies, country size and target age group. The first study costed the measles-rubella (MR) catch-up campaign in India.<sup>1</sup> The second costed the MR catch-up campaign in Sierra Leone, which was co-delivered with oral polio vaccine (OPV) nationwide, and vitamin A and deworming tablets in half of the country.<sup>2</sup> The third study estimated the cost of yellow fever (YF) campaigns in three Nigerian states, and in one of the states YF was co-delivered with meningitis A (MenA) vaccine.<sup>3</sup> The studies were designed to test several methods and tools, and implemented in a phased manner so that learnings from the first study could be integrated into the second. This document reflects the recommendations coming out of these studies. This guide was reviewed by and incorporates inputs from an advisory group with a wide range of expertise in costing and conducting campaigns (see [Annex B](#)).

## PURPOSE OF THIS GUIDE

**This guide offers methodological advice for field researchers, country practitioners and academics worldwide on how to cost an immunization campaign.** The guide walks through the design of a campaign costing study, determining the scope and methods, and how to analyze the data. It is not meant as an introduction to costing health programs in general, and will refer to other guidance as much as possible (see [Annex A](#)). Rather, it discusses campaign-specific considerations and offers recommendations on what methodology to use given certain campaign characteristics. It also provides guidance specific to multi-antigen campaigns and immunization campaigns that are integrated with non-immunization interventions wherever relevant. The methods recommended in this guide are a mix of detailed **bottom-up costing** approaches

and simplified generalized methods to yield the best value for money for an immunization campaign costing study. The guide covers prospective and retrospective costing, although will often mainly focus on the latter as this is the most commonly used costing method for campaigns. The guide does not discuss other kinds of costing methods more often utilized for healthcare management costing, such as step down allocation methods. For the purpose of costing campaign-style COVID-19 delivery, and to facilitate a rapid increase in evidence around this, it also offers guidance on potential 'shortcuts'; what can be excluded and what cost components to focus on when the time available for a study is minimal. The guide is meant to improve standardization of campaign costing processes and reporting, and ultimately enhance the availability and comparability of evidence and to improve its use by country and global level stakeholders.

## WHAT IS AN IMMUNIZATION CAMPAIGN?

**An immunization campaign is defined as the mass administration of vaccine doses to a large population over a short period of time.** The strategy is applied to deliver vaccination to children otherwise missed by routine vaccines (e.g. the hard-to-reach and underserved groups and communities) or to older susceptible individuals who are not among the age groups targeted by the routine Expanded Program on Immunization (EPI) services. Immunization campaigns are often organized to **prevent or react to a disease outbreak**, to generate herd immunity in a given target group at the start of a new vaccine introduction (**catch-up campaign**) and to cyclically compensate for low routine coverage (follow-up campaigns). Immunization campaigns are often also referred to as **supplementary immunization activities (SIA)**. **Periodic Intensification of Routine Immunization (PIRI)** is another form of campaign-style delivery conducted on a more regular basis. Sometimes, in order to create efficiencies, multiple vaccines are **co-delivered** through the same campaign or a vaccination campaign can be combined with non-immunization interventions, such as nutritional supplementation, which can either be included or excluded from the campaign costing study (see Considerations for co-delivery campaigns). Although this guide will not explicitly discuss **child health weeks or child health days**, because of the similarities between campaigns and these delivery methods, many of the costing methods will be relevant to these initiatives as well.

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### Bottom-up costing

Detailed measurement of resource use (quantity of inputs multiplied by their unit prices), of which a proportion is utilized for and allocated to immunization.<sup>5</sup>





## WHAT IS AN IMMUNIZATION CAMPAIGN COSTING STUDY?

Our definition of an **immunization campaign costing study** is a study that collects, analyzes and interprets primary and secondary data related to the costs incurred by some or all actors involved in the organization and implementation of an immunization campaign. Compared with a top-down financial expenditure analysis, a campaign costing study collects information from campaign sites to better understand variations in cost across sites with different characteristics, to collect more detail to facilitate future planning of campaigns, and to understand the opportunity costs involved in conducting a campaign (namely health worker time allocation). Depending on the scope of the study, this could include the costs of planning and preparing for the campaign, the actual implementation of the campaign and any linked follow-up activities. A study can focus only on big ticket items such as labor costs and transport or also include items that are not as significant in driving the delivery cost of an immunization campaign, such as capital cost of equipment and vehicles. This document will guide a researcher when making such choices.

## HOW DOES CAMPAIGN COSTING DIFFER FROM COSTING OTHER TYPES OF IMMUNIZATION DELIVERY STRATEGIES?

Many users of this guide will be familiar with other methodological guidance documents for the costing of routine immunization programs. This guide is meant to complement existing guidance on immunization costing (see Table 1), and aims to align to the methodological consensus wherever possible. Where the guide deviates, it explains how and why this is necessary. The guide is accompanied by a one page summary that highlights the main differences between the guidance proposed in this document compared with the EPIC guide on routine immunization costing<sup>7</sup>, together with the sections to review for more information regarding the proposed approach for immunization campaign costing studies. Annex A indicates for each of the steps in this guide what sections in other guides are relevant to read for more information.

TABLE 1 Key costing guidance references

Source	Link	How do we use it?
#1 <b>Global Health Cost Consortium (GHCC):</b> Reference Case for Estimating the Costs of Global Health Services and Interventions, 2017 <sup>4</sup>	 GHCC	General costing principles
#2 <b>Centre for Health Economics:</b> The University of York: The main methodological issues in costing health care services, A literature review, Research Paper 7, 2005 <sup>5</sup>	 CHE	General costing principles
#3 <b>EPIC:</b> How to cost immunization programs: a practical guide on primary data collection and analysis. 2020. Cambridge, MA: immunizationeconomics.org/ Harvard T.H. Chan School of Public Health <sup>6</sup>	 EPIC	Immunization-specific costing methods
#4 <b>WHO:</b> Planning and Implementing High-Quality Supplementary Immunization Activities for Injectable Vaccines Using an Example of Measles and Rubella Vaccines, Field Guide, World Health Organization, 2016 <sup>7</sup>	 WHO	All campaign-related operations language
#5 <b>WHO-led Consensus Statement on Vaccine Delivery Costing:</b> Process, Methods and Findings, 2021 <sup>8</sup>	WHO (forthcoming)	Alignment on terminology

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## Immunization campaign

A time-limited and dedicated strategy for delivering vaccination to those otherwise missed by routine services or to older susceptible individuals who are not among the age groups targeted by the Expanded Programme on Immunization (EPI) services.<sup>7</sup>

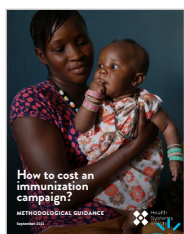
## HOW TO USE THIS GUIDE

**This guide offers methodological guidance on how to cost an immunization campaign, and is accompanied by supplementary materials for more guidance on data collection, standard datasets, practical examples and tools.**

This guide is a part of a set of documents to guide researchers when conducting an immunization campaign costing studies.

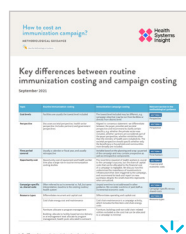
The other products are mentioned throughout this document, and links to their web sources are included. The document introduces and uses various costing terms, and the definitions of the terms in blue can be found in the glossary. At any point in time, you can use the navigation menu on the right to jump to the various sections of the guide. This is a standalone guide, but in order to keep the document short and focused, it refers to existing guides for all methodological applications for which broad consensus exists in the (immunization) costing community. Table 1 lists the main references that the guide refers to. A full list of all references referred to in this guide, can be found in the References section at the end of the guide. The [Glossary](#) summarizes and explains the key campaign and costing terms that are used throughout this guide.

## Set of documents included in this guide



1

**How to cost an immunization campaign? Methodological guidance**



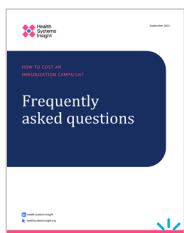
2

**Key differences between routine and campaign costing (one-pager)**



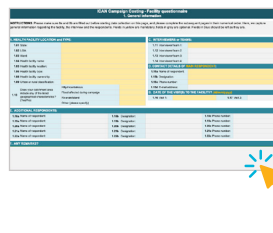
3

**Practical tips on data collection and reporting for immunization campaign costing studies**



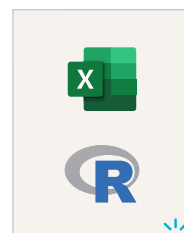
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**Frequently asked questions about campaign costing**



5

**Data collection and analysis tools for campaign costing studies and a user manual**



6

**Practical examples in Excel and STATA/R: annualizing capital costs, calculating unit costs, and calibration**

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FIGURE 1 Illustrative steps to conducting an immunization campaign costing study

# Relevant products  
(Outlined on the previous page)



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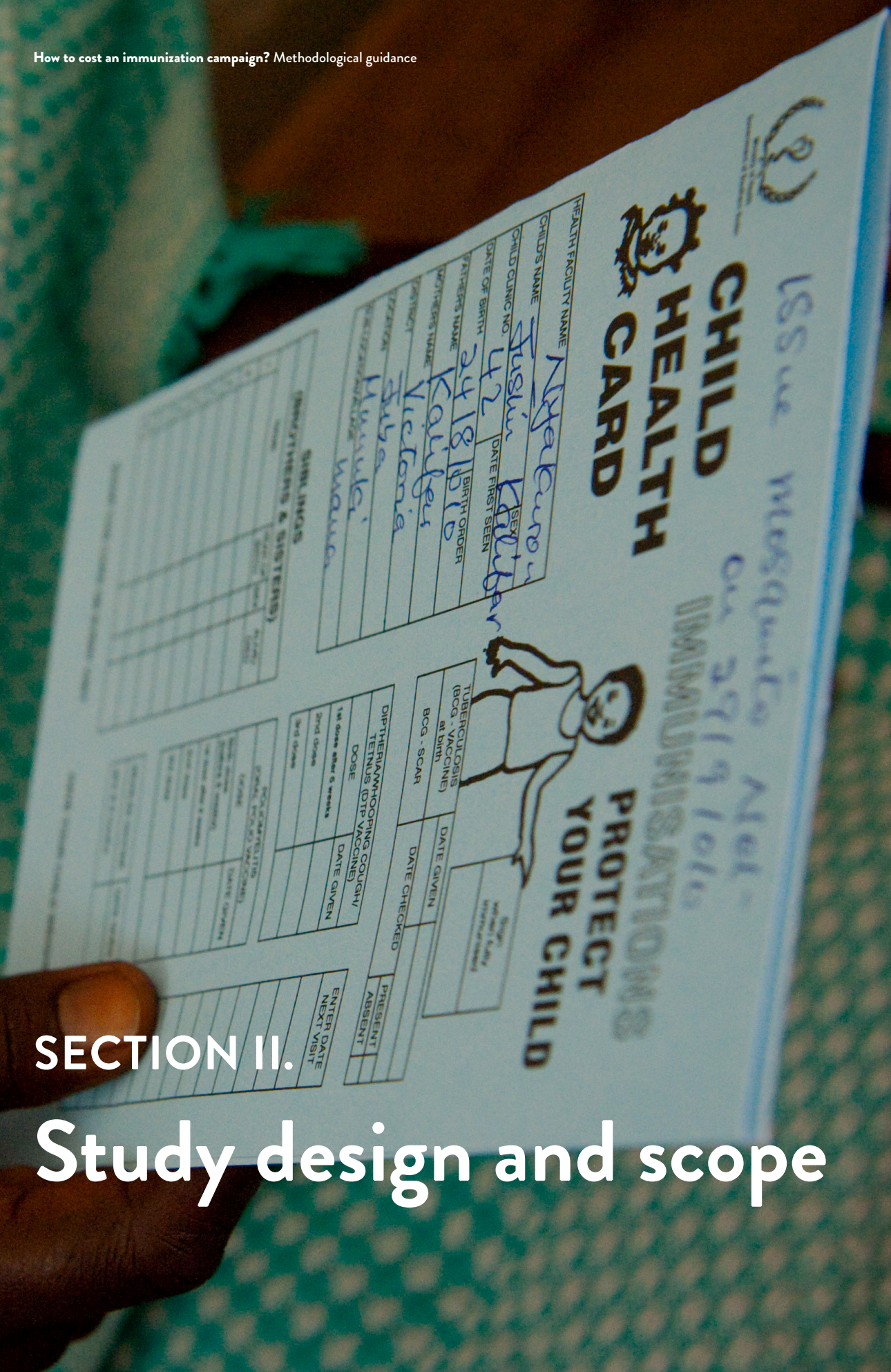
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# Study design and scope



## II. Study design and scope

### STUDY OBJECTIVE

**Clearly outlining the objectives of the study and the audience for the results will help you choose the right scope and limit the required data to collect to what is most critical to answer the research question at hand.**

The design of a costing study will greatly depend on the objective that the study is trying to achieve, which in turn is linked to the target audience for its results. For budgeting purposes, a country may want to obtain a ballpark figure for the total financial expenditures expected for an upcoming campaign, while longer term planners may be interested in the tradeoffs of allocating scarce resources to campaigns compared to routine or other delivery strategies. The EPI manager may want more granular data to better understand the differences in **cost drivers** between urban districts as compared to hard-to-reach areas, to inform funding allocation for future campaigns. Donors may want to better understand the additional funding required, on top of the routine budget, to be able to conduct a campaign. Development partners may want to compare the **full cost** of a campaign to other interventions aimed at boosting routine coverage that may render campaigns unnecessary.

**Cost evidence is more likely to be used if it addresses a specific policy question or operational issue.** Costing studies involving primary data collection are time-intensive and costly, and choosing a clear objective and linking this to the minimum scope for data collection required will help to ensure the costing study provides the best value for money. A focused discussion with the ultimate target audience and users of the data will help to narrow down the research question as much as possible. As part of the research design discussions, it is also important to discuss any additional campaign indicators that you wish to collect as well, for example to be able to compare the cost against the quality of the campaign.

### PERSPECTIVE

**For campaign costing studies, the provider perspective is usually taken, and as many campaigns in low- and middle-income countries are heavily donor-funded, the payer perspective will also often be relevant in these settings.** The perspective of a study is the point of view

considered for costs, i.e., by whom the costs were or will be incurred. Table 2 shows the three perspectives most relevant for immunization campaign costing studies, and what costs should generally be included for each. Although researchers generally agree on the broad scope of the definitions of the various perspectives, there are a number of areas where there is less clarity. For example, studies often talk about a **government perspective** while perhaps having meant the public health sector as the payer or provider. Additionally, they may only include costs incurred by the ministry of health, while ministries of education are often involved in campaigns involving school-aged children, and some campaigns involve the ministry of defence or ministries of local government.

**To avoid ambiguity and facilitate comparisons across studies, researchers should clarify the specifics of the chosen perspective in their reporting.** For instance, whether private sector providers are included or whether only public providers are part of the scope should be clearly stated. A costing study with a payer perspective should indicate whether costs will only be gathered from the ministry of health or also from other government entities. The relevance of the inclusion of costs incurred by other ministries than the ministry of health is context specific and depends on the level of contribution from these ministries.

#### BOX 1 Study perspective

In 2001, Abidjan experienced a yellow fever outbreak, and responded with a vaccination campaign to stop transmission. The study's objective was to determine the funds that Côte d'Ivoire would have to budget for a similar campaign in the future. The chosen perspective for the study was therefore that of the Ministry of Health. The study did not include the costs incurred by development partners that supported the campaign.

Source: Zengbe-Acray et al. (2009). *Coûts de la riposte vaccinale contre la fièvre jaune à Abidjan, 2001*. Santé Publique

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#### Cost driver

Line item or campaign activity that leads to significantly higher cost.<sup>6</sup>



#### Full cost

The sum of all costs associated with the campaign implementation, including the use of resources already part of the routine immunization system.<sup>6</sup>

For a study from a **societal perspective**, the researcher will need to specify whether just the beneficiaries or communities as a whole have been incorporated in the study. Costs incurred by beneficiaries are generally expected to be low as campaign strategies aim to bring the vaccination services closer to beneficiaries.

