



# Cost of Vaccine-Preventable Disease Surveillance in Ethiopia, 2018-2019

U.S. Centers for Disease Control and Prevention, The Ohio State University – Global One Health initiative, Ethiopian Public Health Institute, and World Health Organization

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*Note: Please do not circulate nor cite these preliminary results*

# Disclaimer

The views expressed in this presentation are solely those of the authors and do not necessarily represent the official positions of the Ethiopian Public Health Institute, U.S. Centers for Disease Control and Prevention, World Health Organization, and The Ohio State University – Global One Health initiative.

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**Background**

# Vaccine-Preventable Disease (VPD) Surveillance is Critical to Global Goals



From Patel, M.K. and Pallas, S.W. (2020). Global Comprehensive VPD Surveillance.

# Project Rationale

- Despite the critical role of VPD surveillance to inform public health decisions, previous literature has identified that there is a lack of information about its cost
- Anticipated reductions in external polio eradication funding make it more important to understand the resource needs for VPD surveillance in order to **inform the transition to government ownership and management**
- Better understanding of country-level surveillance costs will:
  - Facilitate **planning and budgeting** processes to ensure that national programs allocate adequate **funds for VPD surveillance** activities
  - **Promote advocacy efforts** at both national and international levels to secure additional donor funding for the implementation of optimal surveillance



Vaccine

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Review

## A systematic review of vaccine preventable disease surveillance cost studies

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## Expenditures on vaccine-preventable disease surveillance: Analysis and evaluation of comprehensive multi-year plans (cMYPs) for immunization

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# Study Objectives

## General objective

- To produce country-level estimates of the economic and financial costs of the VPD surveillance system and collect feedback to improve the global guidance on cost analysis methodology.

## Specific objectives

1. To adapt, field test, and **refine a cost methodology to determine country-level costs of surveillance platforms** for each VPD included in the VPD surveillance system of the country
2. To estimate **costs of VPD surveillance** at different administrative levels by **resource types and surveillance support functions**
3. To determine the **sources of funding** for the current VPD surveillance costs at different administrative levels by VPD

**Methods**

# Study Characteristics

## Design:

- A program costing study
- Cross-sectional retrospective quantitative study
- Primary and secondary data collection on resource utilization and costs

## Time-frame and analytic horizon:

Ethiopian Fiscal Year 2018-19 (July 1, 2018 to June 30, 2019)

## Perspective:

Public health sector for VPD surveillance [Ethiopian Public Health Institute, Department of Public Health Emergency Management (EPHI PHEM) and WHO] and implementing partners

## Geographical levels included:

Federal, regional, zonal, woreda (district), and health center/hospital<sup>1</sup>

*<sup>1</sup>Community-based surveillance activities were captured from respondents at the level(s) responsible for funding/implementing those activities.*

# Sampling

**Regions included:** Addis Ababa, Amhara, and Somali

**Sampling approach (unit - cost centers):**

**Federal level:** all cost centers from MoH, EPHI PHEM, WHO, and implementing partner offices

**Regional and sub-regional levels:** a mix of purposive and random sampling of cost centers

**Sample size:** 47 cost centers

- Federal level: 4 offices
  - 1 EPHI PHEM office (including 1 national laboratory)
  - 1 MoH/Expanded Program on Immunization Office
  - 1 CORE Group (international NGO funded by USAID)
  - 1 WHO Country Office
- Regional level: 3 Regional Health Bureaus; 2 Regional Laboratories
- Zonal level: 8 Zonal Health Departments
- Woreda level: 6 Woreda Health Offices
- Health center/hospital level: 24 publicly-owned sites
  - 12 health centers
  - 12 hospitals, including sentinel sites

**Cost centers:**  
organizational units  
that incur costs to  
implement VPD  
surveillance in  
Ethiopia

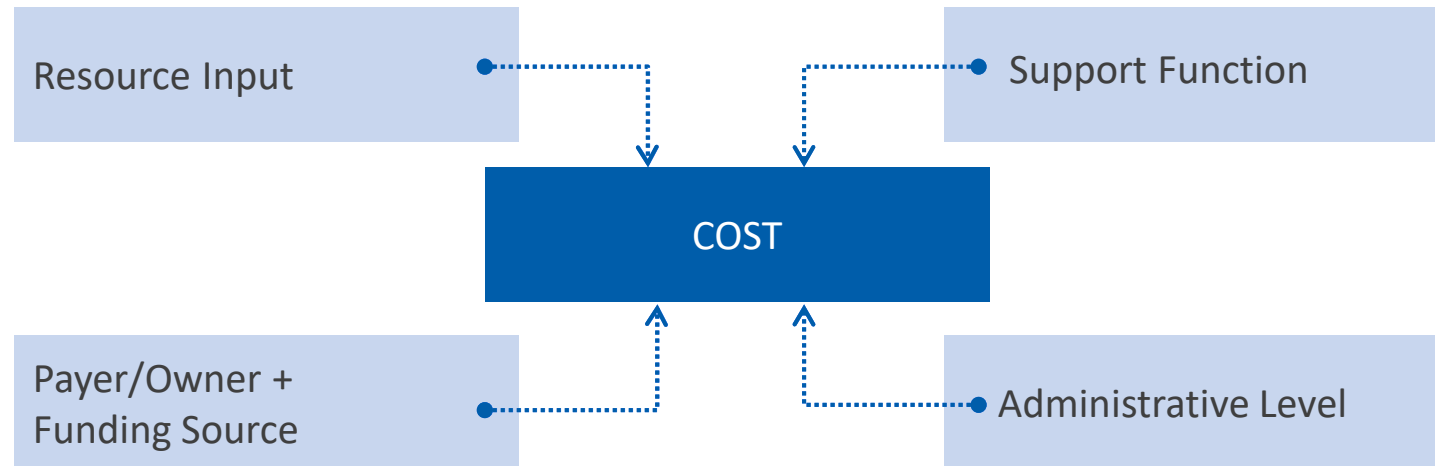
# Administrative Units and Sampled Sites by Level

Cost Center Level	# of administrative units in country, (2018-2019)	# of sampled sites	sampled units as a % of administrative units
Federal	4	4	100
Regional	14	5	36
Health Bureau	11	3	27
Laboratory	3	2	67
Zonal	93	8	9
Woreda	727	6	1
Health Center/Hospital <sup>1</sup>	4,298	24	<1
Hospital	313	10	3
Health Center	3,985	14	<1

<sup>1</sup>Public health center or hospital

# Cost Categorization Dimensions

- Every cost was categorized into four dimensions:



## 4 COST DIMENSIONS

Each cost amount was categorized according to four dimensions: resource input, support function, administrative level, and payer/owner and funding source.

## PUBLIC HEALTH SECTOR PERSPECTIVE

- Includes costs incurred by the public health sector, including government and external partners (e.g., WHO)
- Excludes any patient costs, vaccination costs, outbreak response costs, surveillance costs for VPDs or other diseases not included in the study.

# Surveillance Support Functions Facilitate Implementation of Core Functions

## Support functions (inputs)

- Governance
- Program management
- Workforce capacity
- Field logistics & communication
- Laboratory
- Supervision
- Data management and use
- Coordination

## Opportunities for

- Shared funding
- Linkage across areas
- Innovations

## Core functions (outputs)

- Case detection
- Case notification
- Case investigation/confirmation
- Reporting
- Data analysis & interpretation
- Feedback
- [Outbreak response & control]\*

*\*Outbreak response & control not included in Ethiopia costing study, only included outbreak detection surveillance*

# 16 VPDs included in Ethiopia Cost Evaluation

Ethiopia Indicator-Based Surveillance for Vaccine Preventable Diseases, 2017

Immediately Reportable VPDs	Weekly Reportable VPDs	Other VPDs in the surveillance system
<b>Minimum surveillance standards<sup>1</sup> achieved</b>		
<ul style="list-style-type: none"> <li>Cholera<sup>2,3,5</sup></li> <li>Measles<sup>2,3,5</sup></li> <li>Neonatal tetanus<sup>2,3</sup></li> <li>Polio/Acute flaccid paralysis<sup>2,3,5</sup></li> <li>Yellow fever<sup>2,3,5</sup></li> </ul>		<ul style="list-style-type: none"> <li>Rotavirus</li> </ul>
<b>Minimum surveillance standards<sup>1</sup> not achieved</b>		
<ul style="list-style-type: none"> <li>Human rabies<sup>2,5</sup></li> <li>Rubella<sup>2,5</sup></li> <li>Smallpox<sup>2,5</sup></li> </ul>	<ul style="list-style-type: none"> <li>Meningococcal meningitis (pediatric)<sup>2,4,5</sup></li> <li>Typhoid fever<sup>2,5</sup></li> </ul>	<ul style="list-style-type: none"> <li>Congenital Rubella Syndrome<sup>4</sup></li> <li>Diphtheria</li> <li>Invasive-bacterial vaccine-preventable diseases (Streptococcus pneumoniae<sup>4</sup>, Hemophilus influenzae b<sup>4</sup>)</li> <li>Pertussis</li> </ul>

Other VPDs excluded from study scope:

- COVID-19
- Dengue
- Hepatitis
- HPV
- Influenza
- Japanese encephalitis
- Malaria
- Mumps
- Tuberculosis
- Tick-borne encephalitis
- Varicella

<sup>1</sup>Minimum surveillance standards by VPD available in the WHO 2017 Joint Reporting Form Supplementary Questionnaire on Surveillance.

<sup>2</sup>Aggregated surveillance. <sup>3</sup>Case-based surveillance in place. <sup>4</sup>Sentinel surveillance as of 2021. <sup>5</sup>Diagnosis is supported by laboratory tests.

# Data Collection



*Pictures courtesy of Ohio State University*

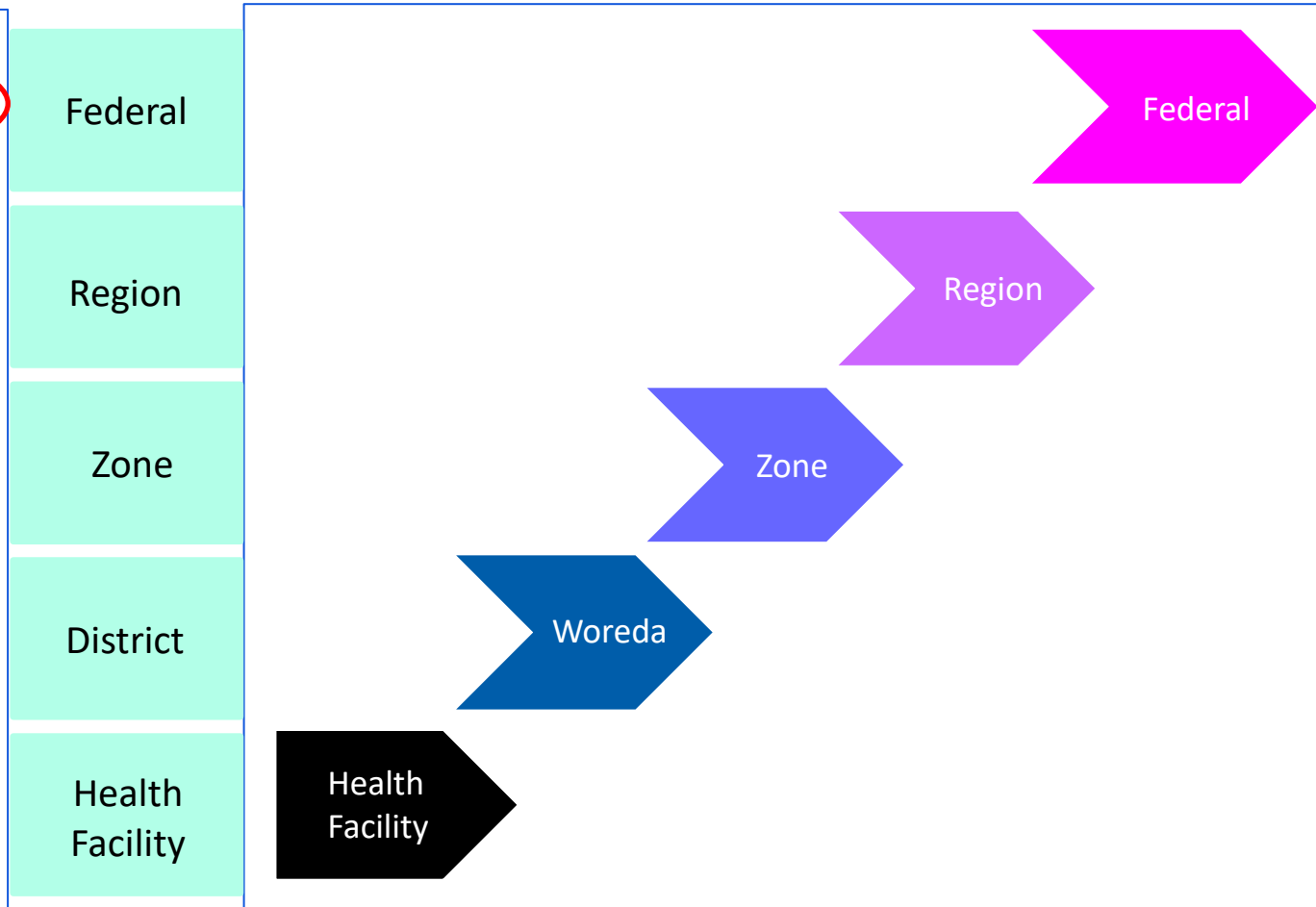
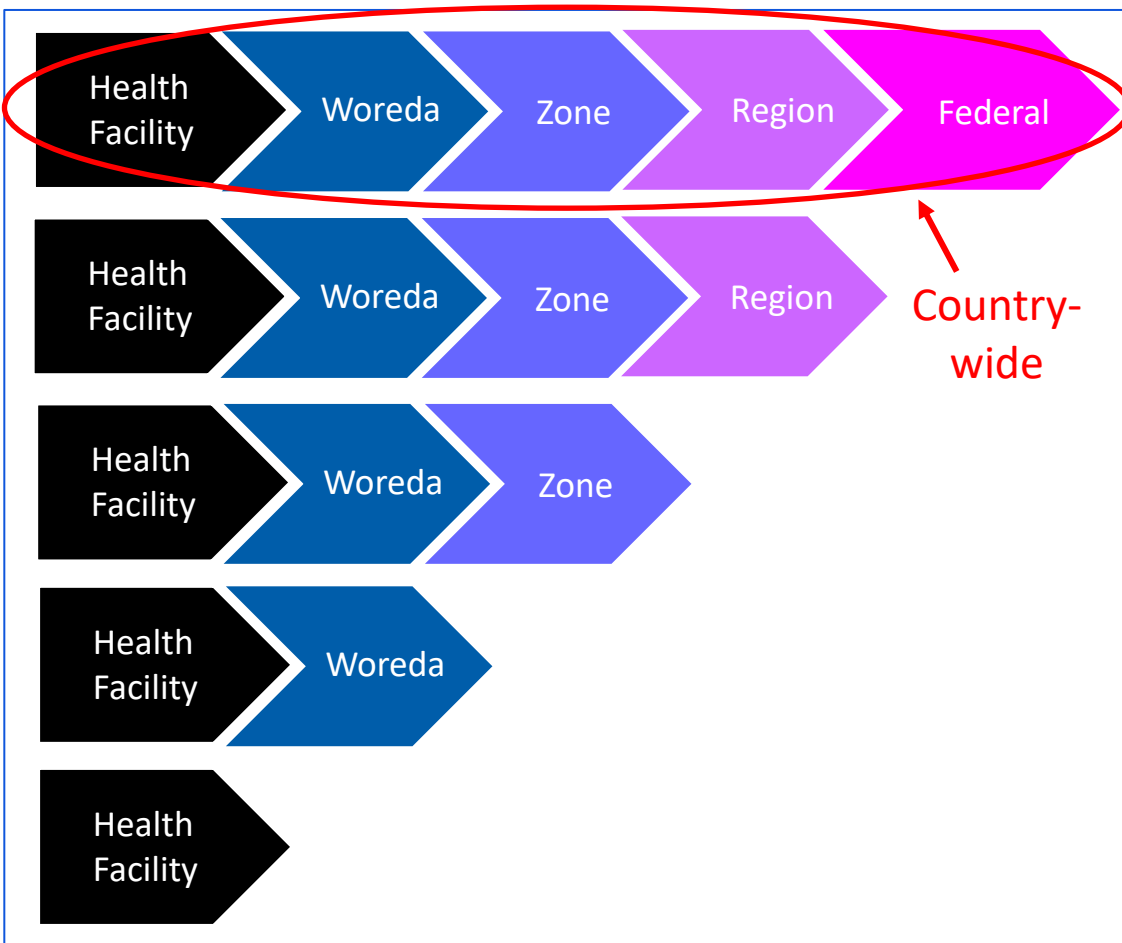
- Data collected March 21 to May 27, 2022 by implementing partner Ohio State University, Global One Health Initiative Ethiopia (OSU-GOHI Ethiopia)
- Standardized Excel-based questionnaires developed by CDC based on those used by WHO in analogous Nepal study
- Example survey participants:
  - Immunization program manager, VPD surveillance focal point
  - Finance specialist, human resources specialist, transportation focal point
  - Lab technician, lab manager, microbiologist, virologist
- Example data sources:
  - Disease surveillance budget and expenditure records
  - Hospital financial records, payrolls, receipts, accounting logbooks

