COST OF DELIVERING ESSENTIAL HEALTH SERVICES PACKAGES, LAOS PDR (2019-2025): A NORMATIVE COSTING APPROACH

Draft Report

JULY 29, 2020

SHANKAR PRINJA

Contents

List of Tables

List of Figures

Abbreviations

Abbreviation	Full form
ART	Antiretroviral Therapy
BCG	Bacillus Calmette Guerin
CD	Communicable Disease
C-MYPs	Comprehensive- Multi-year Plans
CVD	Cardiovascular Disease
EHSP	Essential Health Services Package
EMS	Emergency Medical Services
ENT	Ear, Nose and Throat
EPI	Expanded Program On Immunization
GBD	Global Burden Of Disease
GDP	Gross Domestic Product
Hb	Hemoglobin
HCW	Healthcare Worker
HIV	Human Immunodeficiency Virus
HPV	Human Papilloma Virus
HR	Human Resources
HTC	HIV Testing and Counseling
ITN	Insecticide-Treated Bed Nets
LDL	Low-Density Lipoprotein
LFT	Liver Function Test
LLIN	Long-Lasting Insecticide-Treated Nets
M&E	Monitoring And Evaluation
MCH	Maternal And Child Health

MDR-TB	Multi-Drug Resistant Tuberculosis
MMR	Maternal Mortality Ratio
MOH	Ministry of Health
NCD	Noncommunicable Disease
NHA	National Health Accounts
NGO	Nongovernmental Organization
ORS	Oral Rehydration Solution
PEP	Post-Exposure Prophylaxis
RBC	Red Blood Count
RFT	Renal Function Test
RHT	Rapid HIV Testing
RMNCH	The Reproductive and Child Health Programme
SDG	Sustainable Development Goals
TB	Tuberculosis
U-5	Under 5
VPD	Vaccine Preventable Diseases
WHO	World Health Organization

Executive Summary

As part of the implementation of strategic plan for the health sector, Government of Lao People's Democratic Republic (Laos PDR) introduced the Essential Health Services Package (EHSP). The EHSP enlists essential health care services to be provided to the entire population. Besides enlisting the services and their details, information on cost of implementing the interventions is crucial for concern of fiscal sustainability. Despite the fact that the information on cost of delivering health interventions and the major cost drivers is critical for expanding the health sector, current knowledge of these costs is limited. The present study thus aimed to ascertain the costs of delivering EHSP for Laos PDR, using a normative costing approach.

Overall, 120 services have been identified by Government to be delivered as a part of EHSP. These have been further split into different service packages. These can be clubbed into various service domains namely: Immunization, Reproductive Maternal Neonatal and Child Health (RMNCH), Non-communicable diseases (NCD), Communicable diseases (CD), HIV and Tuberculosis (TB) etc. The RMNCH service domain included antenatal care services (SO2), abortion, intra-natal and postnatal care (SO3), special newborn care services (SO4), neonatal & child health services (SO5) and reproductive & adolescent care services (SO7).

A normative costing approach, from a financial perspective, was used to collect data on recurrent resources required to deliver the EHSP using an excel based tool. The primary objectives of this analysis was to estimate the unit cost of individual core service packages, and to assess the annual cost of EHSP implementation in Laos PDR under various scenarios of scale up.

In order to estimate the cost of specific services and service packages, a three-step approach was used for cost estimation which included determining the unit cost of individual service, demand estimation (annual) for services within a package, and finally computing the annual cost estimation for each service package. Firstly, to estimate unit cost of services, the standard quantity of recurrent resources (staff type and time,

drugs and supplies, and diagnostic tests) required to provide a service were determined. This was estimated at different levels of service delivery. The cost of existing capital items was not accounted for in the costing. The quantity of individual resources was then multiplied by the corresponding wages/prices of each resource to arrive at a unit cost of each service. Secondly, the incidence/prevalence rates in catchment population were used to estimate the number of service contacts (annual demand for service) needed under each EHSP service, considering the current level of service-specific coverages and patterns of care utilization across levels of service delivery for year 2019. Thirdly, the annual cost of delivering a specific service and service package for Laos was ascertained using the estimated demand and unit cost of that service. As the estimates of demand and unit costs were specific to level/type of health facility and therefore, data on utilization patterns by the level/ type of health facilities was key to arrive at the total cost. The annual cost for year 2020- 2025 were estimated by increasing the coverage of services to achieve the stated program targets by 2025 (without scale up scenario). Additionally, scale up for program management, governance and administration expenditures was undertaken using program expenditure data and information in National Health Accounts of Laos (With Scale up scenario). (Table 1)

Table 1: Key Health Financing Indicators for EHSP implementation in Laos PDR

Indicators	2019		2025	
	Without Scale up	With Scale up#	Without Scale up	With Scale up#
Health expenditure as % of GDP	2.40%	2.40%	-	-
Total cost EHSP (In billion Laos kip)	683	1,016	2,159	3,214
Per capita EHSP cost (In thousand Laos kip)	95	142	275	448
Per capita EHSP cost (USD)	11.7	17.4	33.6	54.9
EHSP Cost as % of Current Government Health Expenditure	37.8%	67.9%	98.5%	195%
Total cost of EHSP as percentage of GDP	0.46%	0.69%	1.46%	2.17%

#Scale up refers to program management, governance & administration expenses.
Estimates of cost are representative of value of recurrent resources that would be required.
* The GDP estimate of 2019 was used to compute these indicators
Note: EHSP= Essential Health Service Package, GDP= Gross Domestic Product (Laos).

In 2019, at current coverage levels, the annual cost of delivering EHSP is estimated to be 683 billion Laos kip. For the year 2025, the annual cost was projected based on targets set for coverage scale ups for different services. In 2025, there will be a relative increase of 216 % in the annual budget compared to 2019. As per the National Health Accounts (NHA) report of Laos for year 2016-17, the total health expenditure as a percentage of Gross Domestic Product (GDP) of Laos was 2.4%. In 2019, the annual cost of implementing EHSP is 0.46% of GDP without scale up costs for program management and General administration. It increases to 0.69% if scale up costs are included. The annual cost of EHSP projected for 2025 will be 1.46% of GDP (2019 GDP estimate). (Table 1)

In 2025 at full coverage, there will be a relative increase in the annual cost of NCDs by 302%, RMNCH by 239%, CDs by 192% and immunization services by 86%. (Table 2)

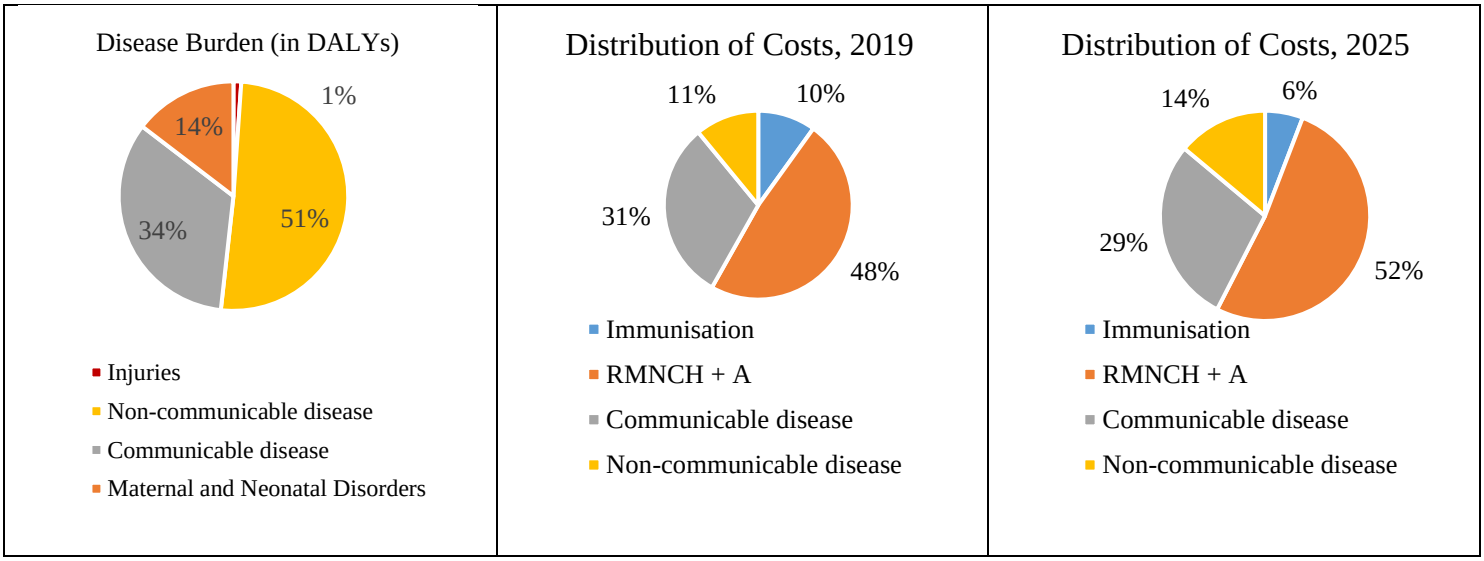
Table 2: Costs (in Billion Laos kip) disaggregated by service objective for 2019 and 2025

Service Domain	2019	2025	% Change
Immunization	68	126	86
RMNCH	329	1,117	239
Communicable disease	211	616	192
Non-communicable disease	75	301	302

*Estimates of cost are representative of value of recurrent resources that would be required.

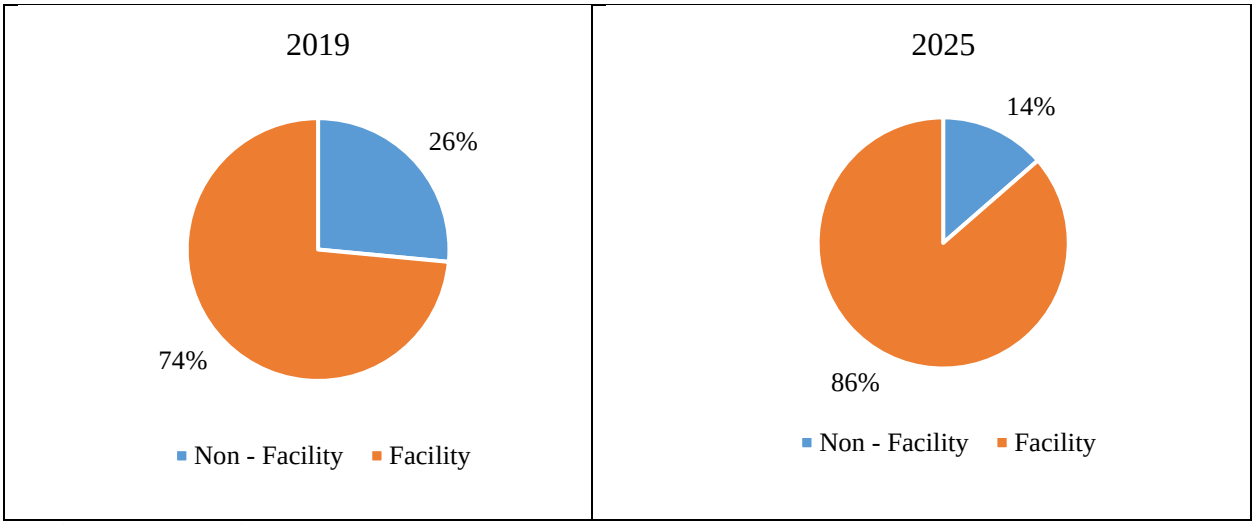
The RMNCH+A accounted for 48% of share in annual cost of EHSP in 2019. This was followed closely by communicable disease services (31%), followed by much lower share of NCDs (11%) and immunization related services (10%). (Figure 1). A review of disease burden in terms of DALYs revealed that the priorities of EHSP need to be aligned with disease burden. Focus needs to be shifted to NCD prevention and control interventions which constitute 51% of DALYs and 25% of premature mortality but just 11% of EHSP costs were related to NCD interventions. (Figure 1)

Figure 1: Comparative distribution of disease burden (DALYs) and EHSP cost



In 2019, three- fourth share of total EHSP cost was incurred on services delivered through different levels of health facilities and remaining through community/outreach services. (Figure 2). The projected cost estimates for 2025 suggest that the cost of EHSP services delivered through health facilities will increase.

Figure 2: Percentage distribution of total cost by level of service delivery for 2019 and 2025, Laos PDR



*****Non-facility is inclusive of mobile/ outreach/community services

The increase in cost for NCDs was highest at district hospital level followed by health centres. At DH level, highest proportionate increase was found for SO5, i.e. child curative care. In the year 2025, cost for

providing safe delivery and emergency obstetric care (SO2 and SO3) gets distributed to different facility levels, i.e. HC, DH, PH, CH as compared to major share of cost at DH level only in 2019. (Figure 3 and 4). Share of nutrition related services at non facility and health center level increased as the years progressed. Cost of Tuberculosis and Malaria related interventions increased at higher facility levels as the years progressed towards 2025.

Figure 3: Composition of total cost by service objectives at different facility levels, 2019 and 2025

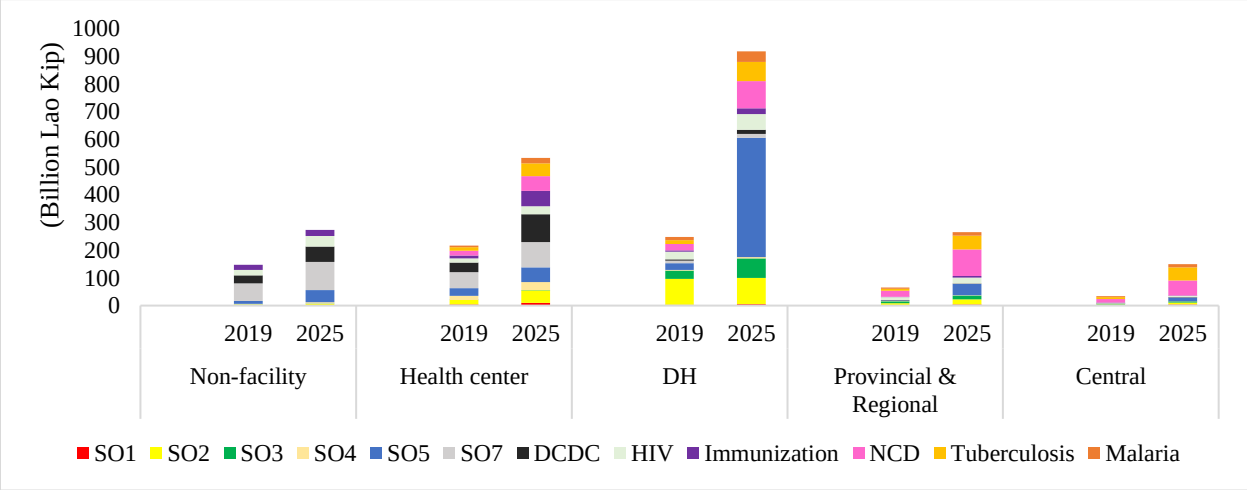
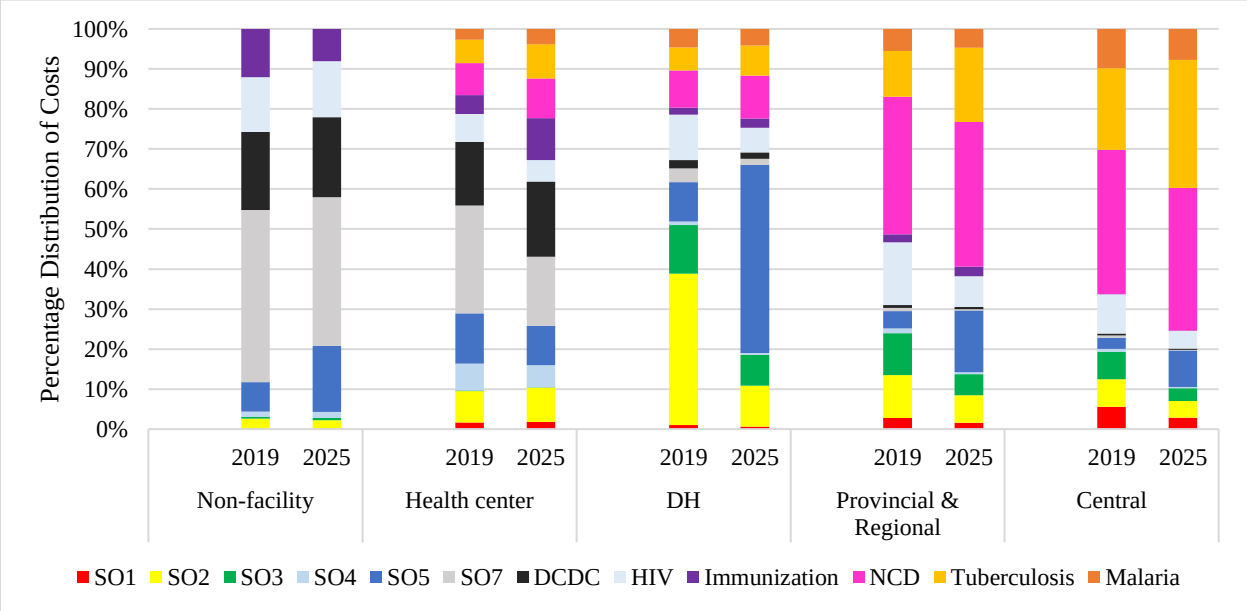