**Researchers should also specify whether the study will include costs incurred by domestic or international development partners that supported the campaign (and any private sector payers if relevant).** Possible confusion arises when support is channelled through the

government, and so the costs are incurred by the government while paid for by others, as opposed to having been used to make direct purchases. It is important to collect and allocate costs at the entity and level at which they were incurred. When funds are channelled through implementing partners, costs should be collected from the implementers, even though funding may have originated from different donors. Gathering costs from donors may be helpful for data triangulation purposes, but a costing study with a payer perspective is different from a resource tracking exercise.

**TABLE 2 Study perspectives and definitions**

Provider	Payer	Societal	Who incurred the costs?	Definition	Examples of costs
✓	✓	✓	Public health service providers	Costs incurred by facilities and their staff (specify whether public only or including private, faith-based and NGO clinics), including costs incurred by frontline providers	Time spent by all providers on planning and administering vaccines (and potential other interventions) during the campaign, including overtime, private cell phone use and private vehicle use for campaign purposes, taxis paid out-of-pocket to attend campaign-specific trainings
?	?	?	Private sector health service providers		
	✓	✓	Ministry of Health	Costs incurred at all levels of the Ministry of Health, for all administrative levels	Time and resources spent on submitting applications for donor support, planning meetings, trainings, monitoring and reporting, including conducting a post-coverage survey
	?	✓	Development partners	Costs incurred by all development partners in the health sector in a country, local NGOs and international donors	Staff involved in the campaign who are not paid by the MOH, vehicles used by partners for monitoring or vaccine distribution activities
	?	✓	Other government entities	Costs incurred by other ministries, including for example the ministry of education, ministry of local government, and ministry of defense, if relevant	Teachers' time and social mobilization activities conducted by other ministries in preparing for the campaign
		?	Households, communities	Costs incurred by e.g. the vaccine's beneficiary's caretaker, communities and institutions involved in the campaign	Participation in community meetings to mobilize the population
		✓	Beneficiary	Costs incurred by the vaccine's beneficiary	Time taken off work, waiting time, travel and other costs incurred for vaccination through a campaign

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## LEVELS

The study should also specify the levels for which costs were included. The **provider perspective** is sometimes ambiguous, as this is sometimes interpreted in a narrow sense as the level of implementation and service provision, and sometimes more broadly, including national level costs. Therefore, the study should report what **administrative levels** were included. At a minimum, an **immunization campaign costing study** should include the costs incurred at the campaign site, as well as other administrative levels of the ministry of health. Costs should be measured at the level of activity. For campaigns, this will often differ from the level of the payer. Campaigns are usually planned and financed centrally, but most time and resources will be spent at the lowest administrative levels and implementation sites (see example in Box 2). Depending on the country, one or more intermediate planning levels will be relevant between the national level ministry of health and the ultimate campaign implementers. In some settings, all campaign sites are managed by health facilities directly, whereas in others, districts organize **outreach** activities directly. The way the campaign is organized will thus determine which cost levels are most relevant.

### BOX 2 Distribution of costs by administrative level in Sierra Leone

Almost three quarters of financial delivery costs of the 2019 integrated MR campaign in Sierra Leone were incurred at the facility level while 16% were incurred by the district level government and partners, and the remainder by the national level government and partners. The share of economic costs incurred at facility level was slightly greater at 77%.<sup>2</sup>

## PROJECTION, PROSPECTIVE OR RETROSPECTIVE COSTING

By far, most campaign costing studies are conducted **retrospectively**, which means that data is collected **after the campaign has been completed**. The advantage of a retrospective costing study is that actual, instead of planned events, are costed, allowing the capture of any changes or unexpected circumstances in the implementation that made the team diverge from the initial microplan. A disadvantage compared to prospective costing is that data collection will still rely to a large extent on health workers' memory of the campaign events, and the longer the time period between the campaign's implementation and data collection, the greater the risk of recall bias. Where a routine immunization costing study would be able to reduce the risk of recall bias by using current practices as a proxy for past practices, for a campaign this cannot be done. However, the risk of recall bias for campaign costing studies would generally be considered lower than for routine studies, due to the exceptional nature of the intervention.

**Data collection for an immunization campaign costing study can also be conducted in advance of the campaign (projection) or during the campaign (prospective).** These methods can only be considered for **planned campaigns**, such as **catch-up**, **follow-up**, and **preventive campaigns**, as **outbreak response campaigns** will always have to be costed retrospectively. All methods have advantages and disadvantages (see Table 3) and judging the trade-off between the methods depends on the objective of the study. A cost projection can be useful to inform budgeting and planning for the campaign, though will not reflect any diversions from the planned approach or unforeseen costs. Prospective costing would give the most precise estimates on components such as staff time, transport cost and vehicle use, as data is collected while the campaign is taking place and the researcher can verify the time and resources spent on the observed activities. However, as prospective costing may distract health workers from their campaign activities, this may be perceived as too big of a burden. Moreover, while direct observation may provide the most accurate estimates of health workers' time, a costing study will still rely to a large extent on operational and financial reports, which will not yet be available during the campaign and most probably only become available several weeks or months after the campaign.

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#### Mobile vaccination posts

Posts required at distant villages and rural settlements with very small and/or disperse populations, set up for the time needed to complete the task (usually less than one day).<sup>7</sup>

#### Preventive campaign

National or subnational campaign aimed at creating an immunity barrier to reduce the risk of a disease outbreak in areas identified as vulnerable through a risk assessment.<sup>20</sup>

**TABLE 3 Advantages and disadvantages of using prospective, simultaneous or retrospective costing**

Timing of cost collection	Advantages	Limitations
<b>Retrospective costing</b>	<ul style="list-style-type: none"> <li>Greater focus on accurately estimating fiscal expenditures</li> <li>Especially suitable when looking for a realistic overall picture of the total costs</li> </ul>	<ul style="list-style-type: none"> <li>Lower level of precision for the non-fiscal costs incurred before and during the campaign, although dependent on how far after the campaign the data is collected</li> </ul>
<b>Projection costing</b>	<ul style="list-style-type: none"> <li>Greater focus on accurately estimating costs of activities leading up the campaign</li> <li>Especially suitable for campaigns with a great level of predictability, such as recurrent campaigns for which a lot of accurate data on the assumptions are already available (for example because of a retrospective study of an earlier, similar campaign)</li> </ul>	<ul style="list-style-type: none"> <li>Does not account for any unexpected events, and relies fully on the accuracy of the costing assumptions</li> </ul>
<b>Prospective costing</b>	<ul style="list-style-type: none"> <li>Greater focus on accurately estimating costs incurred during the campaign</li> <li>Especially suitable when analyzing the full financial and economic cost implications for front-line health workers and middle management, as well as when analyzing cost differences between delivery strategies</li> </ul>	<ul style="list-style-type: none"> <li>Time consuming and so might result in a smaller sample size (or a more expensive study)</li> <li>Front line workers are very busy and the study risks being disruptive</li> <li>Probably requires additional data collection at another point in time to get the financial expenditure data right</li> </ul>

To avoid the risk of recall bias, we recommend to start data collection no later than three months after the completion of the campaign, and to ensure completion of data collection within six months after. Although several studies have looked into the impact of the length of the recall period of patients on the accuracy of health intervention use data, little is known about the accuracy of recall for health workers. Researchers have different perspectives of what is an appropriate recall period, and the consultations with costing experts as part of the development of this guide yielded answers varying from 1-2 months to a full year as the acceptable recall period to interview health workers following a campaign. Generally, a longer recall period was considered acceptable in the case of incremental financial costing studies, for which financial records are the most important source, aided by strong planning and documentation practices. Records on staff time spent are typically not available, while this is the key driver of **economic costs**. Researchers therefore consider a short recall period (conducting interviews within three months after the completion of the campaign) most important for economic costing studies. In countries where several campaigns are conducted within a year, collecting data shortly after the campaign is even more important, so as to avoid confusion with campaigns that were held a few months later.

### FINANCIAL AND ECONOMIC COSTING

For a campaign costing study, **fiscal and financial costs are the most relevant type of costs to capture, followed by the opportunity cost of labor**. Fiscal costs are financial outlays without annualization of capital costs. Campaigns oftentimes trigger investments in additional or replacements of capital goods. The fiscal costs would include these items at their full purchase price, and then allocate a share of that to the campaign (if they will be used by the routine system too). For instance, cold chain equipment and vaccine carriers may be purchased for a campaign, and utilized afterwards for routine immunization delivery. The financial cost consists of the sum of all financial outlays (and the perspective determines who they were incurred by) plus an annual depreciation amount for capital items that were used for the campaign. Because financial costs would **annualize** the purchased items over their **useful life**, to account for the capital that is ‘used up’ in one year, fiscal costs will generally be greater than financial costs. However, it is important to note that neither would include capital investments in full when they are shared between the campaign and the routine (or broader health) system. Therefore, if the purpose is to compare against a campaign’s budget, a budget impact analysis should be conducted.

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**Useful life**

The period during which an asset or property is expected to be usable for the purpose it was acquired.<sup>6</sup>

Given the nature of campaigns, with the most intense use of resources occurring in a very short time span, the depreciation captured in the financial cost will be small. Although the allocation of depreciation will be small, the availability and quality of cold chain equipment and vehicles can be a major driver of the costs, quality and efficiency of a campaign, and we therefore do recommend tracking investments in these resources if they were triggered especially by the campaign (see Box 3). If it is a financial costing study, it will be helpful to report on the number and types of new purchases to contextualize the small but meaningful **capital costs**. However, we do recommend to exclude the cost of office equipment, furniture and general medical equipment (see Table 6) to reduce data collection and analysis time and focus on the inputs that drive campaign costs more.

The **economic or opportunity cost of a campaign can be significant, particularly the value of health worker time, donated materials and volunteer time**. Economic costs represent the value of all resources used for the campaign, regardless of whether there has been a financial outlay. Incorporating their value reflects that they are unavailable for use in other purposes. Capital inputs, such as cold chain or vehicle use, are both annualized and discounted. **Discounting** reflects the value of tying up capital in a particular use, rather than using it in its next best alternative use. This guide is accompanied by an Excel file that includes an example of how to annualize and discount capital items. The opportunity cost of capital of an immunization campaign will be small. However, the opportunity costs of labor and donated materials can be significant.

### BOX 3 Economic cost of the yellow fever campaign in Anambra, Nigeria

During the 2020 yellow fever campaign in Anambra state in Nigeria, personal vehicles belonging to facility staff were sometimes used to attend meetings and trainings, as well as to conduct supervision visits and transport vaccines. The campaign's budget covered their fuel. Although the capital cost of the use of these vehicles was small, their use played an important role in transporting staff and distributing supplies. The costs were included to compare such areas with others where vehicles had to be rented at a much more considerable cost.

Source: Costing study of the yellow fever campaign in three Nigerian states (ongoing)

## CAMPAIGN-SPECIFIC VERSUS SHARED COSTS

The **campaign-specific cost of the campaign is the sum of all resources used solely for the purpose of the campaign, while the shared cost represent an allocation of the value of resources that may be shared between the campaign and other uses**. Examples of campaign-specific costs include per diems paid to health workers for trainings and immunization activities and vehicles rented for campaign outreach. The shared costs of the campaign include labor costs of health workers that are regularly employed by the facilities which are organizing the campaign, and the value of using existing infrastructure such as cold chain equipment and vehicles already in possession of the district health office. Although a health worker's salary would have been paid no matter what, the share of his or her salary that can be attributed to the campaign can be significant. Classifying what is campaign-specific and what is not thus relies on an understanding of the existing capacity and routine service delivery practices. Table 6 shows what **resource types** are part of a campaign-specific or shared costs study.

The use of **shared versus campaign-specific costing depends on the purpose of the study, the main consumer of the costing data and whether the intention is to make cross-country comparisons**. Donors are likely most interested in the campaign-specific, or **incremental cost**, as this represents the additional funding required from donor and government resources to make the campaign happen. However, health workers' time, cold chain space and a vehicle's lifetime are limited resources. Any time spent by facility staff on a campaign is time not spent on administering other health services. Usually, all available vehicles are deployed full-time for the purpose of the campaign, meaning no other types of **outreach** or distribution are possible. Merely looking at campaign-specific costs ignores the significant **opportunity cost** of conducting a campaign—time and resources that would otherwise have been spent on the routine system. In countries where limited infrastructure is available, the campaign-specific costs are likely to make up a bigger share of the total costs than in countries with a strong existing health system, in which case a strong reliance on existing systems reduces the need for high incremental expenses. Estimates of the **full cost** of a campaign are therefore easier to compare between countries than campaign-specific cost estimates.

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### Capital cost

Costs for items that have a useful life of over one year. Reflects depreciation and potentially also opportunity costs.<sup>4</sup>

## TIME HORIZON

**For campaign costing, it is essential to clearly define the earliest and the latest point in time for which cost data related to the campaign will be captured.** This is an additional dimension of campaign costing which is not ordinarily employed in costing routinely provided immunization services. Campaign planning may start as early as two years before the campaign, when forecasting activities start, and grant applications for donor funding may need to be submitted. The cost of program management for the purpose of the campaign can start from the first time a surveillance officer has expressed the need for a preventative campaign or the first time a National Immunization Technical Advisory Group (NITAG) has brought up the introduction of a new vaccine using a catch-up campaign. However, it can be difficult to capture costs related to these very early inputs, particularly time spent on these activities when conducting an economic costing study. It is important to choose a clear point in time, such as an event, that respondents will remember, that is not too long ago, and ideally has been documented. Therefore, this guide recommends the use of the following start and end dates:

- **Start of campaign preparations:** the first meeting of the national or subnational planning committee.
- **End of the campaign:** final programmatic and financial reporting submitted to a higher administrative level.

**Based on these definitions and the actual implementation dates of the campaign, we can distinguish three relevant time periods to cost: before, during, and after the campaign (see Figure 2).** The first national-level planning meeting usually takes place about 6-9 months before the campaign launch date, the campaign itself can take place over the course of anywhere from a few days to two months, and the wrap-up phase usually lasts for about one or two months following the campaign. The way these dates are framed in the context of a campaign may differ (see example in Box 3). The advantage of these cut-off points is that they are clear and make it easy to compare data between studies. The disadvantage is an underestimation of the time spent on a number of preceding activities. For example, time spent on submitting Gavi applications and follow-up from this might all be excluded, but although this will not have been insignificant, it is not likely to be a major cost driver of the entire campaign. If the campaign implementation period has for some reason been interrupted, for example due to stock outs, you may want to track number the number of vaccination days in addition to the start and end date of that phase in order to arrive at a cost per day. This may also be relevant in the case of an **integrated campaign** where certain interventions were delivered only during a part of this phase.



Photo: Sahin Vaccine Institute/Oliver Asselin

### BOX 4 Study time horizon in Sierra Leone

When ICAN costed the integrated MR campaign in Sierra Leone, it used a different definition for the start date of the campaign for each administrative level, namely:

- **Facility:** The first time staff were invited for a meeting at district level to initiate planning for campaign.
- **District:** First meeting to initiate the pre-planning or microplanning for the campaign.
- **National:** First national-level planning meeting for the campaign.