# Aggregated vs Isolated Costs

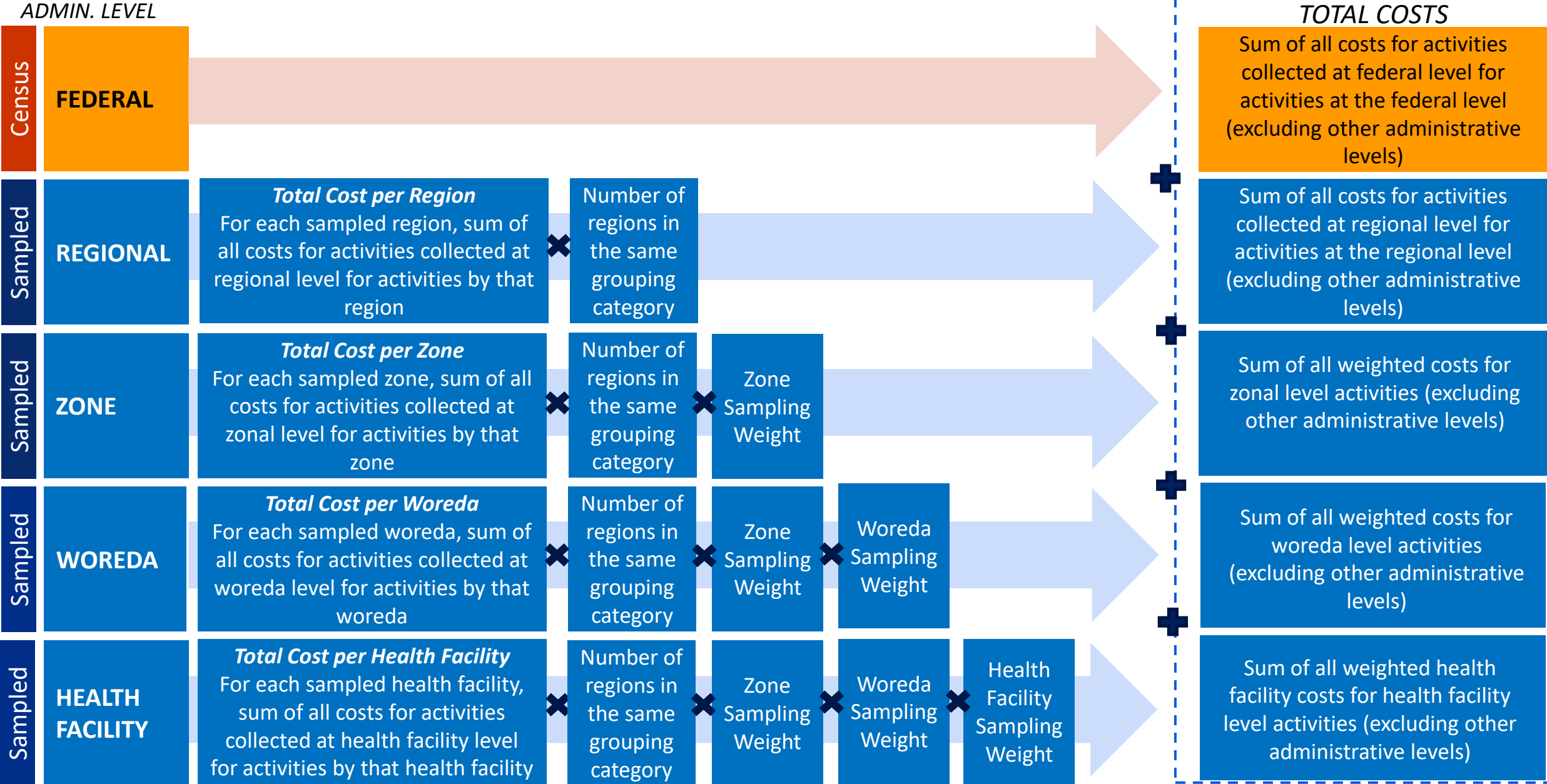
Costs at each administrative level at which they occurred are mutually exclusive and will be presented independently. However, country-wide estimations will aggregate costs from all administrative levels.

## Aggregated Total Costs by administrative level

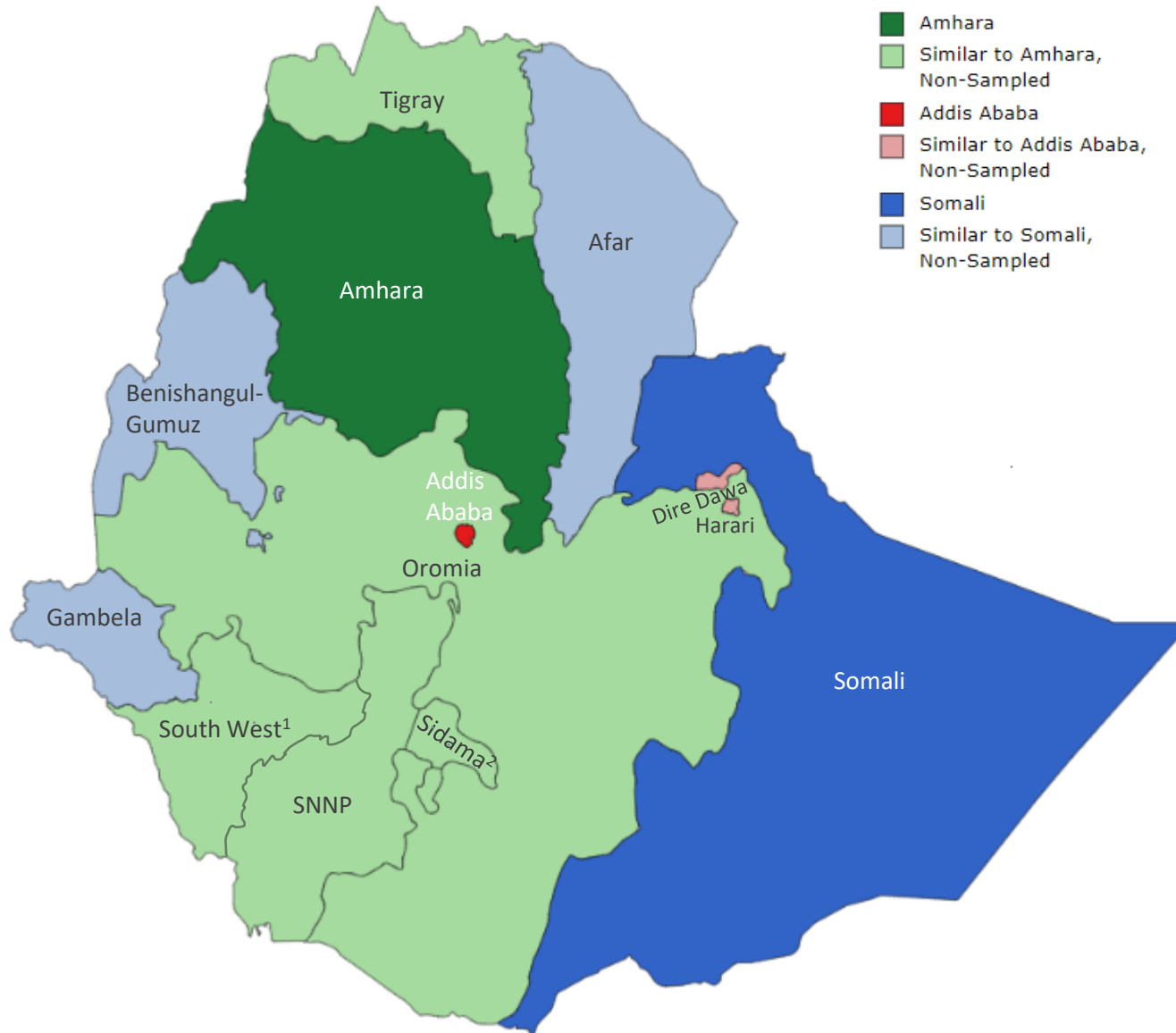
## Isolated Total Costs at each administrative level



# Methods for Weighting Results – Cost Centers Randomly Sampled (14)







## Regional Extrapolation

- National Level
  - Core Group
  - EPHI PHEM
  - Federal Ministry of Health EPI Office
  - WHO Ethiopia Country Office
  
- Regional groups based on wealth quintiles:
  - Similar to Addis Ababa
    - Dire Dawa, Harari
  
  - Similar to Amhara
    - Oromia, SNNP (including Sidama and South West), Tigray
  
  - Similar to Somali
    - Afar, Benishangul-Gumuz, Gambela

<sup>1</sup> South West Ethiopia Peoples' Region (South West) created from Southern Nations, Nationalities, and Peoples' (SNNP) Region in November 2021.

<sup>2</sup> Sidama Region created from SNNP in June 2020.

# Preliminary Results and Interpretations

## FY18-19 Country-wide, Weighted Total Costs (Per Capita) by Aggregate Regions

Aggregate of Cost Centers in Geographic Unit (light gray = extrapolated regions for weighted results)	Economic (including Financial)		Financial		Population (2019)
	Total Costs, Weighted (Mar 2023 USD)	Weighted Costs Per Capita (Mar 2023 USD)	Total Costs, Weighted (Mar 2023 USD)	Weighted Costs Per Capita (Mar 2023 USD)	
Federal Level	8,788,060	0.09	3,491,352	0.04	98,537,000
Addis Ababa + Dire Dawa, Harari	13,029,212	2.99	1,726,977	0.40	4,355,000
Amhara + Oromia, SNNP, Tigray	31,252,707	0.37	7,751,101	0.09	84,641,000
Somali + Afar, Benishangul-Gumuz, Gambela	14,796,070	1.55	6,169,953	0.65	9,541,000
<b>Total at Country Level</b>	<b>67,866,048</b>	<b>0.69</b>	<b>19,139,383</b>	<b>0.19</b>	<b>98,537,000</b>

Ethiopian Central Statistical Agency. (2019). Population estimates by age, sex, and woreda.

