

# Applying Costing Methodology for Immunization Programs

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**TVEE**  
TEACHING VACCINE  
ECONOMICS EVERYWHERE

# Outline

**Section A** General principles of applying costing to vaccines

**Section B** Costing new vaccine introduction

**Section C** Costing COVID-19 modifications to routine immunization

# Required Reading

- How to Cost Immunization Programs: A Practical Guide

[immunizationeconomics.org/costingmethods](http://immunizationeconomics.org/costingmethods).

# **Section A**

## **Applying costing to immunization**

# Review: Steps in Immunization Costing

*Before starting define the scope and perspective:*

- Routine immunization / supplemental immunization / epidemic, outbreak response
- Government health service / societal perspective / Provider / Payer
- Economic / financial cost

**Step 1: Identify** resources used

- What resource use is induced by the program; directly or due to program or treatments effects

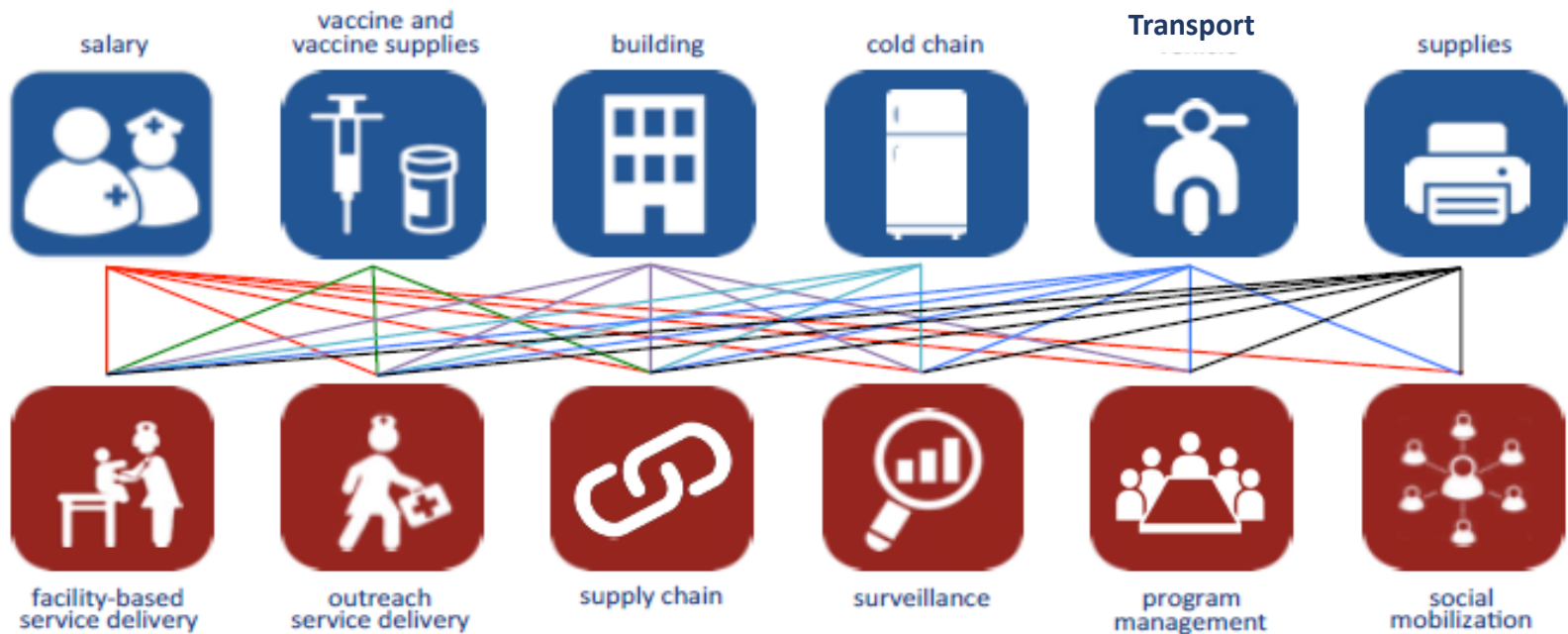
**Step 2: Measure** resources used

- What quantity of each resource is needed per person or per state?

**Step 3: Value** resources used

- How much does each resource cost in monetary terms?

# Defining Standard Line Items and Activities



Generally define activities first to identify what is in and what is out and where there may be use of shared resources

# Collecting Cost Data - Intervention

## Step 1: Identify resources used

- **Service level** - Immunization service component
    - Difference service models:
      - facility based; outreach; mobile; SIA's/ campaigns; school based....
      - Urban/ rural health centres; HC/clinics/ health posts; large vs small?
- Why might this be important?*
- **Higher levels:** District, Province/ Region and National
  - **EPI Functions** at each level – for activity based costing
  - **Line items** at each level

# Identification of activities related to immunization at different levels

If a costing study aims to understand the economic costs by activity, then allocation of time to these activities is important.

If the aims of the study are different, then perhaps not necessary.

# Collecting Cost Data – Routine Immunization (Common Approach , 2014)

Line Items/Cost Drivers	Activities
<ul style="list-style-type: none"> <li>- Salaried labor</li> <li>- Volunteer labor</li> <li>- Per diem &amp; travel allowances</li> <li>- Vaccines</li> <li>- Vaccine injection and safety supplies</li> <li>- Other supplies</li> <li>- Transport/fuel</li> <li>- Vehicle maintenance</li> <li>- Cold chain energy costs</li> <li>- Printing</li> <li>- Building operation, utilities, communication</li> <li>- Cold chain equipment</li> <li>- Vehicles</li> <li>- Lab equipment</li> <li>- Other equipment</li> <li>- Other capital</li> </ul>	<ul style="list-style-type: none"> <li>- Routine facility-based service delivery</li> <li>- Record keeping, HMIS, monitoring and evaluation               <ul style="list-style-type: none"> <li>- Supervision</li> </ul> </li> <li>- Outreach service delivery</li> <li>- Training</li> <li>- Social mobilization &amp; advocacy</li> <li>- Surveillance</li> <li>- Cold chain maintenance</li> <li>- Vaccine collection, dist, storage</li> <li>- Program management</li> <li>- Other</li> </ul>

# Identification of activities related to immunization at different levels

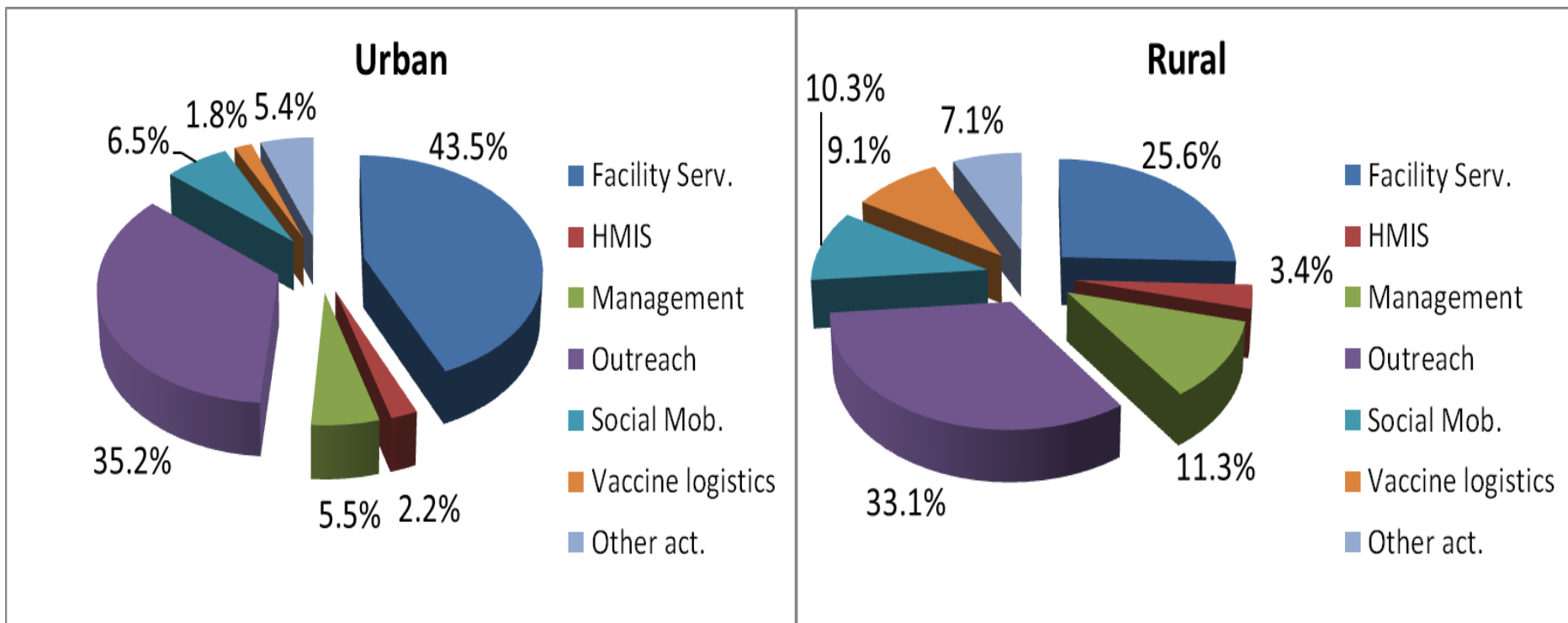
## Facility level

- *Routine facility based service delivery*
- *Outreach service delivery*
- *Supervision*
- *Record-keeping, HMIS*
- *Training and meetings*
- *Vaccine collection, distribution and storage*
- *Social mobilization and advocacy*
- *Cold chain maintenance*
- *Surveillance*
- *Waste management*

## District, regional and national level

- *Service delivery – some items budgeted/ expended at district level)*
- *Program management*
- *Supervision of immunization-related activities*
- *Record-keeping, HMIS*
- *Training and meeting*
- *Vaccine collection, distribution and storage: from higher cold chain points to facilities*
- *Cold chain maintenance*
- *Surveillance*