Most of the delivery costs were incurred during (70% of financial costs, 64% of economic costs, and prior to the campaign (29% of financial costs and 34% of economic costs). Less than 1% of financial costs and 2% of economic costs were incurred after the campaign concluded. Facility- and district-level labor costs accounted for around 70% of all economic costs from before the campaign due to trainings, meetings and social mobilization activities.<sup>2</sup>

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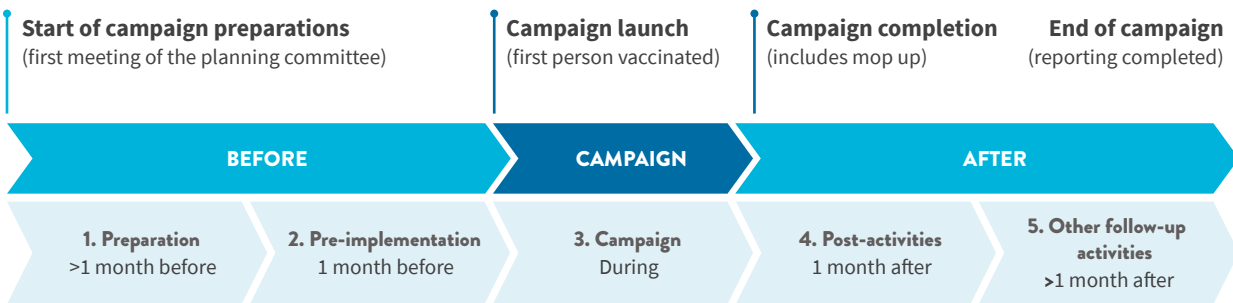
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### Integrated campaign

Full integration involves sharing of both operational and administrative functions and responsibilities and delivery of campaign interventions via primary health care (PHC). It occurs when interventions that were formerly delivered via independent health campaigns are delivered at the PHC level with other ongoing health services.<sup>17</sup>

**FIGURE 2** Relevant phases with approximate dates when costing a campaign



The before and after phases of the campaign are further broken down to demarcate the intensive pre-implementation (2) and post-activities phases (4), which we have fixed at a month before and after the campaign for comparability purposes. The time spent on the campaign at all levels usually intensifies right before the campaign, and a lot of wrap-up activities need to be performed directly after. Therefore, for studies that include economic costing data, the time spent by staff during these phases (2,3 and 4) will be most significant. For the other phases, we recommend focussing on big ticket items that drive financial costs, such as large, organized meetings and workshops. As there is a trade-off between lengthy questionnaires (and questionnaire fatigue) and the costs captured through the various questions, we do not recommend gathering week-by-week staff time data for phases 1 and 5.

### SAMPLING

Campaign costing studies usually have a fixed budget available, so that if a campaign was large, data can only be collected from a sample of sites. If the campaign being studied is a demonstration project, pilot or a small sub-national or outbreak response campaign, a costing study may be able to collect data from all sites that participated, something that is not normally possible for other immunization costing studies. But for a national immunization campaign, the number of campaign sites would be too large to collect data from every single one. The study itself may be focused on the cost in a given area or the cost at higher administrative levels (district and national level), which may reduce the scope to an acceptably small number of sites. However, most often the number of campaign sites of interest for the study (study population) will be too large for the available budget, in which case data can only be collected from a sample of sites.

The **sampling frame** is the total number of immunization campaign sites under study, from all administrative levels that are included. The size of the sampling frame may be all sites that participated in the campaign or just a subset of those. If a study is only interested in estimating the cost in rural areas, the sampling frame will exclude all urban areas. If a study is only interested in estimating the costs incurred at district level, then only the district offices will be included in the sampling frame. For a study that looks at all costs incurred at the district level and facility level, the sampling frame would include all relevant district offices and health facilities within these districts. Depending on the way a given campaign was implemented, and the objective of the study, the sampling frame may be even further disaggregated to, for example, consist of mobile campaign sites utilized for the campaign.

Campaign costing studies should use **stratified random sampling** to ensure sites of various characteristics are included. Immunization delivery costs at facilities are not normally distributed. The **unit cost** of delivering immunization at low-volume sites is generally higher than the unit cost at high-volume sites. As the purpose of a campaign costing study is usually to better understand cost variation across sites with various characteristics, the sample design should be such that sites varying characteristics are included. As much as possible, this should be done using stratified random sampling as opposed to **purposive sampling**. For example, creating a stratum for rural and a stratum for urban facilities will ensure that the sample includes a certain number of each, while still choosing sites randomly within each stratum. However, including specific remote or conflict sites may require purposive inclusion of those sites. Table 4 shows some examples of study objectives and what sampling method would be most suitable for each purpose.

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#### Outbreak response campaign

To reduce morbidity and mortality and prevent further spread of the outbreak of a vaccine-preventable disease by interrupting virus transmission locally. Usually starts with an initial rapid response in the affected areas that selectively targets unvaccinated and under-vaccinated people, and if required, can be followed by a larger scale effort targeting non-selectively, but based on outbreak epidemiology, immunity gaps and risk of virus transmission and spread. Also referred to as Outbreak Response Immunization (ORI) or reactive vaccination campaigns.<sup>18</sup>

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**TABLE 4** Examples of study objectives and appropriate sampling methods for campaign costing

Main objective of the study	Best sampling method	Considerations	Example
Estimate the average cost per dose to conduct the campaign	Potentially no sampling needed	For an estimate of the financial expenditures per dose, financial expense reports and coverage reports can be used	N/A – this is not an ingredients-based costing study
Estimate the cost of a subset of facilities in a set of selected district	Two-stage cluster sampling	First randomly select a certain number of districts, then randomly select a number of facilities in each of the selected districts.	In India’s MR campaign costing study, within each purposively selected state, districts were selected based on certain criteria, after which blocks were stratified and randomly selected within those districts
Analyze the cost drivers of a campaign	Random sampling	The more auxiliary information is available regarding the campaign sites, the smaller the sample needed to achieve a certain level of precision. See ‘sample size’ on how to collect data that can serve as a proxy for delivery cost to improve your sample. However, there is a potential risk that this method may result in undersampling of low volume sites.	Within each of the Nigeria states in the yellow fever campaign costing study, LGAs and wards were randomly selected, with the size of the catchment population serving as a proxy for the delivery cost (see Annex E for more detail)
Analyze differences in cost drivers and cost profiles between two groups e.g. urban and rural areas, high and low coverage areas, areas where the campaign was co-delivered with other interventions and areas where this was not the case	Stratified random sampling	Create a stratum for both types of areas, to ensure both are part of your sample.	In Sierra Leone, half the country co-delivered nutrition interventions while the other half of the country delivered only vaccines. The sample design was such that half of the randomly selected districts would include co-delivered districts.

**The sample size will depend on the budget ceiling for the study, the minimum level of precision required, the various sampling criteria that have been defined and the analysis methods that will be used.** If the study has a fixed budget, you can use estimates on the cost required to collect data from a given site in the sampling frame to derive the maximum possible sample size. Collecting from a large number of districts, but fewer facilities within each is likely to be more expensive than collecting data from fewer district but more facilities within each. If the sample is required to reach a certain level of precision, simulations of potential sampling strategies can guide the minimum sample size and ideal composition of the sample. To help researchers choose their ideal sampling design and size, the Harvard T.H. Chan School of Public Health (HSPH) has developed the **Sample Design Optimizer**.<sup>25</sup> Based on the defined sampling constraints and criteria, and using available proxy data that can serve as a predictor of the outcome under study, it can estimate the precision that a given sample design will provide. In the case of campaign costing studies, the most optimal proxy data would be costing data from a previous campaign (the cost of delivering a single dose from a given

campaign site) or if not available, the **delivery cost** per dose in routine. Annex E shows an example of the use of this tool for the selection of a stratified sample for a campaign costing study. For more complex sampling designs and methods, a statistician can be consulted.

**The sampling replacement strategy determines the method of replacing a site in the sample from which data cannot be collected.** There may several reasons why data cannot be collected from a given site that was selected as part of the original sample, from floods to security risks or it may turn out that a facility did not participate in the campaign after all. Facilities may have also closed down since the campaign or staff involved in the campaign may have been deployed elsewhere. The replacement strategy will indicate what reasons are sufficient for replacing a sample site, and what happens when this is the case. The study may treat it as missing data or may choose to replace the facility purposively with another one close by. However, just as with the original sampling strategy, random sampling is preferred as a replacement strategy as well.



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### III. Data requirements and costing methods

#### DATA SOURCES

**Campaign costing studies should use an efficient and meaningful mix of primary and secondary data, collected from different levels.** There is a trade-off between the time and cost associated with capturing granular **ingredients-based** data, and the value this adds to the study outcomes in terms of accuracy of the overall cost and cost variability. To conduct data collection in the most efficient way possible, data should be collected from the highest **administrative level** where reliable, granular data can be found. Although technically you could collect data on every single pen purchased at a given site, using financial expenditure reports to determine the cost of stationery is more time-efficient and is just as informative. While data such as time spent by health workers cannot be collected anywhere else than from health workers themselves. Quicker top-down costing methods can be used for some items, but ingredients-based costing should always be used for important cost drivers for which a **top-down costing** method would not yield meaningful data. An example of a combination of methods is provided in Box 5.

**Where data are not available from reports, or not available at a granular enough level, these should be collected from interviews, direct observation or diaries.**

Table 5 provides a list of relevant secondary data sources and primary data collection methods. Mapping out what data becomes available when can help the planning of the data collection process, inform the research protocol and help determine what to include in the data collection questionnaires. Figure 3 shows an example of when some key data could become available around the timing of a campaign, and. For more tips on collecting primary data through interviews and using questionnaires, please refer to the guide 'Practical tips on data collection and reporting for immunization campaign costing studies'.

#### BOX 5 Bottom-up and top-down costing

In 2002, the Mexican district of Monterrey administered DTP, pentavalent, MR, MMR, Td, BCG and OPV through an intensive vaccination day at facilities, followed by a 5-day house-to-house strategy. A prospective costing study aimed to estimate the cost of OPV vaccination, including the training and preparation week. The study used a combination of bottom-up and top-down methods to estimate the costs:

Bottom-up	
<b>Personnel</b>	Number of personnel × time dedicated exclusively to polio vaccination × daily salary
<b>Volunteers</b>	Number of volunteers × time dedicated exclusively to polio vaccination × Mexican hourly unskilled wage rate
<b>Promotion &amp; publicity</b>	Number of leaflets and posters × unit cost
Top-down	
<b>Supplies/stationery</b>	Fixed cost for stationery equipment (instead of using an estimation of the number of items × unit cost)
<b>Maintenance/overheads</b>	A share of the total maintenance costs were allocated to polio

Source: Mascarenäs, A. et al. (2005). *Polio immunization policy in Mexico: economic assessment of current practice and future alternatives*. Public Health

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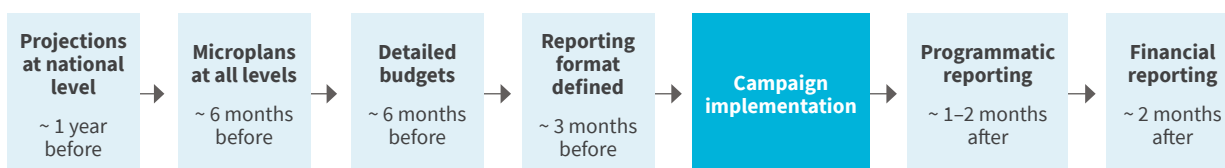
#### Bottom-up costing

Detailed measurement of resource use (quantity of inputs multiplied by their unit prices), of which a proportion is utilized for and allocated to immunization.<sup>5</sup>

#### Top-down costing

Allocates expenditures made by higher levels of the system or within a facility (e.g., hospital) down to lower levels based on a series of allocation rules.<sup>4</sup>

FIGURE 3 Example timeline of key data points required for costing



**TABLE 5 Data sources relevant to campaign costing studies**

Data source	Where to collect from	When to collect	Why collect
<b>Secondary data sources</b>			
Campaign budget	National EPI, districts, and partners, Gavi application for campaign support	Rough estimate available 1-2 years before, revised budgets closer to 6 months before	Usually covers all line items part of the incremental financial costs  <i>Relevant resource types:</i> Per diems, transport and fuel, IEC and other printing costs, stationery and other supplies, workshops and meetings, communication
Campaign microplans and target population lists	National EPI and districts	Roughly 6 months before the campaign	To understand the relevant level for each activity, usually includes expected commodities required at each level and number of persons targeted for the campaign
Vaccine price, price of vaccine injection and safety supplies and other commodities/health interventions	National EPI, UNICEF and/or Gavi	Once vaccines have been procured, data usually available several months before the campaign	For the costing of the service delivery line items  <i>Relevant resource types:</i> Vaccine injection and safety supplies, vaccines
Operational guidelines of the campaign (incl. social mobilization strategy, etc.)	National EPI and/or partners	Several months before the campaign	To better understand the campaign proceedings for the study design
Training schedule and meeting participants lists	National EPI and/or partners	Several months before the campaign	To understand the expected types and numbers of trainings and meetings conducted at each level, as well as their timing  <i>Relevant resource types:</i> Paid labor, volunteer labor
Facility list for sampling	Administrative levels and all facilities within can be collected from the MOH	As soon as the sampling strategy has been developed	Any form of randomized sampling will require a full sampling frame
Data that can serve as a proxy for the delivery cost per dose data for a campaign site	National MOH / EPI (e.g. number of outpatient visits, size of each facility's catchment area)  Other sampling data such as the proportion of the population living in rural/urban areas can be collected from the country's statistic's bureau	As soon as the sampling strategy has been developed	To make the sample 'smarter'
Salary, benefits and allowances	Ministry of Health	Any time	For the paid labor line item as well as to determine the opportunity costs of volunteer time  <i>Relevant resource types:</i> Paid labor, volunteer labor
Daily rate of a laborer	Ask at relevant district or check country level minimum wage statistics	Any time	To cost non-health staff volunteer time  <i>Relevant resource types:</i> Volunteer labor
Committee and other campaign meeting participants lists	All levels	Before, during and after the campaign	To determine staff time  <i>Relevant resource types:</i> Paid labor, volunteer labor
Tally sheets and/or daily summaries	Facility or district level	During or after the campaign (though tally sheets may not be kept once summaries have been made)	To establish the denominator for the cost per dose delivered and to allocate cost by intervention based on the proportion of volume delivered

**TABLE 5 (CONTINUED) Data sources relevant to campaign costing studies**

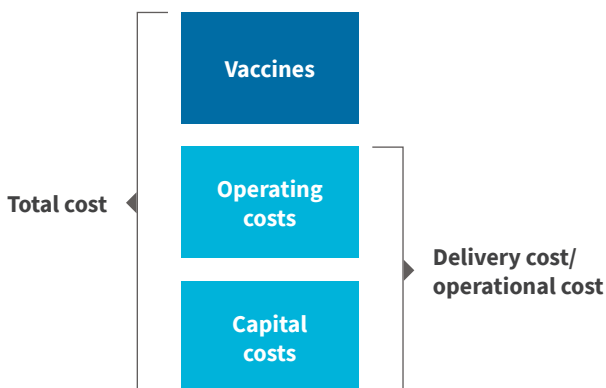
Data source	Where to collect from	When to collect	Why collect
Vehicle logbooks	Facility or district level	During or right after the campaign	To determine the milage and fuel usage of vehicles used for the campaign <i>Relevant resource types:</i> Transport and fuel, vehicles
Fuel prices, electricity unit costs, currency exchange rates	Use the monthly average exchange rate for the month of the campaign <a href="http://www.x-rates.com/average/">www.x-rates.com/average/</a> Fuel prices from <a href="https://www.globalpetrolprices.com/">https://www.globalpetrolprices.com/</a>	Just after the campaign has taken place to utilize the rates relevant to that period	<i>Relevant resource types:</i> Transport and fuel
Inventory/equipment directory for <b>replacement prices</b> and useful life of cold chain equipment and vehicles	District or national level, partners or our useful life table (Annex C)	Anytime though targeting specific equipment following data collection on those that were used during the campaign	To calculate capital costs of cold chain equipment and vehicles <i>Relevant resource types:</i> Cold chain equipment, vehicles
Coverage report	District or national level	1-2 months after the campaign	To verify the data on doses delivered against the targets, to calculate cost per target, to compare the costs of the campaign against the coverage achieved
Campaign financial expenditure report	National, district, facility level	Available 1-2 months following the completion of the campaign	To extract data for items that will be costed top-down, and triangulation for items that were costed bottom-up <i>Relevant resource types:</i> Per diems, transport and fuel, IEC and other printing costs, stationery and other supplies, workshops and meetings, communication
<b>Discount rate</b>	Standard: use 3% for global comparability unless there is a specific reason to deviate, <sup>1</sup> such as if comparability against other country studies requires the use of another rate as per local guidance	N/A	To calculate the opportunity costs of capital used for the campaign, for economic costing studies only
<b>Primary data sources</b>			
Interviews	Interviews at facilities, districts, national level using questionnaires	Before: for estimates During: for actuals After: for actuals with recall bias	To determine staff time by activity for the paid and volunteer labor line items <i>Relevant resource types:</i> Paid labor, volunteer labor
Diary (only for prospective costing)	Health workers	Share template a month before the campaign starts, collect afterwards	To determine staff time by activity for the paid and volunteer labor line items <i>Relevant resource types:</i> Paid labor, volunteer labor
Direct observation	Campaign sites at various levels, particularly at the immunization sites	During the campaign	To log how health workers spend their time on certain activities during the campaign <i>Relevant resource types:</i> Paid labor, volunteer labor

1 Although the EPIC guide and GHCC recommend 3%, some other sources recommend the use of a 5% discount rate for low and middle income countries: Haacker M, Hallett TB, Atun R, On discount rates for economic evaluations in global health, Health Policy and Planning, Volume 35, Issue 1, Pages 107–114, February 2020

## RESOURCE TYPES

**Resource types (or line items) are the inputs required to implement immunization activities, from staff time and transport costs to the vaccines themselves.** Immunization costing studies usually split the total cost of the campaign between the cost of the vaccines that are administered and the costs associated with their delivery. The costs of the vaccines themselves are more predictable, as these are often procured at standard prices. Therefore, the key challenge of an immunization costing study is usually to accurately estimate the **delivery cost** line items that are relevant to a campaign. We define delivery costs as those costs associated with delivering immunizations from their arrival location in country to target populations. Delivery costs therefore exclude the cost of the vaccines themselves and international freight and insurance (Figure 4).