## Overview of Economic (including Financial) Costs by Level

Cost Center Level	Sum of weighted costs, country-wide estimate (March 2023 USD)	Mean, weighted (March 2023 USD)	SD, weighted (March 2023 USD)	Share of Total (%)	N
Federal	8,788,060	-		12.9	4
Regional	3,200,202	640,040	905,689	4.7	5
Zonal	7,209,357	901,170	1,291,705	10.6	8
Woreda	8,650,924	1,441,821	980,095	12.7	6
Health Center/ Hospital	40,017,506	1,667,396	2,253,030	59.0	24
Hospital	8,853,116	885,312	1,169,149	13.0	10
Health Center	31,164,390	2,226,028	2,688,489	45.9	14
<b>Total at Country Level</b>	<b>67,866,048</b>	-		<b>100</b>	<b>47</b>

# Overview of Financial Costs by Level

Cost Center Level	Sum of weighted costs, country-wide estimate (March 2023 USD)	Mean, weighted (March 2023 USD)	SD, weighted (March 2023 USD)	Share of Total (%)	N
Federal	3,491,352	-	-	18.2	4
Regional	1,939,486	387,897	518,271	10.1	5
Zonal	3,477,021	434,628	602,069	18.2	8
Woreda	4,008,621	668,103	774,753	20.9	6
Health Center/ Hospital	6,222,904	259,288	531,075	32.5	24
Hospital	1,245,424	124,542	203,197	6.5	10
Health Center	4,977,480	355,534	668,183	26.0	14
<b>Total at Country Level</b>	<b>19,139,383</b>	-	-	<b>100</b>	<b>47</b>

# Country-wide, Weighted Economic (including Financial) Costs by Resource Input

**Yellow** highlight = Category with the largest share of costs in cost center level.

		Resource Input										
Cost Center Level	Statistic	1a. Labor - Full-Time	1b. Labor – Temporary	2. Equipment	3. Building & Utilities	4. Supplies	5a. Transport - Vehicles	5b. Transport - Fuel	5c. Per Diem, Travel, Lodging	6. Contracted Services	7. Other	TOTAL
Federal	Sum, weighted (Mar 2023 USD)	435,657	425,209	374,314	111,752	2,433,676	469,866	36,181	1,454,843	175,691	103,171	6,020,360
	Share of total in cost center level (%)	7.2	7.1	6.2	1.9	40.4	7.8	0.6	24.2	2.9	1.7	100
Regional	Sum, weighted (Mar 2023 USD)	294,653	-	89,016	149,043	116,189	1,084,952	127,628	330,855	-	-	2,192,334
	Share of total in cost center level (%)	13.4	-	4.1	6.8	5.3	49.5	5.8	15.1	-	-	100
Zonal	Sum, weighted (Mar 2023 USD)	1,443,093	-	144,227	45,061	31,401	1,158,836	581,186	1,528,632	-	6,416	4,938,852
	Share of total in cost center level (%)	29.2	-	2.9	0.9	0.6	23.5	11.8	31.0	-	0.1	100
Woreda	Sum, weighted (Mar 2023 USD)	2,657,759	-	215,808	58,901	59,993	2,416,323	250,982	149,591	-	117,057	5,926,413
	Share of total in cost center level (%)	44.8	-	3.6	1.0	1.0	40.8	4.2	2.5	-	2.0	100
Hospital	Sum, weighted (Mar 2023 USD)	2,065,603	17,910	600,868	572,523	390,063	1,985,237	91,620	341,103	-	-	6,064,928
	Share of total in cost center level (%)	34.1	0.3	9.9	9.4	6.4	32.7	1.5	5.6	-	-	100
Health Center	Sum, weighted (Mar 2023 USD)	11,839,418	-	783,364	1,131,946	3,771,666	3,472,522	54,606	295,996	-	-	21,349,518
	Share of total in cost center level (%)	55.5	-	3.7	5.3	17.7	16.3	0.3	1.4	-	-	100
Country-wide	Sum, weighted (Mar 2023 USD)	27,349,644	646,832	3,222,480	3,020,496	9,930,481	15,455,164	1,667,300	5,986,353	256,460	330,838	67,866,048
	Share of total country-wide (%)	40.3	1.0	4.7	4.5	14.6	22.8	2.5	8.8	0.4	0.5	100

# Country-wide, Weighted Financial Costs by Resource Input

Yellow highlight = Category with the largest share of costs in cost center level.

		Resource Input										
Cost Center Level	Statistic	1a. Labor - Full-Time	1b. Labor – Temporary	2. Equipment	3. Building & Utilities	4. Supplies	5a. Transport - Vehicles	5b. Transport - Fuel	5c. Per Diem, Travel, Lodging	6. Contracted Services	7. Other	TOTAL
Federal	Sum, weighted (Mar 2023 USD)	N/A to financial costs	620,688	58,123	145,911	184,705	357,731	51,885	1,665,248	256,460	150,601	3,491,352
	Share of total in cost center level (%)		17.8	1.7	4.2	5.3	10.2	1.5	47.7	7.3	4.3	100
Regional	Sum, weighted (Mar 2023 USD)		-	50,784	40,523	169,604	1,009,318	186,301	482,956	-	-	1,939,486
	Share of total in cost center level (%)		-	2.6	2.1	8.7	52.0	9.6	24.9	-	-	100
Zonal	Sum, weighted (Mar 2023 USD)		-	54,437	64,141	43,620	225,707	848,371	2,231,379	-	9,366	3,477,021
	Share of total in cost center level (%)		-	1.6	1.8	1.3	6.5	24.4	64.2	-	0.3	100
Woreda	Sum, weighted (Mar 2023 USD)		-	16,231	77,532	87,108	3,072,153	366,364	218,362	-	170,871	4,008,621
	Share of total in cost center level (%)		-	0.4	1.9	2.2	76.6	9.1	5.4	-	4.3	100
Hospital	Sum, weighted (Mar 2023 USD)		-	158,805	47,580	152,103	337,501	133,731	415,704	-	-	1,245,424
	Share of total in cost center level (%)		-	12.8	3.8	12.2	27.1	10.7	33.4	-	-	100
Health Center	Sum, weighted (Mar 2023 USD)	-	88,796	398,953	3,201,117	834,230	79,710	374,675	-	-	4,977,480	
	Share of total in cost center level (%)	-	1.8	8.0	64.3	16.8	1.6	7.5	-	-	100	
Country-wide	Sum, weighted (Mar 2023 USD)		620,688	427,176	774,640	3,838,256	5,836,639	1,666,362	5,388,324	256,460	330,838	19,139,383
	Share of total country-wide (%)		3.2	2.2	4.0	20.1	30.5	8.7	28.2	1.3	1.7	100

# Country-wide, Weighted Economic (including Financial) Costs by VPD Yellow highlight = Category with the largest share of costs in cost center level (CCL). Blue highlight = Category with the largest share of costs, excluding general, in CCL.

		Vaccine-Preventable Disease (VPD)												
Cost Center Level	Statistic	General (i.e., not specific to one VPD)	Polio/ Acute Flaccid Paralysis	Measles & Rubella	Neonatal Tetanus	Meningococcal meningitis (pediatric)	Yellow Fever	Cholera	Rotavirus	Congenital Rubella Syndrome	Invasive-bacterial VPDs	Human Rabies	Other (diphtheria, pertussis, typhoid, smallpox)	TOTAL
Federal	Sum, weighted (Mar 2023 USD)	2,434,220	3,087,083	2,258,041	166,711	119,849	162,462	10,660	58,270	3,762	475,021	6,188	5,792	<b>8,788,060</b>
	Share of total in cost center level (%)	27.7	35.1	25.7	1.9	1.4	1.8	0.1	0.7	<0.1	5.4	0.1	0.1	<b>100</b>
Regional	Sum, weighted (Mar 2023 USD)	2,296,041	145,135	324,413	74,244	27,048	15,586	151,963	15,759	15,586	37,022	80,360	17,045	<b>3,200,202</b>
	Share of total in cost center level (%)	71.7	4.5	10.1	2.3	0.8	0.5	4.7	0.5	0.5	1.2	2.5	0.5	<b>100</b>
Zonal	Sum, weighted (Mar 2023 USD)	5,913,533	313,014	328,801	84,751	135,901	57,248	69,126	43,524	43,518	69,122	101,680	49,139	<b>7,209,357</b>
	Share of total in cost center level (%)	82.0	4.3	4.5	1.2	1.9	0.8	1.0	0.6	0.6	1.0	1.4	0.7	<b>100</b>
Woreda	Sum, weighted (Mar 2023 USD)	4,507,537	898,082	1,364,794	450,930	111,161	85,927	697,126	84,935	79,767	86,225	186,941	97,501	<b>8,650,924</b>
	Share of total in cost center level (%)	52.1	10.4	15.8	5.2	1.3	1.0	8.1	1.0	0.9	1.0	2.2	1.1	<b>100</b>
Hospital	Sum, weighted (Mar 2023 USD)	4,046,929	360,139	1,520,282	164,296	1,010,198	154,150	166,438	565,679	163,476	324,354	223,025	154,150	<b>8,853,116</b>
	Share of total in cost center level (%)	45.7	4.1	17.2	1.9	11.4	1.7	1.9	6.4	1.8	3.7	2.5	1.7	<b>100</b>
Health Center	Sum, weighted (Mar 2023 USD)	18,497,352	2,652,014	5,142,373	687,980	496,384	313,088	1,245,706	315,741	294,180	523,707	535,880	459,984	<b>31,164,390</b>
	Share of total in cost center level (%)	59.4	8.5	16.5	2.2	1.6	1.0	4.0	1.0	0.9	1.7	1.7	1.5	<b>100</b>
Country-wide	Sum, weighted (Mar 2023 USD)	37,695,612	7,455,467	10,938,705	1,628,912	1,900,541	788,460	2,341,020	1,083,907	600,289	1,515,451	1,134,074	783,612	<b>67,866,048</b>
	Share of total country-wide (%)	55.5	11.0	16.1	2.4	2.8	1.2	3.4	1.6	0.9	2.2	1.7	1.2	<b>100</b>

# Country-wide, Weighted Financial Costs by VPD

**Yellow** highlight = Category with the largest share of costs in cost center level.  
**Blue** highlight = Category with the largest share of costs, excluding general, in cost center level.

		Vaccine-Preventable Disease (VPD)												
Cost Center Level	Statistic	General (i.e., not specific to one VPD)	Polio/ Acute Flaccid Paralysis	Measles & Rubella	Neonatal Tetanus	Meningococcal meningitis (pediatric)	Yellow Fever	Cholera	Rotavirus	Congenital Rubella Syndrome	Invasive-bacterial VPDs	Human Rabies	Other (diphtheria, pertussis, typhoid, smallpox)	TOTAL
Federal	Sum, weighted (Mar 2023 USD)	494,202	2,163,182	480,980	134,297	92,451	2,154	2,138	29,459	3,131	89,352	4	1	3,491,351
	Share of total in cost center level (%)	14.2	62.0	13.8	3.8	2.6	0.1	0.1	0.8	0.1	2.6	<0.1	<0.01	100
Regional	Sum, weighted (Mar 2023 USD)	1,362,516	109,782	229,851	31,658	11,589	8,536	116,216	8,603	8,536	12,965	30,556	8,677	1,939,486
	Share of total in cost center level (%)	70.3	5.7	11.8	1.6	0.6	0.4	6.0	0.4	0.4	0.7	1.6	0.4	100
Zonal	Sum, weighted (Mar 2023 USD)	3,307,294	50,552	55,490	19,409	8,639	3,907	12,832	2,132	2,127	4,366	5,881	4,393	3,477,021
	Share of total in cost center level (%)	95.1	1.5	1.6	0.6	0.2	0.1	0.4	0.1	0.1	0.1	0.2	0.1	100
Woreda	Sum, weighted (Mar 2023 USD)	1,980,215	604,176	550,922	258,472	19,814	8,031	535,574	8,265	8,031	8,329	16,915	9,876	4,008,621
	Share of total in cost center level (%)	49.4	15.1	13.7	6.4	0.5	0.2	13.4	0.2	0.2	0.2	0.4	0.2	100
Hospital	Sum, weighted (Mar 2023 USD)	427,253	115,759	492,192	15,733	49,359	15,733	15,748	15,733	15,733	42,516	23,933	15,733	1,245,424
	Share of total in cost center level (%)	34.3	9.3	39.6	1.3	4.0	1.3	1.3	1.3	1.3	3.4	1.9	1.3	100
Health Center	Sum, weighted (Mar 2023 USD)	3,708,845	534,597	324,721	60,397	46,745	21,297	137,296	17,540	11,367	43,281	33,169	38,224	4,977,480
	Share of total in cost center level (%)	74.5	10.7	6.5	1.2	0.9	0.4	2.8	0.4	0.2	0.9	0.7	0.8	100
Country-wide	Sum, weighted (Mar 2023 USD)	11,280,326	3,578,048	2,134,157	519,966	228,596	59,657	819,804	81,733	48,925	200,809	110,459	76,904	19,139,383
	Share of total country-wide (%)	58.9	18.7	11.2	2.7	1.2	0.3	4.3	0.4	0.3	1.0	0.6	0.4	100

# Country-wide, Weighted Economic (including Financial) Costs by Support Function

**Yellow** highlight = Category with the largest share of costs in cost center level.

		Support Function								
Cost Center Level	Statistic	Coordination	Data Management and Use	Field Logistics and Communication	Governance	Laboratory	Program Management	Supervision	Workforce Capacity	TOTAL
Federal	Sum, weighted (Mar 2023 USD)	378,327	366,361	2,569,010	146,964	3,888,706	356,504	718,687	363,501	8,788,060
	Share of total in cost center level (%)	4.3	4.2	29.2	1.7	44.2	4.1	8.2	4.1	100
Regional	Sum, weighted (Mar 2023 USD)	53,702	135,006	384,862	17,109	242,645	300,353	1,124,079	942,446	3,200,201
	Share of total in cost center level (%)	1.7	4.2	12.0	0.5	7.6	9.4	35.1	29.4	100
Zonal	Sum, weighted (Mar 2023 USD)	118,545	530,849	1,472,852	-	-	263,810	2,284,347	2,538,954	7,209,357
	Share of total in cost center level (%)	1.6	7.4	20.4	-	-	3.7	31.7	35.2	100
Woreda	Sum, weighted (Mar 2023 USD)	-	747,459	2,937,994	-	-	683,974	2,779,337	1,502,160	8,650,924
	Share of total in cost center level (%)	-	8.6	34.0	-	-	7.9	32.1	17.4	100
Hospital	Sum, weighted (Mar 2023 USD)	61,829	801,692	1,522,797	-	831,973	1,183,653	3,483,592	967,581	8,853,116
	Share of total in cost center level (%)	0.7	9.1	17.2	-	9.4	13.4	39.3	10.9	100
Health Center	Sum, weighted (Mar 2023 USD)	1,554,143	3,652,470	4,056,090	236,052	2,323,679	5,162,276	3,637,361	10,542,319	31,164,390
	Share of total in cost center level (%)	5.0	11.7	13.0	0.8	7.5	16.6	11.7	33.8	100
Country-wide	Sum, weighted (Mar 2023 USD)	2,166,546	6,233,836	12,943,605	400,124	7,287,003	7,950,571	14,027,402	16,856,960	67,866,048
	Share of total country-wide (%)	3.2	9.2	19.1	0.6	10.7	11.7	20.7	24.8	100