Figure 4: Percentage distribution of costs by service objective at different levels of health system, 2019-2025



Limitations

The results of this analysis need to be viewed keeping few limitations in mind. Firstly, the analysis was conducted from financial perspective and includes salaries, drugs, consumables, diagnostic and program management and no increase in capital costs with regard to implementation of EHSP have been included here. However, this is not expected to bring major changes to the results until significant changes in infrastructure are undertaken by Government agencies for service delivery in Laos. Second, we assumed a linear increase in coverage for several interventions. Scale up costs were also assumed to be linear. In absence of any published evidence on the patterns of increase in service utilization in initial years following EHSP implementation, this was decided to be the best approach to follow. Moreover, input resources which have been valued are unlikely to have a non-linear cost function. Scenario analysis could be conducted only for immunization services as various other scenarios prioritizing equity and efficiency or exploring other policy objectives required inputs from Programme Officers which were not available during the course of the study. Adapting the package to actual service utilization at client level was a challenge wherein many services had to be segregated into components to accurately estimate costs. This was done using latest program guidelines, which is the standard approach in these scenarios. The time spent by human resources for service provision was not elicited through a time motion study, but determined using the expert group opinion which is again a well-established approach for EHSP costing. As package is still in the stage of evolution, we could not estimate costs for quality improvement measures.

Conclusions and Recommendations

Increase in per capita EHSP cost from current 95 to 275 (In thousand Laos kip) and 142 to 448 (In thousand Laos kip) in without scale up and with scale up scenarios respectively point towards need of significant increase in health system funding. Government will require to increase the health expenditure from 0.46% of GDP to 1.46% of GDP. Delivering all the services at 80% coverage levels will amount to relative increase

in the annual cost by 216% form 2019 which equals to 2,159 billion Laos kip in without scale up scenario. Within country as well as donor funding mechanisms will need to be strengthened in the next five years to account for increased requirement of resources to deliver services.

Introduction

The healthcare system of Laos consists primarily of public healthcare facilities, distributed over 17 provinces having hard-to-reach and rural areas as well as urban areas. Considerable efforts are being made by Government to ensure equitable distribution of health care services throughout the country to promote accessibility and availability. There are four administrative strata in the health system: the central (the Ministry of Health); provincial (provincial health department); district (district health offices); and health centers levels. In 2017, its health facilities consisted of five central teaching hospitals; four regional hospitals, 13 provincial hospitals; 136 district hospitals; and about 1,055 health centers. District hospitals are further classified as category A or B, where category A implies that the facilities for surgical care exist and vice versa. In its efforts to increase access to services village volunteers and village revolving drug funds were introduced. Government has managed to reach 5,226 villages through these two initiatives. A total of 11,070 hospital beds were available in 2017, 1.7 beds per 1,000 inhabitants.(1) The Government announced greater autonomy for public health facilities. In 2007, the Lao Health Maintenance Organization was created under the Health Care Department MoH, which led to establishment of 1028 private clinics/ hospitals from 2010- 2017. Despite increase in reach of state health system, it remains underutilized, especially in the peripheral areas.

In order to improve the availability and accessibility of services across Laos, Government initiated the development and implementation of an Essential Health Service Package (2018- 2020). The package details the preventive, promotive, diagnostic, screening, curative, palliative and rehabilitation health services that are appropriate to address the health needs of populations. These services will be delivered at different points ranging from outreach, health centre, district hospital, provincial hospital and central hospital. The process of developing the package is part of phase 2 of health sector reform strategy (2016- 2020) which aims for essential service provision and financial protection for the population.

The overall goal of package development is to achieve universal coverage by providing a standardized package of basic services that forms the core of service delivery in all public healthcare facilities.

Though the essential health service package has been finalized by identifying basic services from relevant national strategies and action plans of each of the eight programs, there are several questions on cost of delivering the services/ package, its feasibility given the fiscal capacity, and as a result whether there is any need or rationality in prioritization within the EHSP. Achieving expanded health coverage has systemic cost implications and requires data to justify resource allocations. Understanding the costs of delivering health interventions and the major cost drivers is critical to expanding access to health services.

Various approaches towards costing of health care services has been described in literature.(2-4) These include the top-down, bottom-up, and normative approaches to cost data collection and analysis. The choice of the method to be used for the costing is ultimately guided by the policy question to be answered. For example, top-down and bottom-up methods would be very suitable to generate evidence on cost of providing a given service which could in turn be used for setting provider-payment rates. Within the two, the bottom-up would be even more suitable in view of its detailed disaggregation of cost by type of input resources as well as by type of micro-activities involved in a package of care.

However, such estimates of top-down or bottom-up costing are dependent on actual use of resources to provide services. Hence, these are likely to be biased if the infrastructure is underfunded, or service delivery is inefficient (e.g. under-utilized or over-utilized), or not appropriately organized (e.g. the level of health service provision on provider is inappropriate), or if the quality of care is compromised. The latter becomes especially relevant in view of the recent evidence which shows that the number of premature deaths attributable to poor quality of services is far more than that due to problems of access and unmet need.(5) Table 3 lists the costing approaches and their relative suitability. Hence, while the former two methods of costing would be suitable for estimating the provider payment rates which is determined based on current practice, it may not be suitable to estimate the cost of scaling up existing services, or for estimating the cost of an essential service package in a supply-side financing mode.

In view of the above, a normative approach to estimate the cost of EHSP, from a financial perspective, was considered appropriate in the context of Laos PDR.

Table 3: Choice of costing methodologies for different policy questions

Broad Purpose of Costing	Specific Purpose of Costing	Perspective	Recommended Costing Methodology
Planning and Budgeting	Assess resource requirements and project future costs	Purchaser and Provider	Bottom-up Or Normative costing
	Estimate costs of expanding health coverage	Purchaser and Provider	Bottom-up Or Normative costing
	Estimate the cost of 'Basic or Essential Health Package'	Purchaser and Provider	Normative costing
Setting Provider Payment Rates	Provide a cost basis for the health services paid through a provider payment system	Provider and Patient	Bottom-up
	Inform coverage decisions and payment policies	Purchaser and Provider	Bottom-up Or Top-down Or Mixed methodology
	Compare costs with payment rates	Purchaser and Provider	Bottom-up Or Top-down Or Mixed methodology
	Inform contract negotiations between providers and purchasers	Purchaser and Provider	Bottom-up Or Top-down Or Mixed methodology
	Set performance-based financing arrangements	Provider	Top-down
Improving Provider Internal Management and Performance	Compare costs and performance of different departments or services within facilities	Provider	Bottom-up Or Top-down Or Mixed methodology
	Establish standards and benchmarks to increase accountability	Purchaser and Provider	Bottom-up Or Normative costing
	Inform decisions about operations or infrastructure investments	Purchaser and Provider	Mixed methodology
	Provide data for informed decision making to improve management and provider operations	Purchaser and Provider	Top-down

Adapted from Costing of Health Services for Provider Payment. A practical manual based on Country costing challenges, Trade-offs, and solutions. Joint Learning Network.

The primary objective of the costing was to estimate the unit cost of individual core service packages which are part of EHSP and assess the total cost of EHSP implementation in Laos PDR under various scenarios of scale up.

The secondary objective of the cost analysis was to compare the normative and bottom-up cost estimates, which could provide an assessment of the extent of difference between what the Government of Laos is

currently spending and what it ought to be spending, if the services are delivered as per standard guidelines. Secondly, we aim to assess cost of implementation of EHSP under various scale-up scenarios to provide an evidence- based scale-up path for Government of Laos which will address concerns of fiscal sustainability. Finally, the study would generate evidence which could be used subsequently to undertake health technology assessment to develop a framework for priority setting within EHSP.

Methods

Following steps were involved in determining normative cost of the EHSP:

Identification of core service package by level of service delivery: This step involved categorization of the core service packages as per availability at different levels of service delivery, i.e. outreach, health centre, district hospital, provincial hospital or central hospital. This was already available.

Identification of individual services within the core service package, by level of service delivery: This step involved creation of separate Technical Working Groups (TWGs) for each specialty who identified specific individual services within each service package. The individual services included outpatient consultation, hospitalization, procedure or surgery, diagnostic test etc. Each TWG comprised of 3-5 persons comprising of a specialist doctor, a program manager, a medical professional with familiarity of working at different level of health care system, and a development partner representative. In addition, the TWG referred to standard treatment guideline (STG), both from within or outside Laos. The TWG was provided a background note as well as an excel template on which to record the responses.

Data collection on the type and quantity of recurrent operational resources per service within the service package, by level of service delivery: The TWG identified the individual resources from within clinical human resources, medicines, consumables for each service in each package at different levels of service delivery. Secondly, the TWG also identified the quantity of each resource required per service in the package. For example, the minutes spent by a nurse during outpatient consultation for an antenatal care at health centre. Alternatively, type and quantity of each drug which needs to be prescribed for an individual case of pathology at district hospital. The cost of capital items was not accounted for in the costing.

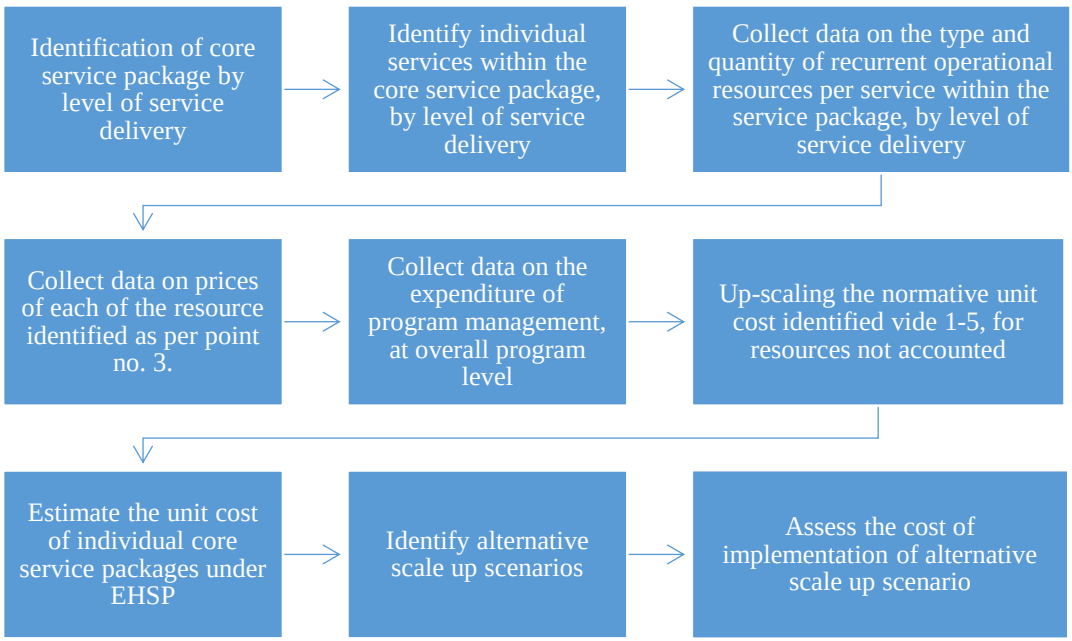
Data collection on prices of each of the resource: Data for each resource identified vide above consultation was assessed based on the current procurement prices in the public health system in Laos.

Data collection on the expenditure of program management, at overall program level: Data on expenditure for overall program management was obtained from the relevant program divisions within Laos. In case of joint or shared nature of program management cost across different core service packages, the overall cost of program management was apportioned for each service according to the proportion of number of service utilization episodes for each package under EHSP.

Identification of alternative EHSP scale up scenarios: The alternative scenarios for scale-up scenarios were assessed jointly in consultation with the senior program officers, development partners as well as academicians. The scale up scenarios included possible combinations of core services within the EHSP, different coverage of individual core services, and different combinations of levels at which services were delivered etc.

Assessing the cost of implementation of alternative EHSP scale up scenarios: Finally, the cost of alternative EHSP scale up scenarios were evaluated. In order to do so, demand for each core service were estimated, which in turn required data on incidence and prevalence, as well as care seeking behavior and scale-up scenario.

Figure 5: Step wise approach to Normative Cost Estimation



Data Collection

Table 4 below mentions the type of data collected, units of its measurement, and sources of respective information.

Table 4: Indicators & data source

Type of Data	Unit of Measurement	Data Sources	Remarks
Human Resource	• Type of HR • Time per service delivered • Wage rate	• TWGs • STGs • Accounts department	Each of this data were elicited from the TGW members as per their clinical opinion or STG. This required organizing meetings, explaining the purpose and eliciting the required data
Drugs and Consumables	• Number per service episode • Price	• TWGs • STGs • Procurement department	
Diagnostics cost	• Number of diagnostic tests per service • Price of diagnostic test	• TWG and STG • Price based on payment rates under national insurance scheme	
Program management expenditure cost	• Annual Expenditure on program management	• Program division • Development partner	
Overhead Cost	• % of total cost represented by overheads at each service delivery level	• Bottom up and health facility costing analysis	
Other	• Utilization statistics for each core service for last 1 year • Burden of disease (incidence/ prevalence) • Care seeking behavior: Percent seeking care at different levels	• Program division HMIS data • Published papers • Disease burden studies	
Scale up factor (to be used only when the normative estimates are compared with bottom up estimates	• Proportion of total cost represented by building and space, non-medical & medical equipment and non-clinical HR in health facility	• Derived based on analysis of the bottom-up and health facility cost data	To be coordinated with teams undertaking bottom-up and HF costing
Gaps in capital infrastructure	• % increase in number of health centres, district hospitals, provincial and central hospitals required	• Consultation with program officers	

Data Analysis

Overall approach to analysis

The data was parameterized in an excel spreadsheet which was used to calculate unit normative cost of individual EHSP core services, total cost of EHSP package of care under different scale up scenarios. The minute time cost of human resources was multiplied with the gross salary rates of individuals at respective delivery levels. The cost of diagnostics was estimated based on multiplication of number of diagnostic tests per service with the price of each diagnostic test. Cost of drugs and consumables was estimated by multiplying price with quantity. Mathematical equations for the abovementioned calculations are given below:

Human Resource Cost

$C_{\omega\,(salary)} = \Sigma_m(S_{m(annual)} * N_m * F * P_m * \beta)$

$C_{\omega\,(salary)}$ = Salary for service A at service delivery level A in reference period

$S_{\omega\mu}$ = Wage rate

N_m = Number of employees

F = Fixed time equivalent

P_m = Time spent on service A

β = Number of beneficiaries of service A (or treated episodes for disease A) in reference period

ω = 1(Primary level), 2(Secondary level) etc.

m = m_1, m_2.....m_n (Category of employees)

Drugs and consumables Cost

$C_{drugs} = \Sigma_{\omega} (q_{i\ (annual)} * p_{i\ (drugs)})$

C_{drugs} = Total cost of drugs at for service/disease episode A at service delivery level A

$q_{i\ (annual)}$ = Quantity of i^{th} drug required for service/disease episode A at service delivery level A

$p_{i\ (drugs)}$ = Unit price of i^{th} drug

$i = i_1, i_2 \ldots\ldots i_n$ (drugs)

ω = 1(Primary level), 2(Secondary level) etc.