**FIGURE 4** Definitions of different types of costs



**Table 6 provides a list of relevant resources to implement a campaign, and what should be included as part of the campaign-specific and shared costs.** Some resource types or parts of resource types are recommended to be excluded based on experiences from campaign costing studies, and the difficulty, cost and time associated in capturing data on a given activity, as well as the extent to which it drives the overall cost and cost variability between sites. Note that the **perspective** determines whether costs would be considered financial or economic costs. For example, if donors were part of the perspective (**payer**, see Perspective section), then their support would be a part of the financial cost, while if they were excluded then their support would be considered donations and only included as part of the **economic costs**.

### BOX 6 Annualization of capital costs

Capital costs should be annualized to reflect the expected life of capital inputs, and economic costing studies will discount capital to reflect people's time preference. Financial costing studies will use straight line depreciation (zero discount rate), while economic costing studies should use a discount rate of 3%, unless there is a specific justification for another rate.

$$\text{Annualization factor} = \frac{(1+r)^n - 1}{r \times (1+r)^n}$$

$r$  = discount rate

$n$  = number of years of useful life (period during which an asset or property is expected to be usable for the purpose it was acquired; may or may not correspond with the item's actual physical or economic life)

Source: How to cost immunization programs, EPIC

**Capital items are resources with a useful life greater than one year, while operating costs are the costs of inputs that are used frequently and are used up in one year.** Obvious examples of capital items are buildings, vehicles, and cold chain equipment. Examples of operating costs include health worker time, supplies, fuel, and utilities. Operating costs are often referred to as **recurrent costs**. However, for the purpose of a campaign, not all operating costs are recurrent costs. Health workers receive monthly payments, but the printing of tally sheets, radio jingles and the purchase of vaccine supplies may be one-off campaign-specific expenses. That is why this guide prefers the use of the term operating costs, covering both the **incremental expenses** for the campaign as well as the use of routine recurrent resources.

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### Delivery cost

Costs associated with delivering immunizations to target populations, exclusive of vaccine costs. Also referred to as operational costs.<sup>24</sup>

### Shared costs

Costs that cannot be directly traced to services or products in an economically feasible way,<sup>5</sup> i.e. costs that are shared between the campaign and routine or between immunization and the broader health system.

**TABLE 6 Relevant resource types**

Definition	Campaign-specific (financial or economic costs, depending on the perspective)	Shared costs (economic costs)	How to estimate
<b>Operating costs</b>			
<b>Paid labor</b>			
Allocation of salaried labor to campaign-related activities. Salaries are fully loaded thus including any regular fringe benefits.	Any additional payments made to health workers for overtime, or to other types of workers to help with campaign activities	Allocation of salaried labor of health care workers engaged in campaign-related activities. Salaries (or monthly stipends in the case of e.g. community health workers) should reflect benefits and allowances. This excludes auxiliary staff such as cleaners, cooks, security staff, etc.	Salaries: for public facilities, collect grade level at facility and grade scales (fully loaded salaries) from national level. For private facilities, collect all at facility level or if not possible, estimate based on government salary scales with a potential adjustment factor
<b>Volunteer labor</b>			
Estimation of the market value of volunteer labor used for campaign-related activities. Includes unpaid health workers.	Economic value of volunteer labor used for campaign-related activities, estimated using average day laborer's wage or average salary for cadre if relevant.	N/A	Salaries: for unpaid health workers, collect grade equivalent, for volunteers, collect day labor rate estimates from the district
<b>Per diem and travel allowances</b>			
Any allowances paid to campaign staff and volunteers for campaign-related activities.	Allowances paid to all persons engaged in campaign-related activities.	N/A	Per diem rates per staff per day per activity from reports or through questionnaires. Use average fuel usage per mile/kilometer data from the country to quantify fuel cost
<b>Vaccines (and other health commodities in case of co-delivery campaigns)</b>			
Cost of vaccines and other drugs, supplements or commodities in case of co-delivery campaigns.	Value of vaccines (including insurance, freight and wastage) and other health campaign commodities procured and/or donated and used for the campaign, including wastage.	N/A	Opening stock – closing stock * vaccine price (or price of other drugs/commodities)  (If stock data is unavailable, use vaccines administered * campaign wastage rate)
<b>Vaccine injection and safety supplies</b>			
Cost of supplies used for the administration of vaccines for the campaign.	Value of auto-disabled syringes, diluent, reconstituting syringes, safety boxes, cotton wool, hand sanitizer, disposal bags, and/or other supplies used and wasted for administration of vaccines for the campaign.	N/A	Opening stock – closing stock * price of supplies  (If unavailable, estimate supplies used based on vaccines administered)
<b>Stationery and other supplies</b>			
Cost of stationery and other supplies for the campaign.	Value of stationery and other supplies used for the campaign.	N/A	Aggregate amounts from financial expenditure reports at each level
<b>Transport and fuel</b>			
Cost of using public transport, hiring vehicles, and purchasing fuel for the campaign.	Cost of bus fares, plane travel, boat travel, taxis, vehicle, motorcycle and/or boat hire, and the cost of fuel for campaign-related transport.	N/A	Expenses on rental vehicles from financial expenditure reports at donors or MOH  Use of public transport: ticket prices and taxi fares  Use of owned and rented vehicles: Distance travelled for each activity (estimating fuel use per km) or liters consumed (estimating fuel use per liter) from vehicle logbooks or by asking respondents  Fuel cost for the incinerator

TABLE 6 (CONTINUED) Relevant resource types

Definition	Campaign-specific (financial or economic costs, depending on the perspective)	Shared costs (economic costs)	How to estimate
<b>Vehicle maintenance</b>			
Cost of maintaining vehicles used for campaign-related activities.	Value of maintaining vehicles (of all types) used for campaign-related activities for the period of the campaign.	N/A Recommendation to exclude regular maintenance (conducted outside of the campaign timeframe)	Capture expenditures incurred in the last 30 days before the start of the campaign, during the campaign and in the 30 days after the campaign
<b>Cold chain repairs and energy costs</b>			
The cost of repairing existing cold chain equipment and running the cold chain.	Cost of ice, fuel (or butane, gas, etc.) for cold chain equipment used especially for the campaign, any repairs performed especially for the campaign, rental of cold chain equipment (and solar panels and generators) especially for the purpose of the campaign.	The value of the portion of cold chain maintenance and running costs for both existing and donated items for the campaign.	Expenditures on cold chain repairs in the last 30 days before the start of the campaign and during the campaign.  Expenditures on renting of generators for the purpose of the campaign  Amount of fuel used to run the cold chain * unit prices of the type of fuel used  If grid electricity was used: no. of campaign days in a month as a % of monthly bill
<b>IEC and other printing costs</b>			
The cost of campaign-related information, education and communication (IEC) materials for the campaign.	The value of printing immunization cards, developing advocacy and social media materials, posters, tally sheets, radio jingles, tv ads and other materials that are campaign-related.	N/A	Expenditures at all levels on printing tally sheets, vaccination cards, training materials, radio jingles, tv ads, etc. for the purpose of the campaign. If possible through expenditure reports, otherwise from respondents
<b>Utilities</b>			
Costs related to building overheads, including maintenance, and utilities (but excluding cold chain energy costs).	N/A (Technically could include the opportunity cost of buildings not normally used for a campaign that are not normally used for immunization sessions such as community centers and churches, and the cost of energy used outside of normal facility operating hours, but as these is small, we recommend to exclude this)	Exclude (except when cold chain specific, see 'Cold chain repairs and energy costs'): the share of the building space allocated to a campaign of a limited number of days is small (less than 1% of the total financial and economic costs)	N/A
<b>Workshops and meetings</b>			
Costs related to organizing campaign-related workshops, trainings and meetings.	Costs related to workshops, trainings and meetings organized for the campaign, including the venue and refreshments provided on the day, but related transport costs, per diems or printing of training materials are included under other resource types.	If only a small part of the time of a regular meeting was dedicated to the campaign, exclude these costs.	Expenses on venue hire, food and refreshments, renting a projector, etc.
<b>Communication</b>			
Costs related to purchasing airtime and mobile data for the purpose of the campaign.	Value of airtime and mobile data purchased (or donated) for the purpose of the campaign	Exclude: the share allocated to a campaign of a regular phone bill or internet connection is very small	Expenses on data and airtime for the purpose of the campaign, ask for campaign activities this was most used for  Exclude regular landline costs
<b>Other operating costs</b>			
Other recurrent costs for campaign-related activities that are not included in the above line items.	Other incremental costs for campaign-related activities.	Other recurrent costs for which no financial outlays were incurred given the perspective, and for which a portion should be allocated to the campaign	Third party providers for e.g. waste management

TABLE 6 (CONTINUED) **Relevant resource types**

Definition	Campaign-specific: in case of fiscal costing only	Shared costs: financial and economic costing	How to estimate
<b>Capital costs</b>			
<b>Cold chain equipment</b>			
Value of all cold chain equipment used to store and transport vaccines. A share of solar panel and generator costs used to power the cold chain are also included here.	Share of the value of newly purchased cold chain equipment (not annualized or discounted)	Share of the annualized (and in case of economic costing also discounted) cost of cold chain equipment used to store and transport the campaign's vaccines for the period of the campaign	% of cold chain (overall) used for the campaign  Number of items and brand  Annualize using price and useful life data from district or national level or use <a href="#">Annex C</a>
<b>Vehicles</b>			
Value of all vehicles and modes of transport (could include cars, motorcycles, boats, bicycles, tricycles, camels)	Share of the value of vehicles that were newly purchased for the campaign (not annualized or discounted)	Share of the annualized (and in case of economic costing also discounted) cost of vehicles attributed to the campaign	Use of owned vehicles: Distance travelled for each activity (ask or derive from fuel use)  Annualize using price and useful life of vehicles (refer to useful life doc)
<b>Other equipment/ capital</b>			
Value of other equipment, such as computers, printers, peripherals, phones, furniture, incinerators, other medical equipment used for campaign-related activities or any other capital investments (e.g. mobile clinics).	Share of the value of other equipment that was newly purchased for the period of the campaign (not annualized or discounted)	Exclude: technically includes the economic value of other equipment utilized for the period of the campaign, but as the depreciation and opportunity cost for these items is very small, we recommend to exclude this <sup>2</sup>	Exclude other equipment (such as laptops, phones, thermometers, etc.)  We recommend excluding incinerator costs, but when included anyway, ask about the waste disposal method, whether an on-site incinerator was used, and allocate based on fuel use and to Waste management
<b>Buildings</b>			
Value of building space used to deliver and store vaccines.	N/A	Exclude: the depreciation and opportunity costs that can be allocated to the campaign is insignificant	

<sup>2</sup> The costing study of the 2019 integrated MR campaign in Sierra Leone showed that 'other equipment' accounted for less than 1% of the cost across all facilities and district health offices, and only 0.001% of the overall economic cost.

## CAMPAIGN ACTIVITIES

The costs related to the implementation of the campaign should be organized around groups of activities. Table 7 provides a definition of each of the **campaign activities** that are typical for the preparation, implementation and wrap-up of an immunization campaign, and what components should be included or excluded as part of each. The activity list has been adapted from those used for the EPIC studies and ICAN studies. Although many other studies follow similar definitions of activities, the actual components that are included or excluded from the costing study differ a lot across studies (see Box 4 for an example). Annex D gives an overview of what **resource types** should be included for what campaign activities. We recommend to follow these activities and resource type definitions to facilitate comparisons across studies. Nevertheless, some activities may need to be contextualized, for example based on the specific **delivery strategies** deployed for a given campaign.

Reasons why certain components are recommended to be excluded:

- a** = not campaign-specific
- b** = too far outside of the immediate timeframe of the campaign
- c** = labor-intensive to gather information on while costs collected are likely small and not expected to be big drivers of cost variation
- d** = captured under another activity

### BOX 7 Defining campaign management costs

Campaign management costs are a good example of a campaign activity that requires clear boundaries. From the moment a planning committee is established, planning meetings usually take place frequently, and the composition of the group and the frequency of meetings are often easy to remember. Many larger meetings will also have had a dedicated budget for expenditures on venue hire and refreshments, which are usually well-recorded. However, planners will have spent time during their regular office hours on program management activities as well. Where do we draw the line?

This guide recommends to focus on the expenses incurred for large campaign-dedicated meetings held before, during and after the campaign, staff time spent on campaign management during the campaign and the month before and after, and exclude any time spent on regular, smaller meetings outside of this time period (see Table 7).