# Understanding Costs of Routine Immunization – Activity-Based Costing (Zambia)



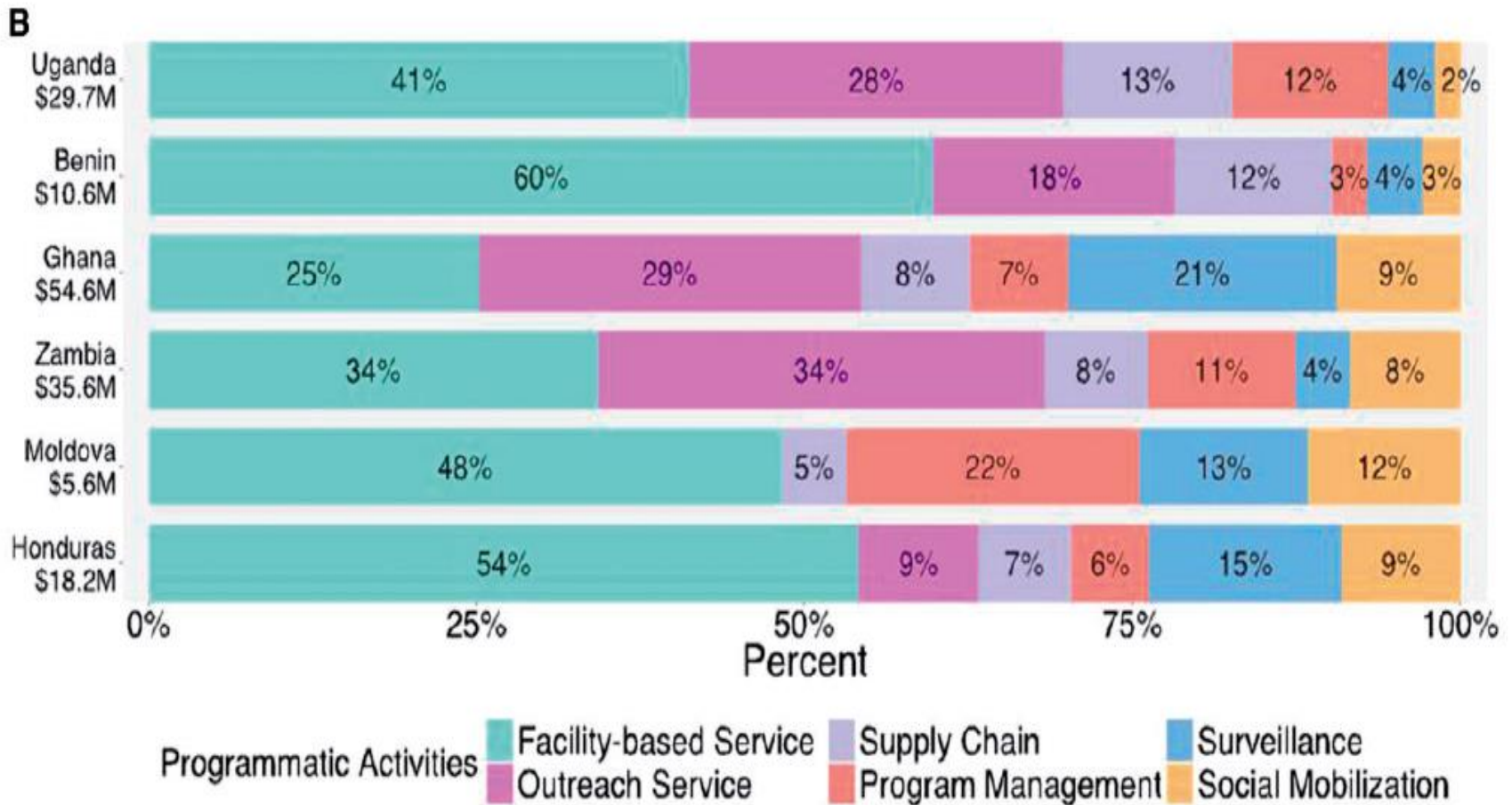
Urban Health Centre:

- What are the main features of interest?

Rural Health Centres:

- ◆ How do cost contributions differ?

# Understanding Costs of Routine Immunization – Activity-Based Costing from Six Countries (EPIC)



# Identification of Cost Line Items

## Recurrent Costs

- Paid labour
- Volunteer labour
- Per diem and travel allowances
- Vaccines
- Vaccine injection and supplies
- Other supplies
- Transport and fuel
- Vehicle maintenance
- Cold chain energy costs
- Printing costs
- Utilities and communication
- Other recurrent

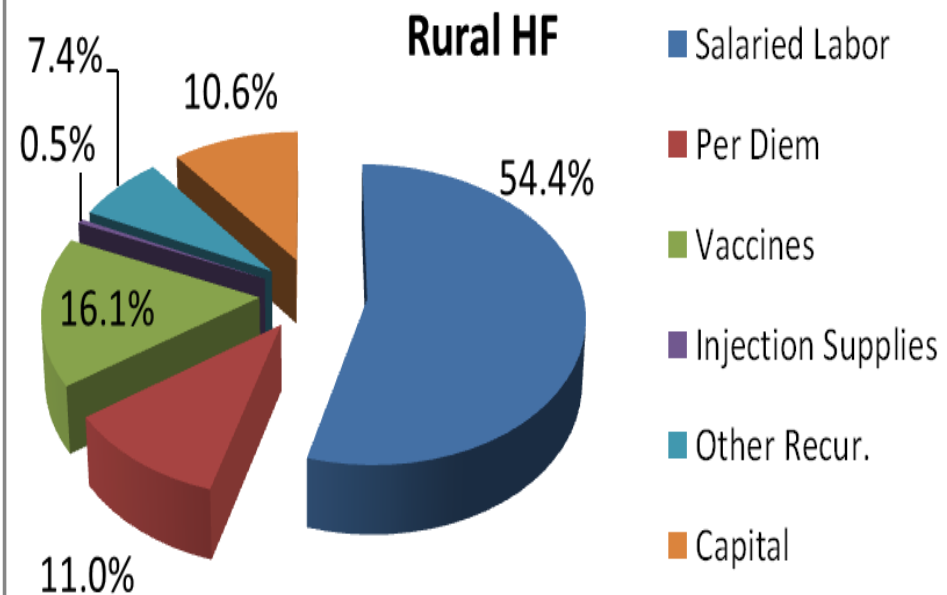
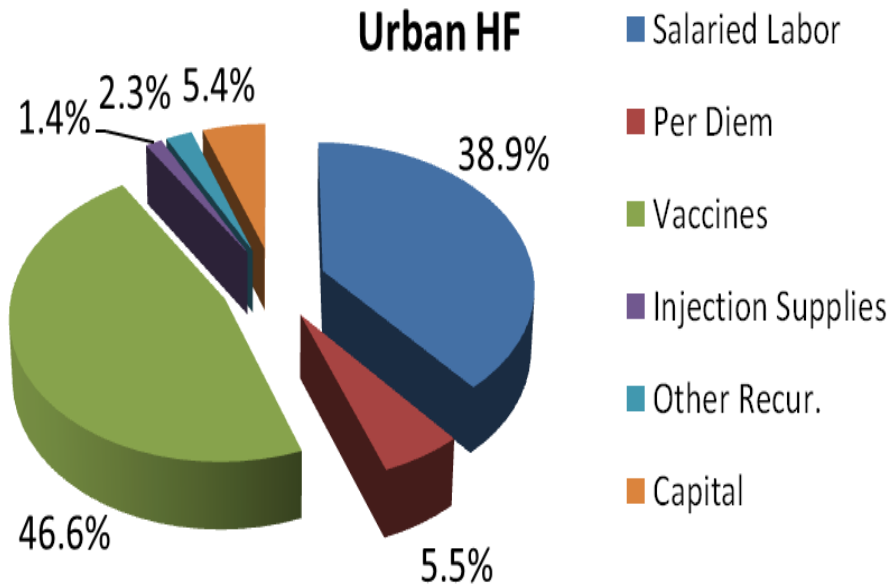
## Capital Costs

- Cold chain equipment
- Vehicles
- Lab equipment
- Other equipment
- Building
- Other capital investments



# Distribution of facility cost drivers – Line Items







## Urban vs. Rural HF Economic costs (Zambia)



- What are the main features of the costs that can be useful to planners or understanding how best to cost new vaccine for CEA?

# **Sources and Estimation of Data**

# Data Source Options: Program Costs

Item	Source and Method
 Vaccines	<ul style="list-style-type: none"> <li>• Country procurement records; UNICEF/ GAVI/ Revolving Fund prices; includes insurance &amp; freight</li> <li>• Stock management records or WHO norms for wastage</li> </ul>
 Supplies	<ul style="list-style-type: none"> <li>• Procurement records; WHO GPRM; MSH Drug Price Guide; Drug Topics Red Book</li> </ul>
 Labor	<ul style="list-style-type: none"> <li>• Staff and manager surveys; Time-motion; time diaries</li> <li>• Public service remuneration packages</li> </ul>
 Patient time	<ul style="list-style-type: none"> <li>• Survey for time amount</li> <li>• Value with average gross wages</li> </ul>
 Maintenance, Fuel	<ul style="list-style-type: none"> <li>• District or facility accounts</li> </ul>
 Subsistence/ other Allowances	<ul style="list-style-type: none"> <li>• District or facility accounts</li> </ul>

Variable Cost

# Data Source Options: Program Costs (2)

Item	Method
Clinic space	<ul style="list-style-type: none"> <li>Market price, annualize, allocate based on minutes used</li> </ul>
Overhead	<ul style="list-style-type: none"> <li>Step-down allocation of facility-level costs?</li> </ul>
Surveillance	<ul style="list-style-type: none"> <li>Proportion of EPI budget? allocate based on vaccine type?</li> </ul>
Cold chain	<ul style="list-style-type: none"> <li>Country records; UNICEF &amp; WHO product information sheets</li> <li>Refrigerators alloc. based on vaccine volume ('semi-fixed')</li> </ul>
Social mobilization	<ul style="list-style-type: none"> <li>One-time push at launch - annualize; child health weeks etc</li> </ul>
Training	<ul style="list-style-type: none"> <li>Large training at launch treated as capital, plus recurrent amount linked to staff turnover</li> </ul>

Fixed Costs



# Data Source Options: Program Output Data

Item	Method
EPI program outputs	<ul style="list-style-type: none"><li>• Program records at various levels</li></ul>
Outpatient numbers	<ul style="list-style-type: none"><li>• HIS at various levels</li></ul>
Denominator populations	<ul style="list-style-type: none"><li>• Central Statistics, Census and MoH catchment population estimates</li></ul>
Staff numbers	<ul style="list-style-type: none"><li>• Facility and District offices</li></ul>
Km	<ul style="list-style-type: none"><li>• Log books or Google?</li></ul>
Space – m <sup>2</sup>	<ul style="list-style-type: none"><li>• Measure directly (preferred); plans</li></ul>

EPI and HIS statistics, denominator populations and coverage estimates can be larger source of uncertainty and inaccuracy than cost data

# Data Source Options: Immunization Delivery Costs

Estimates present financial and economic costs for 136 LMICs, by WHO region, income classification, and GAVI transition phase, based on a recently published study and methodology.

The [published study](#) provides a broad indication of immunization delivery costs that may be useful when accurate local data are unavailable.

The authors modeled estimates of the delivery cost per dose for routine childhood immunization services, i.e., excluding vaccine costs (see the [ICAN Immunization Delivery Cost Catalogue](#) for a definition and original country data).