Diagnostics Cost

$C_{diag.} = \Sigma\omega (N_{i\ (annual)} * p_{i\ (diag.)})$

$C_{diag.}$ = Total cost of diagnostic tests for service/disease episode A at service delivery level A

$N_{i\ (annual)}$ = Number of diagnostic tests of i^{th} type for service/disease episode A at service delivery level A

$p_{i\ (diag.)}$ = Unit price of i^{th} diagnostic test

$i = i_1, i_2 \ldots\ldots i_n$ (diagnostic tests)

ω = 1(Primary level), 2(Secondary level) etc.

Per unit cost of service/disease episode A at service delivery level A

$\theta\omega = [C_{(salary)} + C_{(capital)} + C_{drugs} + C_{diag.} + C_{(overheads)}]$

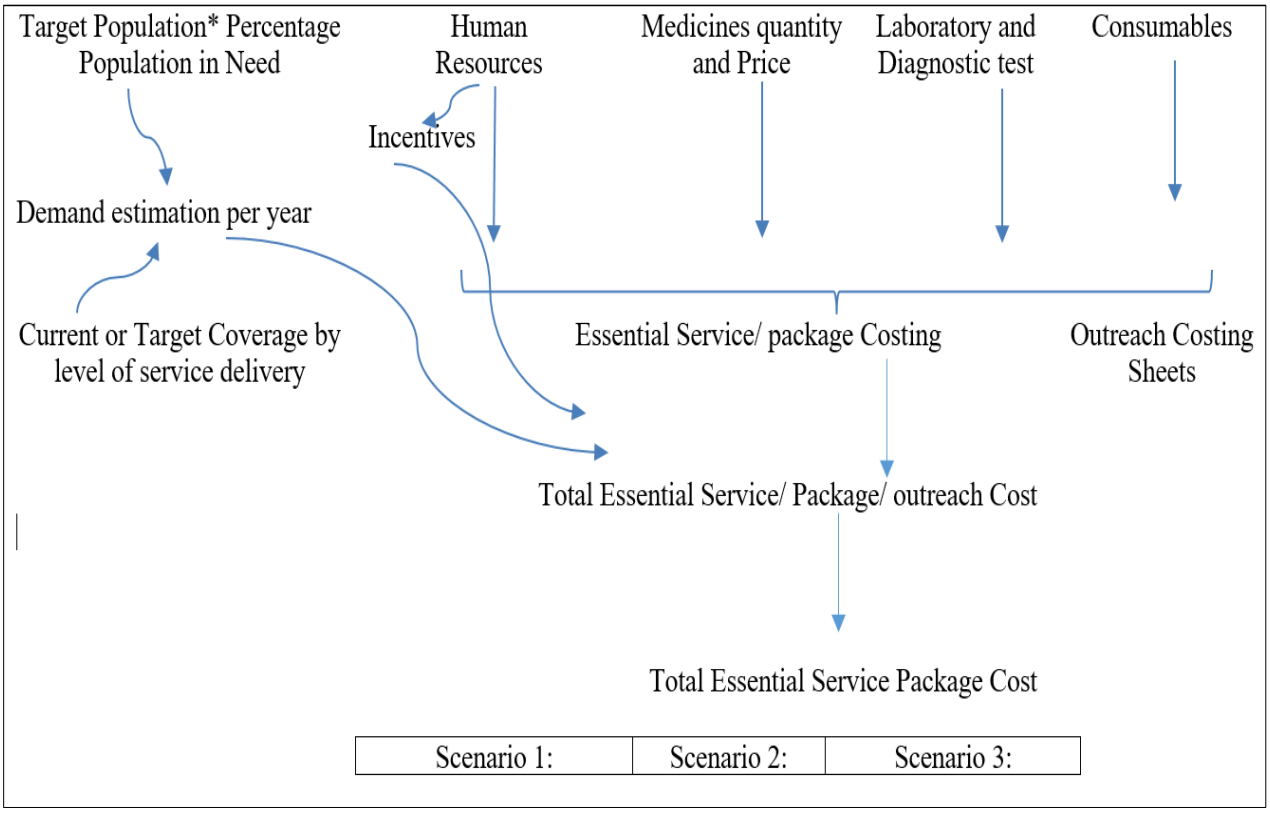
Where; θ_{DH} = Per unit cost of delivering service A (or treating disease episode A) at service delivery level A

ω = 1(Primary level), 2(Secondary level) etc.

Data received was reviewed for completeness, confirmation with related literature and assumptions used in delivering each service were added. Outliers were identified and clarifications were sought from working groups regarding accuracy.

Data was entered into an excel tool having series of excel sheets. (Figure 6) These sheets had lists of items listed in the EHSP for each service. Individual sheets acted as input sheets for final sheets calculating cost of delivering the services. For different sheets (population assumptions, medical consumables, human resources, laboratory and diagnostic tests), the resources used were linked with EHSP list. Information on salary, price of a medicine or consumable, dosage, frequency of use was added to sheets created specifically to collect the information. A manual covering different aspect of tool was prepared to help planners estimate the costs of individual services or provide a package of services.

Figure 6: General Framework of Annual Cost Estimation



*Denotes multiplication

National estimates for population in Laos for baseline year (2019) was derived from World Bank population estimation resources. Population has been assumed to change from one year to next using a uniform growth rate of 1.54%. Assumed population estimates have been given in Table 5.

Table 5: Population estimates (2019-2025)

	2019	2020	2021	2022	2023	2024	2025
Population	7,169,000	7,279,403	7,391,505	7,505,335	7,620,917	7,738,279	7,857,448
Male	3,579,000	3,634,116	3,690,081	3,746,909	3,804,611	3,863,202	3,922,696
Female	3,591,000	3,636,301	3,702,454	3,759,472	3,817,368	3,876,155	3,935,848
Population >40	1,804,840	1,832,635	1,860,857	1,889,514	1,918,613	1,948,159	1,978,161
Reproductive age women	1,752,810	1,779,803	1,807,212	1,835,043	1,863,303	1,891,998	1,921,135
Pregnant women	220,805	211,813	227,658	231,164	234,724	238,339	242,009
Birth Cohort	200,732	195,088	189,223	185,382	181,378	174,885	168,149
Girls 11-14 years	302,000	315,328	319,901	324,539	329,245	334,019	338,862
U5 population	701,161	711,959	722,923	734,056	745,361	756,839	768,494
School going children (5-15 years)	1,485,930	1,508,813	1,532,049	1,555,643	1,579,599	1,603,925	1,628,626

Selected baseline coverage and target coverage rates are provided in Table 6. Assumptions and data sources for different services are annexed in tabular format at the end of report. (Annexure 1)

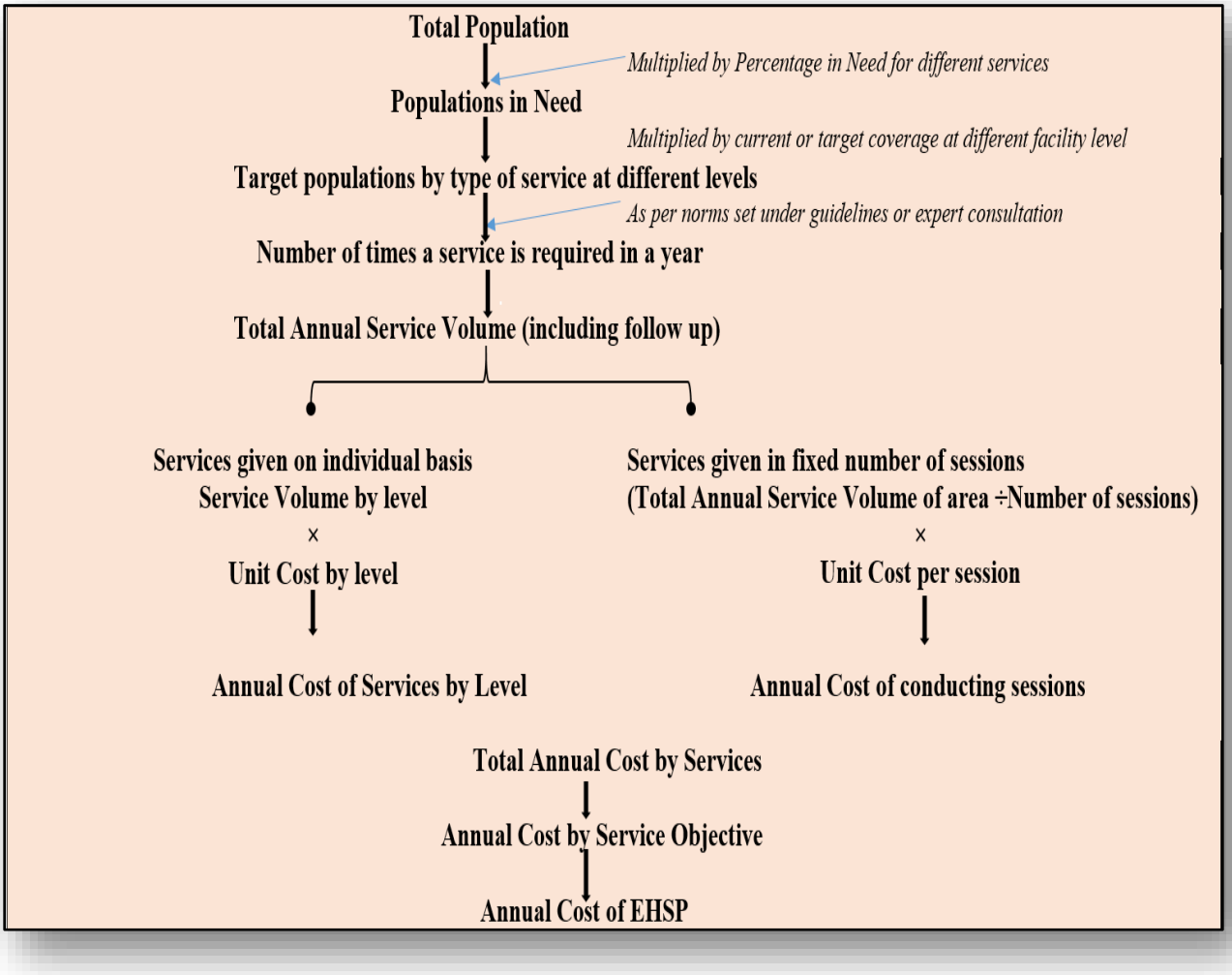
Table 6: Selected baseline and coverage targets for Costing EHSP

Indicator (s)	Current coverage 2019	Target coverage 2025	Source
Pregnant women receiving 4 or more ANC	70	80	DHIS 2019
Women using modern contraceptive methods	35	65	LSIS 2017
Percentage who engage in heavy episodic drinking (male)	63.7	60.3	National Multi-sectoral Action Plan, NCD
Physical inactivity	9.9	9.4	
Current daily tobacco smoking (both sexes)	25.3	20.9	
Current daily tobacco smoking (male)	50.2	41.4	
Current daily tobacco smoking (female)	7.6	6.2	
Salt intake	5.5	4.6	
Raised BP/Hypertension	16	13.7	
Obesity	5.4	5.4	
Diabetes	6.8	6.8	
Treated for Hypertension	20	50	
Diagnosis of Diabetes Mellitus	14.1	50	STEPS 2008
Tuberculosis incidence	154	120	Estimation based on trend from National strategic plan
Prevalence of RTI/ STI	10	10	LSIS 2017
Rapid Diagnostic Testing (RDT) for suspected Malaria cases	226,374	708,895	National Malaria control strategy 2016-20
Microscopic confirmation of suspected Malaria cases	250,915	785,745	
Treatment for uncomplicated Malaria (P.f)	6595	0	
Treatment for uncomplicated Malaria (P.v, and mixed infections)	22081	7857	
RDT for G6PD testing for P.v. positive cases	21220	5815	
Artesunate injectable for severe/ complicated Malaria cases	1721	471	
Annual Parasite index (Parasitic incidence/ case per 1000)	4	1	
Percentage of complicated malarial cases	6	6	
Total number of malarial cases	28,676	7,857	
Test positivity rate per 100 suspected cases	5%	5%	
Rapid Diagnostic Testing (RDT) for suspected Malaria cases	226,374	708,895	
Microscopic confirmation of suspected Malaria cases	250,915	785,745	

Overview of analytical steps

Figure 7 provides a general description of analysis steps undertaken to derive the unit cost per service and total cost of EHSP. The cost of outreach activities was estimated on annual basis. The estimates have been derived using a mix of actual estimates and few assumptions related to population numbers, expected number of services, quantities of supplies/ commodities used in sessions. For each outreach session, normative cost of the services that are catered through mobile/outreach session was calculated using the norms that have been laid down by national guidelines/protocols.

Figure 7: Overview of analytical steps to derive units

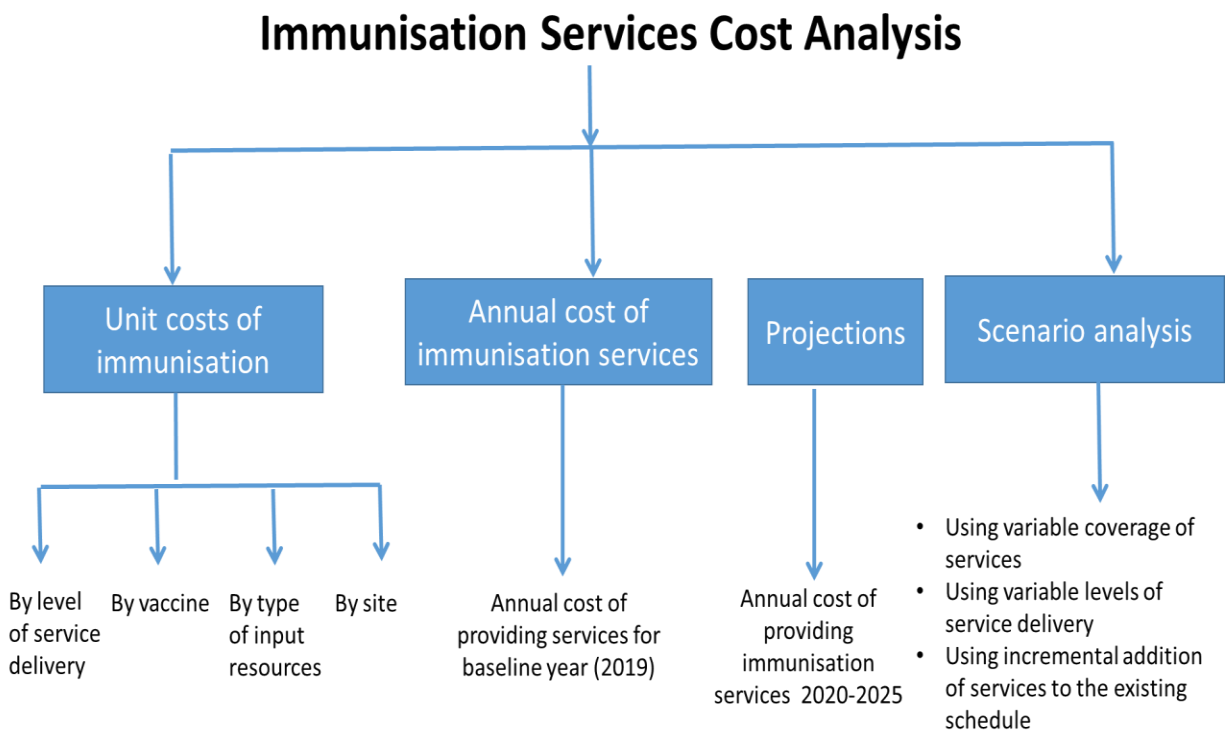


Service area specific data analysis approach

Immunization related services

Technical Working Groups (TWGs) provided information pertaining to current pattern of immunization service delivery, future directions to be followed and related microplans. Data was compiled on the type and quantity of recurrent operational resources by level of service delivery. They further identified the individual resources from within clinical human resources, vaccines, consumables for each dose/ injection administered at different levels of service delivery. Secondly, they also identified the quantity of each resource required per dose/ injection administered. Data for each resource identified vide above consultation was assessed based on the current procurement prices in the public health system in Laos. Figure 8 represents the summary of cost analysis undertaken for EPI program in Laos.