Source: How to cost immunization programs, EPIC

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### Resource type

The inputs required to implement immunization program activities, and can be further broken down into capital items and operating items. Also referred to as 'resource type'.<sup>6</sup>



Photo: U.S. Navy by Mass Communication Specialist 1st Class Kyle Stecker

**TABLE 7 Definition of campaign activity groups**

Campaign management			
Definition	What tasks and resources are included	What tasks and resources can be excluded	Administrative level
Planning, budgeting, managing the immunization campaign.	<p><b>Overall:</b> Expenses on large, organized campaign-dedicated meetings before, during and after the campaign, printing plans, budgets, operational guidelines, etc.</p> <p><b>Pre-implementation, during the campaign, and post-activities:</b> an estimate of time spent in regular committee meetings, estimate of time spent on managing the campaign, travel and airtime expenses.</p>	<ul style="list-style-type: none"> <li>■ General management of the immunization program and health system <b>a</b></li> <li>■ Activities that took place before the official planning stage was launched (see: Start date) such as early vaccine forecasts, preparing Gavi applications, and desk time spent on campaign management ahead of the campaign start date <b>b</b></li> <li>■ Time spent by facility staff on the campaign more than a month before or later than a month after the campaign <b>c</b></li> </ul>	All
Vaccine collection, distribution and storage			
Definition	What's included	What can be excluded	Administrative level
Collecting vaccines and other campaign commodities at the airport or other distribution points, storing vaccines in national or subnational cold stores, distributing vaccines down to the facility, and to the temporary campaign sites. If the campaign is co-delivered with other interventions, the category can include collection, distribution and storage of other drugs, supplements and commodities as well, following the same principles.	<p><b>Before:</b> Customs clearance, transport cost for and staff time spent on distributing down to lower levels. Purchase or rental of cold chain equipment especially for the campaign. Capital cost of existing cold chain equipment.</p> <p><b>During:</b> Cost of running the cold chain, capital cost of existing cold chain equipment, staff time spent on collecting and distributing vaccines.</p> <p><b>After:</b> Transport cost for and staff time spent on collecting vaccines after campaign.</p>	<ul style="list-style-type: none"> <li>■ Cold chain costs prior to the campaign, because it is often hard to capture the exact date that vaccines arrived at the facilities <b>c</b></li> <li>■ Time spent by staff on the distribution of vaccines more than a month ahead of the campaign <b>c</b></li> <li>■ Oftentimes the vaccines and staff travel together to the temporary campaign sites, in which case this cost is allocated fully to service delivery instead of vaccine distribution. <b>d</b></li> </ul>	All
Cold chain maintenance			
Definition	What's included	What's excluded	Administrative level
Maintaining and repairing the cold chain for the purpose of the campaign.	<p><b>Before &amp; during:</b> Any financial expenditures that can be considered campaign-specific i.e. performed during the campaign or within the 30-day period before or after the campaign, and any staff time associated with that.</p> <p><b>After:</b> N/A</p>	<ul style="list-style-type: none"> <li>■ Regular annual maintenance activities <b>a</b></li> </ul>	All
Training			
Definition	What's included	What's excluded	Administrative level
Attending and/or providing campaign-related training, including topics such as administering vaccines, storage and logistics, record keeping, AEFI management, social mobilization, microplanning, supervision, etc.	<p><b>Before:</b> Expenditures on printing training materials, per diems and travel expenses for participants and trainers, venue hire, refreshments, staff time.</p> <p><b>During &amp; after:</b> N/A</p>	<ul style="list-style-type: none"> <li>■ Regular routine immunization trainings will be excluded <b>a</b></li> <li>■ If a training in the lead up to a catch-up campaign touches on the routine delivery of that same vaccine as well, the training will be included and considered fully campaign-specific</li> <li>■ Building costs of using existing spaces to conduct trainings should be excluded (slack resources) <b>c</b></li> </ul>	All

TABLE 7 (CONTINUED) Definition of campaign activity groups

Social mobilization and advocacy			
Definition	What's included	What's excluded	Administrative level
Mobilizing and sensitizing the community and households, conducting events, and advocating for vaccination.	<p><b>Before:</b> Resources spent on holding community meetings, printing flyers and educational materials, the cost of television and radio time, as well as the cost of hiring actors, purchase of equipment (e.g. megaphones) and associated supplies (e.g. batteries), the costs of staff transport to and from activities and any per diems received by staff and incentives given to participants of community meetings. For social mobilization meetings in the month ahead of the campaign an estimate of staff time is also included.</p> <p><b>During:</b> All items listed under 'Before' plus time spent by social mobilizers on other, more informal social mobilization activities during the campaign.</p> <p><b>After:</b> N/A</p>	<ul style="list-style-type: none"> <li>■ Time spent on the organization and preparation of such meetings (hard to remember and likely not significant)</li> <li>■ Speeches of the president and other government officials etc. (hard to capture senior government officials' time and not likely a replicable expense for future campaign) <b>c</b></li> <li>■ Capital cost of equipment such as megaphones which were not purchased specifically for the campaign (as these will be very minor costs) <b>c</b></li> </ul>	All
Supervision			
Definition	What's included	What's excluded	Administrative level
Supervising subordinate or peer health or community workers.	<p><b>Before &amp; after:</b> N/A</p> <p><b>During:</b> Time spent by district or team supervisors visiting facilities and campaign sites, and associated travel expenses, per diems, and airtime.</p>	<ul style="list-style-type: none"> <li>■ Regular supervision activities that are not campaign-related <b>a</b></li> </ul>	All
Service delivery: facility-based/fixed permanent vaccination posts			
Definition	What's included	What's excluded	Administrative level
Administering the vaccine to children within the facility/compound.	<p><b>Before &amp; after:</b> N/A</p> <p><b>During:</b> Finger marking, staff time spent waiting while not conducting other routine activities, per diems, and the cost of the vaccines (administered as well as wasted).</p>	<ul style="list-style-type: none"> <li>■ Health worker time and resources spent on traveling between home and the facility (unless a societal perspective is chosen) <b>a</b></li> </ul>	Facility level
Service delivery: fixed temporary vaccination posts			
Definition	What's included	What's excluded	Administrative level
Traveling to and from temporary fixed sites outside of the facility, the act of administering the vaccine and supporting vaccine administration (crowd control, screening). Could include school-based, sites at markets, churches, community centers or using mobile clinics.	<p><b>Before &amp; after:</b> N/A</p> <p><b>During:</b> Introduction briefing at schools, waiting time at schools, travel time and costs to/between schools, cost of a mobile clinic if applicable, per diems, and the cost of the vaccines that were delivered or wasted.</p>	<ul style="list-style-type: none"> <li>■ Preparing the list of targeted children for schools (see Campaign Management) <b>d</b></li> <li>■ Following up on AEFIs <b>c</b></li> <li>■ Count health worker time traveling from home to schools only if this is significantly greater than the travel time to the facility</li> </ul>	Facility level
Service delivery: mobile/outreach			
Definition	What's included	What's excluded	Administrative level
Traveling to and from a non-facility non-fixed location and the act of administering the vaccine there. Includes support such as crowd control and screening.	<p><b>Before &amp; after:</b> N/A</p> <p><b>During:</b> Time spent and travel costs incurred while moving around in the community from site to site or from house to house, per diems, and the cost of the vaccines that were delivered or wasted.</p>	<ul style="list-style-type: none"> <li>■ Regular routine outreach activities <b>a</b></li> </ul>	Facility level (sometimes district)

TABLE 7 (CONTINUED) Definition of campaign activity groups

Service delivery: mop-up/sweeping			
Definition	What's included	What's excluded	Administrative level
Traveling to and from a non-facility location and the act of administering the vaccine of targets not immunized during the campaign at that location. Includes support such as crowd control and screening.	<p><b>Before &amp; during:</b> N/A</p> <p><b>After:</b> Time spent on administering vaccines on the days that follow the planned campaign dates, travel time and expenses to and from these places, per diems, and the cost of the vaccines that were delivered or wasted.</p>	<ul style="list-style-type: none"> <li>Analyzing reports to determine if and where a mop up session should be conducted (see Campaign Management, Record-keeping, HMIS, monitoring and evaluation) <b>d</b></li> </ul>	Facility level
Waste management			
Definition	What's included	What's excluded	Administrative level
Disposing of sharps and infectious non-sharp waste.	<p><b>Before:</b> N/A</p> <p><b>During &amp; after:</b> Preparing a burn pit for the purpose of the campaign, incinerating waste on-site, fuel for incinerators, collecting safety boxes for transport to waste disposal site, transporting campaign waste to other waste disposal sites, cost of a third-party waste disposal company.</p>	<ul style="list-style-type: none"> <li>The act of disposing syringes in safety boxes at the site where vaccines are administered is included with service delivery time <b>d</b></li> <li>Training on waste management (see: Training) <b>d</b></li> <li>Share of the value of an existing incinerator (negligibly small cost) <b>c</b></li> </ul>	Facility and/or district level
Adverse event(s) following immunization (AEFI) management			
Definition	What's included	What's excluded	Administrative level
Time and resources spent following-up on post-vaccination events.	<p><b>Before:</b> Purchasing AEFI kits.</p> <p><b>During:</b> Time and travel spent on visiting persons that have fallen ill following immunization, communication to the press regarding AEFI cases.</p> <p><b>1 month after:</b> Time and travel spent on following up on AEFI cases.</p>	<ul style="list-style-type: none"> <li>Training on AEFI management (included under: Training) <b>d</b></li> <li>Reporting on AEFI cases (included under: Record-keeping, HMIS, monitoring and evaluation) <b>d</b></li> <li>Routine surveillance activities <b>a</b></li> </ul>	All
Record-keeping, HMIS, monitoring and evaluation			
Definition	What's included	What's excluded	Administrative level
Data entry and analysis, reporting, monitoring.	<p><b>Before:</b> Printing of vaccination cards and tally sheets, purchase of any office supplies especially for the campaign, a share of the cost of adjusting the electronic health information system.</p> <p><b>During:</b> Record-keeping during vaccination sessions, maintaining stock registers, data compilation and data entry, time spent tracking coverage by external supervisors, airtime expenses.</p> <p><b>After:</b> Completing reports, analyzing and evaluating campaign data, post-campaign coverage survey.</p>	<ul style="list-style-type: none"> <li>Routine monitoring and reporting activities <b>a</b></li> <li>Other post-campaign analysis <b>b</b></li> </ul>	All

## ALLOCATING SHARED COSTS

Shared inputs between the campaign and other health activities need to be valued on the basis of **allocation rules** (sometimes called tracing factors).

Table 8 shows the most appropriate method to allocate the value of shared inputs to the campaign and campaign activities, based on the data being collected. These allocation rules are based on the guidance for routine immunization costing studies, and tailor to the context of campaigns. Figure 5 shows an illustrative example of how to allocate the value of a health worker's time to the campaign, and subsequently to the various campaign activities.

**As most trainings and social mobilization events are usually fully campaign-specific, this guide recommends to consider all such investments that occurred shortly before the campaign took place (within 6 months or less) as a campaign-specific, non-capital investment.** Certain non-tangible investments such as one-time health worker trainings or long-lasting social mobilization campaigns are sometimes annualized in immunization costing studies. For example, when a new vaccine is introduced into the routine program following a campaign, and no routine-specific trainings will be conducted following the campaign, considering the campaign trainings as a cost to be shared between the campaign and the routine program may be warranted. In this case, the 'useful life' of the campaign must be determined (e.g. by linking it to the frequency at which routine trainings are conducted), and allocating a part of the first year's **annualized cost** to campaign (e.g. based on the share of doses delivered).

## COLLECTING OTHER CAMPAIGN AND IMMUNIZATION DATA

To understand the meaning of the findings of an **immunization campaign costing study**, the costs will need to be interpreted in relation to the campaign's **output and quality**. The number of doses delivered during the campaign is the most frequently used output indicator, and for two-dose campaigns or multi-antigen/intervention campaigns with overlapping target populations, the number of beneficiaries reached is another important metric. Recognizing the increasing **marginal cost** of reaching high coverage, coverage data helps to put the cost per dose delivered or beneficiary reached into perspective. These data can be collected from the sites where cost data is collected or alternatively from national-level administrative or post-coverage survey data.

**Apart from the number of doses delivered, beneficiaries reached, and the coverage achieved, there are various other factors that drive cost differences between areas on which it might be useful to collect data.** Campaign managers usually have a good sense of what factors are driving the cost of conducting a campaign, but the links between such factors and the cost of a campaign are rarely quantified. Campaigns often use more than one **delivery strategy**, which may have very different cost structures (e.g., school-based and mobile teams), and some regions will incur lower transport costs (e.g., in areas with high population density) than other regions with geographic challenges (e.g., mountains, rivers). Through interviews with staff involved in the campaign and pilot testing, a small set of priority questions can be identified and included in the questionnaires to enrich the analysis of the campaign's cost drivers.

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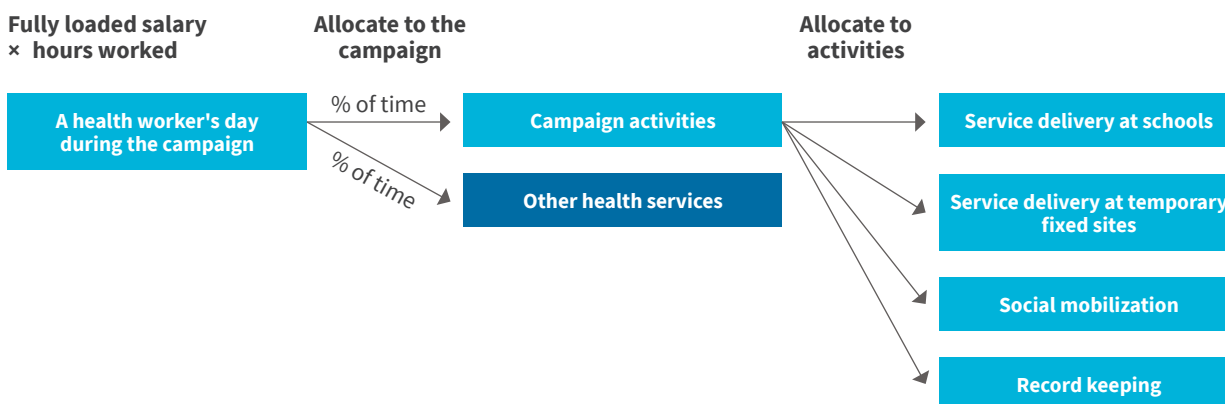
#### Annualization

Costing method to spread the costs of items used for more than one year over the lifetime of the item.<sup>24</sup>

#### Marginal cost

Incremental or additional cost of producing one additional unit of a service/output.<sup>4</sup>

FIGURE 5 Example of allocating labor costs



**TABLE 8 Data collection and allocation rules for shared costs**

	Allocation to the campaign	Allocation to activities	Reduced scope for a lighter study
<b>Operating cost</b>			
Paid labor	Hours spent conducting campaign-related activities * hourly wage (with hours spent in addition to the regular working hours as economic cost) or monthly salary * share of the campaign time out of the month	Data collection tools ask respondents to provide this by campaign activity. If not possible due to recall bias, allocate to activity based on staff position (e.g. community health workers to social mobilization, managers to supervision, etc.). Time spent in meetings is allocated to campaign management, time spent in trainings is fully allocated to training.	Focus on financial outlays for pre-campaign activities (such as venue hire and per diems) and exclude staff time. For during the campaign, consider capturing time by team as opposed to individual staff members. Or potentially consider excluding opportunity costs altogether for a study focused on financial costs
Volunteer labor	For unpaid health workers, see 'Paid labor' method. Volunteers are usually 100% campaign-specific so multiply time & hourly rate estimate.	See 'Paid labor' method	Focus on financial outlays and potentially exclude opportunity costs altogether
Per diem and travel allowances	Per diems and allowances are usually 100% campaign-specific. For general allowances (e.g. such as monthly stipends for community health workers), use same allocation method as 'Paid labor'.	Per diems usually fall under a specific activity already (e.g. training) or can clearly be allocated given a staff member's role during the campaign (e.g. supervision), and campaign per diems for vaccination teams should be allocated to each service delivery activity according to the percentage of time spent on each delivery strategy	Per diems are a large component of the cost of a campaign. We recommend collecting this in detail. But to save time, you could consider allocating a share from financial expenditure reports from mid-level offices) as opposed to requesting this bottom-up from the sampled sites (per diem level * number of staff * days, etc.)
Vaccines (and commodities for other interventions)	Number of vaccines (or other drugs/commodities) used (administered and wasted) for the campaign (ensure doses used for routine are excluded)	100% to service delivery for each specific intervention (immunization or co-delivered intervention), then by % of volume used to delivery strategies	Daily reports of quantities shipped and administered are usually easier to come by than stock data and can sometimes also be collected from higher administrative level to save time at facilities themselves
Vaccine injection and safety supplies	Number used during the campaign (excluding those used for routine)	100% to service delivery, then by % of volume used to delivery strategies	Same as for vaccines
Stationery and other supplies	Usually 100% as specifically purchased for the campaign (use of routine items is most likely limited and can be disregarded)	If not immediately evident (e.g. pens purchased for trainings), then allocate to Record keeping	Collect aggregate amounts from financial expenditure reports at higher administrative levels to save time
Transport and fuel	Already campaign-specific	If trips were shared between activities (such service delivery, vaccine distribution, social mobilization or supervision): allocate based on the number of staff in the vehicles (e.g. 4 vaccinators and 1 supervisor) and allocate proportionally or when in doubt, allocate 100% to service delivery.	Expenditures on rental vehicles and fuel costs are the key drivers to focus on
Vehicle maintenance	These will be considered as 100% campaign-specific, due to the heavy use of vehicles during campaign times.	Allocate to activities based on mileage or fuel use data collected through examining log books and/or from interviewees. Time spent in/on a vehicle can also be used but is less accurate and not preferred.	Collect from financial expenditure reports at higher levels
Cold chain repairs and energy costs	Any repairs conducted in the time period specified will be considered 100% campaign-specific. For grid electricity: no. of campaign days in a month as a % of monthly bill	100% to cold chain maintenance	Collect from financial expenditure reports at higher levels
IEC and other printing costs	100% campaign-specific	Allocate vaccination cards and tally sheets to record keeping, training materials to Trainings, and all others to Social Mobilization	Collect from financial expenditure reports at higher administrative levels
Workshops and meetings	Most meetings will likely have been 100% campaign-specific, if not, allocate according to the % of time in the meeting dedicated to the campaign	Expenses on community engagement meetings etc. should be allocated to social mobilization, expenses for trainings to the training activity and other meeting expenses to campaign management	Include only for fully campaign-specific meetings and trainings
Communication	100% campaign-specific	Allocate to activities based on number of activities this was used for as per the respondents	Exclude (accounts for only about 2% of the financial costs)
Other operating cost	100% campaign-specific	Dependent on the item, for the example provided: 100% to waste management	

**TABLE 8 (CONTINUED) Data collection and allocation rules for shared costs groups**

	Allocation to the campaign	Allocation to activities	Reduced scope for a lighter study
<b>Capital cost</b>			
Cold chain equipment	% share of cold chain used × days of the campaign / days that year × annual depreciation  100% for cold boxes and ice packs	100% to vaccine collection, distribution and storage	Exclude all capital costs
Vehicles	100% campaign-specific during the campaign, otherwise based on km/ miles used. If unavailable, can be based on time that people drove in/on vehicles, although this is less preferred. If the latter method is not used, it means waiting time of a running vehicle is excluded from the costing study.	% of miles/kms or fuel usage for a given activity. If the information is not available by activity, allocate based on number of trips.	