Link:

[http://immunizationeconomics.org/s/Standardized\\_Delivery\\_Unit\\_Costs\\_15\\_Sept\\_2020 .xlsx](http://immunizationeconomics.org/s/Standardized_Delivery_Unit_Costs_15_Sept_2020.xlsx)

# Data Source Options: Immunization Delivery Costs

IMMUNIZATION ECONOMICS.ORG

EPIC IMMUNIZATION COSTING

ICAN IMMUNIZATION COSTING ACTION NETWORK

## Standardized country-level immunization delivery unit cost estimates

We modeled estimates of the delivery cost per dose for routine childhood immunization services, i.e., excluding vaccine costs (see the ICAN Immunization Delivery Cost Catalogue - <http://immunizationeconomics.org/ican-icdc/> - for a definition and original country data). A Bayesian meta-regression model was used to regress delivery cost per dose estimates, stratified by cost category, against a set of predictor variables including country-level (gross domestic product per capita, reported diphtheria-tetanus-pertussis third dose [DTP3] coverage, population, and number of doses in the routine vaccination schedule) and study-level (study year, single antigen or programmatic cost per dose, and financial or economic cost) predictors (see reference below for further details). The fitted prediction model was used to generate standardized estimates of the routine immunization delivery cost per dose, stratified by cost category, for each low- and middle-income country in 2018, as well as additional country groupings. Lower and upper bounds represent equal-tailed 95% credible intervals.

To cite: Portnoy A, Vaughan K, Clarke-Deidler E, Suhairin C, Resch SC, Brenzel L, Menzies NA. Producing standardized country-level immunization delivery unit cost estimates. *PharmacoEconomics*. Sept 2020;38(9):995-1005.

Led by:



In collaboration with:



With funding support from:



	Economic cost per dose: average, lower bound, upper bound												Financial cost per dose: average, lower bound, upper bound																				
	Total			Labor			Supply Chain			Service Delivery			Capital			Total			Labor			Supply Chain			Service Delivery			Capital					
	Average	Lower bound	Upper bound	Average	Lower bound	Upper bound	Average	Lower bound	Upper bound	Average	Lower bound	Upper bound	Average	Lower bound	Upper bound	Average	Lower bound	Upper bound	Average	Lower bound	Upper bound	Average	Lower bound	Upper bound	Average	Lower bound	Upper bound	Average	Lower bound	Upper bound	Average	Lower bound	Upper bound
<b>Global LMIC</b>	<b>1.87</b>	<b>0.64</b>	<b>4.38</b>	<b>0.74</b>	<b>0.26</b>	<b>1.70</b>	<b>0.26</b>	<b>0.08</b>	<b>0.67</b>	<b>0.65</b>	<b>0.20</b>	<b>1.66</b>	<b>0.22</b>	<b>0.06</b>	<b>0.57</b>	<b>2.00</b>	<b>0.66</b>	<b>4.87</b>	<b>0.79</b>	<b>0.27</b>	<b>1.86</b>	<b>0.28</b>	<b>0.08</b>	<b>0.74</b>	<b>0.70</b>	<b>0.21</b>	<b>1.83</b>	<b>0.24</b>	<b>0.06</b>	<b>0.64</b>			
<b>WHO Region</b>																																	
Africa	1.49	0.57	3.31	0.59	0.23	1.28	0.21	0.07	0.49	0.52	0.17	1.23	0.17	0.06	0.43	1.59	0.57	3.70	0.63	0.23	1.44	0.22	0.07	0.55	0.55	0.18	1.35	0.19	0.06	0.48			
Americas	2.61	0.87	6.33	1.02	0.35	2.42	0.37	0.11	0.94	0.91	0.27	2.44	0.31	0.09	0.81	2.80	0.89	7.15	1.10	0.36	2.72	0.40	0.11	1.06	0.98	0.28	2.65	0.33	0.09	0.91			
Eastern Mediterranean	1.86	0.71	4.05	0.73	0.29	1.56	0.26	0.09	0.62	0.65	0.22	1.52	0.22	0.07	0.52	1.99	0.73	4.45	0.78	0.30	1.73	0.28	0.09	0.68	0.69	0.23	1.66	0.23	0.07	0.59			
Europe	3.51	1.21	8.18	1.38	0.50	3.19	0.50	0.15	1.35	1.22	0.38	3.06	0.41	0.12	1.07	3.74	1.27	9.06	1.47	0.51	3.51	0.53	0.16	1.37	1.30	0.40	3.62	0.44	0.12	1.17			
Southeast Asia	1.35	0.40	3.48	0.53	0.16	1.34	0.19	0.05	0.52	0.47	0.13	1.26	0.16	0.04	0.45	1.44	0.41	3.76	0.57	0.17	1.46	0.20	0.05	0.58	0.50	0.13	1.37	0.17	0.04	0.51			
Western Pacific	2.07	0.59	5.47	0.81	0.24	2.10	0.29	0.07	0.81	0.73	0.18	2.09	0.24	0.06	0.69	2.22	0.61	6.00	0.87	0.25	2.28	0.31	0.08	0.88	0.78	0.19	2.20	0.26	0.06	0.76			
<b>World Bank Income Classification (2019)</b>																																	
Low-income	1.41	0.52	3.16	0.56	0.20	1.24	0.20	0.07	0.47	0.49	0.16	1.17	0.16	0.05	0.41	1.50	0.53	3.43	0.59	0.21	1.34	0.21	0.07	0.52	0.52	0.17	1.28	0.18	0.05	0.45			
Lower middle-income	1.36	0.44	3.32	0.54	0.18	1.28	0.19	0.06	0.50	0.47	0.14	1.21	0.16	0.04	0.43	1.45	0.46	3.68	0.57	0.19	1.42	0.21	0.06	0.56	0.51	0.15	1.34	0.17	0.04	0.48			
Upper middle-income	2.59	0.82	6.38	1.01	0.34	2.44	0.37	0.10	0.95	0.91	0.25	2.39	0.30	0.08	0.81	2.77	0.85	7.03	1.08	0.35	2.68	0.39	0.11	1.03	0.96	0.26	2.60	0.33	0.08	0.90			
<b>Gavi Transition Phase (2020)</b>																																	
Initial self-financing	1.15	0.41	2.65	0.48	0.17	1.10	0.17	0.05	0.42	0.42	0.13	1.05	0.14	0.04	0.37	1.22	0.42	2.91	0.52	0.17	1.21	0.18	0.06	0.47	0.45	0.14	1.13	0.15	0.04	0.41			
Preparatory transition	1.62	0.61	3.59	0.68	0.26	1.49	0.24	0.08	0.58	0.60	0.20	1.41	0.20	0.06	0.49	1.72	0.63	3.96	0.72	0.27	1.63	0.26	0.08	0.64	0.64	0.21	1.53	0.22	0.06	0.54			
Accelerated transition	0.99	0.26	2.68	0.41	0.11	1.11	0.15	0.04	0.43	0.37	0.09	1.06	0.12	0.03	0.37	1.06	0.27	2.94	0.44	0.12	1.22	0.16	0.04	0.48	0.39	0.09	1.15	0.13	0.03	0.41			
Non-Gavi	2.25	0.75	5.42	0.94	0.33	2.21	0.34	0.10	0.87	0.84	0.24	2.16	0.28	0.08	0.74	2.40	0.77	5.90	1.00	0.34	2.43	0.36	0.10	0.94	0.89	0.26	2.36	0.30	0.08	0.82			
<b>Country</b>																																	
Afghanistan	0.75	0.20	2.02	0.30	0.08	0.79	0.10	0.03	0.30	0.26	0.06	0.74	0.09	0.02	0.26	0.81	0.20	2.25	0.32	0.08	0.88	0.11	0.03	0.33	0.28	0.06	0.83	0.09	0.02	0.29			
Albania	6.47	2.90	12.78	2.56	1.14	5.03	0.91	0.37	1.93	2.26	0.87	4.91	0.75	0.30	1.63	6.89	3.08	14.02	2.73	1.19	5.55	0.97	0.38	2.12	2.39	0.94	5.23	0.80	0.31	1.78			
Algeria	2.82	0.89	6.82	1.11	0.36	2.65	0.40	0.11	1.04	0.98	0.28	2.48	0.33	0.09	0.89	3.01	0.92	7.48	1.19	0.37	2.93	0.43	0.12	1.13	1.04	0.29	2.72	0.36	0.09	0.98			
Ananda	1.06	0.34	3.13	0.41	0.10	1.10	0.16	0.03	0.44	0.37	0.07	1.18	0.12	0.03	0.37	1.16	0.34	3.64	0.46	0.10	1.41	0.16	0.03	0.50	0.40	0.07	1.14	0.13	0.03	0.44			

# Collection of Data

# Data Collection Instruments

- Data on costs, outputs, and facility characteristics should be collected using pre-tested, standardized questionnaire formats.
- Several tools exist for constructing data collection instruments.
  - The ProVac Initiative has specifically designed tools for immunization costing studies, UNIVAC and COSTVAC
  - In the Excel-based COSTVAC tool, custom data collection forms can be tailored to specific studies.
  - A convenient feature of the COSTVAC tool is that it can include instructions and scripts for data collectors to use, and has data validations and data consistency checks built-in. It also has feature to create 1 unique workbook per sampled site, and a macro to aggregate data from all of these workbooks once data has been collected.
  - Other generic tools include EpiInfo7, KoboToolbox, and RedCap.

# When to Sample Facilities

If goal is to:

- Measure nationally representative average cost for routine immunization
- Observe variation in costs among
  - Facilities
  - Marginal cost of vaccinating a child

# Approach to Sampling in Routine Immunization Programs

- Common approach
  - Not possible to collect data from all facilities in each country
    - Use a sample of facilities
    - Select facilities that will represent the range of variation
    - Use two-stage sampling approach
- Define what is the primary sampling unit
  - Public facilities or Private facilities (Non-governmental organization)
  - Include secondary hospitals if believed important source of immunization activity
- Define the geographical areas of focus in the study (i.e. region, province, etc.)
  - Suggested to select areas that reflect range of costs (high performance, medium performance, low performance)

# Developing a Sample Design

Common sample design questions that research teams have when planning an immunization costing study include:

- Will my design lead to a representative sample?
- How many sites do we need to collect data from?
- How should we select those sites?
- Should we use a form of cluster sampling in which we first select clusters (e.g., districts), and then a sample of sites within clusters (e.g., facilities)?
- Should we stratify districts or health facilities, and if so, on what basis?
- How will different sample designs impact the cost of data collection and the precision of the results?
- Can information from prior studies be used to improve sample design?