Figure 8: Summary of cost analysis undertaken for EPI program in Laos



Normative costs were estimated for vaccines and associated injection supplies by site of vaccination (fixed site as well as outreach), human resource involved and other consumables required in delivering services. Vaccine delivery (including capital cold chain operation costs), capital investment in cold chain capacity and other shared health system costs such as buildings were excluded. Media and information, education and communication costs are based on estimates from existing budget for social mobilization. Costs in USD for baseline year (2019) were estimated using an exchange rate of 8762.57 Laos Kip for one USD.

Type of costs:

a. Total Costs
b. Cost by vaccines
c. Cost by session
d. Cost by health facility level
e. Cost by input category
f. Costs per dose administered and per fully immunized beneficiary.

Tuberculosis related services

National Tuberculosis Strategic action plan 2017-2020 was followed to identify country specific target coverage levels for different services under tuberculosis. Tuberculosis incidence, prevalence, number needed to screen related specific information was derived through review of literature. Information related to incidence of tuberculosis by age group was derived from Global Burden of Disease dataset.

Estimation of conditional probabilities (%):

1. The population data from Census 2015 was used for calculating target population for tuberculosis in 2019.
2. A linear increase in the coverage is assumed from the baseline year (2019) to the target year (2025).

3. The estimation of the price of different drugs is based on the changes of the targets.

4. The national strategic plan of Laos has no mention regarding bacteriologic coverage for screening of tuberculosis. It was assumed to increase to 90% considering 57% coverage in 2017.

5. Decrease in incidence of 3.7% per year has been assumed in National Strategic Action Plan (2017-2020). Same assumption has been extended till 2025.

Noncommunicable disease related services

Estimation of conditional probabilities (%):

1. The population data from Census 2015 was used for calculating target population for NCDs in 2019. Different population categories that have been used for NCD services are: 25- 40 years, >40 years, 35- 49 years.
2. Probabilities of population falling in different age/ disease categories were derived through review of literature.
3. Out of total 30 NCD services, 28 services will be delivered at different health facilities except primary prevention of NCDs through health education and encouraging women to perform self-breast examination. 50% of the services were assumed to be delivered at Health Centre level, 10% at DH level, 15% each at Provincial and Central hospital.
4. Constant incidence and survival was assumed for different NCDs in baseline year for cancer cases
5. A linear increase in the coverage is assumed from the baseline year (2019) to the target year (2025).
6. The estimation of the cost of different resources for NCDs is based on the changes of the targets
7. Target 8 and Target 9 of Global Monitoring Framework have been selected as final end line targets for suitable services.
    i. Target 8: 50% of eligible people receive drug therapy and counseling (including glycemic control) to prevent heart attacks and strokes by 2025 and 25% by 2020

ii. Target 9: 80% availability of affordable basic technologies and essential medicines (including generics) required to treat major NCDs in both public and private facilities by 2025 and 50% by 2020.

Malaria related services

Estimation of conditional probabilities (%):

1. RDTs would be used for all patients with malaria-like illness (10%) to detect P. falciparum in all areas with significant transmission of the parasite. As WHO currently does not recommend using RDTs in under 5 age-group in areas of intense transmission, U- 5 population was excluded. As per WHO guidelines 10% of the population should be subjected to any diagnostic test for malaria (Rapid Diagnostic testing or microscopic examination). Both statements support assumption of 10%.
2. All RDT cases will be followed by microscopic examination. In addition, as per WHO guidelines children <5 years cannot be subjected to RDT, so total population inclusive of under 5 populations is taken into account in this calculation.
3. Based on annual parasitic index, total cases in 2019 were estimated (API=4). Keeping targets listed under NSAP for malaria in mind, the incidence was reduced to 1 in 2025 as P. falcifarum transmission is targetted to be interrupted with decrease in P. Vivax incidence.
4. Case distribution of different types of malaria is derived from NSAP. (P. Falcifarum: 23%, P. Vivax: 74%, Mixed infections:3%.

HIV related services

Estimation of conditional probabilities (%):

1. High Risk Groups (HRG) population has been reported as 2.782% of total population in Laos Narrative Report (2016). Constant prevalence was assumed between 2019- 2025.
2. Prevalence for different high risk population groups as per 2014 reports: FSW – 1.4%, MSM – 1.6%, PWID – 1.5%, Clients – 1.5%.

Maternal and Child Health related services

Estimation of conditional probabilities (%):

1. Crude Birth rate was assumed to decrease from 28 in 2019 to 22 in 2025
2. Prevalence of STI/RTI: 10% of general population
3. Percent women requiring abortion: (medical/ surgical): 45.8/ 54.2
4. Percent women underwent abortion: 6.5%
5. Pre-eclampsia rate: 37.0%
6. Percent premature births were assumed to be 10% as per information given in "Retrospective review of Birth Outcomes at the mother and child health hospital in Lao PDR, 2004-13
7. Assisted vaginal deliveries (%) out of total: 64.4
8. Percent neonates requiring bag and mask resuscitation: 64.4
9. Caesarean section rate: 5.8% (Laos PDR MICS, 2017)
10. Home deliveries (%): 34.5% (Laos PDR MICS, 2017)
11. Maternal Mortality Ratio (per 100,000): 170
12. Percent Infants weighing less than 2.5 kg, pre term, small for gestational age: 9.7 (Laos PDR MICS, 2017)
13. Percent newborns with complications (Sepsis, jaundice, severe asphyxia, seizures, preterm births)

14. Percentage of non-bloody diarrhea, bloody diarrhea, and ARI was 156, 20, and 40 respectively among U-5 children (Laos PDR MICS, 2017)

DCDC related services

Estimation of conditional probabilities (%):

1. Incidence of dengue was assumed as 0.42%.
2. 24.6% of suspected cases were assumed to be symptomatic

Family Planning services

Estimation of conditional probabilities (%):

1. Percentage married women in the reproductive age group (15-49) was assumed as 35%
2. Women using modern FP methods (%) were assumed as 34

Key strategies and documents guiding costing exercise

Immunization: The Expanded Program on Immunization (EPI) in Laos has received a renewed drive with successful drafting of consecutive Comprehensive Multi-year Plans (CMYPs) for immunization services. The program has taken up dual burden of enhancing scope of diseases to be covered under EPI (through introduction of new vaccines) as well enhancing overall target coverage. The detailed description of year wise targets is given in CMYPs

Tuberculosis: The National Tuberculosis strategic (2017-2020)(6) Plan for the Prevention and Control of tuberculosis, acted as a blueprint for estimating cost of delivering tuberculosis related services for current as well as future years. Details related to target treatment coverage levels of anti- tubercular interventions and population to be covered were derived from this strategic plan and a survey document entitled, “TB Policies in 29 Countries: A survey of prevention, testing and treatment policies and practices.” The strategic

action plan of Laos is consistent with WHO End TB strategy which was also referred to estimate targets and disease burden in 2025

Non-communicable Diseases: Several different diseases/ conditions have been clubbed under NCD services included in essential health service package of Laos. The National Multi-sectoral Action (MSA) Plan for the Prevention and Control of Non communicable Disease (NCD), 2014–2020 acted as a blueprint for estimating cost of delivering NCD services for current as well as future years.(7) Details related to target levels of risk factors for NCD control, coverage levels of interventions and population to be covered were derived from Laos MSA plan. The NCD action plan of Laos is consistent with the Global Action Plan 2013–2020 for the prevention and control of NCDs and took into account four common NCD risk factors – alcohol, unhealthy diet, tobacco, and insufficient physical activity. According to GBD 2017, stroke and ischemic heart diseases were third and fourth leading causes of premature mortality in Laos.(8) Information available from published reports NCD risk factors surveys was entered into the tool directly. In addition, Laos specific data from global databases was used.

Reproductive Maternal Newborn and Child health: The National Strategy and Action Plan for Integrated Services on Reproductive, Maternal, Newborn and Child Health 2016–2025, articulated the vision of the Government reflected in the National Socio-Economic Development Plan, HSDP and HSR as well as the global priorities set out in the SDGs. The strategy aims to achieve a set of results set by the Ministry of Health to continue the momentum and progress made in the MDG-era, yet moving towards an approach focused more on quality and equity. The major change is that responsibility for implementation of the strategy shifted from being the sole concern of the Mother and Child Centre (MCHC) to being a cross-cutting strategy with clear responsibilities from across the Ministry of Health to achieve the overall goals for RMNCH. Regular technical- and policy-level meetings were integrated into the governance arrangements to encourage evidence-based planning and monitoring for improved accountability.

Malaria: This National Strategic Plan for Malaria Control and Elimination (2016-2020)(9) lays out the goals, objectives, strategies, parties responsible and coordination mechanisms, and costs to successfully

reduce the burden of malaria in the Lao People's Democratic Republic (PDR) over the next five years to prepare the country for national elimination by 2030. The 2016-2020 Strategy is the first part of a three-phase approach to eliminate all forms of malaria in Lao PDR and includes strengthened interventions targeted to the southern part of the country to reduce the primary malaria burden while beginning efforts to eliminate malaria in the remaining focal areas in central and Northern Lao PDR.

HIV: The National HIV and AIDS Strategy and Action Plan (2016-2020) sets the goals for HIV program which aims to end the transmission of HIV and alleviate the impact of AIDS in Lao PDR. The specific objectives to achieve this goal included enabling the environment for effective HIV response, to increase the coverage and quality of HIV prevention interventions and to increase coverage and improve quality of HIV treatment/care/support services. As per the plan, several strategic actions were targeted for the period 2016-2020 which included improved planning, reporting and forecasting of HIV test kits. Strengthening of capacity on HIV testing and counselling, distribution of HIV/AIDS laws and policy to reduce stigma and discrimination and lastly, continuous encouragement of PLHIV for participation in support groups.

Family Planning: Method mix information from FP 2020 was used to project the use of contraceptives and to calculate contraceptive costs to ensure full coverage. For the first year, the country's current number of WRA and the current population growth rate, percentage of married women, and percentage of eligible couples was used. The data was used to estimate the total number of users for each year. The modern contraceptive prevalence rate was assumed to be 34%. More than half of these were contributed by oral (18%) and injectable contraceptives (8.6%). These were followed by tubectomy and IUCDs at 3.4% and 1.4% respectively. Condom usage was low, at 0.8% of the total. Total unmet need for family planning was computed as the fertile married women in reproductive age group who were not using any modern method of contraception. This was computed to be around 66%.

Since Laos Health Policy targeted to achieve a CPR of 65% by end of year 2020, the eligible couples not using contraception were stratified as per their parity status. Women expecting their first child were around 45%, second child 36.4%, third child 12.4% and fourth child were 5.9% respectively. Subsequent to

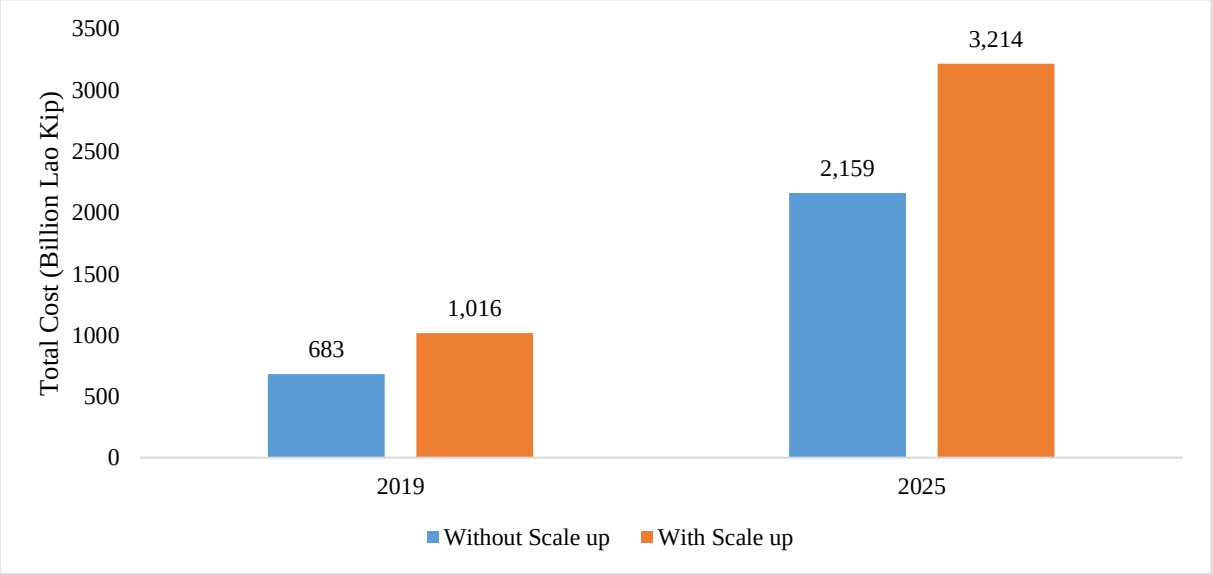
counselling efforts, it was assumed that 50% of the women with one or two children will start using temporary contraception, while 50% of the women with three children and all women with four or more children will opt for a permanent method of contraception. These figures were added to current contraception usage statistics to compute additional family planning resources' requirements for the year 2020.

DCDC: The program office provided the baseline coverage for the various interventions and targets to be achieved in 2019. Owing to limited understanding about the disease prevalence of different parasitic diseases, population to be given these interventions was estimated as per programmatic use, i.e., school going children (6- 15 years).

Results

The estimated annual cost of implementing EHSP in Laos was found to be 683 billion Laos kip considering the current level of coverage for independent services under EHSP. In 2025, a relative increase in the annual cost by 216% considering 80% coverage for all EHSP services is expected which amounts to 2159 billion Laos kip. (Figure 9) When costs of program management and general administration were added, costs increased by 49% in 2019 as well as 2025.

Figure 9: Total Cost of EHSP (In billion Laos kip), Laos PDR



*Estimates of cost are representative of value of recurrent resources that would be required.

As per the National Health Accounts (NHA) report of Laos for year 2016-17, the total health expenditure as a percentage of Gross Domestic Product (GDP) of Laos was 2.4%. In 2019, the annual cost of implementing EHSP is 0.46% of GDP. The annual cost of EHSP projected for 2025 will be 1.46% of GDP (2019 GDP estimate). (Table 7)

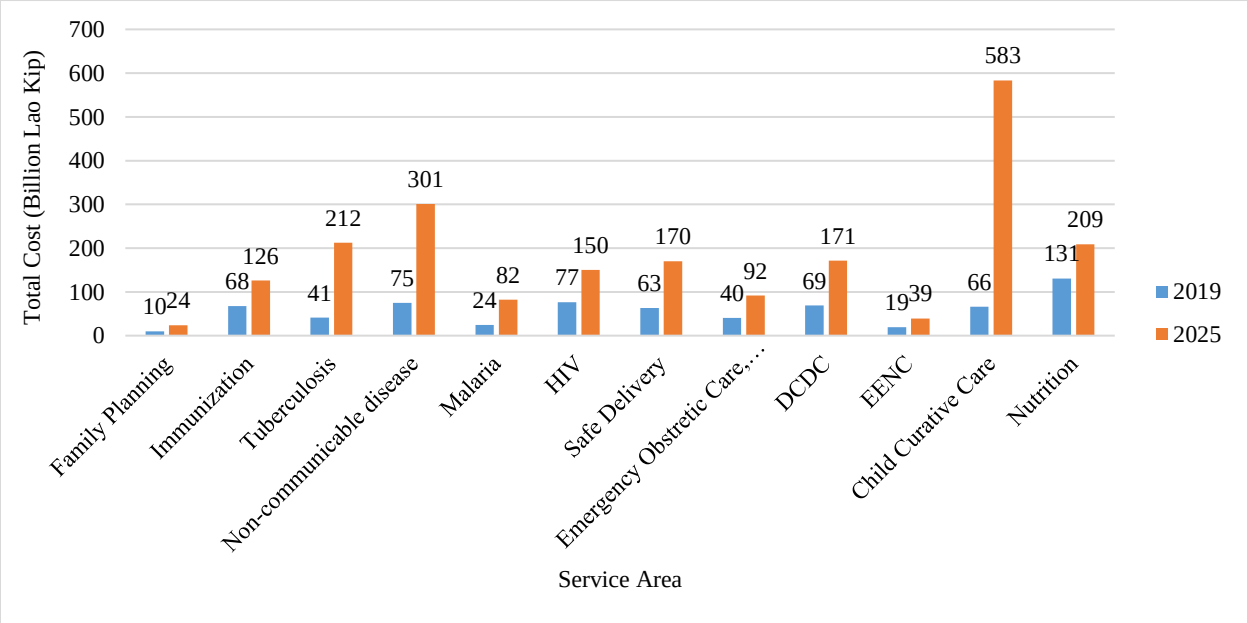
Maximum percentage increase in budget will be required for neonatal and child health services followed by tuberculosis services. (Table 7)

Table 7: Costs (In billion Lao kip) disaggregated by nature of services, Laos PDR*

Service Objective	2019	2025	% Change
Immunization (All Vaccinations)	68	126	86
Tuberculosis	41	212	416
Non-communicable disease	75	301	302
Malaria	24	82	239
HIV	77	150	96
Antenatal care services	63	170	169
Abortion, intra-natal and post-natal services	40	92	127
DCDC	69	171	149
Newborn care services	19	39	102
Neonatal & Child health services	66	583	782
Reproductive & adolescent care services	131	209	60
Family Planning services	10	24	144
Total	683	2,159	216

*Estimates of cost are representative of value of recurrent resources that would be required.