# Country-wide, Weighted Financial Costs by Support Function

**Yellow** highlight = Category with the largest share of costs in cost center level.

Cost Center Level	Statistic	Support Function								TOTAL
		Coordination	Data Management and Use	Field Logistics and Communication	Governance	Laboratory	Program Management	Supervision	Workforce Capacity	
Federal	Sum, weighted (Mar 2023 USD)	166,605	223,507	1,740,647	120,507	41,527	231,652	650,294	316,612	3,491,352
	Share of total in cost center level (%)	4.8	6.4	49.9	3.5	1.2	6.6	18.6	9.1	100
Regional	Sum, weighted (Mar 2023 USD)	15,070	7,045	252,852	-	147,839	80,668	730,275	705,737	1,939,486
	Share of total in cost center level (%)	0.8	0.4	13.0	-	7.6	4.2	37.7	36.4	100
Zonal	Sum, weighted (Mar 2023 USD)	4,127	26,645	1,222,997	-	-	123,653	975,998	1,123,601	3,477,021
	Share of total in cost center level (%)	0.1	0.8	35.2	-	-	3.6	28.1	32.3	100
Woreda	Sum, weighted (Mar 2023 USD)	-	187,889	1,793,355	-	-	247,042	1,653,104	127,230	4,008,621
	Share of total in cost center level (%)	-	4.7	44.7	-	-	6.2	41.2	3.2	100
Hospital	Sum, weighted (Mar 2023 USD)	-	47,137	497,353	-	78,074	213,531	409,295	34	1,245,424
	Share of total in cost center level (%)	-	3.8	39.9	-	6.3	17.1	32.9	<0.1	100
Health Center	Sum, weighted (Mar 2023 USD)	-	242,217	853,661	-	2,374	3,430,773	443,520	4,934	4,977,480
	Share of total in cost center level (%)	-	4.9	17.2	-	<0.1	68.9	8.9	0.1	100
Country-wide	Sum, weighted (Mar 2023 USD)	185,802	734,441	6,360,865	120,507	269,815	4,327,320	4,862,485	2,278,149	19,139,383
	Share of total country-wide (%)	1.0	3.8	33.2	0.6	1.4	22.6	25.4	11.9	100

# Country-wide Economic (including Financial) Costs by Funding Source and Resource Input

**Yellow** highlight = The three largest tabulations of two dimensions (cross-tabs) of costs.

Resource Input	Funding Source (Costs in March 2023 USD)											TOTAL
	Ethiopian Government - MoH Federal Level	Ethiopian Government - non-MoH Federal Level	Health Facility/ Hospital	Regional Government	U.S. Centers for Disease Control and Prevention (CDC)	U.S. Agency for International Development (USAID)	UNICEF	World Health Organization	Personal/ Self-Paid	Unknown	Others (e.g., DANGOTE, Clinton Health Access Initiative) <sup>1</sup>	
1a. Labor - Full-Time	24,255,250	689,848	53,248	1,727,906	20,696	70,980	17,247	511,820	-	-	2,650	27,349,644
1b. Labor - Temporary	-	-	-	-	-	-	-	646,832	-	-	-	646,832
2. Equipment	1,908,901	28,154	15,315	163,446	32,604	1,427	8,816	565,577	252,528	17,853	227,859	3,222,480
3. Buildings & Utilities	613,652	38,443	375,763	1,673,198	1,178	-	-	145,909	-	18,083	154,269	3,020,496
4. Supplies	6,364,185	-	7,742	60,254	45,604	516	-	3,446,050	465	-	5,665	9,930,481
5a. Transport - Vehicles	12,106,215	-	-	975,911	167,746	25,728	-	639,016	416	-	1,540,133	15,455,164
5b. Transport - Fuel	683,211	-	-	834,657	-	971	-	148,452	9	-	-	1,667,300
5c. Per Diem, Travel, Lodging	1,180,857	179,412	-	262,505	81,975	9,302	-	4,271,816	249	237	-	5,986,353
6. Contracted Services	-	-	-	-	-	-	-	256,460	-	-	-	256,460
7. Other	180,238	-	-	-	-	-	-	150,601	-	-	-	330,838
<b>Total at Country Level</b>	<b>47,292,508</b>	<b>935,857</b>	<b>452,068</b>	<b>5,697,876</b>	<b>349,803</b>	<b>108,924</b>	<b>26,062</b>	<b>10,782,533</b>	<b>253,667</b>	<b>36,173</b>	<b>1,930,576</b>	<b>67,866,048</b>
<b>Share of Total (%)</b>	<b>69.7</b>	<b>1.4</b>	<b>0.7</b>	<b>8.4</b>	<b>0.5</b>	<b>0.2</b>	<b>&lt;0.1</b>	<b>15.9</b>	<b>0.4</b>	<b>0.1</b>	<b>2.8</b>	<b>100</b>

0 USD Allocation: African Development Bank, Bill & Melinda Gates Foundation, Core Group, Chinese Government, Gavi, World Bank

<sup>1</sup>Others: American Joint Fund Committee, Carter Center, Family Health International, ICAP at Columbia University, Institute of Tropical Medicine Antwerp, Japan International Cooperation Agency (JICA), John Snow Inc., UN Pop. Fund

# Country-wide Financial Costs by Funding Source and Resource Input

Yellow highlight = The three largest tabulations of two dimensions (cross-tabs) of costs.

Resource Input	Funding Source (Costs in March 2023 USD)											TOTAL
	Ethiopian Government - MoH Federal Level	Ethiopian Government - non-MoH Federal Level	Health Facility/ Hospital	Regional Government	U.S. Centers for Disease Control and Prevention (CDC)	U.S. Agency for International Development (USAID)	UNICEF	World Health Organization	Personal/ Self-Paid	Unknown	Others (e.g., DANGOTE, Clinton Health Access Initiative) <sup>1</sup>	
1a. Labor - Full-Time	-	-	-	-		-		-				-
1b. Labor - Temporary	-	-	-	-		-		620,688				620,688
2. Equipment	260,141	28,154	1,229	46,913		738		90,001				427,176
3. Buildings & Utilities	496,182	38,412	5,525	88,612		-		145,909				774,640
4. Supplies	3,577,161	-	7,742	60,254		516		192,583				3,838,256
5a. Transport - Vehicles	4,508,846	-	-	970,063	<i>N/A – Not considered an implementing partner</i>	13,448	<i>N/A – Not considered an implementing partner</i>	344,283	<i>N/A to financial costs</i>	<i>N/A to financial costs</i>	<i>N/A to financial costs</i>	5,836,639
5b. Transport - Fuel	682,282	-	-	834,657		971		148,452				1,666,362
5c. Per Diem, Travel, Lodging	1,179,585	179,412	-	262,505		9,302		3,757,521				5,388,324
6. Contracted Services	-	-	-	-		-		256,460				256,460
7. Other	180,238	-	-	-		-		150,601				330,838
<b>Total at Country Level</b>	<b>10,884,433</b>	<b>245,978</b>	<b>14,497</b>	<b>2,263,003</b>		<b>24,975</b>		<b>5,706,498</b>				<b>19,139,383</b>
<b>Share of Total (%)</b>	<b>56.9</b>	<b>1.3</b>	<b>0.1</b>	<b>11.8</b>		<b>0.1</b>		<b>29.8</b>				<b>100</b>

0 USD Allocation: African Development Bank, Bill & Melinda Gates Foundation, Core Group, Chinese Government, Gavi, World Bank

<sup>1</sup> Others: American Joint Fund Committee, Carter Center, Family Health International, ICAP at Columbia University, Institute of Tropical Medicine Antwerp, Japan International Cooperation Agency (JICA), John Snow Inc., UN Pop. Fund

# Comparison of Ethiopia and Nepal VPD Surveillance Cost Studies

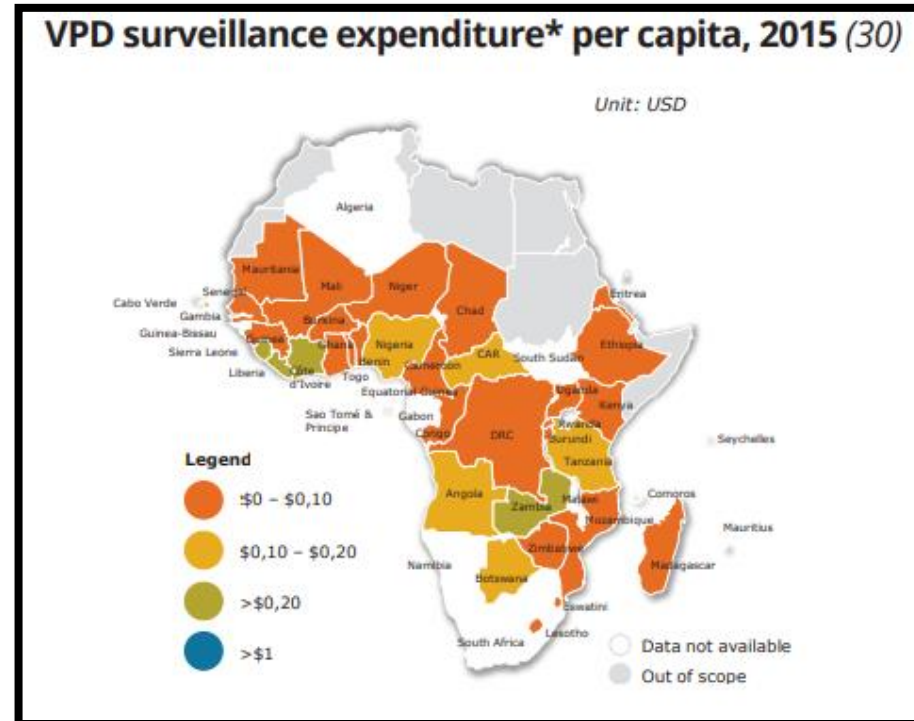
Country-wide category	Ethiopia	Nepal
Total economic cost of VPD surveillance (in Mar 2023 USD)	67.9 million USD 0.69 USD per capita	7.1 million USD 0.26 USD per capita
Largest funders	Ethiopian Ministry of Health (70%) WHO (16%)	Government of Nepal (56%) WHO (44%)
Costliest resource input	Personnel (40%)	Personnel (51%)
Costliest program activity	Workforce capacity (25%)	Mission activities (active surveillance visits) (18%)
Costliest VPD, excluding general	Measles (34%, excluding general)	<i>Not reported in publication</i>

Huang, X. X., Bose, A. S., Gupta, B. P., Rai, P., Joshi, S., Gautam, J. S., Tinkari, B. S., Vandelaer, J., Cohen, A. L., & Patel, M. K. (2021). Vaccine preventable diseases surveillance in Nepal: How much does it cost?. *Vaccine*, 39(40), 5982–5990.

# Preliminary Interpretations – African Region VPD Surveillance Investment Case

- **\$0.69** estimated economic cost of VPD surveillance per capita in FY18-19 in Ethiopia (in March 2023 USD; \$0.48 in 2015 USD)
- VPD surveillance costs comprise ~3% of domestic government and external health expenditures per capita

## AFR VPD surveillance investments



WHO Global Health Expenditure Database  
(USD per capita, Ethiopia, 2019)

Indicator	Value <sup>‡</sup>
Current Health Expenditure	\$38.64
Domestic Government	\$8.59
Domestic Private	\$17.17
External	\$12.88

<sup>‡</sup> Inflated to March 2023 USD.

Note: \*VPD surveillance expenditure as expressed in cMYPs only takes into account the following activities: detection and notification, case and outbreak verification and investigation, data management, laboratory and supportive activities.

# Limitations

- Recall bias
  - Retrospective allocation of share of time or use during FY18-19
- Non-representative statistical sampling at country-level, and small sample size for select administrative levels
- Limited accessibility in certain regions and/or certain woredas of regions
- Potential underestimation of vehicle costs as certain dates of purchase and/or maintenance costs were unknown
- No simultaneous collection of programmatic data at subnational levels for context (e.g., incidence, annual number of cases)
- Exclusion of certain vaccine-preventable diseases (e.g., influenza)

# Collaborators

- **CDC HQ**
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  - Sarah Pallas
  - Ben Dahl
- **CDC Ethiopia**
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- **World Health Organization, Regional Office for Africa**
  - Jason M. Mwenda
- **World Health Organization HQ**
  - Anindya Sekhar Bose