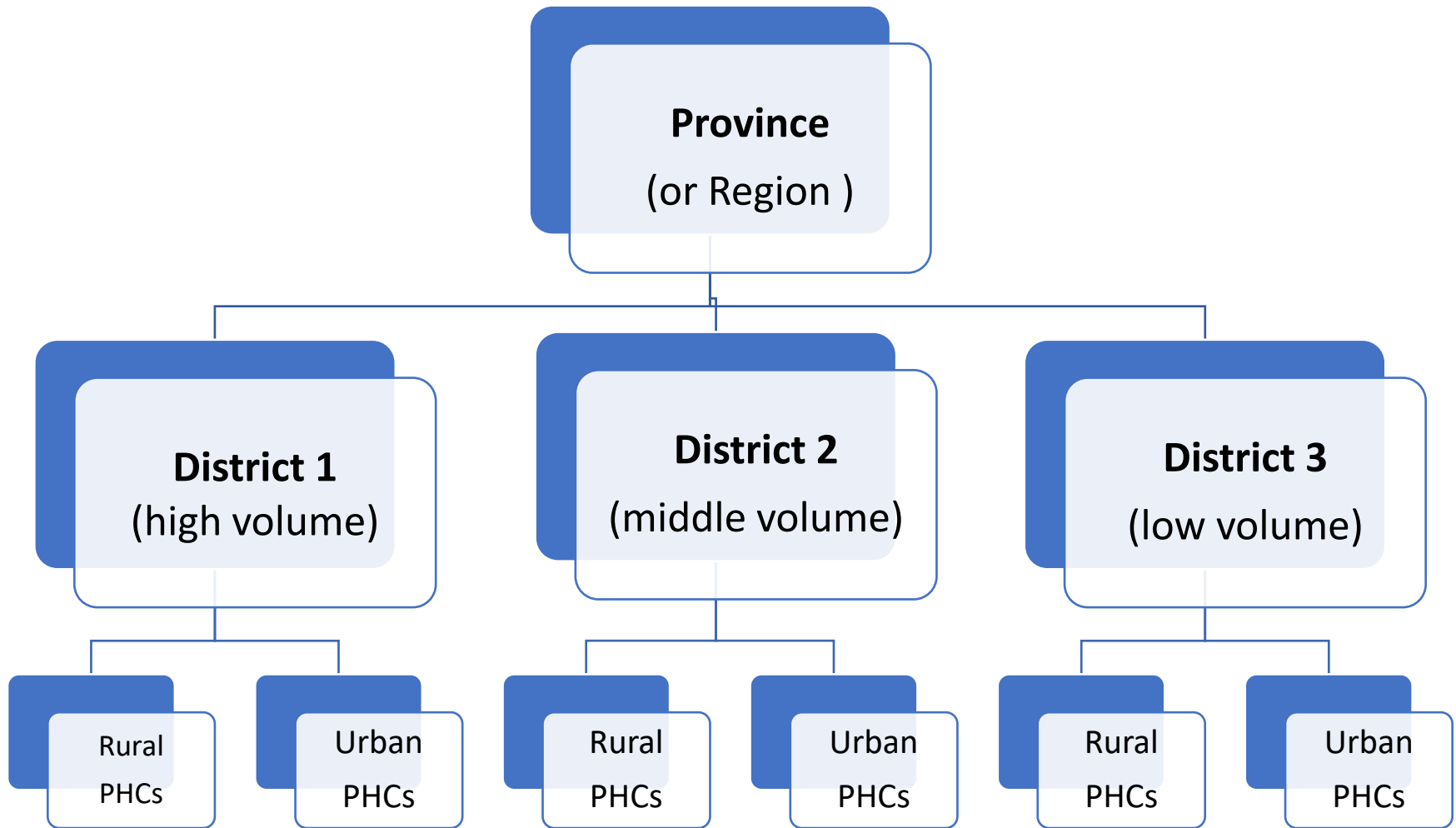
# Random Sampling

- Use random sampling when the goal is to make estimates of total cost, or mean cost per dose, or comparisons of cost between different locations, types of sites, or services delivery approaches.
- Standard statistical approaches can be used to calculate an unbiased measure of the mean, and the uncertainty in this mean estimate.
- When facilities are selected purposively (i.e., the research team chooses sites deliberately based on some features of those facilities), these choices may bias study results (either by mistake or by design), and it will be difficult to estimate uncertainty in the final results

# Sample Size

- increasing the number of sites included in the sample will improve the precision (reduce sampling uncertainty) of the results.
- However other elements of the design can affect precision, such as
  - the structure of a cluster design
  - stratification of units (e.g., urban vs. rural districts, facility types)
  - basis of the probability of selection (e.g., simple random sample in which all units have equal probability, vs. probability proportional to size).
- Two types of approach:
  - Given a fixed data collection budget, what sample design will result in the most precise estimates of the quantities of interest in this study?
  - Given that a certain level of precision is required at the end of this study (e.g., estimate cost per dose delivered with a 10% margin of error), what is the most efficient sample design for achieving this, and how much will the data collection cost?
- Ultimately, the sample design for an immunization costing study will depend on the list of all relevant sites.
  - For example, if the study is going to collect information at the central/national level, and from a sample of districts, and from a sample of facilities within the sampled districts, it will be important to know – in advance of data collection – the total number of districts, and the total number of facilities within each district.
  - We will refer to this list of sites as the **sampling frame**. It is this population of sites that we will make inference to, based on what we learn from the sites selected to be in the sample.

# Example of the Proposed Sampling Frame



# Sample Design Optimizer Tool

- The EPIC Project developed an Excel-based tool that can aid in constructing efficient hierarchical sample designs for costing studies.
- When sampling frame data is available, the tool can be used to compare a large set of alternative sample designs and identify designs that efficiently maximize precision for a given fixed data collection budget. T
- he tool requires a “prior” estimate of the outcome which the study is trying to estimate (e.g., immunization program cost), which can be supplied by the user or can be generate based on a predictive model derived from previous studies.
- Link: <http://immunizationeconomics.org/sample-design-optimizer>

# Approach To Sampling in Routine Immunization Programs

- 1<sup>st</sup> Stage: List all the districts in these areas & order these by number of doses administered and population density
  - Randomly selected 3 to 5 districts
- 2<sup>nd</sup> Stage: List all the facilities in each district & order these rural/urban
  - Randomly select 2 to 4 facilities (or more if you can afford to survey more) from each district
  - Recommendation is to over-sample rural (remote) facilities compared to urban (near-urban facilities)

# Sampling Procedure Example

- The sampling procedure determines the weights used in **reporting of average facility cost**
  - Weights: Are the inverse of the probability of being selected

- Example:

Data:

Province X has 12 Districts. Randomly select 3 Districts

District 1 has 20 facilities. Randomly select 4 facilities from each District

- What is the probability of selecting a facility in District 1?

$$\text{Prob. of selecting a district: } \frac{3}{12} = \frac{1}{4}$$

$$\text{Prob. of a HF in district 1: } \frac{4}{20} = \frac{1}{5}$$

$$\frac{1}{4} * \frac{1}{5} = \frac{1}{20}$$

- What is the weight? 20
- How to use the weights?

To get nationally representative values estimate average weighted facility cost

# **Cost Analysis**

# Cost Analysis: Recurrent Costs

- *Cost of labour:*
  - Wage rate \* Hours allocated to immunization  
OR
  - Annual salary \* Portion of Paid Work Hours Allocated to Immunization
- *Cost of vaccine:*
  - Doses used \* Average Price per Dose
  - Adjust for wastage
  - The prices of vaccines should include freight and insurance costs (CIF) and can be obtained from UNICEF Supply Division; UNICEF local office procurement records; or the Ministry of Health (MOH) or EPI
- *Cost of injection supplies:*
  - Quantity of supply item used \* Item price  
OR
  - Doses delivered \* Expected Quantity of Supplies Consumed per Dose \* Item Price
  - Adjust for wastage
  - The prices of syringes and supplies should reflect freight and insurance costs (CIF) and can be obtained from UNICEF Supply Division; UNICEF local office procurement records; or the MOH/EPI.
- *Cost of training:*
  - Training event cost = venue rental + catering + training materials + travel + (number of participants \* number of days) \* (per diem + daily wage rate)
  - initial training is capital cost; ongoing, routine training is recurrent

# Cost Analysis: Recurrent Costs

- *Cost of social mobilization:*
  - community meetings, printing flyers and materials, events; other sensitization (per diem, staff time, materials).
- *Vehicle maintenance:*
  - total vehicle maintenance costs per facility (per district) and (x) the share of mileage (km) made for routine immunization related activities.
- *Cold chain maintenance:*
  - fuel and energy costs required to run the cold chain as well as the cost of repairs and spare parts.
  - The cMYP Guidelines suggests estimating cold chain operation and maintenance as 5% of the capital cost of equipment.
- *Surveillance cost:*
  - proportion of time spent, transport cost, cost of laboratory materials etc.

# Cost Analysis : Capital Cost

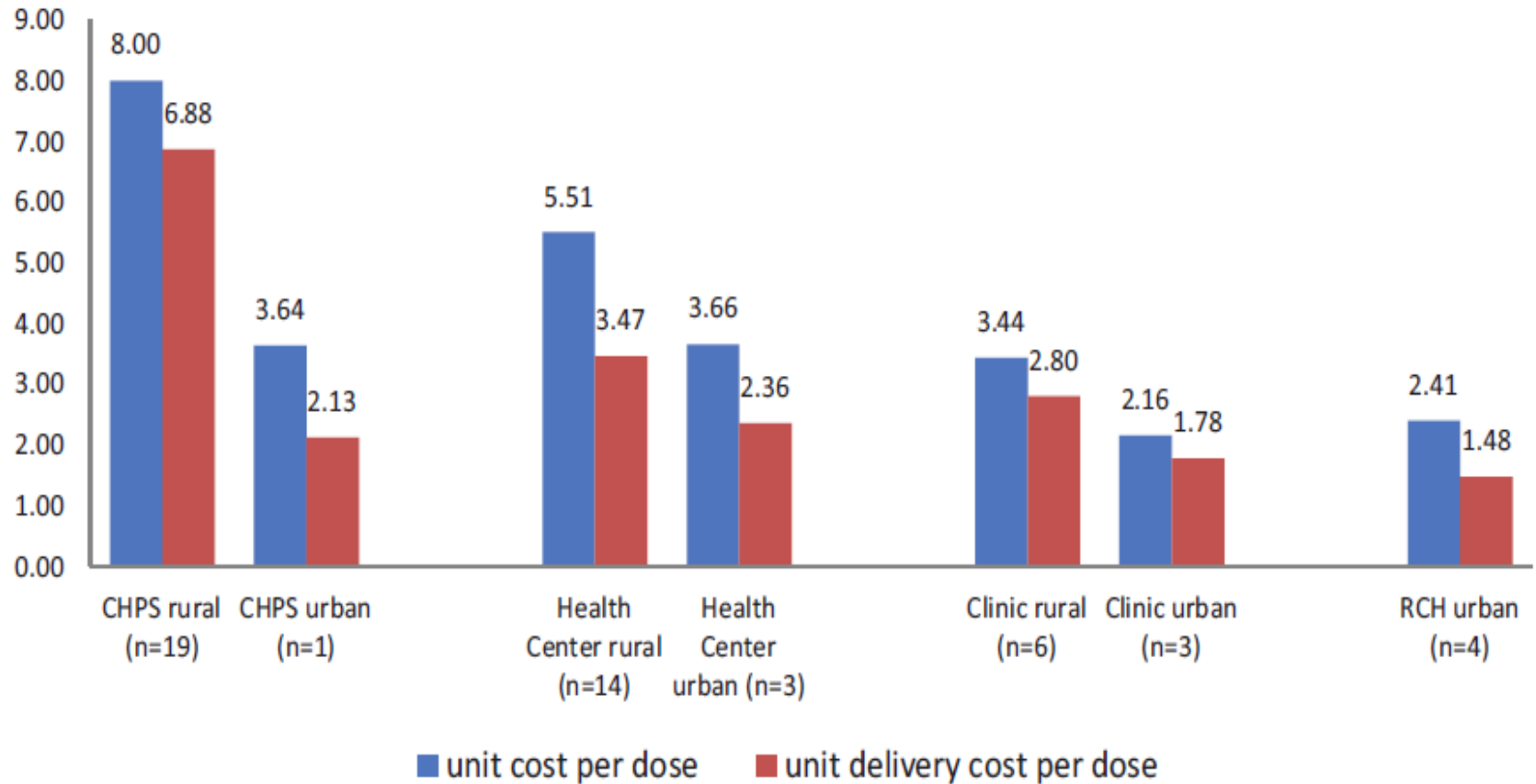
- *Cold chain equipment:*  
Number of cold chain equipment (by type) x average replacement price X % capacity used by particular vaccine
  - annualized over useful life of item
- *Vehicles:*  
Number of vehicles (by type) x replacement price (by type) x % use by the routine immunization program X annualization factor
- *Building:*  
 $m^2 \times \text{cost}/m^2 \times \% \text{ allocation to immunization}$
- *Computers and office equipment:*  
discounted annual value of these inputs