Figure 10: Comparison of total costs by nature of services in 2019 and 2025



In 2019, at current coverage levels, the annual cost of delivering EHSP is estimated to be 683 billion Laos kip. For the year 2025, the annual cost was projected based on targets set for coverage scale ups for different services. In 2025, there will be a relative increase of 216 % in the annual budget compared to 2019. As per the National Health Accounts (NHA) report of Laos for year 2016-17, the total health expenditure as a percentage of Gross Domestic Product (GDP) of Laos was 2.4%. In 2019, the annual cost of implementing EHSP is 0.46% of GDP without scale up costs for program management and General administration. It increases to 0.69% if scale up costs are included. The annual cost of EHSP projected for 2025 will be 1.46% of GDP (2019 GDP estimate). (Table 8)

In 2025 at full coverage, there will be a relative increase in the annual cost of NCDs by 302%, RMNCH by 239%, CDs by 192% and immunization services by 86%. (Table 9)

Table 8: Key Health Financing Indicators for EHSP implementation in Laos PDR

Indicators	2019		2025	
	Without Scale up	With Scale up#	Without Scale up	With Scale up#
Health expenditure as % of GDP	2.4%	2.4%	-	-
Total cost EHSP (In billion Lao kip)	683	1,016	2,159	3,214
Per capita EHSP cost (In thousand Lao kip)	95	142	275	448
Per capita EHSP cost (USD)	11.7	17.4	33.6	54.9
EHSP Cost as % of Current Government Health Expenditure	37.8%	67.9%	98.5%	195%
Total cost of EHSP as percentage of GDP	0.46%	0.69%	1.46%	2.17%

#This data pertains to year 2016-17.
* The GDP estimate of 2019 was used to compute these indicators
Note: EHSP= Essential Health Service Package, GDP= Gross Domestic Product (Laos).

All the EHSP services were broadly classified into 4 service domains i.e. immunization, RMNCH+A, communicable diseases and non-communicable diseases. Nearly half of the total EHSP cost in 2019 was determined by RMNCH+A services (48%), followed by Communicable Diseases (31%), 11% for NCDs and least i.e. 10% for immunization related services.

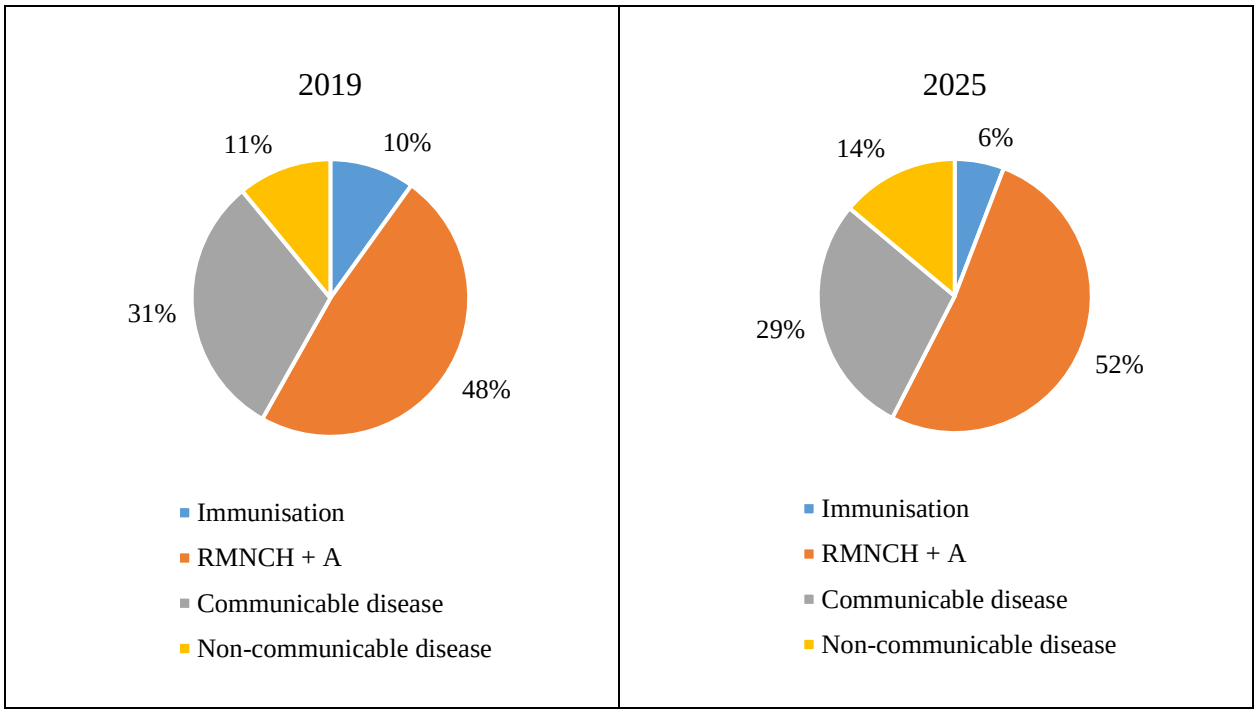
Table 9: Costs (in billion Lao kip) disaggregated by service objective for 2019-2025*

Service Domain	2019	2025	% Change
Immunization	68	126	86
RMNCH#	329	1,117	239
Communicable disease	211	616	192
Non-communicable disease	75	301	302

*Estimates of cost are representative of value of recurrent resources that would be required.
#RMNCH includes Family planning, safe delivery, Emergency Obstretic Care, MDSR, Safe Abortion, EENC, Child curative care and Nutrition.

There will an increase in share of NCDs and RMNCH+A costs as per the projected total cost estimates for 2025 considering full coverage. (Figure 11). As per the Global Burden of Disease (GBD-2010) report for Laos, the causes of premature mortality related to CDs and RMNCH was 39.2%, whereas NCDs related causes had a share of 23.9% in the total premature mortality.

Figure 11: Distribution of total EHSP cost by service domain, Laos PDR



In 2019, 68% of total EHSP cost is dedicated to preventive services followed by 21% for curative services and 11% for promotive services. In 2025, the percentage share of curative services related costs increases to 40% with a decrease in cost of preventive services (52%). (Figure 12)

Figure 12: Distribution of total cost by nature of service, Laos PDR

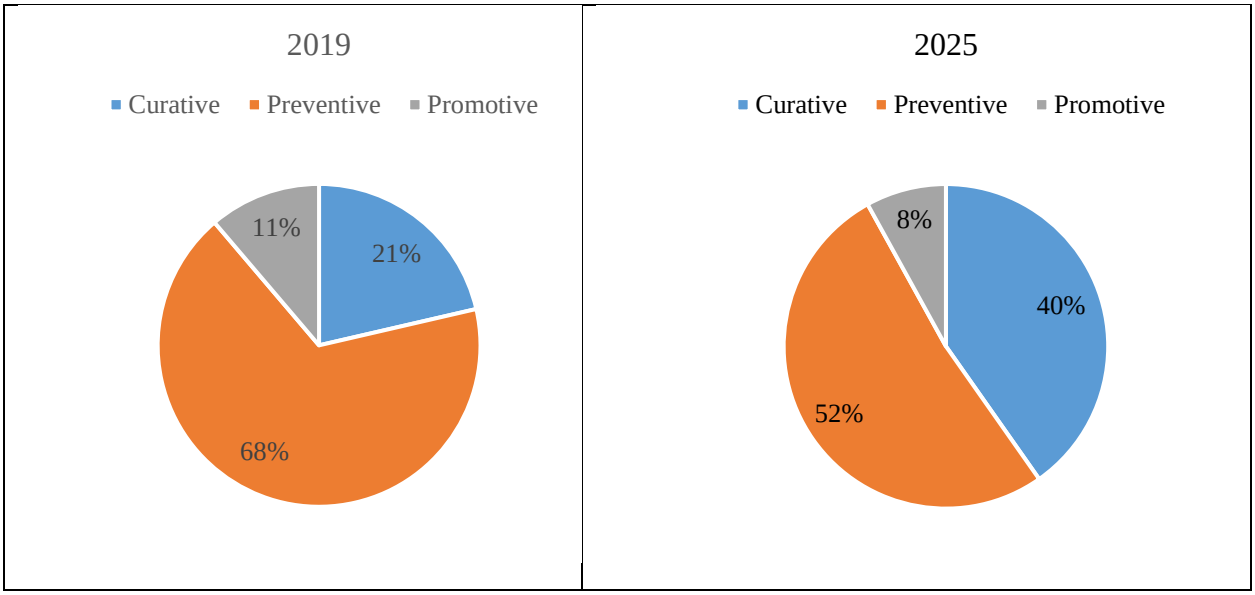


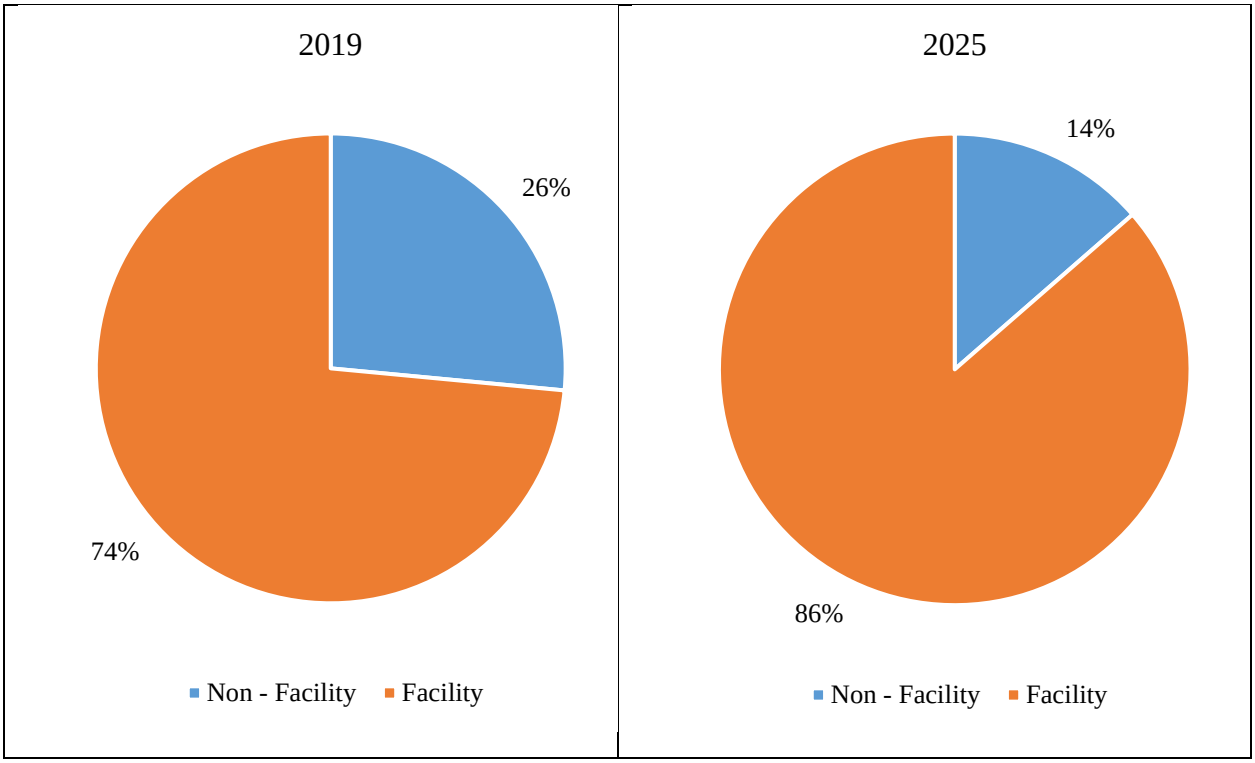
Table 10: Total cost (In billion Lao kip) by place of service delivery, Laos PDR*

	2019	2025	% Change
Non- facility	181	294	62
Health Facility	502	1,866	272
Total	683	2,159	216

***** Estimates of cost are representative of value of recurrent resources that would be required. Non Facility includes mobile and outreach services

In 2019, three- fourth share of total EHSP cost was incurred on services delivered through different levels of health facilities and remaining for community/outreach services (Figure 13). The projected cost estimates for 2025 suggest that there will be an increase in the cost of EHSP services delivered through health facilities compared to community/outreach services (Table 10). The distribution by input resources (only recurrent) shows that the cost of human resources account for 38% and 29% of total EHSP cost in 2019 and 2025 respectively.

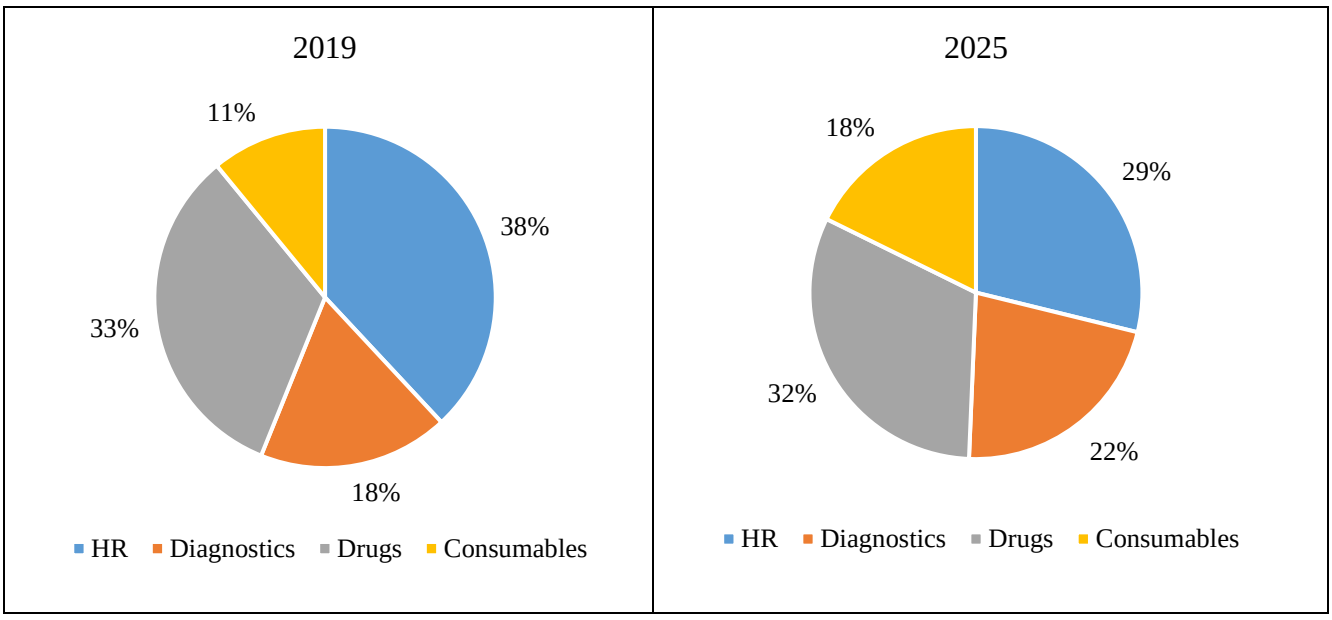
Figure 13: Percentage distribution of total cost by level of service delivery, Laos PDR



*****Non-facility is inclusive of mobile/ outreach/community services

Both drugs and consumables account for 33% and 11% (Figure 14).