# Thank You

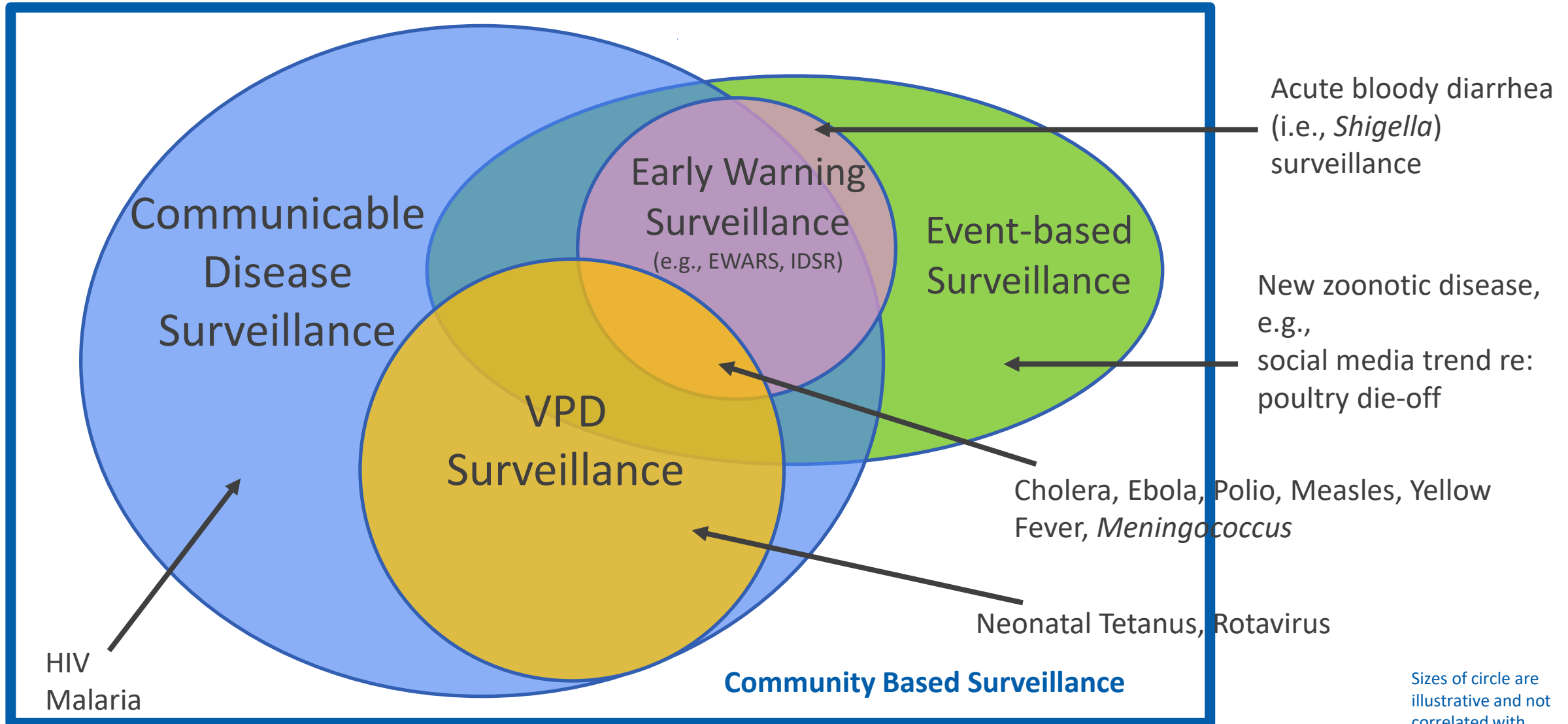
For more information, please contact Nelly Mejia ([muz3@cdc.gov](mailto:muz3@cdc.gov)) or Roopa Darwar ([rdarwar@cdc.gov](mailto:rdarwar@cdc.gov)).

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.



**Additional Slides**

# VPD Surveillance: the Backbone for Broader Disease Surveillance



**Resources for VPD surveillance support other types of surveillance and vice versa**

# Summary of Updated WHO Minimal Recommended VPD Surveillance Standards

Minimal recommended standard for VPD surveillance	Type of surveillance			
	Nationwide, case-based with laboratory confirmation of every case	Nationwide, aggregate with laboratory confirmation of outbreaks	Sentinel, case-based with laboratory confirmation of every case	Other (e.g., VPDs have different minimum standard of surveillance based on context)
Surveillance commitment in every country	<ul style="list-style-type: none"> <li>• Measles</li> <li>• Poliomyelitis</li> </ul>	-	-	<ul style="list-style-type: none"> <li>• Neonatal Tetanus (no lab confirmation)</li> </ul>
Surveillance commitment varies by country	<ul style="list-style-type: none"> <li>• Diphtheria</li> <li>• Meningococcus</li> <li>• Rubella</li> <li>• Yellow fever</li> </ul>	<ul style="list-style-type: none"> <li>• Hepatitis A</li> <li>• Hepatitis B</li> <li>• Mumps</li> </ul>	<ul style="list-style-type: none"> <li>• Congenital rubella syndrome (CRS)</li> <li>• H. influenzae</li> <li>• Influenza</li> <li>• Japanese encephalitis</li> <li>• Pertussis</li> <li>• Pneumococcus</li> <li>• Rotavirus</li> <li>• Typhoid</li> </ul>	<ul style="list-style-type: none"> <li>• Cholera (event-based)</li> <li>• HPV (surveillance not recommended)</li> <li>• Non-neonatal Tetanus (no lab confirmation)</li> <li>• Varicella (no lab confirmation)</li> </ul>

# Components of Comprehensive VPD Surveillance

1. **Includes**, at a minimum, **all VPDs with global surveillance mandates**, diseases as defined by International Health Regulations, and other regional and country priorities
2. Meets minimal surveillance requirements for each VPD, such as
  1. **Reliable and timely laboratory confirmation** of disease
  2. **Case-based data** to pinpoint specific diseases by geographic location and affected groups
3. **Timely identification of cases and outbreaks** for epidemic-prone VPDs
4. **Consistent reporting** of surveillance data even in the absence of cases, i.e., zero reporting
5. **Monitoring of significant changes** in disease and strain causing disease (e.g., influenza, meningococcus, and pneumococcus)
6. **Monitoring progress towards** global and regional **eradication and elimination goals** (e.g., polio, measles and neonatal tetanus)

# Building Comprehensive VPD Surveillance

1. Ensure **robust surveillance** for polio, measles, and neonatal tetanus
2. **Build out** various surveillance support functions and **related support function activities** at country, regional, and global levels
3. **Add various VPDs** to existing surveillance platforms, **through integration** or adaptation of existing systems. Including:
  - National case-based surveillance and sentinel case-based surveillance
  - Notifiable disease surveillance and event-based surveillance to support International Health Regulations for identification of smallpox, COVID-19, or the next novel pathogen
4. Support needed at a global level for:
  1. Development of **standards** -- for VPD surveillance and related information systems
  2. Expansion of **laboratory** networks
  3. **Technical support** for implementation
  4. Advocacy, costing, and **resource mobilization**

# Economic Evaluation Methods

<i>Economic Evaluation Method</i>	<i>Comparison</i>	<i>Measurement of Effects</i>	<i>Economic Summary Measure</i>
<b>Cost Analysis</b>	Used to compare costs of implementing a program/intervention	Dollars	Cost of program
<b>Cost of Illness Analysis</b>	Used to measure the economic burden of a disease	Dollars	Cost of illness
<b>Cost-Effectiveness Analysis</b>	Used to compare two or more interventions that produce a common health outcome	Health outcomes, measured in natural units	Incremental Cost-effectiveness ratio Cost per case averted Cost per life-year saved
<b>Cost-Utility Analysis</b>	Used to compare interventions with health outcomes (morbidity and mortality)	Health outcomes, measured as years of life, adjusted for quality of life	Cost per quality-adjusted life year (QALY)
<b>Cost-Benefit Analysis</b>	Used to compare different programs with different units of outcomes (health and non-health)	Dollars	Net benefit or cost Benefit to cost ratio
<b>Budget Impact Analysis</b>	Used to estimate the financial consequences of adopting a new intervention for local, regional, and national budgets	Dollars	Annual change in resource use Annual change in cases of condition and associated resource use and costs

# Evaluation Setting: Ethiopia (2018-2019)

- GDP per capita<sup>1</sup>
  - 2019: 840.4 (current USD)
- Population<sup>2</sup>
  - 2019: 98.5 million
- Regions (first level administrative units)<sup>2</sup>
  - 2019: 11 regions
    - Sidama Region and South West Ethiopia Peoples' Region (South West) created from Southern Nations, Nationalities, and Peoples' Region (SNNPR) in 2020 and 2021, respectively
- Disease burden – reported incidence rates per 1M (2019):
  - Ethiopia<sup>3</sup>
    - Measles: 35
    - Rubella: 2.3
    - Polio (vaccine-derived polioviruses): 0.3
  - WHO African Region<sup>4</sup>
    - Measles: 559.8
    - Rubella: 5.5
    - Polio (vaccine-derived polioviruses): 0.7

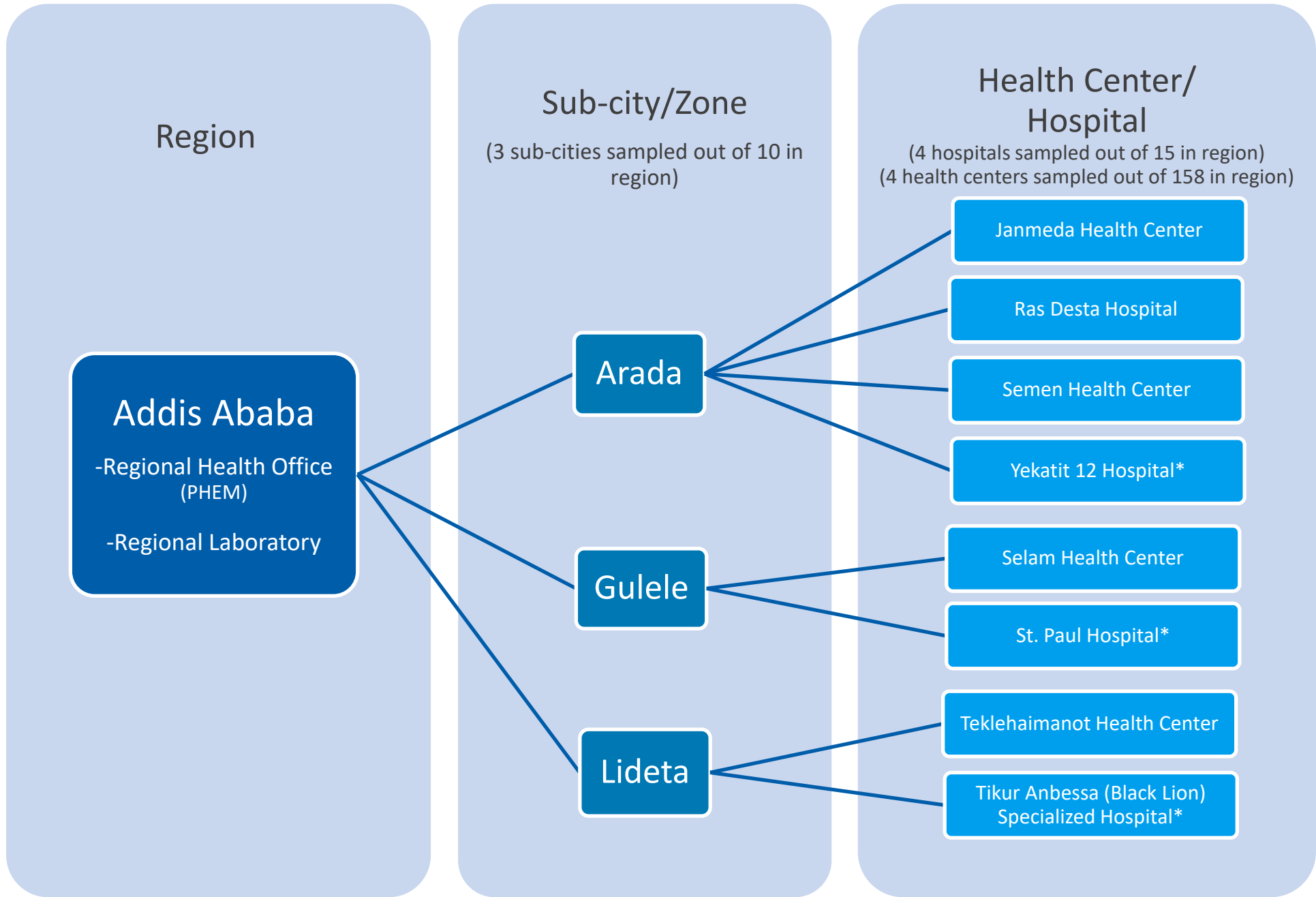


1 World Bank. (2023). 2019 GDP per capita (current US\$) – Ethiopia.

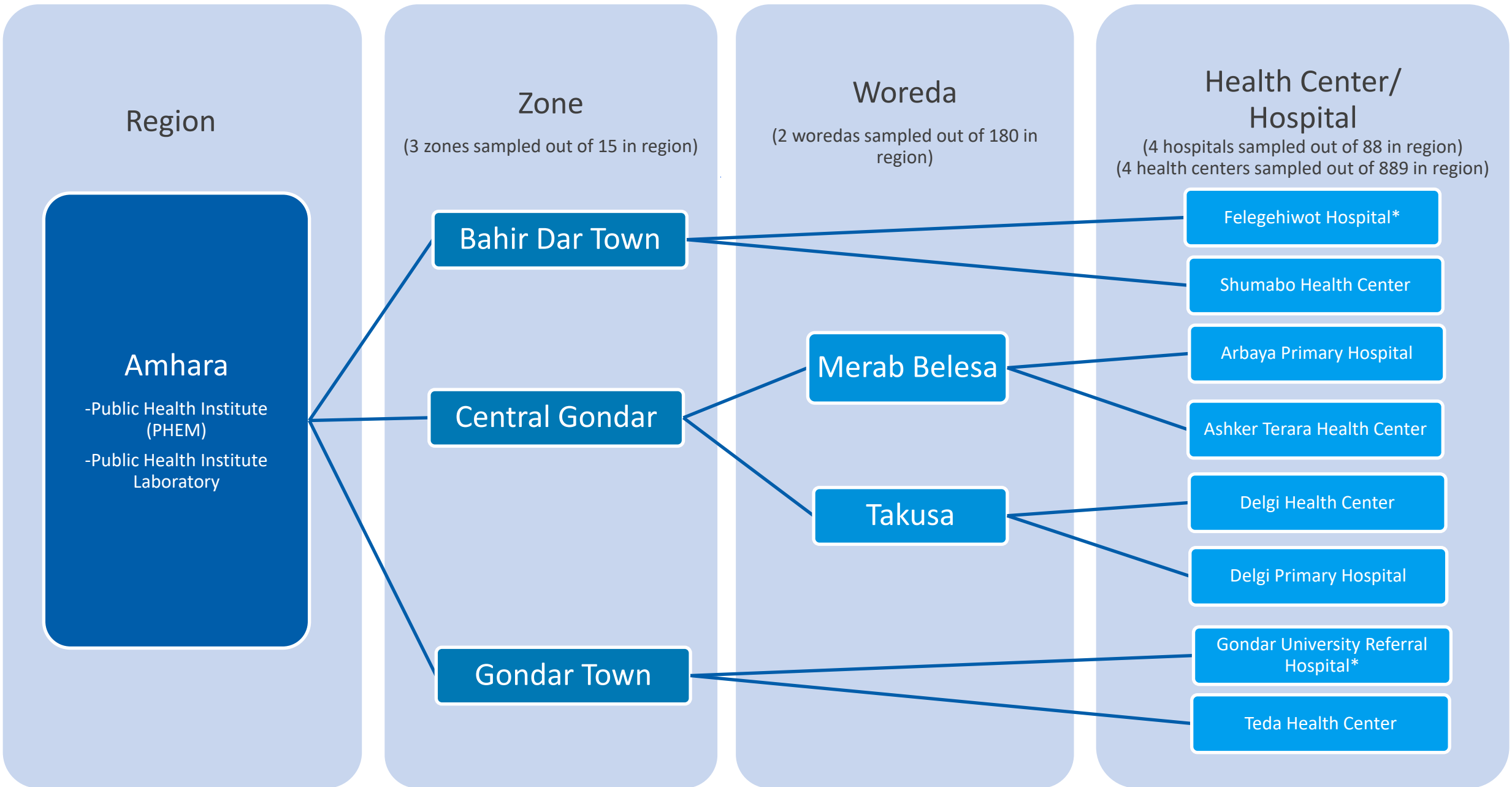
2 Ethiopia Central Statistical Agency. (2019). Population estimates by age, sex, and woreda.