Photos: UNICEF Ethiopia/2013/Sewunet

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### OUTPUT AND UNIT COSTS

**Most campaign costing studies estimate the cost per dose, per targeted child and per vaccinated child of implementing the campaign, but more detailed sub-group analyses may be useful, depending on the study objective.** An estimate of the total cost of a campaign can be used for resource mobilization purposes, and average cost per dose estimates are useful for high-level budgeting and financial forecasting and to compare high-level estimates across countries. However, real insight in the cost structure of a campaign is only obtained when breaking down results further. Campaigns are often an effort to reach zero-dose children. Therefore, it will be important to evaluate costs for rural remote sites, urban poor sites, and sites that are in fragile and conflict-affected zones. Furthermore, the study might want to evaluate differences between governance levels (national, district, facility), facility types (hospital, health center, health post), facility ownership (public, private non-profit, private for-profit), **delivery strategies** (fixed, temporary, outreach, mobile), or aim to identify the greatest **cost drivers** among resource types and activities. In case of a campaign that implemented multiple interventions, disaggregated costs between the different interventions may be desired.

### MISSING DATA STRATEGIES AND OTHER PRE-ANALYSIS CHECKS

**Before analyzing the data, researchers should check and resolve missing data gaps and outliers across sites.** During data collection, some data may be challenging to collect at certain sites. Researchers should document how these missing data will be treated, and when data can be imputed from other sites. For example, per diem amounts will likely have been similar across facilities, and the amount per person from other facilities can probably be used. While for other data, such as how staff spent their time during the campaign, there will not be a probable alternative, and every effort should be made to collect this in the field. [Annex F](#) gives an indication of what information can generally be imputed from other facilities and which data points are worth fighting for. By comparing data across sites, errors in the data collected may become apparent, for example improbably long training durations. [Annex G](#) gives further examples of some checks to perform.

**Before aggregating the costs, make sure all are reporting in the same currency and in the same year.** If certain campaign activities took place in different years, make sure to convert the data so that they reflect the same year. To adjust data to another reporting year, we recommend using the ratio of the consumer price index (CPI, IMF World Economic Outlook) to account for inflation. We recommend inflating prices in their original currency, and if necessary, convert to another currency after the inflation adjustment. When converting costs between local currency and US dollars, we recommend using the World Bank historical exchange rates where possible. However, these are usually not available until about 6 months after the year has ended. If conversion rates are needed sooner than that, we recommend using [oanda.com](#) which provides free historical currency conversion for the last 180 days.

### AGGREGATING COSTS ACROSS SITES AND LEVELS

**If no sample has been taken, or the sample sites are a good reflection of the population, volume-weighted means are appropriate for estimating total and unit costs for the overall campaign.** To calculate average unit costs, use a volume-weighted average, also accounting for sampling probability if applicable. The sum of the total costs from all sites (weighted by inverse probability of sampling) will be divided by the sum of the delivery volume across all sampled sites (weighted by inverse probability of sampling) to estimate average unit costs by intervention. This method can also be used for any sub-group analyses. Following the estimation of unit costs for each **administrative level**, a total unit cost per dose can be calculated by simply adding up the unit cost at each level. To calculate the total cost of the campaign, multiply the unit cost by the total delivery volume (see Box 8). The use of **simple averages** (means) should always be avoided, as they have been shown to have a large upwards bias in simulations based on empirical routine immunization cost data from low- and middle-income countries.

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#### Aggregate costs

The total or unit cost aggregated across all administrative levels incorporated in a given study.

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**GLOSSARY****ANNEXES****BOX 8 Unit and total cost estimates**

Capital costs should be annualized to reflect the expected life of capital inputs, and economic costing studies will discount capital to reflect people's time preference. Financial costing studies will use straight line depreciation (zero discount rate), while economic costing studies should use a discount rate of 3%, unless there is a specific justification for another rate.

**Volume-weighted average unit cost** (with  $C_i$  the total delivery cost at site  $i$ ,  $Q_i$  the total volume delivered at site  $i$ , and  $n$  is the sample size):

$$unitcost_{vw} = \frac{\sum_{i=1}^n C_i}{\sum_{i=1}^n Q_i}$$

**Sample weight** (where  $p_i$  is the probability of site  $i$  having been selected as part of the sample)

$$sample\ weight_i = \frac{1}{P_i}$$

**Volume-weighted total cost** (with  $N$  the total number of campaign sites):

$$totalcost_{vw} = unitcost_{vw} \times \sum_{i=1}^N Q_i$$

**Sample- and volume- weighted average unit cost** (with  $C_i$  the total delivery cost at site  $i$ ,  $Q_i$  the total volume delivered at site  $i$ ,  $n$  is the sample size, and  $w_i$  represents the inverse probability of sampling weight for site  $i$ )

$$unitcost_{svw} = \frac{\sum_{i=1}^n C_i \times W_i}{\sum_{i=1}^n Q_i \times W_i}$$

Adapted from: EPIC guide

**The choice on whether to use other analysis methods – calibration estimator and regression estimator – is driven by the sampling strategy, sample characteristics, and data availability.** If the sample's characteristics are significantly different from the population's characteristics, we recommend the use of the calibration estimator to estimate total and unit costs for the campaign. The regression estimator can also be used, but it requires more auxiliary information than the calibration estimator and generally a larger sample as well. Therefore, the choice between these two methods should be based on data availability. The calibration and regression estimators are explained in detail in the EPIC guide, and in Rivera-Rodriguez, Resch, and Haneuse (2018).

**Both the calibration method and the regression estimator will require data on the total volume of doses delivered in the campaign.**<sup>12</sup> Luckily, in many campaigns the total number of doses delivered is often known and can be used instead. If not known, one could consider using delivery volumes from a previous, similar campaign. The definition of 'similar' may vary between settings but the type of vaccine (injectable or oral), the type of campaign (catch-up, follow-up, etc.), the geographical coverage (national or sub-

national), delivery strategies, and target population group should be considered. Annex H includes an example of the calibration method for a campaign costing study, and a link to the R code required to replicate this method.

**We urge researchers to calculate and report 95% confidence intervals for all estimates, to reflect the uncertainty of your sampling method.** In theory, this can be carried out easily for small datasets, though it may be problematic to calculate confidence intervals from the small samples that are common in (campaign and routine) immunization studies, when data on the cost and distribution of the population are missing, and when the sample was not fully random (e.g. by design or due to replacements). Therefore, a bootstrapping exercise is a good method to calculate meaningful confidence intervals. Rivera-Rodriguez, Resch, and Haneuse (2018) describe such a bootstrap method. When calculating confidence intervals for unit costs that aggregate more than one level, you must take into account the variance at each of the levels. For that purpose, we recommend using the *svyratio* package in R, as described in Levy and Lemeshow (2013). Annex H offers an example of this method.

## COMPARING SUBGROUPS

**To compare differences in costs between subgroups (strata) in the sample, several statistical tests could be appropriate.** To analyse differences in costs between two subgroups of the sample, for example, when comparing facilities located in urban areas to facilities located in rural areas or when comparing between two districts, we recommend using two sample t-tests to determine whether these are statistically significant. An alternative method is a bootstrap regression, with e.g. 1000 replications, which can be used to resample the data and improve the precision of variance estimates. For testing the association between different classifications or categories, such as facilities in rural or urban areas, and whether this was associated with high or low unit costs, Pearson’s chi-squared test or Fisher’s exact test can be used. Fisher’s exact test is more suitable for studies with a small sample size. An alternative would be to present estimated means and 95% confidence intervals for each stratum and then describe how they vary. [Annex H](#) includes examples and links to code for the bootstrapping method and of running subgroup significance tests.

## SENSITIVITY ANALYSIS

**Studies should provide detailed reporting regarding any uncertainty in the cost estimates that have been calculated.** At a minimum, each costing study should report any limitations, possible under- or over-reporting of certain line items, missing components and price assumptions to recognize uncertainty around the calculated estimates. Furthermore, confidence intervals should be presented with each cost estimate to reflect sampling uncertainty. More on reporting standards in the guide ‘Practical tips on data collection and reporting for immunization campaign costing studies’.

**Sensitivity analysis should be conducted on all inputs that have a high degree of uncertainty.** Researchers will not be equally confident about each piece of data that has been gathered. Univariate sensitivity analyses can help characterize the vulnerability of the estimated costs to potential measurement errors around a given input. For example, if you expect staff to have underestimated the time spent on certain activities, you could inflate the reported time figures for that activity by a reasonable percentage to estimate the effect of this on the estimated costs. Inputs that carry a high degree of uncertainty in immunization campaign costing studies and are good candidates for a sensitivity analysis. Tornado diagrams are useful visualizations of the sensitivity of the cost to changes in certain inputs.

### BOX 9 Examples of subgroup analyses

#### Geographic area:

- Regions
- Districts
- Urban vs. rural

#### Facility type:

- Hospital
- Health center
- Health post

#### Level of integration:

- Single vaccine
- Multiple vaccines
- Co-delivery of vaccines and other health interventions

#### Delivery strategy:

- Facility-based
- Temporary fixed sites
- Outreach/mobile

#### Facility ownership:

- Government
- Private
- Non-profit, faith-based

#### Coverage levels:

- Campaign coverage levels
- Routine coverage levels (e.g. MCV1, Penta 3)

**Another method of testing the uncertainty around your estimates is utilizing multiple analysis methods for triangulation.** As an example, in addition to calculating volume weighted average unit costs, the calibration method can be used as a sensitivity analysis. As the calibration method re-weights the data using auxiliary information on the sample, the result can be used to gauge the level of precision offered by the original volume (and if applicable sample) weights. This method, however, is dependent on the sourcing of accurate auxiliary data to better describe the population’s characteristics.

**Additional scenario testing can help inform recommendations for future campaigns, and answer ‘what if’ questions for policymakers.** For example, if a campaign was funded in a large part by partners, a ministry of health may be interested in the impact of having to absorb a larger share of the overall operational cost of a campaign in the future. Under a health provider perspective, partner support would be a part of the economic cost, and researchers could consider modeling the impact of the government having to absorb some or all of these costs. The interest to look into some of these questions will be dependent on the country context, but other scenarios that may be of interest include: increases in health worker per diems or salary levels, certain types of volunteers being paid as regular health workers, additional time and resources dedicated towards e.g. trainings or social mobilization activities, a change in fuel prices, the impact of switching delivery strategies, or including personal protective equipment for health workers for campaigns to be held during outbreaks. Also, as we recommend to exclude certain small line items such as buildings, utilities and furniture, a percentage estimate based on existing studies could be used to assess the effect of this on the estimated costs and to compare the results with studies that did include these costs.

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## V. Considerations for co-delivery campaigns

### SCOPE AND DATA

When costing a **co-delivery** campaign, it is important to obtain a good understanding of the degree to which the activities were **integrated** or conducted separately. More and more frequently, additional interventions are co-delivered with immunization campaigns. Table 9 provides an overview of some vaccines and other health interventions that are often co-delivered in campaigns. The degree to which the campaign was integrated determines how shared costs should be allocated across the campaign. For example, in some campaigns, transport and cold chain may be shared, but the interventions are delivered through different strategies. The **activities** and **resource types** mentioned in this guide are relevant to vaccination campaigns and the fully integrated delivery of certain other health interventions, and most costs for co-delivered interventions should fit in these buckets (e.g. additional social mobilization materials, other means of transport, other types of health workers, and various commodities), but researchers may want to look out for other costs that require additional cost categories as well. Record keeping for other programs may also differ from the immunization program, which may complicate the gathering and interpretation of coverage data.

### SAMPLING

If a campaign was only integrated in part of the country, using **integrated/not-integrated strata** can help to shed light on differences in cost and cost composition between the two different implementation methods. Another sampling consideration for integrated campaigns related around the planning unit, and the campaign sites. If not all interventions used the same **delivery strategies**, it is important to ensure that all types of campaign sites are included in the sample. For example, **house-to-house teams** may have been managed from health posts, while large school-based activities may have been organized from larger facilities.

### METHODS AND ANALYSIS

**Co-delivery campaigns require additional allocation rules to allocate costs across health interventions.** Some costs should evidently be allocated towards a certain intervention, for example when allocating cold chain costs for a campaign that delivered measles and deworming tablets, as the latter can be stored outside of the cold chain, or if trainings were intervention-specific. If different delivery strategies were used, for example **house-to-house** for polio while at the same time **temporary fixed sites** for measles, then the time spent on each delivery strategy should be used to allocate the costs between the two vaccines. If the same delivery strategy was used for all interventions, then costs can be split based on the number of beneficiaries reached with each intervention, dose or commodity delivered. If there is reason to assume that a certain intervention takes much more time to deliver than others in the same campaign, staff time estimates could be used to allocate the costs. For some other activities that are not directly linked to volume, such as social mobilization and training, allocating costs equally across interventions may be another option.

**Choosing the right denominator for co-delivery campaigns is challenging, and depends on the degree to which delivery modalities were integrated.** For example, a measles-rubella campaign that also delivered vitamin A supplements through the same delivery strategies will likely have increased staff time per dose or tablet delivered, but big financial cost components such as per diem and transport to campaign sites will have been similar to a standalone measles-rubella campaign. Analyzing these results per MR dose delivered may make more sense than using the total volume of vaccine doses and vitamin A tablets as a denominator. On the other hand, if the campaign added on delivery modalities to accommodate additional interventions, such as mobile teams to deliver oral polio vaccine house-to-house for a measles campaign that would have otherwise only used fixed sites, co-delivery will have had a more substantial impact on the cost. In such cases, considering total delivery volume (both measles and OPV doses) when estimating the **unit cost** of the campaign makes more sense. These cost estimates should also be viewed in relation to the achievements of the campaign, to obtain a full picture of the success of the integrated effort.

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#### Allocation rule

Method of allocating shared costs on the basis of a measure related to the usage of the shared resource. Also called an allocation basis or tracing factor.