Figure 14: Percentage distribution of total EHSP cost by input resources, Laos PDR



*HR=Human resources

The increase in cost for NCDs was highest at district hospital level followed by health centres. At DH level, highest proportionate increase was found for SO5, i.e. child curative care. In the year 2025, cost for providing safe delivery and emergency obstetric care (SO2 and SO3) gets distributed to different facility levels, i.e. HC, DH, PH, CH as compared to major share of cost at DH level only in 2019. (Figure 15 and 16). Share of nutrition related services at non facility and health center level increased as the years progressed. Cost of Tuberculosis and Malaria related interventions increased at higher facility levels as the years progressed towards 2025.

Figure 15: Composition of total cost by service objectives at different facility levels

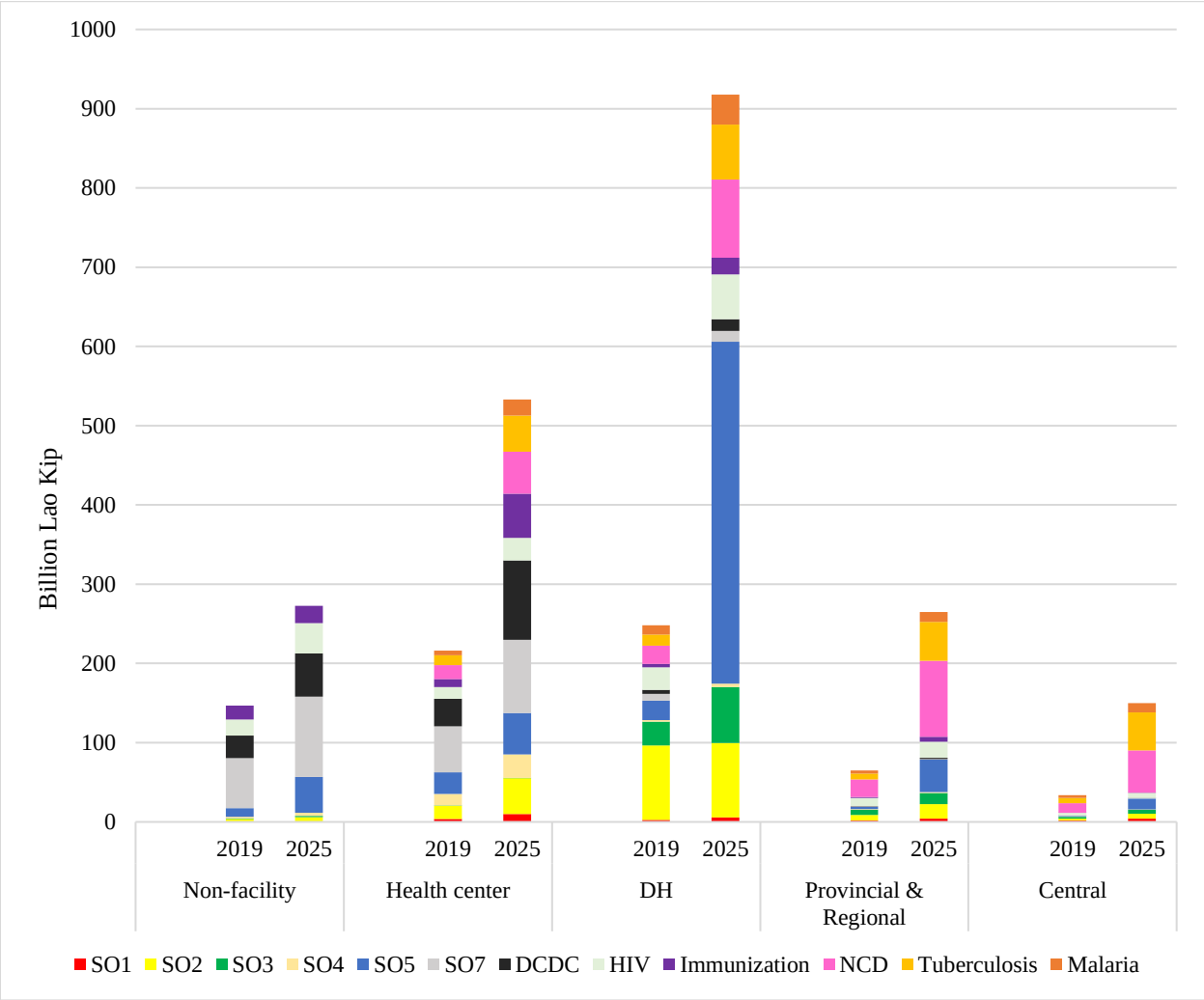
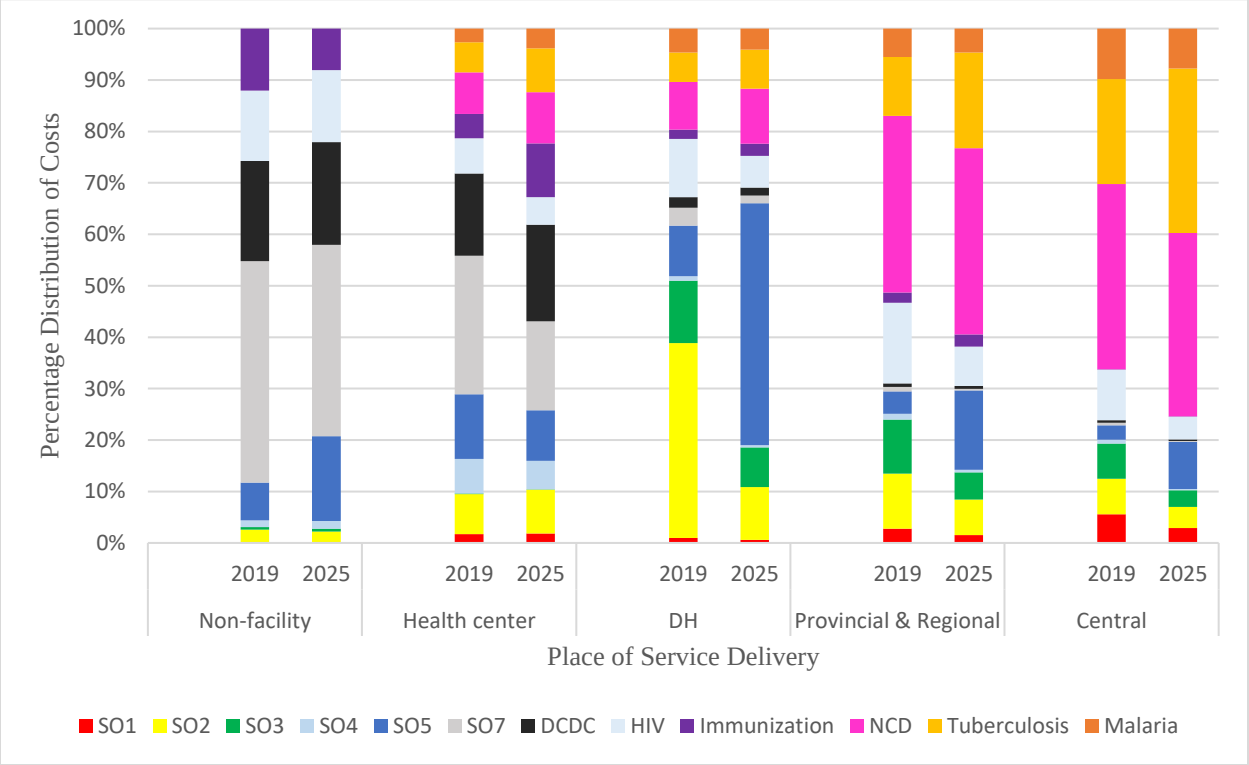


Figure 16: Percentage distribution of costs by service objective at different levels of health system, 2019-2025



Total time spent by each staff category on different services was estimated at different levels. This was used to estimate the number of personnel required to deliver services as per targets set used EHSP. The estimated human resource (medical and para medical staff) requirement for 2019 and 2025 is higher than actual manpower in position as the derived estimates are based on normative requirements for delivering services as per target coverage levels which are higher than current coverage levels (Figure 17 and 18). The only exception to this is specialists. Due to data availability issues, cost analysis of interventions requiring specialist care (emergency, cancer care, general surgery) was not undertaken. This may have led to a lower estimate of number of specialists required to provide specialist care in the country. Table 11 shows the total number of staff of each category that will be required to provide services as per EPHS at different facility levels. At health center level, 9 categories of staff have been proposed under EHSP. Only 7 were selected by experts to deliver different interventions at this level.

Table 11: Man power requirement by Level, 2019- 2025

	2019							2025						
Staff Category	OR	HC	DH A	DH B	PH	CH	Total	OR	HC	DH A	DH B	PH	CH	Total
Medical Health Worker	98	3,628					3,726	28	7,366					7,394
Pharmacist Assistance		100	36	72	9	9	225		182	90	132	24	30	459
Technical Nurse		3,710	263	270	84	25	4,352		6,806	706	735	167	53	8,467
Middle Diploma Midwives		2,725	185	228	191	75	3,404		4,534	418	492	474	210	6,129
Lab Assistance		121	247	15	3	1	387		460	420	30	5	2	917
Volunteer		1,651	78	56	33	29	1,848		2,714	147	113	89	83	3,147
Others		0	2	9	0	0	11		0	10	18	0	0	28
Physician/Doctor		1,586	29	380	280		2,275		3,491	72	964	966		5,493
Dentist (Bachelor)		0	58	0	0	0	58		0	94	0	0	0	94
Pediatric Specialist				131	73	25	228				515	148	50	714
Obstetrics and Gynecologist (OBGY)			149	175	285	128	738			534	526	870	562	2,491
Family Medicine			4	37	1	0	42			6	79	1	0	87
Pharmacist (Bachelor)			643	22	7	1	673			1,441	56	42	3	1,540
Nurse (higher level)			284	174	193	106	758			598	280	562	391	1,830
Master of Public Health Management			1	1	6	5	13			1	1	67	59	128
Health Administration (higher level)			0	14	0	0	14			0	39	0	0	39
Laboratory			78	82	113	80	352			232	233	266	207	938
Surgeons			425		14	14	453			943		1	0	945
Internal Medicine			4		0	0	4			6		0	0	6
Anesthesia Specialist			8		6	0	14			11		9	0	20
X-ray/Imaging			3		0	0	3			3		0	0	4
Surgeons Assistance					3	2	5					4	3	7
Cardiologist					4	4	7					16	16	31
Tropical Diseases Physicians					48	13	61					158	52	210
Physician/Doctors						153	153						700	700
Physician Assistance						7	7						61	61
Primary Health Care Middle Level						0	0						0	0
Medical Health workers						5	5						12	12
Nurse Assistance/lower level of midwives						12	12						70	70
Community Midwife						4	4						9	9

Figure 17: Current strength and Normative EHSP requirement of human resources, 2019

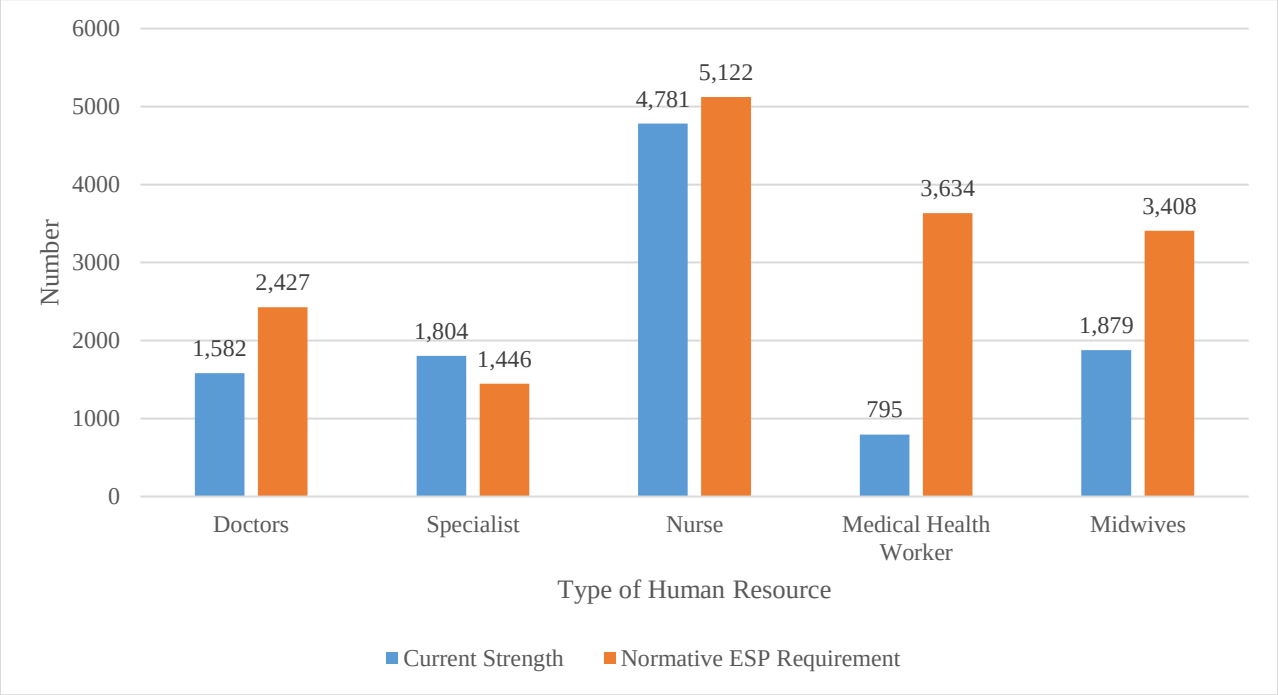
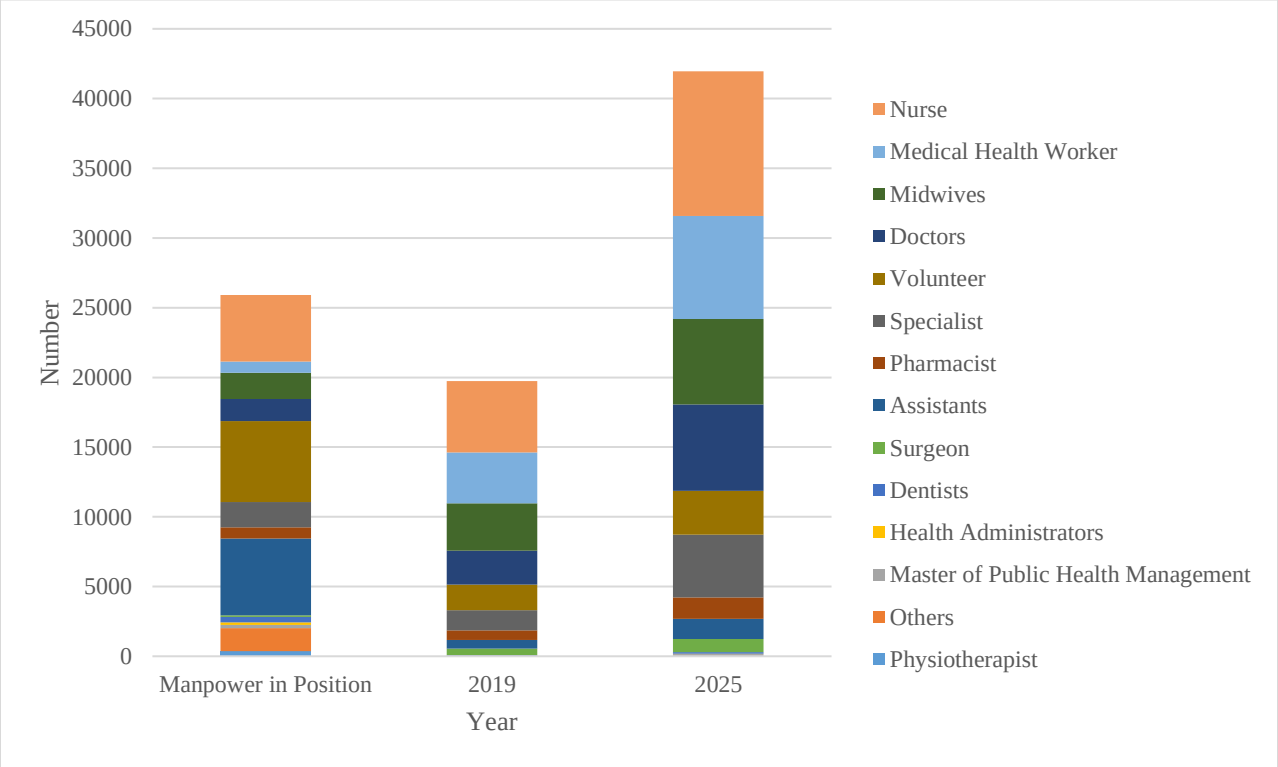