# Examples of Allocation of Shared Costs

Line item	Tracing factor (total to immunization)
Staff time	% of time spent on immunization
Vehicle	% used for routine immunization (share of km travelled for routine immunization)
Building	% of facility area used for immunization
Overhead	Electricity / housekeeping: % of facility area used for immunization Telephone: number of full time equivalent (FTE) in immunization compared to total FTE at the facility
Waste management	share of vaccine load to total load in the incinerator

The more important the cost item is for the analysis, the greater the effort that should be made to estimate it accurately.

# Understanding Unit Costs - Ghana



## Understanding costs of Routine Immunization – Average Unit cost per dose from six countries (EPIC – Menzies 2015)

Country	Average cost per site	Average cost per dose	Average cost per DTP3
Benin	\$18K	\$2.75	\$30
Ghana	\$18K	\$6.09	\$56
Honduras	\$13K	\$9.48	\$128
Moldova	\$4K	\$13.63	\$139
Uganda	\$8K	\$2.76	\$27
Zambia	\$28K	\$4.05	\$40

What does this suggest that we should think about when assessing and modelling cost effectiveness?



# Estimating Unit Costs and Total Program Costs from Data Sample

In this type of analysis, it is important to use methods that correctly account for the underlying relationship between cost and volume, and that are appropriate for the approach used to choose the sample.

## Simple: 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.
- Total cost is calculated as the mean of total costs across all sites in the sample, multiplied by the ratio of the total delivery volume in the overall program to the mean delivery volume in the sample.

# Other Sophisticated Methods

More sophisticated options may be possible depending on the auxiliary information available:

- **Calibration estimator** uses auxiliary information to re-weight the data in the sample to more closely match the true distribution of costs in the population.
  - At a minimum, auxiliary information will include the total volume of services delivered in the overall program of interest ( $\sum_{i=1}^N Q_i$ ) and the total number of sites in the overall program of interest ( $N$ ).
- **Regression estimator** can take many forms. One simple example is a log-log regression of costs on delivery volumes
  - Using a model of this form, unit costs may be estimated as the sum of the predicted costs divided by the (known) total delivery volume in the population.  $\log(C_i) = \alpha + \beta \log(Q_i) + \epsilon_i$

# Aggregating cost data collected from multiple levels of the healthcare system

You can calculate unit and total cost estimates that aggregate data from multiple levels of the healthcare system.

- Use appropriate sample weights and methods for estimation of standard errors at each level of the analysis.

For example, in order to estimate total costs across three levels of the health system, the following procedure could be used:

1. Use one of the estimation methods described above to calculate the total or unit cost (whichever is of interest) at the first level (e.g., the facility level) using the inverse probability of sampling weights for that level.
2. Use one of the estimation methods described above to calculate the total or unit cost (whichever is of interest) at the second level (e.g., the district level) using the inverse probability of sampling weights for that level.
3. Calculate the total or unit costs at the third level (e.g., the national level). This may not require use of one of the estimation methods above because the data collected represent all costs at the national level (rather than a sample).
4. Add estimates from the three levels together to generate estimates of unit or total costs of routine immunization in the overall program.

# Aggregation of costs from facility to national level

## Aggregation Method

Weighted  
Average District  
Costs – Vaccine  
Costs

X

Number  
of  
Districts

+

National  
Level  
Costs

= Total Annual  
National Cost of  
the Routine  
Program

Weighted Average  
Facility Costs –  
Vaccine Costs

X

Number  
of  
Facilities

+

District  
Level  
Costs

= Total Annual  
District Cost of the  
Routine Program

Weighted Average  
Facility Cost

X

Number  
of  
Facilities

= Total Annual Facility  
Cost for the Routine  
Immunization Program

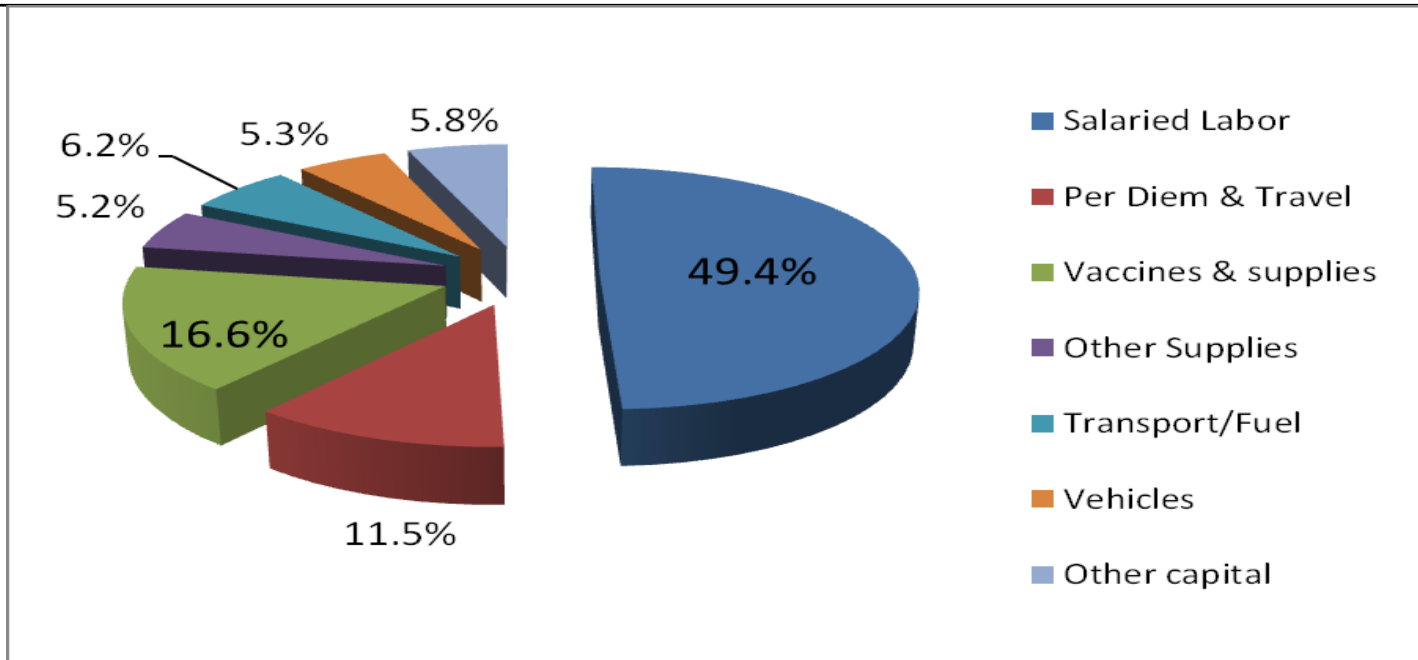
Source: Common approaches for the costing and financing of routine immunization and new vaccines. Working Paper. Brenzel L. 2013. Available at: [https://static1.squarespace.com/static/556deb8ee4b08a534b8360e7/t/55970258e4b03cf942da51ac/1435959896232/WEBSITE\\_Common+Approach.pdf](https://static1.squarespace.com/static/556deb8ee4b08a534b8360e7/t/55970258e4b03cf942da51ac/1435959896232/WEBSITE_Common+Approach.pdf)

Should studies consider aggregate national costs of different interventions?

# Understanding Total national program costs

Zambia EPI economic cost by health system level & line item (Zambia \$2011 '000)

Description	Facility	District	Prov.	Nat.	Total
Total cost	31m	5.4m	0.9m	0.7m	38.16m
Percentage of total	82%	14%	2%	2%	100%



# Summary: Measurement of Vaccine Program Costs

- Measurement of vaccine program / intervention costs is core to economic evaluation of new options for vaccines or implementation models
- General costing process and methods relevant to costing of implementation:
  - Describe intervention -> identify resources -> quantify resources -> value resources -> allocate costs to immunization or specific service
  - Direct/ micro-costing; ingredients based; step down; secondary data?
- Structure costing around immunization 1) activities and then 2) line items

## Suggested readings

1. Common approaches for the costing and financing of routine immunization and new vaccines. Working Paper. Brenzel L. 2013. Available at: [https://static1.squarespace.com/static/556deb8ee4b08a534b8360e7/t/55970258e4b03cf942da51ac/1435959896232/WEBSITE\\_Common+Approach.pdf](https://static1.squarespace.com/static/556deb8ee4b08a534b8360e7/t/55970258e4b03cf942da51ac/1435959896232/WEBSITE_Common+Approach.pdf)
2. World Health Organization (2008). WHO guide for standardization of economic evaluations of immunization programmes. Geneva, Switzerland.
3. Gargasson JBL, Nyongator FK, Adibo M, et al. Costs of routine immunization and the introduction of new and underutilized vaccines in Ghana. *Vaccine*. 2015 May; 33S, A40–46.
4. Janusz CB, Orjuela CC, Aguilera IBM et al. Examining the cost of delivering routine immunization in Honduras. *Vaccine*. 2015 May; 33S, A53–59.
5. Geng F, Suharlim C, Brenzel L, et al. The cost structure of routine infant immunization services: a systematic analysis of six countries. *Health Policy and Planning*. 2017. Available at <https://doi.org/10.1093/heapol/czx067>

**Section B**  
**Costing New Vaccine Introduction**  
**(NUVI)**

# Importance of Costing NUVI

- Understanding the full scope of the cost and implications of introducing a new vaccine is essential to ensure **adequate planning** and **resource mobilization**.
- Additional costs will be incurred in the short-run in the lead up and around the time of introduction (start-up costs), and there will be additional ongoing recurrent costs potentially associated with a new vaccine.
- The additional cost of the vaccine, while it might be initially subsidized at a lower unit price, will eventually become the responsibility of the country. Understanding both the long-term financial consequences of the new vaccine and of associated delivery costs is useful to assess the affordability and sustainability of the vaccine, relative to any health benefits.
- New vaccine introduction can be examined from an economic, financial or fiscal cost perspective.
  - If the objective is to determine whether a new vaccine is a cost-effective investment, then economic costs are evaluated.
  - If the objective is to understand how much up-front money is required to launch a new vaccine, then fiscal costs are evaluated.
  - If the objective is to know the initial and ongoing budget requirement, then financial costs are evaluated.