#### Fixed temporary vaccination posts

Posts that may be set up at schools, churches, mosques, local administrators' offices, for the time estimated to complete the vaccination of the targeted population of that area (may be less than the duration of the campaign).<sup>7</sup>

**TABLE 9 Common co-delivery strategies**

Vaccines that are often co-delivered in campaigns:	Interventions often co-delivered with vaccination campaigns:
<p>Measles-containing vaccines (MCV): measles, measles-rubella (MR), measles-mumps-rubella (MMR) with:</p> <ul style="list-style-type: none"> <li>■ Yellow fever</li> <li>■ Meningitis A</li> <li>■ Polio (OPV)</li> <li>■ HPV</li> </ul>	<p>MCV with:</p> <ul style="list-style-type: none"> <li>■ Vitamin A tablets, deworming tablets</li> <li>■ Ivermectin (treatment for onchocerciasis)</li> <li>■ Bed net distribution</li> </ul> <p>Polio (OPV) with:</p> <ul style="list-style-type: none"> <li>■ Vitamin A, deworming</li> <li>■ Bed nets</li> </ul> <p>HPV with:</p> <ul style="list-style-type: none"> <li>■ Health promotion sessions</li> <li>■ Vitamin A, deworming</li> </ul>

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# Glossary

## ACCELERATED IMMUNIZATION STRATEGIES

<b>Adverse event(s) following immunization (AEFI)</b>	Any untoward medical occurrence which follows immunization and which does not necessarily have a causal relationship with the usage of the vaccine. <sup>7</sup>
<b>Campaign</b>	See health campaign or immunization campaign.
<b>Catch-up campaign</b>	One-time campaign, usually nationwide, to vaccinate the main target population responsible for disease transmission in order to rapidly reduce the number of susceptible individuals. <sup>7</sup>
<b>Co-delivery</b>	Co-delivery of interventions in campaigns occurs when most or all typical campaign components (microplanning, registration, logistics, implementation, and evaluation) are coordinated. Co-delivery, or full integration, allows simultaneous offer of two or more health interventions at the point of service delivery.
<b>Child health day/week</b>	Campaign-style semi-annual events to deliver a package of primarily preventive public health interventions tailored to the epidemiological profiles of national and/or sub-national areas and typically target children under 5 years of age.
<b>Delivery strategy</b>	Alternative ways of delivering immunization services, often requiring different complements of staff, supplies, equipment, and vehicles, to different target populations.
<b>Facility-based vaccination posts</b>	Posts located at permanent health facilities or community health posts as a part of the fixed vaccination posts strategy for the entire duration of the campaign. <sup>7</sup>
<b>Fixed permanent vaccination posts</b>	See facility-based vaccination posts.
<b>Fixed temporary vaccination posts</b>	Posts that may be set up at schools, churches, mosques, local administrators' offices, for the time estimated to complete the vaccination of the targeted population of that area (may be less than the duration of the campaign). <sup>7</sup>
<b>Follow-up campaign</b>	Periodic campaign, usually nationwide, conducted every 2 to 5 years, targeting children born after the last campaign in order to reach the unreached and those who did not gain immunity after the first vaccination. <sup>7</sup>
<b>Health campaign</b>	A coordinated set of activities that targets resources to achieve a specific health goal or goals and is typically time-limited. <sup>17</sup>
<b>House-to-house vaccination</b>	Delivery strategy often used for polio and recommended as a mop-up strategy in areas where there is prior evidence of refusal of vaccination. <sup>7</sup>
<b>Immunization campaign</b>	A time-limited and dedicated strategy for delivering vaccination to those otherwise missed by routine services or to older susceptible individuals who are not among the age groups targeted by the Expanded Programme on Immunization (EPI) services. <sup>7</sup>
<b>Integrated campaign</b>	Full integration involves sharing of both operational and administrative functions and responsibilities and delivery of campaign interventions via primary health care (PHC). It occurs when interventions that were formerly delivered via independent health campaigns are delivered at the PHC level with other ongoing health services.
<b>Mobile vaccination posts</b>	Posts required at distant villages and rural settlements with very small and/or disperse populations, set up for the time needed to complete the task (usually less than one day). <sup>7</sup>
<b>Outbreak response campaign</b>	To reduce morbidity and mortality and prevent further spread of the outbreak of a vaccine-preventable disease by interrupting virus transmission locally. Usually starts with an initial rapid response in the affected areas that selectively targets unvaccinated and under-vaccinated people, and if required, can be followed by a larger scale effort targeting non-selectively, but based on outbreak epidemiology, immunity gaps and risk of virus transmission and spread. Also referred to as Outbreak Response Immunization (ORI) or reactive vaccination campaigns.
<b>Outreach</b>	See mobile vaccination posts.

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<b>Periodic Intensification of Routine Immunization (PIRI)</b>	A form of campaign-like delivery of routine immunization, usually at a smaller scale and more frequent basis than mass campaigns, and used particularly in areas with poor infrastructure and coverage.
<b>Planned vaccination campaign</b>	Examples include catch-up campaigns, preventive campaigns, and follow-up campaigns. Contrary to outbreak response (or reactive) campaigns, which require rapid implementation and are usually implemented on a smaller scale.
<b>Preventive campaign</b>	National or subnational campaign aimed at creating an immunity barrier to reduce the risk of a disease outbreak in areas identified as vulnerable through a risk assessment.
<b>Reactive vaccination campaign</b>	See outbreak response campaign.
<b>Mop-up activities</b>	Additional vaccination activities to increase the level of coverage when it is found that some targets were missed during the campaign. <sup>7</sup>
<b>Supplementary immunization activity (SIA)</b>	See campaign.
<b>Sweeping</b>	See mop-up activities.

## TYPES OF COSTS

<b>Administrative level</b>	Levels of administrative hierarchy of the national health system.
<b>Aggregate costs</b>	The total or unit cost aggregated across all administrative levels incorporated in a given study.
<b>Campaign activity</b>	Categories of activities for which costs will be incurred required to complete an immunization campaign.
<b>Campaign-specific cost</b>	Additional cost required for the intervention (campaign), compared to the baseline cost (routine immunization program/broader health system). <sup>6</sup>
<b>Capital cost</b>	Costs for items that have a useful life of over one year. Reflects depreciation and potentially also opportunity costs. <sup>4</sup>
<b>Cost driver</b>	Line item or campaign activity that leads to significantly higher cost. <sup>6</sup>
<b>Cost per targeted child/person</b>	Cost per child/person in the target population, regardless of whether they were reached through the campaign.
<b>Costs per dose delivered</b>	Cost per dose administered in the campaign. For one-dose campaigns, this equals the cost per vaccinated child/person.
<b>Cost per vaccinated child/person</b>	Cost per child/person that has received one or more vaccine doses through the vaccination campaign.
<b>Delivery cost</b>	Costs associated with delivering immunizations to target populations, exclusive of vaccine costs. Also referred to as operational costs. <sup>24</sup>
<b>Economic cost</b>	Value of resources based on their opportunity cost, regardless of whether a financial transaction occurred. Economic costs includes the value of volunteer time and donated goods. <sup>6</sup>
<b>Financial cost</b>	Financial outlays, usually with straight-line depreciation of capital items. <sup>24</sup>
<b>Fiscal cost</b>	Financial outlays, usually without depreciation of capital items. <sup>24</sup>
<b>Fixed cost</b>	Costs that do not vary with scale (changes in the level of output). <sup>4</sup>
<b>Full cost</b>	The sum of all costs associated with the campaign implementation, including the use of resources already part of the routine immunization system. <sup>6</sup>
<b>Incremental cost</b>	Additional cost required for the intervention, compared to the baseline cost (routine immunization program/broader health system). Referred to as 'campaign-specific' in this guide. <sup>6</sup>
<b>Line item</b>	See 'resource type'. <sup>6</sup>

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<b>Marginal cost</b>	Incremental or additional cost of producing one additional unit of a service/output. <sup>4</sup>
<b>Operating cost</b>	The costs of resource inputs that are used frequently and are used up in less than one year. Together with the capital costs, these are the delivery costs of a campaign. In routine immunization costing studies, these are often referred to as 'recurrent costs'.
<b>Operational cost</b>	The costs associated with delivering vaccines to target populations, exclusive of vaccine costs. Also referred to as delivery costs. <sup>24</sup>
<b>Opportunity cost</b>	The value of using inputs for immunization services as opposed to their next best use in other services. <sup>4</sup>
<b>Recurrent cost</b>	Value of resources/inputs with useful lives of less than one year. <sup>4</sup> Recurrent costs usually occur more than once during a given financial year. <sup>5</sup> As campaigns are time-limited, the term 'operating costs' is preferred to describe the use of items with a useful life of less than one year.
<b>Resource type</b>	The inputs required to implement immunization program activities, and can be further broken down into capital items and operating items. Also referred to as 'resource type'. <sup>6</sup>
<b>Replacement price</b>	The price that would be required to buy an equivalent piece of equipment today. <sup>6</sup>
<b>Shared costs</b>	Costs that cannot be directly traced to services or products in an economically feasible way, <sup>5</sup> i.e. costs that are shared between the campaign and routine or between immunization and the broader health system.
<b>Unit cost</b>	The cost of delivery of a single unit of immunization outcome, such as the cost per dose or cost per child. <sup>24</sup>

## COSTING METHODS

<b>Allocation rule</b>	Method of allocating shared costs on the basis of a measure related to the usage of the shared resource. Also called an allocation basis or tracing factor.
<b>Annualization</b>	Costing method to spread the costs of items used for more than one year over the lifetime of the item. <sup>24</sup>
<b>Bottom-up costing</b>	Detailed measurement of resource use (quantity of inputs multiplied by their unit prices), of which a proportion is utilized for and allocated to immunization. <sup>5</sup>
<b>Calibration method</b>	Using auxiliary information (not used to inform the sampling scheme) to modify the weights used for the standard estimator to reduce uncertainty and more closely match the sample to the true distribution of costs in the population.
<b>Cost projection</b>	Estimation of future costs of both recurrent and capital inputs. <sup>8</sup>
<b>Discount rate</b>	The rate used to reflect the people's time preference. Costing studies usually use a 3% discount rate.
<b>Government perspective</b>	Costs incurred by government institutions. Used with varying definitions from the costs incurred by public providers only, to referring to the ministry of health at all levels, to including other ministries as well. This guide recommends using the terms provider or payer perspective instead, with appropriate additional specifications.
<b>Immunization campaign costing study</b>	Study that collects, analyzes and interprets primary and secondary data related to the costs incurred by some or all actors involved in the organization and implementation of (a part of) an immunization campaign.
<b>Ingredients-based approach</b>	See bottom-up costing.
<b>Micro-costing</b>	Usually has a bottom-up element, measuring both service and resource use directly at the service delivery level, but may allocate some resources using top-down methods. <sup>4</sup>
<b>Payer perspective</b>	Costs incurred by all institutions that paid for the campaign. This will usually include all administrative levels of the ministry of health, from facilities and their staff to national level officials, and may include costs incurred by other ministries and development partners. Used to obtain a national level estimate of the costs of the campaign.

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<b>Perspective</b>	The point of view considered for costs (and benefits, if included), in a costing study; the payer to whom the costs were incurred. <sup>24</sup>
<b>Prospective costing</b>	Cost estimation at the time of a campaign based on direct observation of resource use. <sup>6</sup>
<b>Provider perspective</b>	Costs incurred by providers (e.g. facilities) and their staff (staff's out-of-pocket expenses). Always includes costs incurred by public providers, and may include costs incurred by private providers. Usually used to obtain a deeper understanding of subnational level cost differences.
<b>Regression analysis</b>	In immunization costing, regression analysis can be used to estimate the relationship between the unit cost and volume through the use of auxiliary information on the full population distribution. <sup>6</sup>
<b>Retrospective costing</b>	Cost estimation based on data collected after or near the completion of the campaign.
<b>Simple average</b>	Averaging the unit costs obtained from all facilities (or other levels) in the sample, giving each unit cost equal weight, regardless of the volume delivered at each facility.
<b>Simultaneous costing</b>	See prospective costing.
<b>Societal perspective</b>	Costs incurred by all actors in society, including ministries, health service providers, development partners, as well as households. Must specify whether beneficiaries only or households and communities more broadly were included.
<b>Top-down costing</b>	Allocates expenditures made by higher levels of the system or within a facility (e.g., hospital) down to lower levels based on a series of allocation rules. <sup>4</sup>
<b>Tracing factor</b>	See allocation rule.
<b>Useful life</b>	The period during which an asset or property is expected to be usable for the purpose it was acquired. <sup>6</sup>
<b>Volume-weighted average</b>	The volume-weighted mean unit cost is calculated as the sum of the total costs across all sites in the sample divided by the sum of the delivery volumes across all sites in the sample. <sup>6</sup>

## SAMPLING

<b>Convenience sampling</b>	Informal sampling method whereby units of interest (e.g., districts or facilities) are chosen on the basis of their convenience for interviewing, as opposed to the use of a random selection technique. <sup>26</sup>
<b>Probability proportional to size sampling</b>	Sampling scheme by which units are selected in accordance with their sizes, so that large units are more likely to be selected than smaller ones. <sup>26</sup>
<b>Purposive sampling</b>	Informal sampling method whereby the research team chooses sites deliberately based on some features of those facilities, such as immunization performance. <sup>26</sup>
<b>Simple random sample</b>	Sample method by which every unit in the population is given the same chance of being selected. <sup>26</sup>
<b>Sample size</b>	The number of sites from which data will be collected.
<b>Sample Design Optimizer</b>	Instrument designed by the EPIC project at the Harvard T.H. Chan School of Public Health to assist research teams develop cost-effective and efficient hierarchical clustered sample designs.
<b>Sampling frame</b>	The set of materials from which a sample is selected, usually involving a list of administrative levels and associated facilities.
<b>Stratified sampling</b>	Sampling method by which homogeneous categories, called strata, are constructed and an appropriate sample procedure is applied to each (e.g., urban and rural areas). <sup>26</sup>
<b>Study population</b>	All facilities and/or campaign sites under study.