3 World Health Organization. (2022). Immunization data – reported cases and incidence – Ethiopia.

4 World Health Organization. (2022). Immunization data – reported cases and incidence – African Region.

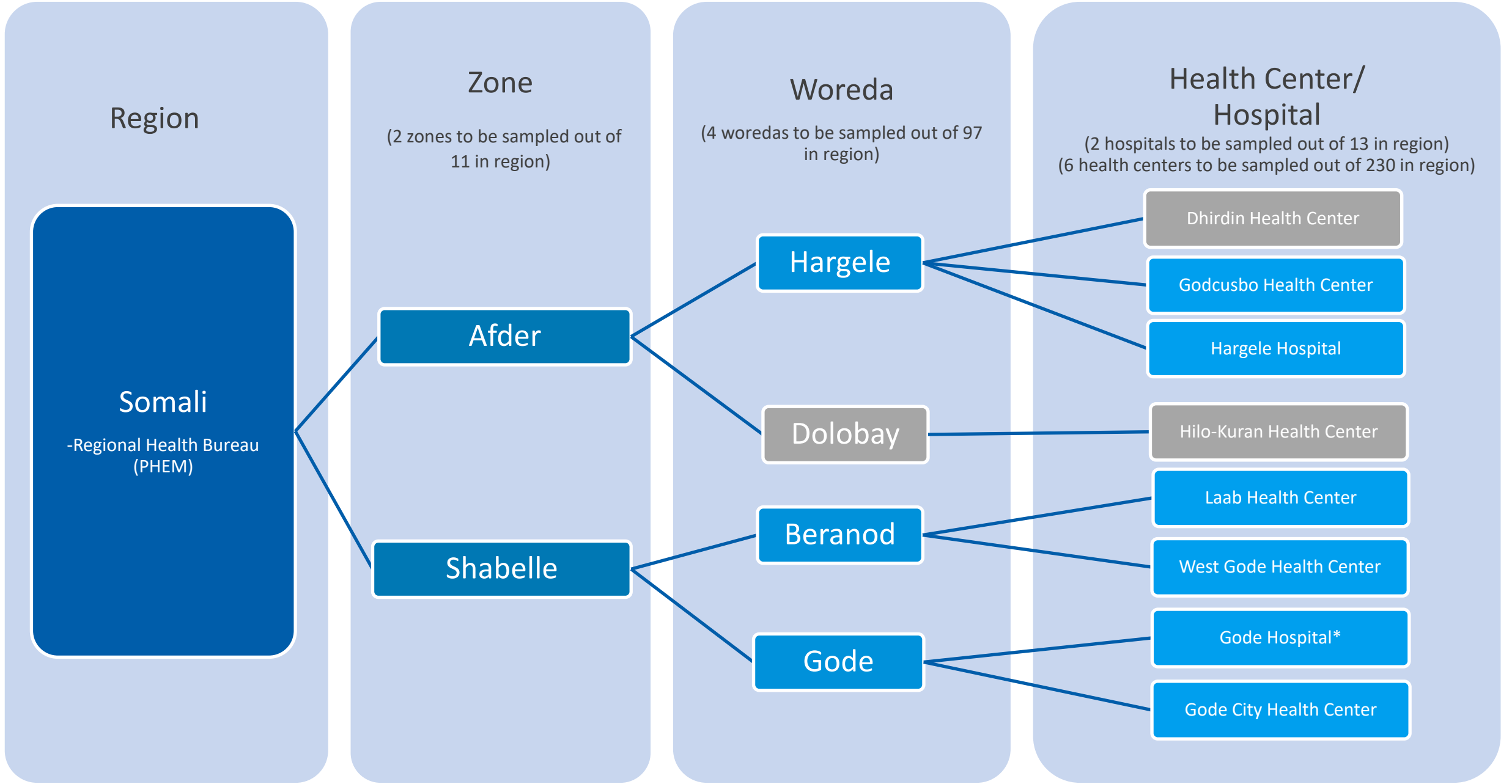


\* = Specialized Hospital/Sentinel Site



\* = Specialized Hospital/Sentinel Site

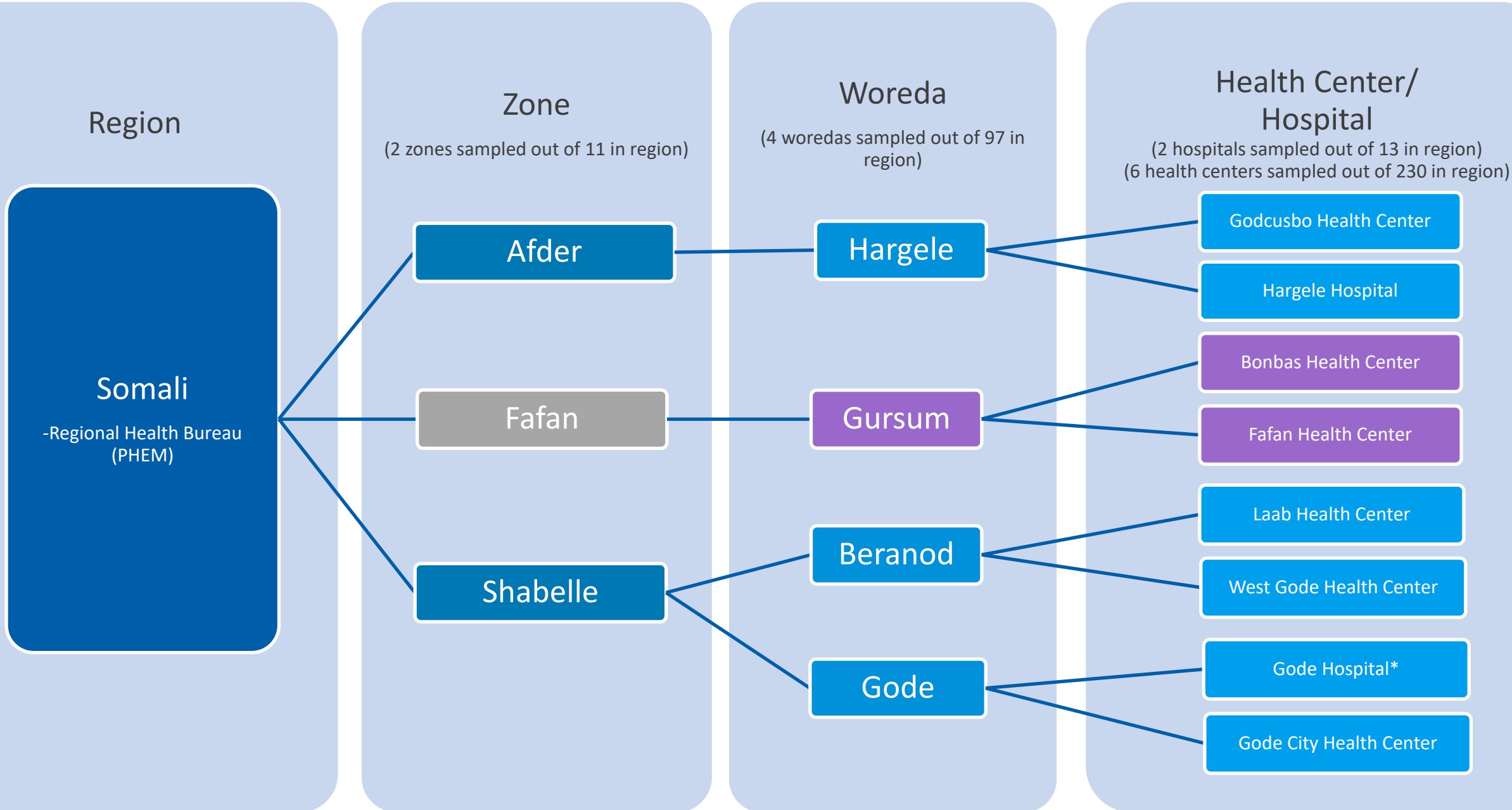
# Original Sampling Frame



Gray = Data not collected

\* = Specialized Hospital/Sentinel Site

# Adjusted Sampling Frame Due to Inaccessibility



Gray = Data not collected

Purple = Replacement sampled units; data collected

\* = Specialized Hospital/Sentinel Site

# Financial vs. Economic Costs

- **Financial**: the **real monetary outlays** for resources required to produce a program or intervention and operate the VPD surveillance system in Ethiopia
  - Ex) Per diem, training fees, consumables, and purchases of new equipment during FY 18-19
  - Financial costs are defined based on the perspective of the study and the included payers
    - For this study, financial costs were defined as monetary outlays by the Ethiopia MoH, WHO, or USAID via Core Group
- **Economic**: **opportunity costs** of the resources used to implement an intervention and operate the VPD surveillance system
  - Ex) Use of existing staff, use of existing vehicles, building space
  - Economic costs include financial costs

# VPD Surveillance Support Functions

VPD Surveillance Support Function	Definition and Examples
Coordination	<b>Linking surveillance program to relevant stakeholders</b> (e.g., EPI) for data review, dissemination, and use; improvement planning; <b>surveillance strengthening</b> as core function of IHR implementation framework, including rapid response teams and Emergency Operations Centers
Data management and use	<b>Information system</b> development, <b>data</b> harmonization, implementation, and use for performance improvement
Field logistics and communication	Airtime and internet for notification and reporting, <b>specimen collection and transport</b> ; feedback of results; <b>any resource input besides personnel used for core functions</b> of case detection, notification, investigation, reporting
Governance	Standards and <b>guidelines</b> development, <b>policy</b> , laws/mandates, roles, and responsibilities (including for private sector), <b>funding</b>
Laboratory	Specimen <b>collection kits, reagents</b> and supplies, <b>equipment</b> , physical space, and training; expansion and diversification of regional and global networks; shared procurement processes; <b>quality management</b> systems; personnel
Program management	<b>Budget creation</b> , resource mobilization, financial <b>management</b> , sustainability, infrastructure/equipment management, <b>human resources, external surveillance assessments and reviews</b>
Supervision	Supportive <b>supervisory visits</b> , workplans, checklists
Workforce capacity	<b>Training/capacity building</b> at all levels; <b>staff for core functions</b> including case detection, notification, investigation, reporting, and response; epidemic <b>preparedness</b>

	Resource Input									
Support Function	Personnel	Temporary Labor	Equipment	Building & Utilities	Supplies	Vehicles	Fuel	Per diem/transport/lodging	Contracted services	Other
Workforce capacity	Surveillance officers conducting case investigations				Printing training materials			Per diem for training of surveillance officers		
Field logistics & communication	N/A	N/A			Mobile phone credit	Motorcycle for case investigation		Taxi for specimen collection		
Laboratory	Lab technician		PCR machine		Reagents and test kits				Specimen transport	
Supervision			Mobile phone			PHEM vehicles for supervisory visits	Fuel for supervisory visits			
Program management			Laptop	PHEM office space used for VPD surveillance						Bank fees
Data management and use	Data manager	Consultant for data analysis			Printing case reporting forms					
Coordination				Space used for meeting with MCH/EPI					Venue rented for VPD surveillance review	
Governance	Staff developing VPD surveillance guidelines						Fuel to attend donor meetings			

# Years of Useful Life

- **Useful life:** the period during which an asset or property is expected to be usable for the purpose it was acquired
- General rule: useful life is equivalent to the number of years until:
  - The cost of maintaining and repairing a piece of equipment > the cost of buying a new piece of equipment
- Often, items that have exceeded their useful life are still in use
  - However, the definition of useful life should not be based on these examples, nor on the current age of the item
- Useful life is an average

# Criteria for Financial Costs by Resource Input

Resource Input	Financial Cost	Economic Cost Only
1a. Labor – Full-Time		<ul style="list-style-type: none"> <li>Any full-time labor</li> </ul>
1b. Labor – Temporary	<ul style="list-style-type: none"> <li>Any temporary labor paid by Ethiopian Government, Core Group (USAID), or WHO</li> </ul>	
4. Supplies 5b. Transport - Fuel 5c. Per Diem, Travel, Lodging 6. Contracted Services 7. Other	<ul style="list-style-type: none"> <li>Any activity paid by Ethiopian Government, Core Group (USAID), or WHO</li> </ul>	<ul style="list-style-type: none"> <li>Any activity <b>not</b> paid by Ethiopian Government, Core Group (USAID), or WHO</li> </ul>
2. Equipment 3. Building & Utilities 5a. Transport – Vehicles	<ul style="list-style-type: none"> <li>Any item purchased on or after July 1, 2018 AND paid by Ethiopian Government, Core Group (USAID), or WHO</li> <li>Any rental item paid by Ethiopian Government, Core Group (USAID), or WHO</li> </ul>	<ul style="list-style-type: none"> <li>Any item purchased prior to July 1, 2018 OR <b>not</b> paid by Ethiopian Government, Core Group (USAID), or WHO</li> </ul>

# Methods for Weighting Results

- **Sub-national randomly sampled cost centers (n=14)**
  - Multiplied each cost by the product of the administrative-level weights (i.e., regional weight, zonal weight, woreda weight, health facility weight) for that cost center level and higher levels
  - Sampling weight determined by inverse probability of selection
    - E.g., inverse of 1 urban zone selected out of 6 urban zones in region: sampling probability for zone =  $1/6$ ; sampling weight for zone = 6