Figure 18: Normative EHSP Human Resources Requirement, 2019 and 2025



Detailed analysis of cost estimations for different sections are provided as detailed annexures at the end of report (Annexure 3). However, results of scenario analysis conducted for immunization services is given below. For this analysis, three different scenarios were compared to estimate most efficient approach to enhance immunization services:

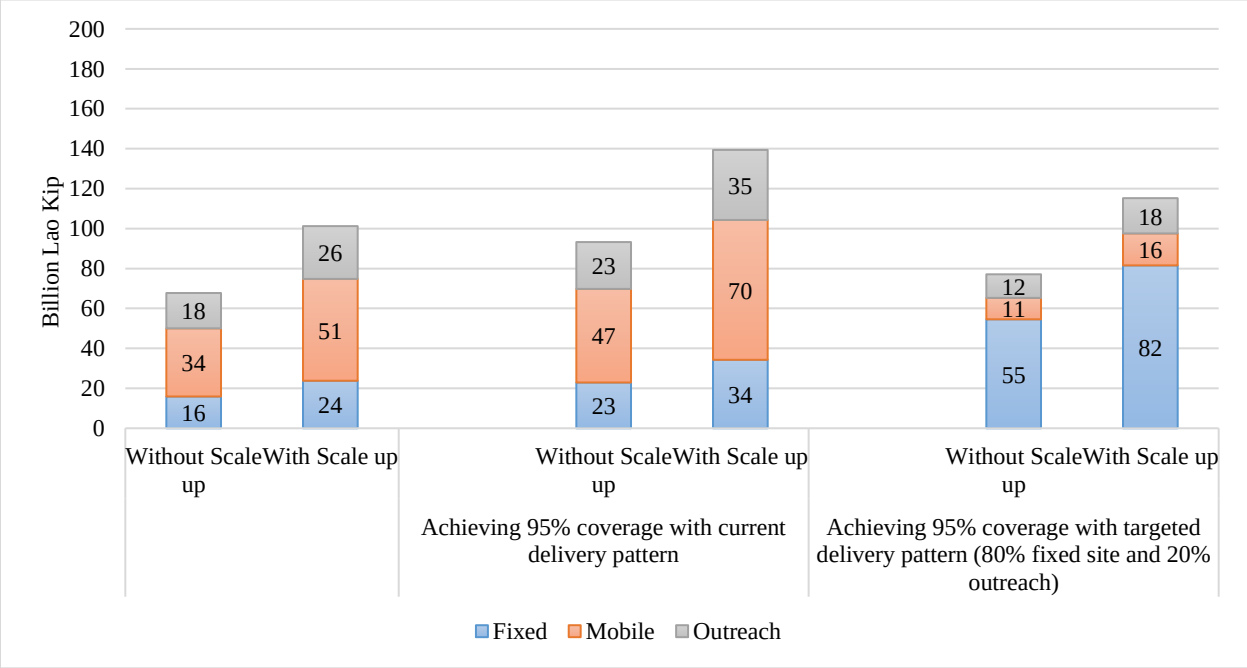
Scenario 1: Current levels of coverage and current delivery pattern

Scenario 2: Achieving the target level of coverage (i.e. 95%) and current delivery pattern

Scenario 3: Achieving the target level of coverage (i.e. 95%) and target delivery pattern (i.e. 80% fixed site and 20% outreach)

Figure 19 shows the results for different scenarios with clear indication that if scenario 3 is followed, a higher level of coverage can be achieved at costs comparable to current scenario.

Figure 19: Annual Cost of Routine Immunization under three scenarios



In addition, we disaggregated the analysis for (1) direct intervention cost only excluding HR (DI); (2) DI + HR; (3) DI + HR + Programmatic costs. Results of analysis are provided as Table 12 and Table 13.

Table 12: Disaggregated Analysis of input costs by service category (in Billion Lao Kip), 2019-2025

	2019			2025		
	DI	DI+HR	DI+HR+Prog.	DI	DI+HR	DI+HR+Prog.
SO1	1	1	1	1	1	1
SO2	7	8	8	9	10	10
SO3	7	8	8	8	10	10
SO4	1	2	2	1	2	2
SO5	5	5	5	6	6	6
SO7	0.3	1	1	0.4	1	1
DCDC	0.0	0.4	0.4	0.0	0.5	0.5
HIV	2	3	3	3	3	3
Immunization	1	2	2	1	2	2
NCD	7	9	9	8	10	10
Tuberculosis	6	6	6	6	7	7
Malaria	2	2	2	2	2	2
Total	39	48	48	46	56	56

Table 13: Disaggregated Analysis of Total costs by service category, 2019-2025

	2019			2025		
	DI	DI+HR	DI+HR+Prog.	DI	DI+HR	DI+HR+Prog.
SO1	8	10	10	18	24	24
SO2	40	63	63	107	170	170
SO3	31	40	40	73	92	92
SO4	12	19	20	24	39	40
SO5	53	66	66	539	583	586
SO7	70	131	131	117	209	209
DCDC	0.03	69	69	0.70	171	172
HIV	55	77	77	109	150	151
Immunization	56	68	68	111	126	127
NCD	49	75	75	193	301	302
Tuberculosis	33	41	41	187	212	213
Malaria	17	24	24	59	82	83
Total	425	683	686	1,537	2,159	2,169

Discussion

This report has documented cost estimates to achieve universal health coverage through essential health packages in the country. In this normative costing of essential health service package, we have assessed cost of delivering 120 services at different levels of health care system in Laos.

We estimated costs at current level of coverage as well as at increased coverage as per targets set for coming year. A minimum increase in the annual cost of service delivery by 173% considering 80% coverage for all EHSP services is minimal to ensure effective service delivery in Laos. The underestimation of costs in results is expected as we estimated costs against the selected targets for key diseases. The actual costs will be higher if the disease targets are not met on time.

Through essential health package, Government of Laos has definitely documented their extent of commitment towards health of people. However, had this not been followed by such costing exercise, it would have remained unclear as to what resource envelope is required to achieve desired coverage levels of service in current year as well as targets set for future. This is not the first time that costs related to essential health care packages have been studied and reported. Several such exercises have been undertaken for different countries.(10-16) Costing tools already in use include OneHealth (17) and Core plus. These have been used extensively. However, as part of this study, a normative costing tool has been developed and documented in a way that it can be used as “standard” for estimating normative health care costs for different service objectives using simple spreadsheet-based platform. The inputs required to start the costing process are derived from EHSP.

The costing exercise has been taken up in a way that it will assist in enhancing the understanding of subcomponent costs at both community and health facility level. Some of the costs may not be accurate due to use of several assumptions and that may have affected the results.

Concurrent to development of EHSP, Government of Laos should develop standard treatment guidelines for each intervention related to different stages or severity of disease. Had those been available, the cost

estimates would have been more robust. Still, setting up of the technical working group was the next best alternative and the costing exercise can be referred to as “normative”, despite absence of established norms for different service objectives.

We did not undertake an extensive burden of disease estimation considering time limits, so in case the targets set by government are not achieved, the cost will be on higher side than estimated for the next years. Similarly, it was difficult to ascertain baseline level of coverage for few interventions, especially by level of facility. Overlapping catchment populations of facilities add to the uncertainty over estimates, for which availability of facility wise service utilization data would have been useful. Lack of these data points point towards need for a strengthened health management information system in the country.

Highest increase in cost of services will be required for immunization followed by neonatal and child health services. As the interventions included in the package have demonstrated cost effectiveness in other settings, the efficient delivery of services will be required to contain the costs. It includes reducing wastage rate of vaccines, accurate assessment of children requiring treatment.

The increase in costs required for NCD related service delivery should be considered cautiously as we have estimated costs only for common NCDs. The cancer treatment related costs are underestimated as package lacked details of drugs and treatment options to be provided to patients. Had the treatment choices been available, the cost of treatment of cancer patients may have exceeded the costs required for diabetes and hypertension considering tool low drug prices as compared to cancer treatment costs.

The increase in costs by nature of services is proportionate. Half of the total EHSP cost in 2019 as well as 2025 is determined by RMNCH+A services.

Several preventive interventions have been added to package. In terms of costs, 68% of total EHSP cost is dedicated to preventive services, followed by 21% for curative services and 11% for promotive services and. Costs are higher as the preventive interventions are delivered to all the individuals falling under target

population. Sensitivity and specificity of screening tests become very important as a higher number of false positives will lead to additional resources which could have been used elsewhere.

Human resource constitutes 33% of total resource cost. With addition of services and increase in coverage of services, the highest increase in cost is expected for consumables. Some of the cost reagents have not yet been included and prices for few tests were not available at the time of costing. Considering this, the costs estimated for consumables may be a slight underestimation of even normative costs.

Estimation of costs of EHSP will definitely strengthen the future planning of health service delivery. The normative tool developed for costing of services in Laos could be adapted to manage and monitor resource inputs and outputs for effective delivery of services. The current tool has been designed to estimate costs by level as well as site of service delivery. This will allow to conduct scenario analysis by varying resource inputs, prices and estimated outputs of the services included in package. This will help the policy makers to understand possible changes in total and unit costs and prospectively examine efficiencies.

The interventions chosen by the government have already proven cost effectiveness. In order to increase efficiency most important factor is to contain costs of implementation of package or improve quality of service delivery. Careful planning will be required to implement the interventions in practice. This may require implementation of services using different scenarios and assess and evaluate the cost of implementation of services. In other words, capacity building in the country to conduct detailed unit cost analysis of intervention implementation followed by assessment of cost effectiveness of implemented interventions will be required in future. It was also observed that for many services or programs, Government of Laos has started development of costed implementation plans (immunization, malaria). For those programs, where such resource planning exercise has not been started, these estimates and assumptions listed in document can act as blueprint to start costing.

Limitations and challenges

This study faced several challenges during costing:

1. Eliciting the data from the TWG on the resource use for each of the different service package at different level was challenging. Repeated communication with program managers and experts was established through mails.
2. Heterogeneity in services required detailed discussions through multiple channels at frequent intervals with experts to determine the cost. Multiple meetings or communications were held with the experts.
3. Adapting the package to actual service utilization at client level was a challenge. Many services had to be segregated into components to accurately estimate costs. Latest program guidelines were reviewed for some interventions (Maternal and Child Health). For other interventions, particularly treatment packages, standard treatment guidelines from other settings were used.
4. Matching service figures derived using demand estimation methods with health information system was a challenge as very limited information was available pertaining to disease specific service outputs in Laos.
5. Getting accurate health services utilization figures for catchment populations was difficult. We relied on numbers received from government for a few services and applied same proportions to other similar services.
6. Estimating need (e.g. incidence) and demand for all the diseases listed under the EHSP required separate reviews for each disease group or service objective. Eliciting the time spent by a medical officer or CHWs to provide each service was not obtained through a time motion study, but determined using the expert group opinion which is a well-established approach for EHSP costing.
7. Laos specific prices were unavailable for some medicines and supplies. We used donor agency estimates of provision of same supplies to other countries to calculate cost.

8. As package is still in the stage of evolution, we could not estimate costs for quality improvement measures.
9. This is an analysis from financial perspective and includes salaries, drugs, consumables, diagnostic and program management. Due to lack of data, increase in capital costs with regards to implementation of EHSP have not been included.
10. A linear increase in coverage/ scale up was assumed. Actual path may be different and there could be changes in pattern of care utilization which can affect actual cost of implementation. We included indirect costs such as general administration costs and program management using NHA estimates and current program management expenditure. However, scale- up for future years was assumed to be constant from 2019- 2025.
11. While different scenarios of program implementation were considered and analyzed for immunization, similar analysis for other SO's could not be undertaken.
12. There is need to assess the cost-effectiveness of different interventions and the service delivery platforms.
13. Some of the services, including specialty care, could not be costed due to lack of intervention implementation details (palliative care for patients with cancer, basic surgical operation, oral care, eye care) or resource use details (drugs for cancer treatment, ACE inhibitors, beta-blockers and diuretic for congestive cardiac failure and DM management with insulin), which can be undertaken at a later stage.

Cost estimates should be interpreted in a dynamic context, necessitating updates as Government institutionalizes the mechanisms to replace assumptions used in this study with actual figures. Outcomes of strategic plans costed in other sectors, such as Expanded Programme on Immunization, will strengthen new costing exercises. Our costs estimates will definitely benefit development of initial resource envelopes for budget planning in Laos where no previous information on costing is available.

Finally, a review was conducted to compare reported unit costs of EHSP implementation by different countries. Table 12 indicates high variation in per capita unit cost for EHSP implementation in different countries.(18-25) The wide range of unit costs can be attributed to differences in demography, epidemiology, public health systems as well as approach employed towards costing.

Table 14: Comparison of per capita costs of EHSP implementation in different countries

Country	Cost per Capita (USD)
Laos , 2020	54.9
Uganda, 2015	60.0
India, 2012	38.0
Ethiopia, 2015	34.3
Malawi, 2018	30.0
India, 2014	26.0
Ghana, 2010	25.1
Kenya, 2011	24.2
Indonesia, 2012	19.4

Conclusions and Key Recommendations

Costing of the health service packages using normative costing approach has allowed to estimate cost of implementing different interventions to uplift the health status of population in Laos. Increase in per capita EHSP cost from current 95 to 275 (In thousand Laos kip) points towards need of massive increase in health system funding. Government will require to increase the health expenditure from 0.46% of GDP to 1.46% of GDP. Delivering all the services at 80% coverage levels will amount to relative increase in the annual cost by 216% form 2019 which amounts to 2,159 billion Laos kip. Within country as well as donor funding mechanisms will need to be strengthened in the next five years to account for increased requirement of resources to deliver services. The costed service packages will inform in advance the distribution of resource allocations among interventions that the government wishes to implement. Additionally, the results can be used by government to estimate the resource envelope required to achieve Sustainable Development Goals in general or disease specific targets in particular.

Key Recommendations are as follows:

1. In order to deliver the services committed under Essential Health Service Package, Government of Laos has to increase the health budget by minimum three times the existing budget for recurrent resources.
2. Per capita health spending (In thousand Laos kip) will need to be increased from current 95 to 275. This will further require an increase in health system funding to 1.46% of GDP from current 0.46% of GDP.
3. Delivering all the services at 80% coverage levels will amount to relative increase in the annual cost by 216% form 2019 which amounts to 2,159 billion Laos kip. Within country as well as donor funding mechanisms will need to be strengthened in the next five years to account for increased requirement of resources to deliver services.

4. As preventive services costs, 68% of total EHSP cost, mechanisms need to be devised to contain cost of preventive interventions. Integrated delivery of preventive interventions can be planned and tested for cost effectiveness.
5. Hospital Information Systems as well surveillance systems need to be strengthened in the country to generate robust estimates in future.
6. Establish MIS system and additional data capture mechanisms in the country to allow for better capture of the true disease burden and service utilization picture and to plan implementation of package. This further enables updating of cost analysis in future.
7. Treatment coverage needs to be captured by all the programs in more effective manner for community as well as hospital based interventions.
8. Standard treatment guidelines as well as operational guidelines need to be adopted for successful implementation of package. The existing guidelines need incorporation of strategies to be adopted for improvement of services as well as increase in treatment coverage rates.
9. ESP Costing Analysis could be used for developing Sector-wise Plans.
10. Prioritize ESP package by identifying scale-up of cost-effective interventions.