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# Annex A

## Mapping of the guide’s sections against other sources

Sections in this guide	Related sections in other costing guidance references
<b>Study design &amp; scope</b>	
<b>Study objective</b>	EPIC how to cost immunization programs: 3. Using the objectives to design a costing exercise GHCC, Methodological Principle 1: Defining the purpose
<b>Perspective</b>	EPIC how to cost immunization programs: 4.1 Perspective GHCC, Methodological Principle 2: Defining perspective (societal and provider perspectives only)
<b>Levels</b>	N/A
<b>Projection, prospective or retrospective costing</b>	EPIC how to cost immunization programs: 4.9 Time horizon, 6.2.2 Retrospective self-report of program manager and staff, 6.2.3 Direct observation GHCC, Methodological Principle 10: Timing of data collection
<b>Financial and economic costing</b>	EPIC how to cost immunization programs: 4.2 Financial vs. Economic cost, 7.4 Annualization of capital costs, 7.2 Replacement prices GHCC, Estimating the cost of health interventions, an introduction: Economic and financial costs, Principle 12: Valuing capital inputs & Principle 13: Discount, inflation and conversion rates
<b>Campaign-specific versus shared costs</b>	EPIC how to cost immunization programs: 4.3 Full vs. incremental cost GHCC, Estimating the cost of health interventions, an introduction: Economic and financial costs, Principle 12: Valuing capital inputs & Principle 13: Discount, inflation and conversion rates
<b>Time horizon</b>	EPIC how to cost immunization programs: 4.9 Time horizon GHCC, Methodological Principle 5: Determining the appropriate time horizons and periods
<b>Sampling</b>	EPIC how to cost immunization programs: 6.1 Sampling GHCC, Methodological Principle 8: Sampling
<b>Data requirements &amp; costing methods</b>	
<b>Data sources</b>	EPIC how to cost immunization programs: 6.2 Information gathering and data sources GHCC, Methodological Principle 11: Sources of price data
<b>Resource types</b>	EPIC how to cost immunization programs: 5.1.2 Resource categories, 7.3 Analysis of recurrent costs, 7.5 Analysis of capital costs GHCC, Methodological Principle 6: Scope of the costing York, The main methodological issues in costing health care services: Resource use measurement
<b>Campaign activities</b>	EPIC how to cost immunization programs: 5.1.1 Activity categories GHCC, Methodological Principle 6: Scope of the costing
<b>Allocating shared costs</b>	EPIC how to cost immunization programs: 7.1 Shared costs GHCC, Estimating the cost of health interventions, an introduction: Terminology around costing methods & Methodological Principle 7: Measuring and allocating resource use
<b>Collecting other campaign and immunization data</b>	EPIC how to cost immunization programs: 5.2 Other data: immunization program output and contextual factors

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Data analysis	
Output and unit costs	GHCC, Methodological Principle 4: Clear definition of ‘units’
Aggregate the costs across sites and levels	EPIC how to cost immunization programs: 7.6 Estimating unit costs and total program costs with data from a sample of sites
Comparing subgroups	N/A
Sensitivity analysis	GHCC, Methodological Principle 16: Dealing with uncertainty
Considerations for co-delivery campaigns	
Scope and data	N/A
Sampling	N/A
Methods and analysis	N/A

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# Annex B

## Stakeholder consultations

Individual	Affiliation
Ryan Novak	CDC (MenA)
Marc Papania	CDC (MRI)
Sarah Pallas	CDC
Erin Staples	CDC (YF)
Devi Aung	Gavi (MRI & JE)
Anais Colombini	Gavi
Laura Fisher	Gavi
Maya Getchell	Gavi
Wilson Mok	Gavi
Stephen Sossler	Gavi
Vittal Mogasale	IVI
David Bishai	Johns Hopkins
Felicity Cutts	LSHTM
Mercy Mvundura	PATH
Matthew Ferrari	Penn State
Ulla Griffiths	UNICEF
Yodit Sahlemariam	UNICEF PD
Lori Sloate	UN Foundation
Antoine Durupt	WHO (MenA)
Raymond Hutubussy	WHO
Lorenzo Pezzoli	WHO (OCV)
Mercy Ahun	Independent consultant (YF, MenA, OCV)
Robin Biellik	Independent consultant
Ann Levin	Independent consultant
Jean-Marc Olive	Independent consultant

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# Annex C

## Useful life assumptions

A useful life is defined as the period during which an asset or property is expected to be usable for the purpose it was acquired. It may or may not correspond with the item's actual physical life or economic life. A general rule of thumb is that useful life is equivalent to the number of years until the cost of maintaining and repairing a piece of equipment (opportunity cost of using an outdated model/make) outweighs the cost of buying a new piece of equipment. We suggest using the following useful life estimates which were used for ICAN's studies and are taken from recent validated estimates for immunization, other costing studies, and WHO CHOICE:

Item	WHO CHOICE	ICAN (range)
<b>Cold chain equipment</b>		
Walk in Cold Room	15	10
Refr. Electric/Kerosene	10	
Refr. Electric	10	10
Refr. Electric/Gas	10	10
Refr. Solar	10	10
Cold Box	10	5
Vaccine carrier	20	3–5
Ice Packs	15	2
Freezer	10	10
Temperature monitor	6	10
<b>Vehicles</b>		
Motorcycles	3	4
Motor vehicles (Mainly LDV 4x4 type)	5	6
Freezer truck/van	7	-
<b>Other equipment and vehicles</b>		
Voltage stabiliser	5	2
Generator (small to medium size)	5	5
Air conditioner	10	5
Incinerator	10	5
Copy machine	5	-
Television	8	-
Desktop computer	4	5
Printer	3	-
Desk/table	10	-
Chair	5	-
Cabinet/cupboard	10	5
Bench	5	-
Fax	5	-
Telephone	7	-
Smart phone or mobile phone	-	2
Megaphone	-	3–10
Fan	-	5
<b>Buildings</b>		
Clinic buildings and similar outreach facilities	-	30
<b>Other</b>		
Trainings applicable to the routine program	-	2-3, or however often repeated

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# Annex D

## Mapping of resource types against campaign activities

ICAN cost activity category	Operating cost											Capital cost			
	Paid labor	Volunteer labor	Per diem and travel allowances	Vaccines	Vaccine injection & safety supplies	Stationery & other supplies	Transport & fuel	Vehicle maintenance	Cold chain repairs and energy costs	IEC and other printing costs	Workshops & meetings	Communication	Cold chain equipment	Vehicles	Other equipment
Campaign management	✓	✓	✓			✓	✓	✓		✓	✓	✓		✓	?
Vaccine collection, distribution and storage	✓	✓	✓			✓	✓	✓	✓	✓		✓	✓	✓	
Cold chain maintenance	✓	?					?		✓						
Training	✓	✓	✓			✓	✓	✓		✓	✓			✓	?
Social mobilization and advocacy	✓	✓	✓			?	✓	✓		✓	✓	✓		✓	?
Supervision	✓		✓			?	✓	✓		✓		✓		✓	?
Service delivery: facility-based	✓	✓	✓	✓	✓	?						✓			?
Service delivery: temporary fixed sites	✓	✓	✓	✓	✓	?	✓	✓				✓		✓	?
Service delivery: mobile/outreach	✓	✓	✓	✓	✓	?	✓	✓				✓		✓	?
Service delivery: mop-up/sweeping	✓	✓	✓	✓	✓	?	✓	✓				✓		✓	?
Waste management	✓	✓	?		✓	?	?	?				?		?	?
AEFI management	✓	✓	?			?	✓	?		✓		✓		✓	?
Record keeping, HMIS, monitoring and evaluation	✓	✓	?			✓				✓		✓		✓	?

✓ = resource type usually relevant to the campaign activity

? = cost item might be relevant depending on the country or the specific campaign

# Annex E

## Example of a sampling process

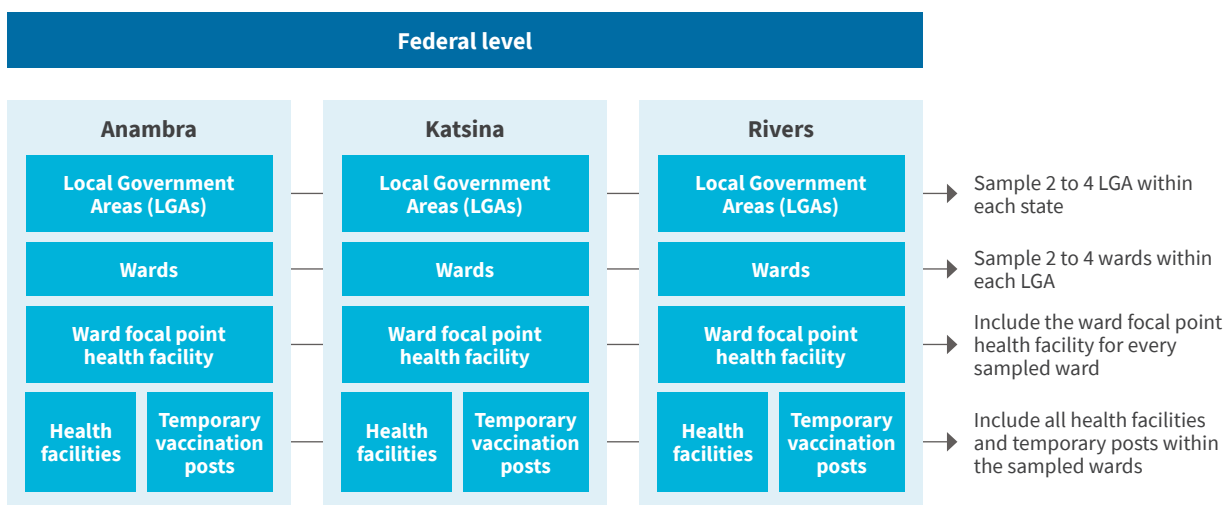
The costing of Phase 3 of Nigeria’s yellow fever campaigns required collecting data from a representative sample in three states, and the Sample Design Optimizer (SDO) was used to identify the optimal representative sample given the sampling strategy and data collection budget. The study team defined a sampling strategy with the ward administrative level as the sampling unit—with data collection including all vaccination teams and vaccination sites covered by the sampled wards—and equal probability simple random selection of wards within each of the three states. Figure 6 summarizes the sampling strategy.

To facilitate the selection of the samples in each state, the research team used the Sample Design Optimizer developed by the Harvard T.H. Chan School of Public Health. Given the study’s sampling strategy, the SDO required the following input data:

- The sampling frame for each level of data collection—i.e. the list of all wards and LGAs in the three states—as well as a size measure at LGA and ward level, such as the catchment population, for every unit in the frame;
- An estimate of the expected output of the analysis, such as the cost of a previous campaign;
- The cost of data collection for every unit in the sampling frame, and the total data collection budget.

Obtaining the necessary input data presented several challenges, requiring the research team to identify proxy data, define sensible assumptions, and face significant delays. For each of the three states, the research team requested a list of all LGAs that included all wards in each LGA and all health facilities within each ward, together with total catchment population at ward and LGA level. While in some context this information can be easily available, obtaining consistent data for this study required careful triangulation and follow ups, as not all datasets were consistent. To estimate the sample’s accuracy, the SDO requires the expected outcome of the study’s analysis—i.e. the cost of the yellow fever campaign in each of the three states—which for this study was not available. After considering existing immunization costing data for Nigeria and for campaigns in other countries, the research team assumed campaign costs at ward level would be correlated with the number of health facilities within each ward, and thus estimated a proxy for the study’s outcome as a function of the number of health facilities. Conversely campaign costs at LGA level were expected to be rather constant. Finally, the tool requires the cost of data collection at each unit, which is used to maximize the sample’s accuracy given a certain budget. The research team used the expected days of data collection at each sampling unit as a proxy for this, and the total budget was also converted in days of data collection set the constraint.

FIGURE 6 Sampling strategy for the Nigeria yellow fever campaign costing study



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**TABLE 10 Summary of sampling data challenges and solutions**

Input data	Challenges	Solutions
<b>Sampling frame</b>	<ul style="list-style-type: none"> <li>Inconsistencies in the datasets that make up the sampling frame</li> </ul>	<ul style="list-style-type: none"> <li>Triangulation and follow up</li> </ul>
<b>Size</b>	<ul style="list-style-type: none"> <li>Inconsistencies in the catchment population at various levels</li> </ul>	<ul style="list-style-type: none"> <li>Triangulation and follow up</li> </ul>
<b>Expected output</b>	<ul style="list-style-type: none"> <li>No prior or expected output data available</li> </ul>	<ul style="list-style-type: none"> <li>Used a function of the number of health facilities within each ward as proxy of total campaign costs</li> </ul>
<b>Cost of data collection</b>	<ul style="list-style-type: none"> <li>Actual cost of data collection per site not available</li> </ul>	<ul style="list-style-type: none"> <li>Used expected data collection days as proxy measure of cost</li> </ul>
<b>Data collection budget</b>	<ul style="list-style-type: none"> <li>Budget needed to be in the same unit as the cost of data collection</li> </ul>	<ul style="list-style-type: none"> <li>Expressed the total budget in days of data collection</li> </ul>

The SDO’s output provided all possible samples for this study’s sampling strategy, allowing researchers to identify the sample with the highest accuracy for every level of data collection budget. Based on the input data and the study’s sampling strategy, the SDO provided a list of all possible combinations LGAs and wards, for each specifying data collection cost, expected precision, and sampling weights: based on this the research team selected the sam-

ple with the highest level of precision within the available budget. After drawing a random sample for each state using the SDO, the research team also identified replacement samples for each state by selecting LGAs and wards with similar catchment population for each LGA in the sample. These were utilized when security concerns in certain LGAs prohibited data collection there.

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# Annex F

## Missing data strategies

Item	What's missing	Best way to resolve
Cold chain equipment, vehicles	Replacement price	Use from other facilities/levels
Doses delivered	Breakdown by strategy	Use same proportions from facilities in the same area or consider percentage of doses that other facilities delivered per strategy per hour and apply this
Incinerator operating costs	Operating cost	Use from other facilities, adjust for facility catchment population
Fuel and transport	Breakdown of the activities that vehicles were used for	Ask in more general terms: what were the main activities that the vehicle was used for, and split costs based on the number of days these activities were conducted or equally if this isn't possible
Paid labor	Salaries	Use equivalent salary level from similar staff at other facilities
Paid labor	Staff time	No alternative, should be a big focus at facilities and measures should be taken to avoid recall bias
Per diem	Breakdown of what per diems were given for	If a lump sum of per diem is given, consider dividing it across activities on the basis of time (hours) spent during the campaign
Printing costs	Breakdown of what was spent on different types of printing	Check the level that the costs were incurred at as printing may have been done at a higher level and only estimates given at lower levels
Vaccine injection and safety supplies	Quantity of stocks used for campaign	Check records at a higher administrative level, calculate using number of doses delivered plus wastage rate

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## Data analysis checks

- Identify any in-kind contributions made, since these are usually listed as notes, and are not accounted for in a standardized cost calculations template.
- Similarly, check whether there are any 'other' expenses included in the questionnaire that would not be automatically costed by the template.
- Check whether there are any other notes listed on the questionnaire that would alter the way that costs should be calculated.
- At sites where the delivery volume split by strategy was not available, apply an average from the district/region across the total delivery volume.
- Make sure you have collected useful life and replacement price data from national level or use our proposed standard values (see [Annex C](#)).
- Check whether time has been allocated to 'other campaign activities' and whether the description gives an indication that allows for the reclassification of this time to one of our standard cost activities.
- Sometimes percentages provided do not add up to 100%. Revise these proportionally so that these add up to 100%.
- Allocate the hiring of drivers as casual labor to 'paid labor' and not to the resource type transport.
- Make sure that there are no duplications of costs captured. E.g. the rental price of a vehicle inclusive of fuel, and a separate cost entry for fuel costs for that same vehicle.
- Check that the salary grades provided make sense given the grade scale of the country (i.e. fits in the range and is comparable to similar cadres at similar facilities in the area)
- When comparing data across sites, plot the data for each of the questions/inputs to identify outliers. Analyze whether these are errors or justified outliers.

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# Annex H

## Calibration method and confidence intervals

### CALIBRATION METHOD

As part of the analysis of the 2019 integrated MR campaign in Sierra Leone cost data, the calibration method was used as a sensitivity analysis to test whether the sampled sites were an accurate representation based on the MR volume delivered. The total volume of MR delivered nationwide and total number of facilities that participated in the campaign were used to re-weight the inverse probability of sampling weights for each facility in the statistical program R.

You can download the R code that accompanies this guide which was used for the calibration sensitivity analysis as part of the Sierra Leone MR campaign costing study. You require the following data to run it for your own study:

- Original total cost for the sampled sites
- Volume delivered at each of the sampled sites
- Original sampling weights
- Total number of sites in the campaign
- Total delivery volume of the campaign

### CONFIDENCE INTERVALS

To calculate confidence intervals for aggregated unit costs containing data for more than one administrative level, we used *svyratio* package in R. With this, we were able to obtain confidence intervals for national level delivery cost estimates, accounting for the variance both at facility level as well as district level (with national level costs considering of only one datapoint and therefore zero variance). Download the code for these methods. The required data include:

- Cost per dose at each sampled site
- Volume delivered at each of the sampled sites
- Sample weight for each of the sampled sites

### BOOTSTRAPPING AND SUBGROUP ANALYSIS

The sample for the Sierra Leone campaign costing study included 30 facilities and 6 districts. Comparing subgroups for such a small sample would be challenging given the wide confidence intervals. We therefore used a bootstrapping method and two sample t-tests (for subgroups, e.g. did facilities in hilly districts have higher unit costs than those in non-hilly areas) and Fisher's exact test (for categorical subgroups, e.g. are hilly/non-hilly districts more likely to have achieved high coverage) to estimate whether certain subgroup differences were significant, despite our small sample size. Click here for the STATA code for this procedure.

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