# Typical Cost Elements Associated with NUVI

Line Item	Economic Cost	Financial Cost	Fiscal Cost
Paid labor	Time allocation of existing staff for planning, management, administration of the vaccine	Value of time of additional staff and consultants hired	Full cost of additional staff or consultants hired
Volunteers	Value of time	Not included	Not included
Vaccine	Value of vaccines administered and wasted	Value of vaccines administered and wasted	Procurement value of vaccines
Syringes	Value of syringes utilized and wasted	Value of syringes utilized and wasted	Procurement value of syringes (often these costs are bundled with vaccines)
Safety Boxes	Value of safety boxes used	Value of safety boxes used	Purchase value of safety boxes
Injection supplies	Value of injection supplies used	Value of injection supplies used	Purchase value of injection supplies
Per Diems	Estimated value of per diems for health workers and volunteers	Estimated value of per diems for health workers and volunteers	Per diem costs paid out
Fuel and other transport costs	Value of fuel consumed and other transport costs	Value of fuel consumed and other transport costs	Fuel and other transport costs paid out
Cold chain maintenance	Value of operating and maintaining the cold chain used in new vaccine introduction	Value of operating and maintaining the cold chain used in new vaccine introduction	Purchase costs for cold chain operating and maintenance, and other equipment maintenance

Note: Fiscal costs of vaccines might reflect a subsidy that is given over an initial period of time, such as through Gavi – to evaluate the longer-term costs, suggest using market values.

# Additional Cost Elements for NUVI

Line Item	Economic Cost	Financial Cost	Fiscal Cost
Social mobilization/advocacy *	Value of time, materials utilized for social mobilization/advocacy	Value of time, materials utilized for social mobilization/advocacy	Procurement value of social mobilization activities
Training *	Value of time, materials utilized for training	Value of time, materials utilized for training	Procurement value of training
Cold Chain *	Incremental economic value (based on useful life, discount rate) of existing cold chain capacity that will be utilized and/or economic value of additional cold chain equipment purchased	Incremental financial value (based on straight line depreciation over useful life) of additional existing cold chain capacity that will be utilized and/or financial value of additional cold chain equipment purchased	Procurement value of new cold chain equipment purchased
Vehicles and other equity *	Incremental economic value (based on useful life, discount rate) of existing vehicles and equipment used and/or economic value of additional vehicles and equipment purchased	Incremental financial value (based on straight line depreciation over useful life) of existing vehicles and equipment used and/or financial value of additional vehicles and equipment purchased	Procurement value of new vehicles and equipment

Sources: Guidelines for estimating the costs of introducing new vaccines in national immunization systems [immunizationeconomics.org/costingmethods](http://immunizationeconomics.org/costingmethods).

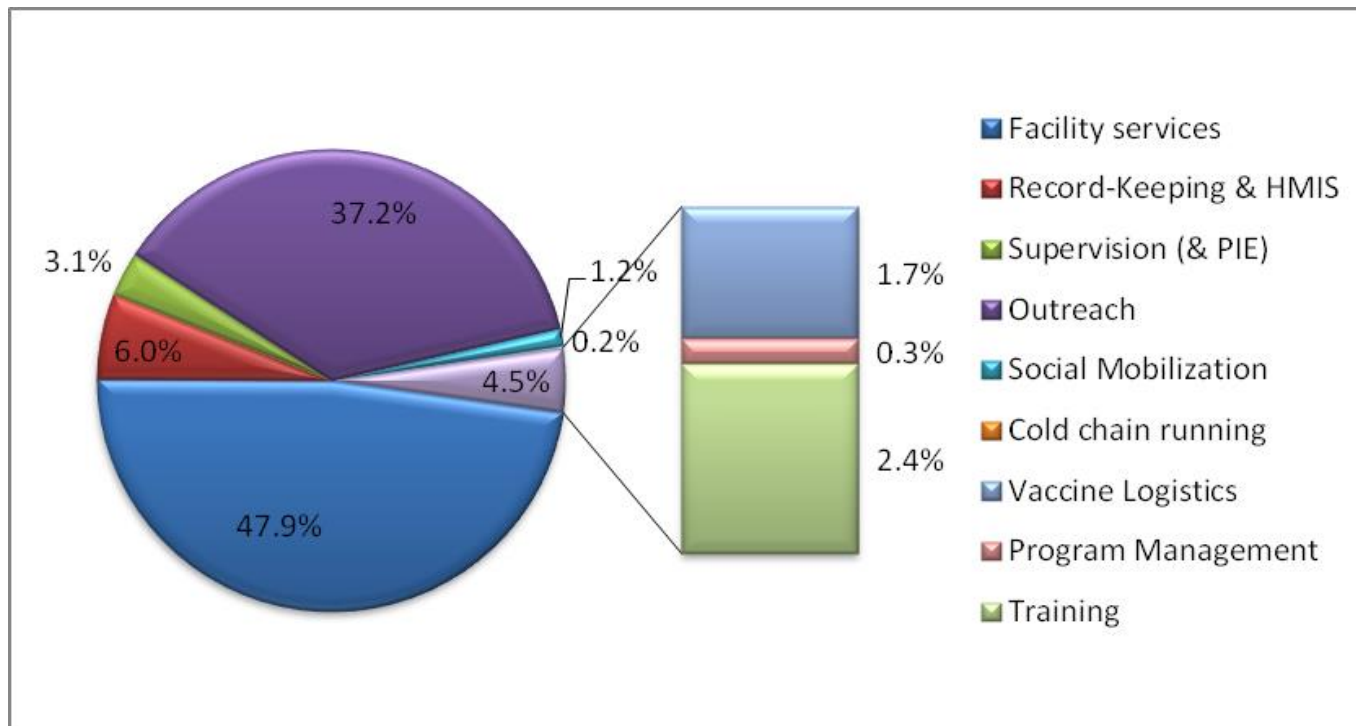
Common Approach: [https://static1.squarespace.com/static/556deb8ee4b08a534b8360e7/t/55970258e4b03cf942da51ac/1435959896232/WEBSITE\\_Common+Approach.pdf](https://static1.squarespace.com/static/556deb8ee4b08a534b8360e7/t/55970258e4b03cf942da51ac/1435959896232/WEBSITE_Common+Approach.pdf)

Note: Starred (\*) cost elements can be treated as a capital investment and annualized if considered a start-up cost and having benefits beyond a year

# Costing Considerations for NUVI

1. Utilize a similar ingredients-based approach as for evaluating ongoing immunization program
2. Determine the time frame and cost estimation period
  - When did planning for NUVI begin – when will the introduction period be over?
3. What type of cost analysis?
  - **Perspective:** payer, provider, societal
  - **Projection** of needs vs **Retrospective** Assessment: usually ingredients-based, plus secondary data needed
4. Need for clear description of the delivery strategy intervention
  - Clarify uptake of the vaccine and how many years to achieve a specific coverage level (i.e., Gavi assumption of 2 years for 60% coverage; some costs e.g. cold chain may be incurred in years before)
5. Sources of data and information
  - EPI managers and staff; External partners, Gavi New Vaccine Application guide
  - Develop detailed understanding of the specific vaccine (e.g, vial size, doses required, storage, reconstitution, administration), additional workload implications etc.
6. Determine cost elements and type of estimation
  - Start-up/ initial costs: planning, social mobilization, training
  - Ongoing costs: cold chain maintenance

# EXAMPLE: Distribution of total economic PCV and Rota introduction costs by function

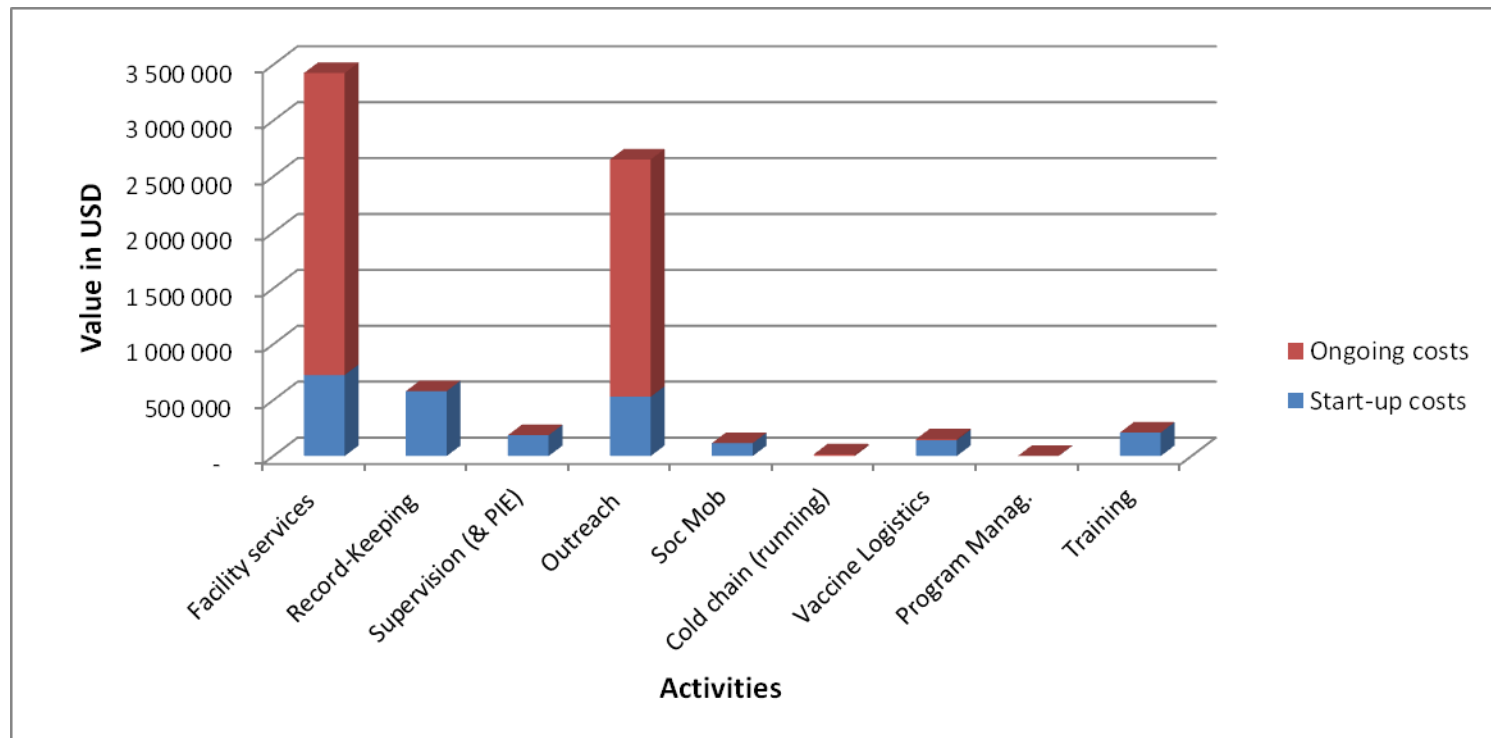


Ongoing economic cost for 90% PCV coverage adds 27% to total RI cost (+/- \$38 million)

Incremental NUVI cost/dose higher than average RI cost/dose (\$7.56 vs. \$7.18);  
Cost/child is an additional 42% of total RI cost/ child (\$24.91 vs \$59.32)

# EXAMPLE: NUVI Start-up vs. On-going costs by function

This graph highlights the importance of knowing both the start-up and on-going implementation costs.