## Methods for Weighting Results cont.

- **Sub-national purposively sampled cost centers (n=29)**
  - Averaged costs across cost centers in the same administrative level and geographic area (e.g., woreda, zone, region)
  - Sampling weight determined by number of cost centers of the same type within administrative level and geographic area
    - E.g., for two health centers sampled in a woreda, averaged costs between the two health centers and multiplied the average by the total number of health centers in the woreda
  - Generated product of average costs for each variable by administrative level weights
- **Total weighted results (47 cost centers)**
  - Summed all the above types of sub-national weighted results (43 cost centers) and added federal-level results (4 cost centers)

# Regional Grouping for Extrapolation

EPHI suggestion for regional groups based on lowest wealth quintile from 2019 Mini Demographic Health Survey:

- Addis Ababa + Dire Dawa, Harari
- Amhara + Oromia, SNNP, Tigray
- Somali + Afar, Benishangul-Gumuz, Gambela

2019 Ethiopia Mini Demographic Health Survey Wealth Quintiles							
Region	Lowest	Second	Lowest and Second Combined	Middle	Fourth and Highest Combined	Fourth	Highest
			<i>Note: Category not in DHS</i>		<i>Note: Category not in DHS</i>		
Addis Ababa	0.0	0.0	0.0	0.0	100.0	1.0	99.0
Harari	5.2	11.4	16.6	11.2	72.2	15.7	56.5
Amhara	13.9	24.1	38.0	<b>25.0</b>	37.0	18.7	18.3
SNNP	15.7	19.8	35.5	24.0	40.5	<b>31.9</b>	8.6
Dire Dawa	16.2	7.6	23.8	2.1	74.1	3.9	70.2
Oromia	18.2	<b>22.4</b>	40.6	21.1	38.2	19.8	18.4
Tigray	18.8	15.9	34.7	14.8	50.4	14.3	<b>36.1</b>
Gambela	21.8	16.0	37.8	12.2	50.0	19.6	<b>30.4</b>
Benishangul-Gumuz	<b>28.5</b>	22.9	51.4	21.2	27.2	16.4	10.8
Afar	<b>66.1</b>	4.4	70.5	4.7	24.7	5.7	19.0
Somali	<b>69.6</b>	9.9	79.5	4.0	16.4	6.3	10.1

## Legend

Green = Better value of indicator (associated with higher socioeconomic development)

Red = Lower value of indicator (associated with lower socioeconomic development)

**Bold** = Largest share of responses in the region

SNNP(R) = Southern Nations, Nationalities, and Peoples (Region)

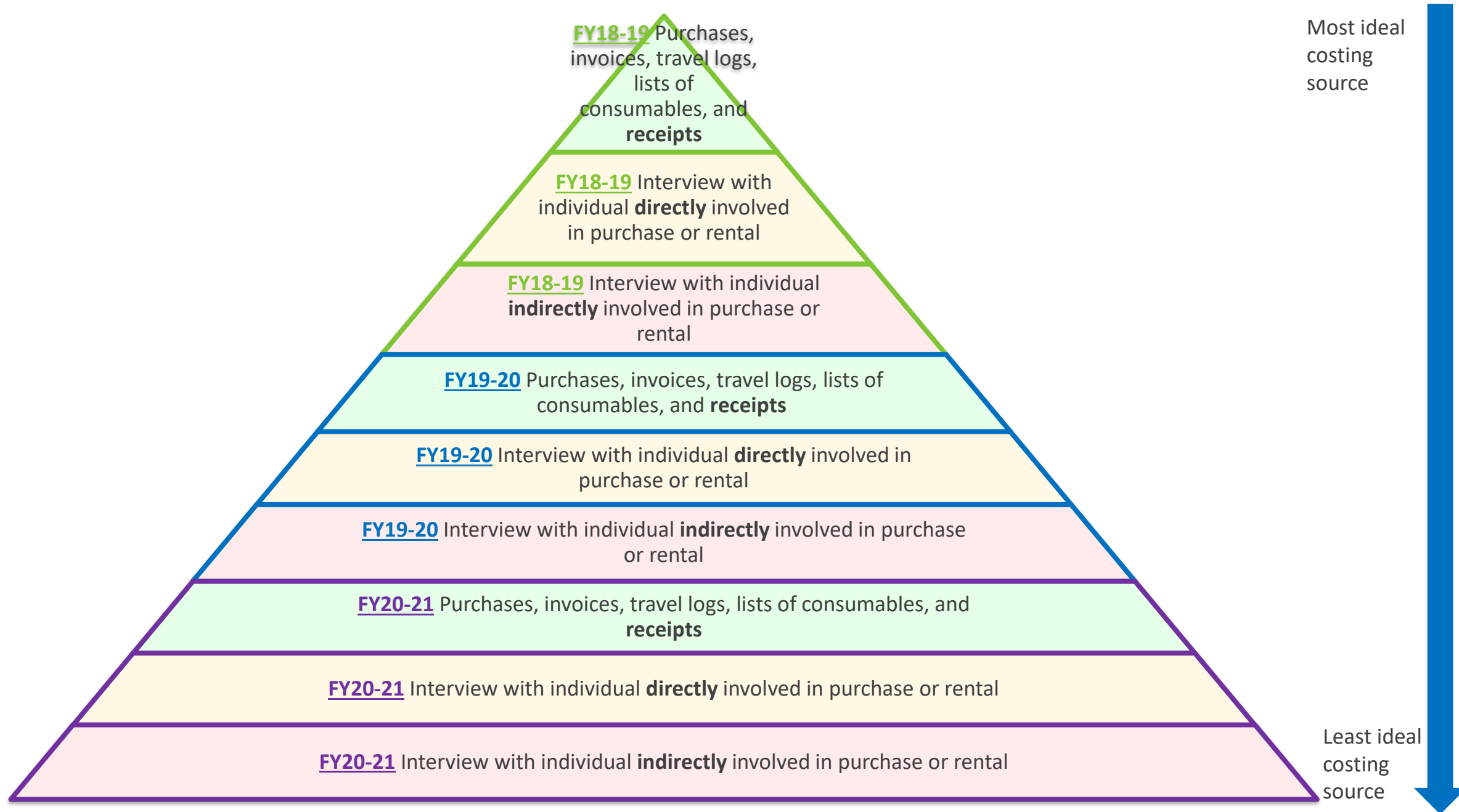
# Timeframe of Costs and Hierarchy of Evidence

## Timeframe of costs

- All costs provided based on the values from Fiscal Year (FY) 2018-2019
- If certain records were **not available from FY18-19**, then the most recent data from FY 19-20 or FY 20-21 was utilized

## Hierarchy of evidence

1. Costs based on **purchases, invoices, travel logs, lists of consumables, and receipts.**
2. If the above files were not available, then an **individual directly involved** with the purchase or rental **was interviewed**
3. If the above files or the above individual was not available, then an **individual indirectly involved** with the purchase or rental **was interviewed**



# Document Sources

*Every cost was categorized into four dimensions*

## 1 RESOURCE INPUT

- **What type of resource was purchased /used?**
  - *Resource Inputs:* Labor time, equipment, buildings & utilities, supplies, vehicles, fuel, per diem/travel/lodging, contracted services, other

## 2 VPD SURVEILLANCE SUPPORT FUNCTION

- **For what type of activity was the resource input used?**
  - *Support Functions:* Coordination; Data Management & Use; Field Logistics & Communication; Governance; Laboratory; Program Management; Supervision; Workforce Capacity; Other

## 3 ADMINISTRATIVE LEVEL

- **What administrative level conducted the activity?**
  - Levels: Multinational, National, Regional, Zonal, Woreda, Health Center, Community

## 4 PAYER/OWNER & FUNDING SOURCE

- **Who paid for or owns the resource? Who provided the funding?**
  - *Payers/Owners:* Ethiopia MoH, UNICEF, WHO, Personal/Self-Paid, Other
  - *Funding Sources:* Ethiopian Government-MoH, non-MoH; UNICEF; WHO; World Bank; AfDB; Gavi; BMGF; USAID; US CDC; Chinese Govt.; Core Group; Personal/Self-Paid; Other

# Resource Inputs

1a. Labor –  
Full-Time

1b. Labor –  
Temporary

2. Equipment

3. Building &  
Utilities

4. Supplies

5a. Transport –  
Vehicles

5b. Transport –  
Fuel

5c. Per Diem/  
Travel/  
Lodging

6. Contracted  
Services

7. Other

# Resource Input Categories – Definitions and Examples

## 1. Labor

### 1a. Full-Time

Salary and benefits (including any top-ups/incentives) intended for permanent employees or long-term full-time staff, regardless of hiring mechanism

### 1b. Temporary

Consultants and other temporary labor contracted for specific terms of reference

### Examples

- Surveillance officer
- Immunization focal point
- Finance officer
- Data manager
- Driver
- Consultant
- Lab technician
- Lab manager

# Resource Input Categories – Definitions and Examples

## 2. Equipment

- Capital Investment or Fixed Asset (in Ethiopia’s public financial management system)
- Purchase or use of an item with a useful life of more than one year
  - Except vehicles (*reported separately under Vehicles resource input*)
- Includes use of existing equipment and new purchases
- Includes rental of equipment and any maintenance/repair costs

### Examples

- Lab equipment (e.g., centrifuge, microscope, PCR machine)
- Cold chain equipment (e.g., refrigerator, freezer, cold box)
- Office equipment (e.g., computers, calculators, photocopiers, fax machines, scanners, monitors, telephone, mobile phone handsets)
- Office furniture

Note: Although software is an intangible asset, software was reported under “Other” if it was already owned prior to July 2018 or was a one-time purchase and has a useful life of more than one year (e.g., perpetual license); software that was used on a subscription or contract basis was reported under “Contracted Services”.

# Resource Input Categories – Definitions and Examples

## 3. Building & Utilities

- Capital Investment (or Fixed Asset in Ethiopia’s public financial management system)
  - Construction of new buildings, renovation of existing building, and value of existing building space
  - Includes existing building/office space used for trainings or meetings
- Rental
  - Rental of office, laboratory, or other VPD surveillance routine workspace
  - *Venue rental for training/meeting/event reported as “Contracted Services”*
- Maintenance
  - Building maintenance/repairs
- Utilities
  - Services for electricity, phone, internet
  - Water, gas, heating/cooling, if applicable

# Resource Input Categories – Definitions and Examples

## 4. Supplies

- Items with a useful life of less than one year
- Typically items that were consumed in the course of their use (“materials” or “consumables”)

### Examples

- Lab supplies (e.g., test kits, reagents, chemicals and solutions, slides, gloves, cotton)
- Office supplies (e.g., notebooks, pens, printer ink, paper)
  - Costs only collected when procured in bulk (e.g., for an office for a year, for all health facilities in the woreda, for all participants in a training), not collected for individual small office items (e.g., 1 pen)
- Training and meeting materials (e.g., printing, folders, notebooks, refreshments)
- Communication supplies (e.g., mobile phone minutes, modem minutes, mobile phone SIM cards, modem cards)

# Resource Input Categories – Definitions and Examples

5a. Transport - Vehicles	<ul style="list-style-type: none"><li>• Vehicle purchase, use of existing owned vehicles, maintenance/repairs, taxes, insurance, other fees (for any vehicle type: truck, car, motorcycle, etc.)</li></ul>
5b. Transport - Fuel	<ul style="list-style-type: none"><li>• Fuel costs per trip or total fuel budget</li></ul>
5c. Per Diem/ Travel/ Lodging	<ul style="list-style-type: none"><li>• General allowance/stipend</li><li>• Travel: Includes airfare, ground transportation (motorcycle, taxi, bus, train; any mode other than owned or rented vehicles reported on 5a)</li><li>• Lodging: Includes hotel, meals, incidentals</li></ul>

# Resource Input Categories – Definitions and Examples

## 6. Contracted Services

- Services (not including temporary personnel) performed under contract for specific terms of reference or deliverables; may be one-time or recurring basis
- Reported rental of venues for meetings/trainings/events in this category

### Examples

- Sample transport services (contracted firm)
- Security services
- Cleaning services
- IT support services; software subscription services
- Media purchases (e.g., radio/TV spots, billboard)
- Graphic design services
- Rental of venues (outside existing office space) for meetings, trainings, or other events

## 7. Other

Not able to be categorized elsewhere (e.g., bank fees, software perpetual license), or lump sum costs with insufficient detail to be disaggregated into distinct resource inputs

# Resource Input Categories – Definitions and Examples

## 8. Multi-Resource Top Down

Lump sum costs covering multiple resource inputs and % shares of lump sum by resource input are able to be estimated.