Reference: Schütte, C., Chansa, C., Marinda, E., Guthrie, T., Banda, S., Nombewu, Z., . . . Kinghorn, A., (2015), Cost analysis of routine immunisation in Zambia, *Vaccine*, 33(Supplement 1), A47-A52.

# Additional Considerations For New Vaccine Introduction Costing

## 1. Cold chain costs

- Identifying true incremental needs vs opportunistic replacement
- Determine whether there is current capacity to store and transport some or all of the new vaccines needed
- The WHO EPI Logistics tool & WHO volume calculator to estimate current and additional capacities and volumes required  
([https://www.who.int/immunization/documents/control/who\\_ivb\\_17.06/en/](https://www.who.int/immunization/documents/control/who_ivb_17.06/en/) )

## 4. Budget impact, sustainability and fiscal space

- Often a key issue when translating evaluation into decisions
- Consider costs at each level in the health system

# Exercise: Which costs to include in incremental cost of new vaccines? (Adapted from WHO 2002)

<b>New Monovalent vaccine</b>	<b>Combination vaccine with 1) fewer doses per vial than older vaccine and/or 2) extra vials for diluent</b>	<b>Combination vaccine with no change in vial size and no extra vials for diluent</b>
<input type="checkbox"/> Vaccines	<input type="checkbox"/> Vaccines	<input type="checkbox"/> Vaccines
<input type="checkbox"/> Reconstitution syringes	<input type="checkbox"/> Reconstitution syringes	<input type="checkbox"/> Reconstitution syringes
<input type="checkbox"/> Additional safety boxes	<input type="checkbox"/> Additional safety boxes	<input type="checkbox"/> Additional safety boxes
<input type="checkbox"/> Vaccine distribution and storage	<input type="checkbox"/> Vaccine distribution and storage	<input type="checkbox"/> Vaccine distribution and storage
<input type="checkbox"/> System to transport & store new vaccine	<input type="checkbox"/> System to transport & store new vaccine	<input type="checkbox"/> System to transport & store new vaccine
<input type="checkbox"/> Waste management costs	<input type="checkbox"/> Waste management costs	<input type="checkbox"/> Waste management costs
<input type="checkbox"/> Additional staff time	<input type="checkbox"/> Additional staff time	<input type="checkbox"/> Additional staff time
<input type="checkbox"/> Disease surveillance related to new vaccine	<input type="checkbox"/> Disease surveillance related to new vaccine	<input type="checkbox"/> Disease surveillance related to new vaccine
<input type="checkbox"/> Initial training	<input type="checkbox"/> Initial training	<input type="checkbox"/> Initial training
<input type="checkbox"/> Social mobilization	<input type="checkbox"/> Social mobilization	<input type="checkbox"/> Social mobilization
<input type="checkbox"/> Extra printing & other costs	<input type="checkbox"/> Extra printing & other costs	<input type="checkbox"/> Extra printing & other costs

1. Review vaccines and costs in groups – share team technical and economic expertise!
2. Identify costs NOT relevant to each of the new vaccines

## Exercise: Answer Key

<b>New Monovalent vaccine</b>	<b>Combination vaccine with fewer doses per vial than older vaccine and/or extra vials for diluent</b>	<b>Combination vaccine with no change in vial size and no extra vials for diluent</b>
<input checked="" type="checkbox"/> Vaccines	<input checked="" type="checkbox"/> Vaccines	<input checked="" type="checkbox"/> Vaccines
<input type="checkbox"/> Reconstitution syringes	<input checked="" type="checkbox"/> Reconstitution syringes	<input type="checkbox"/> Reconstitution syringes
<input checked="" type="checkbox"/> Additional safety boxes	<input type="checkbox"/> Additional safety boxes	<input type="checkbox"/> Additional safety boxes
<input checked="" type="checkbox"/> Vaccine distribution and storage	<input checked="" type="checkbox"/> Vaccine distribution and storage	<input type="checkbox"/> Vaccine distribution and storage
<input checked="" type="checkbox"/> System to transport & store new vaccine	<input type="checkbox"/> System to transport & store new vaccine	<input type="checkbox"/> System to transport & store new vaccine
<input checked="" type="checkbox"/> Waste management costs	<input type="checkbox"/> Waste management costs	<input type="checkbox"/> Waste management costs
<input checked="" type="checkbox"/> Additional staff time	<input type="checkbox"/> Additional staff time	<input type="checkbox"/> Additional staff time
<input checked="" type="checkbox"/> Disease surveillance related to new vaccine	<input checked="" type="checkbox"/> Disease surveillance related to new vaccine	<input checked="" type="checkbox"/> Disease surveillance related to new vaccine
<input checked="" type="checkbox"/> Initial training	<input checked="" type="checkbox"/> Initial training	<input checked="" type="checkbox"/> Initial training
<input checked="" type="checkbox"/> Social mobilization	<input checked="" type="checkbox"/> Social mobilization	<input checked="" type="checkbox"/> Social mobilization
<input checked="" type="checkbox"/> Extra printing & other costs	<input checked="" type="checkbox"/> Extra printing & other costs	<input checked="" type="checkbox"/> Extra printing & other costs

# Application to a COVID Vaccine

- Estimating the cost of introducing a COVID vaccine is important to be able to mobilize the necessary resources in the immediate future
- The type of vaccine and the delivery strategy to be used will affect the introduction costs. However, we don't know have much certainty at the moment.
- Important to estimate a range of plausible costs and to focus on either financial or fiscal costs for budgeting purposes.
- Delivery strategy will depend upon who is being immunized
  - Initial target groups might include essential workers, elderly
    - Immunizing these populations will be outside of the childhood vaccination platforms in countries and could entail additional costs
    - See: <https://www.gavi.org/sites/default/files/covid/covax/who-covid19-vaccine-allocation-final-working-version-9sept.pdf>
  - COVAX Facility to provide initially up to 20% of doses  
<https://www.gavi.org/covax-facility>

# Application to a COVID Vaccine

- Effects on cost elements: see <https://www.gavi.org/covax-facility> for up-to-date details
  - Vaccine characteristics: assume a 2-dose schedule of an injectable vaccine; 5% wastage (see also: <https://www.gavi.org/vaccineswork/covid-19-vaccine-race> )
  - Syringes: these will need to be procured separately
  - Safety boxes and waste management: these will need to be ramped up
  - Social mobilization and advocacy: these costs might be substantial to motivate vaccination, combat hesitancy, and provide clear information on how to get a vaccination
  - Training: health workers will need to receive specific training on how to handle this new vaccine
  - Data systems and registration: as delivery will be outside of the childhood vaccination platform, additional efforts will need to be made to identify who will be vaccinated, and to document when they are vaccinated through secure systems

# Application to a COVID Vaccine

- Effects on cost elements: see <https://www.gavi.org/covax-facility> for up-to-date details
  - Planning and management: At this level of scale, introducing a COVID vaccine will require substantial planning and management
  - Adverse events following immunization: because this is a new vaccine, efforts will need to be made to monitor AEFIs and evaluate introduction
  - PPE and Infection Control: these supplies will need to be provided to health workers and staff
  - Cold chain: Assume a 2-8 degree cold chain. Additional requirements may be found on <https://www.gavi.org/covax-facility>.

# Suggested readings

1. How to Cost Immunization Programs: A Practical Guide

<http://immunizationeconomics.org/recent-activity/2019howtocost>

2. Common Approach for the costing and financing of routine immunization and new vaccines. Working Paper. Brenzel L. 2013. Available at:

<https://static1.squarespace.com/static/556deb8ee4b08a534b8360e7/t/55970258e4b03cf942da51ac/1435959896232/WEBSITE+Common+Approach.pdf>

3. World Health Organization (2008). WHO guide for standardization of economic evaluations of immunization programmes. Geneva, Switzerland.

4. Gargasson JBL, Nyongator FK, Adibo M, et al. Costs of routine immunization and the introduction of new and underutilized vaccines in Ghana. *Vaccine*. 2015 May; 33S, A40–46.

5. Janusz CB, Orjuela CC, Aguilera IBM et al. Examining the cost of delivering routine immunization in Honduras. *Vaccine*. 2015 May; 33S, A53–59.

6. Geng F, Suharlim C, Brenzel L, et al. The cost structure of routine infant immunization services: a systematic analysis of six countries. *Health Policy and Planning*. 2017. Available at <https://doi.org/10.1093/heapol/czx067>

7. Griffiths Kalesha et al. *Costs of introducing pneumococcal, rotavirus and second dose measles vaccine into the Zambian Immunization program: are expansions sustainable?* *Vaccine* (2016)

# **Cost of immunization during COVID-19 pandemic**

Analysis and Presentation by

**THINKWELL: CHRISTINA BANKS, FLAVIA MOI, LAURA BOONSTOPPEL**

**Harvard School of Public Health : ALLISON PORTNOY, STEPHEN RESCH**

# Implications of COVID-19 on Immunization Delivery Costs

- The COVID-19 pandemic has significantly disrupted immunization services.
- EPI Staff need to modify immunization services to optimize coverage.
- They also need to protect their frontline workers from being infected and transmitting COVID-19.
- How much more does it cost to ensure continuation of immunization services during this pandemic?

# Overview of the Scenarios

1.

Personal protective equipment (**PPE**) & Infection Prevention and Control (**IPC**) measures for immunization sessions

2.

Adding staff to ensure **physical distance** is maintained and for **screening** during immunization sessions

3.

**Context adjustments:** changes in session sizes and frequency, hazard pay to compensate health workers

4.

Other **operational cost** increases: additional social mobilization, communication, training, transport, etc.

# Results: IMPLICATIONS DEPEND ON SPECIFIC CHANGES

	Campaign	Routine	Routine outreach
1. PPE & IPC	8-32% increase in cost per dose	Additional costs of PPE represents 2-3% increase in per-facility annual costs	11-14% (IPC only) or 18-39% including masks, 45% incl. gloves & goggles
2. Physical distancing & screening	10% for added staff, 26% incl thermometers	Physical distance measures: 1-4% increase for non-labor, 20-39% increase for labor	9% (1 extra staff) to 43% (incl infrared thermometers)
3. Context adjustments	Campaign extension: 8-32%	Hazard pay for health workers translates to 13-40% increase in per-facility annual costs	Conducting twice as many sessions: 54-119%
4. Ops cost increases	10-40% increase in cost per dose	Training/social mobilization represent 2-7% increase in per-facility annual costs	Increasing outreach to compensate for a drop in routine attendance: + 10-11%

# Campaign – Median % increase in cost per dose

Scenarios	Low	Medium	High
PPE & IPC (n=9)	5%	9%	20%
Physical distancing & Screening (n=4)	10%	-	26%
Extended Campaign Duration (n=5)	8% Reducing to 80% of the daily target	-	32% Reducing to 50% of daily target
Operational Cost Increase	10% With 25% increase in OC	20% With 50% increase in OC	40% With 100% increase in OC

Campaign costs/dose could increase by 19% - 174% depending on the specific changes

# ROUTINE SCENARIOS

Each category is presented as the incremental financial outlays required for the relevant adjustments.

	1. PPE	2. Physical distance	3. Hazard pay	4. Training/social mobilization*
LOW	<ul style="list-style-type: none"> <li>No PPE</li> </ul>	<ul style="list-style-type: none"> <li>One additional team member</li> <li>Hand washing station for facility waiting area (low: simple; medium: higher quality)</li> </ul>	<p>10% of salary hazard pay rate</p>	<p>50/100% of estimated costs required for COVID-19</p>
MEDIUM	<ul style="list-style-type: none"> <li>1 x mask per health worker per day</li> <li>Hand sanitizer for vaccinators</li> </ul>	<ul style="list-style-type: none"> <li>Tape; plexiglass barriers (medium only)</li> </ul>	<p>20% of salary hazard pay rate</p>	<p>100/200% of estimated costs required for COVID-19</p>
HIGH	<ul style="list-style-type: none"> <li>1 x mask per health worker per day</li> <li>Reusable goggles for vaccinators</li> <li>1 x pair of gloves per client per day for vaccinators</li> <li>2 x pair of gloves for non-vaccinators per day</li> </ul>	<ul style="list-style-type: none"> <li>Two additional team members</li> <li>Hand washing station for facility waiting area</li> <li>Tape; plexiglass barriers; one screening tent &amp; thermometer per facility</li> </ul>	<p>30% of salary hazard pay rate</p>	<p>150/300% of estimated costs required for COVID-19</p>

\*According to estimates from 11 IDCC studies inflated to 2018 USD.

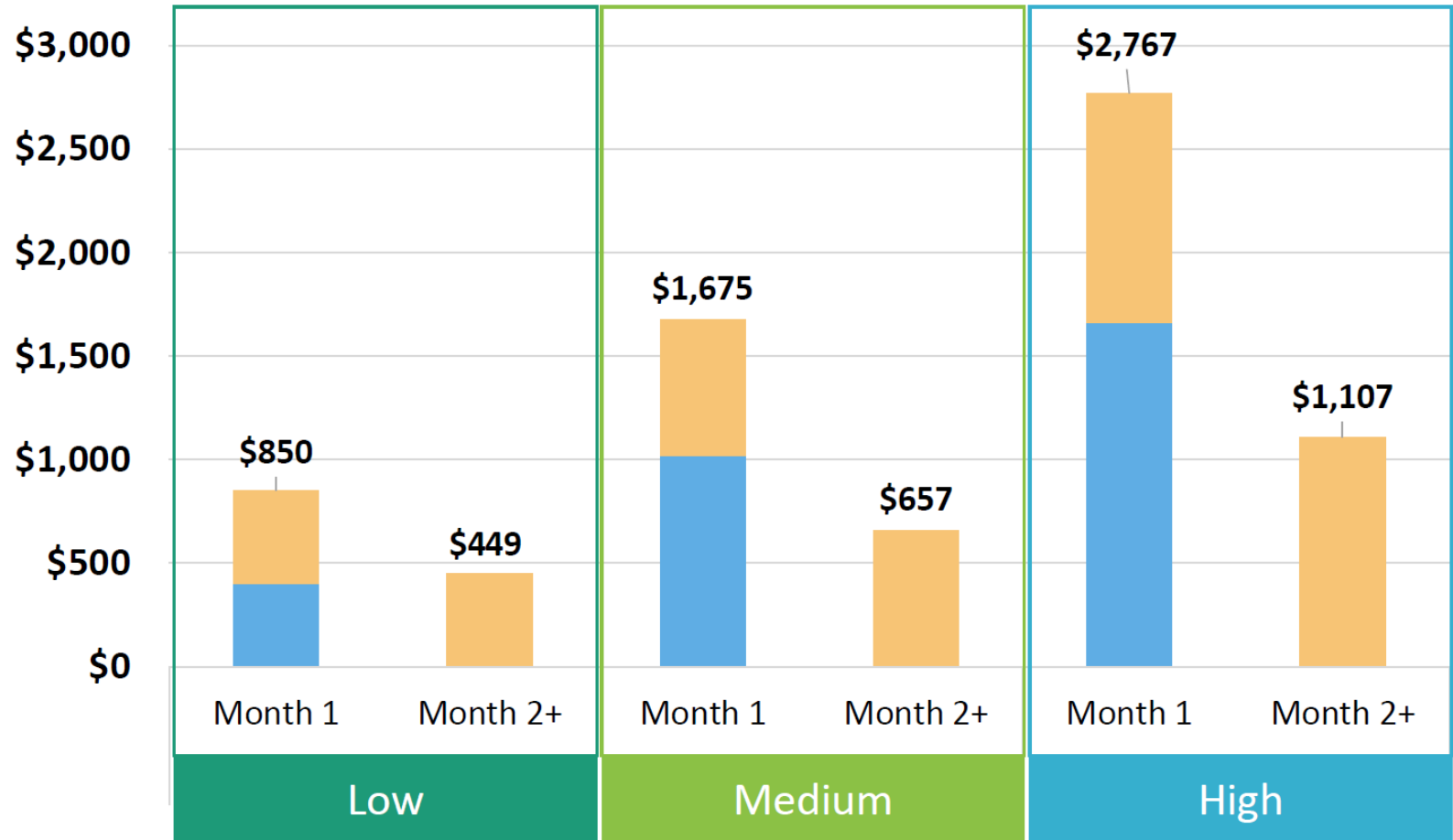
# ROUTINE SCENARIOS

Each category is presented as the incremental financial outlays required for the relevant adjustments.

	1. PPE	2. Physical distance	3. Hazard pay	4. Training/social mobilization*
LOW	<ul style="list-style-type: none"> <li>No PPE</li> </ul> <p><b>R:\$0</b></p>	<ul style="list-style-type: none"> <li>One additional team member</li> </ul> <p><b>S:\$12</b>   <b>R:\$271</b></p>	<p>10% of salary hazard pay rate</p> <p><b>R:\$178</b></p>	<p><b>St:\$145</b> estimated costs required for</p> <p><b>Ssm:\$243</b></p>
MEDIUM	<ul style="list-style-type: none"> <li>1 x mask per health worker per day</li> <li>Hand sanitizer for vacc</li> </ul> <p><b>R:\$24</b></p>	<ul style="list-style-type: none"> <li>simple; medium: higher quality)</li> <li>Tape; plexiglass barriers (medium only)</li> </ul> <p><b>S:\$242</b>   <b>R:\$277</b></p>	<p>20% of salary hazard pay rate</p> <p><b>R:\$271</b></p>	<p><b>St:\$291</b> estimated costs required for</p> <p><b>Ssm:\$485</b></p>
HIGH	<ul style="list-style-type: none"> <li>1 x mask per health worker per day</li> <li>Reusable goggles for vaccinators</li> <li>1 x pair of gloves per client per day for vaccinators</li> <li>2 x pair of gloves for non</li> </ul> <p><b>R:\$35</b> day</p>	<ul style="list-style-type: none"> <li>Two additional team members</li> <li>Hand washing station for facility waiting area</li> <li>Tape; plexiglass barriers; one screening tent &amp; thermometer per facility</li> </ul> <p><b>S:\$496</b>   <b>R:\$538</b></p>	<p>30% of salary hazard pay rate</p> <p><b>R:\$538</b></p>	<p><b>St:\$436</b></p> <p>150/300% of estimated costs required for COVID-19</p> <p><b>Ssm:\$728</b></p>

\*According to estimates from 11 IDCC studies inflated to 2018 USD.

## AVERAGE PER-FACILITY COSTS OVER TIME, COST CATEGORIES COMBINED



■ Startup costs ■ Recurrent costs

# Routine Outreach

- Analysis is based on two costing studies done in Tanzania and Indonesia
- Shows that changes in the outreach delivery costs are highly dependent on the initial strategy such as
  - Volume delivered through outreach
  - Session size
  - Session Frequency
  - Per diem for outreach HCW
- PPE and IPC interventions are the biggest driver of increases in delivery cost for outreach
- The outreach delivery costs in RURAL areas are high with the largest absolute \$ change per dose

# Suggested readings

1. How to Cost Immunization Programs: A Practical Guide  
[immunizationeconomics.org/costingmethods](http://immunizationeconomics.org/costingmethods).
2. World Health Organization. Guidelines for Estimating the Cost of Introducing New Vaccines: <https://apps.who.int/iris/handle/10665/67342>
3. Common Approach for the costing and financing of routine immunization and new vaccines. Working Paper. Brenzel L. 2013. Available at:  
[https://static1.squarespace.com/static/556deb8ee4b08a534b8360e7/t/55970258e4b03cf942da51ac/1435959896232/WEBSITE\\_Common+Approach.pdf](https://static1.squarespace.com/static/556deb8ee4b08a534b8360e7/t/55970258e4b03cf942da51ac/1435959896232/WEBSITE_Common+Approach.pdf)
3. World Health Organization (2008). WHO guide for standardization of economic evaluations of immunization programmes. Geneva, Switzerland.  
[https://apps.who.int/iris/bitstream/handle/10665/69981/WHO\\_IVB\\_08.14\\_eng.pdf](https://apps.who.int/iris/bitstream/handle/10665/69981/WHO_IVB_08.14_eng.pdf)
4. Gargasson JBL, Nyongator FK, Adibo M, et al. Costs of routine immunization and the introduction of new and underutilized vaccines in Ghana. *Vaccine*. 2015 May; 33S, A40–46.
7. Griffiths Kalesha et al. Costs of introducing pneumococcal, rotavirus and second dose measles vaccine into the Zambian Immunization program: are expansions sustainable? *Vaccine* (2016. July 29; 34(35): 4213-4220  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4967451/>