### Example

Activity	Total Cost (lump sum value)	% Labor Perm.	% Labor Temp.	% Equipment	% Building & Utilities	% Supplies	% Vehicles	% Fuel	% Per Diem / Transport/ Lodging	% Contracted Services	% Other	Sum of resource input %
Training	500,000 ETB		5%			5%			70%	20%		100%

# Country-wide, Weighted Economic (including Financial) Costs by Funding Source

Cost Center Level	Statistic	Funding Source											TOTAL
		Ethiopian Government - MoH Federal Level	Ethiopian Government - non-MoH Federal Level	Health Center/Hospital	Regional Government	U.S. Centers for Disease Control and Prevention (CDC)	U.S. Agency for International Development (USAID)	UNICEF	World Health Organization (WHO)	Personal/Self-Paid	Unknown	Others*	
Federal	Sum, weighted (Mar 2023 USD)	244,234	-	-	-	99,417	108,924	17,722	8,309,412	4,603	-	3,747	8,788,060
	Share of total in cost center level (%)	2.8	-	-	-	1.1	1.2	0.2	94.6	0.1	-	0.0	100
Regional	Sum, weighted (Mar 2023 USD)	1,196,670	-	-	1,628,677	129,127	-	19	44,585	4,740	1,606	194,777	3,200,202
	Share of total in cost center level (%)	37.4	-	-	50.9	4.0	-	<0.1	1.4	0.1	0.1	6.1	100
Zonal	Sum, weighted (Mar 2023 USD)	3,538,112	255,486	2,261	2,019,364	39,285	-	-	1,208,430	2,389	1,625	142,406	7,209,357
	Share of total in cost center level (%)	49.1	3.5	<0.1	28.0	0.5	-	-	16.8	0.0	0.0	2.0	100
Woreda	Sum, weighted (Mar 2023 USD)	8,257,410	8	-	44,127	-	-	-	183,823	32,611	14,622	118,322	8,650,924
	Share of total in cost center level (%)	95.5	<0.1	-	0.5	-	-	-	2.1	0.4	0.2	1.4	100
Hospital	Sum, weighted (Mar 2023 USD)	7,316,509	49,293	391,844	365,893	81,975	-	449	610,828	11,309	18,320	6,697	8,853,117
	Share of total in cost center level (%)	82.6	0.6	4.4	4.1	0.9	-	<0.1	6.9	0.1	0.2	0.1	100
Health Center	Sum, weighted (Mar 2023 USD)	26,739,573	631,070	57,962	1,639,815	-	-	7,872	425,455	198,015	-	1,464,627	31,164,390
	Share of total in cost center level (%)	85.8	2.0	0.2	5.3	-	-	<0.1	1.4	0.6	-	4.7	100
Country-wide	Sum, weighted (Mar 2023 USD)	47,292,509	935,857	452,068	5,697,877	349,803	108,924	26,062	10,782,533	253,667	36,173	1,930,576	67,866,049
	Share of total (%)	69.7	1.4	0.7	8.4	0.5	0.2	0.0	15.9	0.4	0.1	2.8	100

0 USD Allocation: African Development Bank, Bill & Melinda Gates Foundation, Core Group, Chinese Government, Gavi, World Bank

\*Others: American Joint Fund Committee, Carter Center, Family Health International, ICAP at Columbia University, Institute of Tropical Medicine Antwerp, Japan International Cooperation Agency (JICA), John Snow Inc., UN Pop. Fund

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# Country-wide, Weighted Financial Costs by Funding Source

		Funding Source											
Cost Center Level	Statistic	Ethiopian Government - MoH Federal Level	Ethiopian Government - non-MoH Federal Level	Health Center/ Hospital	Regional Government	U.S. Centers for Disease Control and Prevention (CDC)	U.S. Agency for International Development (USAID)	UNICEF	World Health Organization (WHO)	Personal/ Self-Paid	Unknown	Others*	TOTAL
Federal	Sum, weighted (Mar 2023 USD)	83	-	-	-	N/A – Not considered an implementing partner	24,975	N/A – Not considered an implementing partner	3,466,294	N/A to financial costs	N/A to financial costs	N/A to financial costs	3,491,352
	Share of total in cost center level (%)	<0.1	-	-	-		0.7		99.3				100
Regional	Sum, weighted (Mar 2023 USD)	608,513	-	-	1,286,814		-		44,159				1,939,486
	Share of total in cost center level (%)	31.4	-	-	66.3		-		2.3				100
Zonal	Sum, weighted (Mar 2023 USD)	1,131,421	245,978	2,261	890,113		-		1,207,248				3,477,021
	Share of total in cost center level (%)	32.5	7.07	0.1	25.6		-		34.7				100
Woreda	Sum, weighted (Mar 2023 USD)	3,796,848	-	-	38,745		-		173,028				4,008,621
	Share of total in cost center level (%)	94.7	-	-	1.0		-		4.3				100
Hospital	Sum, weighted (Mar 2023 USD)	754,120	-	6,472	7,191		-		477,642				1,245,424
	Share of total in cost center level (%)	60.6	-	0.5	0.6		-		38.4				100
Health Center	Sum, weighted (Mar 2023 USD)	4,593,449	-	5,763	40,140	-	338,127	4,977,480					
	Share of total in cost center level (%)	92.3	-	0.1	0.8	-	6.8	100					
Country-wide	Sum, weighted (Mar 2023 USD)	10,884,433	245,978	14,497	2,263,003	-	24,975	5,706,497	19,139,383				
	Share of total (%)	56.9	1.3	0.1	11.8	-	0.1	29.8	100				

0 USD Allocation: African Development Bank, Bill & Melinda Gates Foundation, Core Group, Chinese Government, Gavi, World Bank

\*Others: American Joint Fund Committee, Carter Center, Family Health International, ICAP at Columbia University, Institute of Tropical Medicine Antwerp, Japan International Cooperation Agency (JICA), John Snow Inc., UN Pop. Fund

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# Country-wide Economic (including Financial) Costs by Support Function and Resource Input

**Yellow** highlight = The three largest tabulations of two dimensions (cross-tabs) of costs.

Resource Input	Support Function (Costs in March 2023 USD)								TOTAL
	Coordination	Data Management and Use	Field Logistics and Communication	Governance	Laboratory	Program Management	Supervision	Workforce capacity	
1a. Labor - Full-Time	1,935,698	5,040,024	3,178,869	278,052	237,993	325,006	2,567,874	13,786,127	27,349,644
1b. Labor - Temporary	48,318	132,887	323,519	-	-	-	96,637	45,471	646,832
2. Equipment	32,880	505,655	293,492	-	990,684	1,359,940	23,910	15,920	3,222,480
3. Buildings & Utilities	54,185	108,677	2,587	535	15,914	2,817,917	13,549	7,132	3,020,496
4. Supplies	16,676	266,386	292,509	3,033	6,033,216	3,201,780	70,155	46,725	9,930,481
5a. Transport - Vehicles	25,428	-	4,920,492	3,230	9,139	-	9,535,487	961,387	15,455,164
5b. Transport - Fuel	264	-	321,617	-	56	-	1,168,542	176,821	1,667,300
5c. Per Diem, Travel, Lodging	13,421	-	3,565,461	-	-	245,929	546,649	1,614,893	5,986,353
6. Contracted Services	39,674	-	14,333	-	-	-	-	202,453	256,460
7. Other	-	180,206	30,727	115,274	-	-	4,600	31	330,838
<b>Total at Country Level</b>	<b>2,166,546</b>	<b>6,233,836</b>	<b>12,943,605</b>	<b>400,124</b>	<b>7,287,003</b>	<b>7,950,571</b>	<b>14,027,403</b>	<b>16,856,960</b>	<b>67,866,048</b>
<b>Share of Total (%)</b>	<b>3.2</b>	<b>9.2</b>	<b>19.1</b>	<b>0.6</b>	<b>10.7</b>	<b>11.7</b>	<b>20.7</b>	<b>24.8</b>	<b>100</b>

# Country-wide Financial Costs by Support Function and Resource Input

**Yellow** highlight = The three largest tabulations of two dimensions (cross-tabs) of costs.

Resource Input	Support Function (Costs in March 2023 USD)								
	Coordination	Data Management and Use	Field Logistics and Communication	Governance	Laboratory	Program Management	Supervision	Workforce capacity	TOTAL
1a. Labor - Full-Time	-	-	-	-	-	-	-	-	-
1b. Labor - Temporary	48,318	132,887	323,519	-	-	-	96,637	19,327	<b>620,688</b>
2. Equipment	2,376	61,622	8,324	-	70,720	279,197	1,467	3,469	<b>427,176</b>
3. Buildings & Utilities	53,181	98,993	2,068	364	2,138	605,286	6,241	6,369	<b>774,640</b>
4. Supplies	16,676	260,732	90,323	3,033	196,957	<b>3,196,907</b>	54,198	19,430	<b>3,838,256</b>
5a. Transport - Vehicles	12,331	-	2,458,665	1,837	-	-	<b>2,984,980</b>	378,826	<b>5,836,639</b>
5b. Transport - Fuel	219	-	321,608	-	-	-	1,167,714	176,821	<b>1,666,362</b>
5c. Per Diem, Travel, Lodging	13,026	-	<b>3,111,299</b>	-	-	245,929	546,649	1,471,421	<b>5,388,324</b>
6. Contracted Services	39,674	-	14,333	-	-	-	-	202,453	<b>256,460</b>
7. Other	-	180,206	30,727	115,274	-	-	4,600	31	<b>330,838</b>
<b>Total at Country Level</b>	<b>185,802</b>	<b>734,441</b>	<b>6,360,865</b>	<b>120,507</b>	<b>269,815</b>	<b>4,327,320</b>	<b>4,862,485</b>	<b>2,278,149</b>	<b>19,139,383</b>
<b>Share of Total (%)</b>	<b>1.0</b>	<b>3.8</b>	<b>33.2</b>	<b>0.6</b>	<b>1.4</b>	<b>22.6</b>	<b>25.4</b>	<b>11.9</b>	<b>100</b>

# Country-wide Economic (including Financial) Costs by VPD and Resource Input

Yellow highlight = The three largest cross-tabs of costs  
 Blue highlight = The three largest cross-tabs of costs, excluding general

Resource Input	VPD (Costs in March 2023 USD)												TOTAL
	General	Polio/Acute Flaccid Paralysis	Measles & Rubella	Neonatal Tetanus	Meningococcal meningitis (pediatric)	Yellow Fever	Cholera	Rotavirus	Congenital Rubella Syndrome	Invasive-bacterial VPDs	Human Rabies	Other (diphtheria, pertussis, typhoid, smallpox)	
1a. Labor - Full-Time	15,727,998	1,745,100	3,718,121	718,402	682,055	460,852	1,033,490	772,838	436,620	703,014	818,262	532,890	27,349,644
1b. Labor - Temporary	107,225	312,521	111,633	33,149	25,040	-	-	33,559	966	22,740	-	-	646,832
2. Equipment	1,822,816	148,716	271,276	37,651	445,927	46,175	38,666	96,191	24,042	197,751	57,922	35,346	3,222,480
3. Buildings & Utilities	2,691,155	94,824	71,256	31,193	14,809	9,322	32,211	19,721	8,374	19,936	20,662	7,033	3,020,496
4. Supplies	4,936,580	335,459	3,723,070	19,282	331,433	150,527	91,893	18,218	20,008	249,584	31,403	23,025	9,930,481
5a. Transport - Vehicles	8,401,643	2,528,367	1,647,625	642,597	331,359	107,369	998,783	109,735	96,689	256,128	168,434	166,434	15,455,164
5b. Transport - Fuel	1,273,323	96,298	144,164	35,261	18,282	6,721	37,690	8,211	6,721	15,371	13,869	11,389	1,667,300
5c. Per Diem, Travel, Lodging	2,548,520	1,820,097	1,237,368	107,397	47,964	7,494	108,287	23,298	6,869	48,044	23,522	7,494	5,986,353
6. Contracted Services	-	241,141	8,178	1,984	1,984	-	-	1,984	-	1,190	-	-	256,460
7. Other	186,352	132,945	6,012	1,996	1,688	-	-	152	-	1,693	-	-	330,838
<b>Total at Country Level</b>	<b>37,695,612</b>	<b>7,455,467</b>	<b>10,938,705</b>	<b>1,628,912</b>	<b>1,900,541</b>	<b>788,460</b>	<b>2,341,020</b>	<b>1,083,907</b>	<b>600,289</b>	<b>1,515,451</b>	<b>1,134,074</b>	<b>783,612</b>	<b>67,866,048</b>
Share of Total (%)	55.5	11.0	16.1	2.4	2.8	1.2	3.4	1.6	0.9	2.2	1.7	1.2	100
Share of Total (%), Excluding General		24.7	36.3	5.4	6.3	2.6	7.8	3.6	2.0	5.0	3.8	2.6	100

# Country-wide Financial Costs by VPD and Resource Input

**Yellow highlight** = The three largest tabulations of two dimensions (cross-tabs) of costs.  
**Blue highlight** = The three largest tabulations of two dimensions (cross-tabs) of costs, excluding general.

VPD (Costs in March 2023 USD)													
Resource Input	General	Polio/Acute Flaccid Paralysis	Measles & Rubella	Neonatal Tetanus	Meningococcal meningitis (pediatric)	Yellow Fever	Cholera	Rotavirus	Congenital Rubella Syndrome	Invasive- bacterial VPDs	Human Rabies	Other (diphtheria, pertussis, typhoid, smallpox)	TOTAL
	1a. Labor - Full-Time	-	-	-	-	-	-	-	-	-	-	-	-
1b. Labor - Temporary	107,225	312,521	111,633	33,149	25,040	-	-	7,415	966	22,740	-	-	620,688
2. Equipment	245,540	65,205	41,704	6,893	18,583	5,609	7,016	6,197	5,433	7,360	9,332	8,301	427,176
3. Buildings & Utilities	616,934	75,692	39,505	7,142	6,357	3,472	8,007	3,526	3,298	4,915	4,042	1,751	774,640
4. Supplies	3,276,483	157,871	105,075	19,239	42,157	12,263	91,019	17,557	12,218	50,339	31,381	22,654	3,838,256
5a. Transport - Vehicles	3,124,759	951,584	665,093	306,905	66,541	24,099	567,784	13,669	13,419	49,158	28,312	25,315	5,836,639
5b. Transport - Fuel	1,272,448	96,298	144,164	35,261	18,282	6,721	37,690	8,148	6,721	15,371	13,869	11,389	1,666,362
5c. Per Diem, Travel, Lodging	2,450,585	1,544,791	1,012,792	107,397	47,964	7,494	108,287	23,085	6,869	48,044	23,522	7,494	5,388,324
6. Contracted Services	-	241,141	8,178	1,984	1,984	-	-	1,984	-	1,190	-	-	256,460
7. Other	186,352	132,945	6,012	1,996	1,688	-	-	152	-	1,693	-	-	330,838
<b>Total at Country Level</b>	<b>11,280,325</b>	<b>3,578,048</b>	<b>2,134,157</b>	<b>519,966</b>	<b>228,596</b>	<b>59,657</b>	<b>819,804</b>	<b>81,733</b>	<b>48,925</b>	<b>200,809</b>	<b>110,459</b>	<b>76,904</b>	<b>19,139,383</b>
Share of Total (%)	58.9	18.7	11.2	2.7	1.2	0.3	4.3	0.4	0.3	1.0	0.6	0.4	100
Share of Total (%), Excluding General		45.5	27.1	6.6	2.9	0.8	10.4	1.0	0.6	2.6	1.4	1.0	100