Annexures

Annexure 1: Assumptions and data sources for different services

Table 15: Assumptions and data Sources for RMNCH related services

ES No.	Indicator (s) used for demand estimation	Source	Demand for service	Number of contacts	Base coverage 2019	Source
ES16	Birth rate (+10% pregnancy wastage)	Laos PDR Census 2015	220,805	4	70	LSIS 2017
ES17	Birth rate (+10% pregnancy wastage)	Laos PDR Census 2015	220,805	1	35	LSIS 2017
ES18	Birth rate (+10% pregnancy wastage)	Laos PDR Census 2015	220,805	1	40.2	LSIS 2017
ES19	Birth rate (+10% pregnancy wastage)	Laos PDR Census 2015	220,805	1	40.2	LSIS 2017
ES20	Birth rate (+10% pregnancy wastage)	Laos PDR Census 2015	220,805	1	40.2	LSIS 2017
ES21	Birth rate (+10% pregnancy wastage)	Laos PDR Census 2015	220,805	2	54.4	One health tool
ES25	Prevalence of STI/RTI	Assumed to be 1%	2,2081	1	0.099	Laos Narrative Report 2016
ES26	Birth rate (+10% pregnancy wastage)	Laos PDR Census 2015	220,805	1	13.5	LSIS 2017
ES27	HIV +ve Pregnant women	Laos Narrative Report 2016	707	1	53.67	One health tool
ES30	Birth rate (+10% pregnancy wastage)	Laos PDR Census 2015	220,805	1	64.4	One health tool
ES48	HIV +ve Pregnant women	Laos Narrative Report 2016	707	1	80	One health tool
ES49	Birth rate (+10% pregnancy wastage)	Laos PDR Census 2015	220,805	4	29.2	LSIS 2017
ES50	Birth rate (+10% pregnancy wastage)	Laos PDR Census 2015	220,805	4	29.2	LSIS 2017
ES51	Birth rate	Laos PDR Census 2015	200,732	5	47.1	LSIS 2017
ES11	Percent pregnant women with unintended pregnancies (unplanned, mistimed, unwanted)	Laos PDR MICS 2017	31,575	4	62.2	LSIS 2017
ES12	Percent women requiring medical abortion	Laos PDR MICS 2017	101,129	1	39	One health tool
ES13	Percent women requiring surgical abortion	Laos PDR MICS 2017	7,779	2	39	One health tool
ES14	Percent women underwent abortion	Laos PDR MICS 2017	101,129	2	39	One health tool
ES15	Percent pregnant women with complications	WHO norm	33,121	4	64.4	One health tool
ES28	Percent pregnant women with hypertension	India data used. GOI	17,223	4	33.2	One health tool
ES29	Pre-eclampsia rate	India data used. GOI	6,372	4	33.2	One health tool

ES31	Percent premature births	A retrospective review of birth outcomes at the Mother and Child Health Hospital in Lao People's Democratic Republic, 2004–2013	22,081	4	33.2	One health tool
ES32	Post-partum haemorrhage rate	India data used. GOI	7,022	1	48.3	One health tool
ES33	Percent pregnant women with prolonged labour	Sengoma JP et al. BMJ open. 2017 Jul 1;7(7):e015015.	22,081	1	38.6	One health tool
ES34	Percent pregnant women with prolonged labour	Sengoma JP et al. BMJ open. 2017 Jul 1;7(7):e015015.	22,081	4	38.6	One health tool
ES35	Post-partum haemorrhage rate	India data used. GOI	7,022	1	48.3	One health tool
ES36	Percent deliveries with manual removal of placenta (MROP)	Ghag K et al. 2014 Jun 1;99(Suppl 1):A111-.	1,325	1	64.4	One health tool
ES37	Assisted vaginal deliveries (%) out of total	One health tool	142,199	1	64.4	One health tool
ES38	Percent neonates requiring bag and mask resuscitation	One health tool	12,927	2	64.4	One health tool
ES39	Caesarean section rate	Laos PDR MICS 2017	12,807	1	64.4	One health tool
ES40	Home deliveries (%)	Laos PDR MICS 2017	76,178	5	45	One health tool
ES41	Home deliveries (%)	Laos PDR MICS 2017	76,178	5	47	One health tool
ES55	Maternal Moratlity Ratio (per 100,000)	One health tool	363	1	15	One health tool
ES42	Birth rate	Laos PDR Census 2015	200,732	1	58	Laos PDR 2017
ES44	Percent Infants weighing less than 2.5 kg, pre terrm, small for gestational age	Laos PDR MICS 2017	19,471	1	67.4	LSIS 2017
ES45	Percent Infants weighing less than 2.5 kg, pre terrm, small for gestational age	Laos PDR MICS 2017	19,471	1	67.4	LSIS 2017
ES46	Percent newborns with complications (Sepsis, jaundice, severe asphyxia, seizures,preterm births)	Laos PDR Census 2015	-	3	67.4	LSIS 2017
ES47	Percent premature births	A retrospective review of birth outcomes at the Mother and Child Health Hospital in Lao People's Democratic Republic, 2004–2013	20,073	3	67.4	LSIS 2017
ES53	Birth rate	Laos PDR Census 2015	200,732	5	47.1	LSIS 2017
ES54	Home deliveries (%)	Laos PDR MICS 2017	69,253	5	47	LSIS 2017
ES60	Under 5 Population	Laos PDR Census 2015	1,093,811	1	54.4	One health tool
ES61	Incidence of severe acute malnutrition: without complication	Bhadoria AS et al. Journal of family medicine and primary care. 2017 Apr;6(2):380.	21,035	1	2.4	One health tool
ES62	Incidence of sever acute malnutrition: with complication	Mathur A et al. Journal of tropical pediatrics. 2017 Apr 21;64(1):45-50.	631,045	1	2.4	One health tool

ES63	Percentage of under 5 children: with complications	LSIS 2017	175,290	1	54.4	One health tool
ES64	Percentage of under 5 children: non bloody diarrhoea	LSIS 2017	1,093,811	2	25	One health tool
ES65	Percentage of under 5 children: ARI	LSIS 2017	185,107	2	45	One health tool
ES66	Under 5 Population	Laos PDR Census 2015	701,161	2	54.4	One health tool
ES10	15-49 women population	Laos PDR Census 2015	1,752,810	4	62.2	LSIS 2017
ES22	Birth rate (+10% pregnancy wastage)	Laos PDR Census 2015	220,805	1	64.4	One health tool
ES23	Birth rate (+10% pregnancy wastage)	Laos PDR Census 2015	220,805	1	60	One health tool
ES52	Birth rate	Laos PDR Census 2015	200,732	1	60	One health tool
ES57	Under 5 Population	Laos PDR Census 2015	701,161	2	67	One health tool
ES58	Under 5 Population	Laos PDR Census 2015	701,161	2	88	One health tool
ES59	Under 5 Population	Laos PDR Census 2015	701,161	2	88	One health tool

Table 16: Assumptions and data sources related to HIV services

ES No.	Indicator (s) used for demand estimation	Source	Indicator Value	Calculation / Adjustment	Number of contacts	Demand for service	Base cover age 2019	Source
ES99	High risk group population (FSW, MSM, IDU, Clients)	Laos Narrative Report 2016	HRG population 2.782% of total population in 2015.	Same percentage 2.782% applied for 2019.	4	797,766	54.7	Laos Narrative Report, 2016
ES100	High risk group population (FSW, MSM, IDU, Clients)	Laos Narrative Report 2016	HRG population 2.782% of total population in 2015.	Same percentage 2.782% applied for 2019.	12	2,93,299	54.7	Laos Narrative Report, 2016
ES101	High risk group population (FSW, MSM, IDU, Clients)	Laos Narrative Report 2016	HRG population 2.782% of total population in 2015.	Same percentage 2.782% applied for 2019.	2	398,883	52	Slide 9, CHS Template_ Workshop_ 15 Oct 2019
ES102	High risk group population (FSW, MSM, IDU, Clients)	Laos Narrative Report 2016	HRG population 2.782% of total population in 2015.	Same percentage 2.782% applied for 2019.	2	398,883	52	Slide 9, CHS Template_ Workshop_ 15 Oct 2019
ES103	Prevalence in HRG group (Weighted)		Prevalenc e for year 2014. FSW – 1.4% MSM – 1.6% PWID – 1.5% Clients – 1.5%	Weighted average taken for HRG group 1.523%	2	6,075	42.36	Country Report Laos, 2019
ES104	Prevalence in HRG group (Weighted)		Prevalenc e for year 2014. FSW – 1.4% MSM – 1.6%	Weighted average taken for HRG group 1.523%	12	36,447	51	Country Report Laos, 2019

			PWID – 1.5% Clients – 1.5%					
ES105	Prevalence in HRG group (Weighted)		Prevalence for year 2014. FSW – 1.4% MSM – 1.6% PWID – 1.5% Clients – 1.5%	Weighted average taken for HRG group 1.523%	2	6,075	55.2	Laos Narrative Report, 2016

Table 17: Assumptions and data sources for DCDC related services

ES No.	**Indicator (s) used for demand estimation**	**Source**	**Number of contacts**	**Demand for service**	**Base coverage 2019**	**Source**
ES118	Drug administration and treatment of parasitic disease	Program data	1	1,485,930	95	Program data
ES119	Proportion dengue cases systematic	WHO report	4	30,196	54.4	One health tool
ES121	Total population	World Bank 2019	1	7,169,000	54.7	Laos narrative report 2016

Table 18: Assumptions and data sources for immunization related services

ES No.	Indicator (s) used for demand estimation	Source	Indicator Value	Calculation / Adjustment	Number of contacts	Demand for service	Base coverage 2019	Source
ES9	Reproductive aged group women (15-49 years)	Census 2015	27% of the total population	1,752,810	2	3,505,620	3%	Not reported anywhere, (Assumption)
ES24	Pregnant women (Calculation based on birth rate)	Census 2015	200,732	200,732	2	401,464	67%	cMYP document 2018-23
ES43	Total births (Calculation based on birth rate)	Census 2015	200,732	200,732	1 (Depends upon type of vaccine)	200,732	79%(Hepatitis B)	cMYP document 2018-23
ES56	Total births (Calculation based on birth rate)	Census 2015	200,732	200,732	1 (Depends upon type of vaccine)	200,732	BCG - 79% MR – 80% Penta – 85% Polio IPV – 60% Polio OPV – 85% PCV – 83% JE – 60% Rota, HPV & Typhoid – 0% (Newer vaccines)	cMYP document 2018-23

Table 19: Assumptions and data sources related to NCD services

NCDs	Indicator (s) used for demand estimation	Source	Indicator Value	Calculation / Adjustment	Number of contacts	Demand for service	Base coverage 2019	Source
ES67	Population > 15 years	Census 2015	5,280,655	5,280,655	1	5,280,655	0	Service provision data not available, so assumption service not started yet
ES68	Population > 40 years	Census 2015	1,804,840	1,804,840	1	1,804,840	39.9	Pengpid S et al. 2019
ES69	Population > 40 years	Census 2015	1,804,840	1,804,840	1	1,804,840	10	Where no estimates were available, 10% is used a current coverage
ES70	Hypertensive patients	National Multisectoral Action Plan for the Prevention and Control of Noncommunicable Diseases 2014-2020	16% of total population	1,147,040	1	1,147,040	20	Pengpid et al. 2019
ES71	Percentage of AMI patients	Global Burden of Disease, 2017	0.82% of total population	58,785.8	1	58,785.8	10	Where no estimates were available, 10% is used a current coverage
ES72	Percentage of CCF patients	Global Burden of	0.82% of total population	0	1	0	10	Where no estimates were available,

		Disease, 2017						10% is used a current coverage
ES73	Percentage of Stroke patients	Global Burden of Disease, 2017	0.82% of total population	40,146	1	40,146	10	Where no estimates were available, 10% is used a current coverage
ES74	Percentage of Diabetic patients	Lao National NCD policy and MSA Plan for the Prevention and Control of Noncommunicable Diseases 2014-2020. Ppt	6.8% of total population	502,622	1	502,622	10	Where no estimates were available, 10% is used a current coverage
ES75	Prevalence of Diabetic patients	National Multisectoral Action Plan for the Prevention and Control of Noncommunicable Diseases 2014-2020	6.8% of total population	487,492	1	487,492	10	Where no estimates were available, 10% is used a current coverage
ES76	Prevalence of Diabetic patients	National Multisectoral Action Plan for the Prevention and Control of Noncommunicable Diseases 2014-2020	6.8% of total population	487,492	1	487,492	10	Where no estimates were available, 10% is used a current coverage

ES77	Percentage of Diabetic patients	National Multisectoral Action Plan for the Prevention and Control of Noncommunicable Diseases 2014-2020	6.8% of total population	502,622	1	502,622	47	Vonglokham et al. 2019
ES78	50% of diabetic patients	National Multisectoral Action Plan for the Prevention and Control of Noncommunicable Diseases 2014-2020	50% of the diabetic patients	251,311	1	251,311	14.1	Vonglokham et al. 2019
ES79	Percentage of Diabetic patients	National Multisectoral Action Plan for the Prevention and Control of Noncommunicable Diseases 2014-2020	6.8% of total population	502,622	1	502,622	40.3	Vonglokham et al. 2019
ES80	Percentage of Diabetic patients	National Multisectoral Action Plan for the Prevention and Control of Noncommunicable Diseases 2014-2020	6.8% of total population	502,622	1	502,622	10	Where no estimates were available, 10% is used a current coverage
ES81	Diabetic patients	National Multisectoral Action Plan for the	6.8% of total population	502,622	1	502,622	10	Where no estimates were available,

		Prevention and Control of Noncommunicable Diseases 2014-2020						10% is used a current coverage
ES82	Percentage of Diabetic patients	National Multisectoral Action Plan for the Prevention and Control of Noncommunicable Diseases 2014-2020	6.8% of total population	502,622	1	502,622	10	Where no estimates were available, 10% is used a current coverage
ES83	Percentage of Diabetic patients	National Multisectoral Action Plan for the Prevention and Control of Noncommunicable Diseases 2014-2020	6.8% of total population	502,622	1	502,622	0	Service provision data not available, so assumption service not started yet
ES84	Percentage of Bronchial Asthma patients	Lao National NCD policy and MSA Plan for the Prevention and Control of Noncommunicable Diseases 2014-2020. Ppt		344,112	1	344,112	10	Where no estimates were available, 10% is used a current coverage
ES85	Percentage of Bronchial Asthma patients	Lao National NCD policy and MSA Plan for the Prevention		344,112	1	344,112	10	Where no estimates were available, 10% is used a

		and Control of Noncommunicable Diseases 2014-2020. Ppt						current coverage
ES86	Percentage of COPD patients	Lao National NCD policy and MSA Plan for the Prevention and Control of Noncommunicable Diseases 2014-2020. Ppt		227,974.2	1	227,974.2	10	Where no estimates were available, 10% is used a current coverage
ES87	Percentage of COPD patients	Global Burden of Disease, 2017		227,974	1	227,974	10	Where no estimates were available, 10% is used a current coverage
ES88	Percentage of COPD patients	Global Burden of Disease, 2017		227,974	1	227,974	10	Where no estimates were available, 10% is used a current coverage
ES89	Number of females above 40 years of age	Global Burden of Disease, 2017		874,698	1	874,698	10	Where no estimates were available, 10% is used a current coverage
ES90	Number of females above 40 years of age	Global Burden of		874,698	1	874,698	10	Where no estimates were

		Disease, 2017						available, 10% is used a current coverage
ES92	Number of females above 40 years of age	Global Burden of Disease, 2017		874,698	1	874,698	10	Where no estimates were available, 10% is used a current coverage

Table 20: Assumptions and data sources related to Malaria services

Malaria	Indicator (s) used for demand estimation	Source	Indicator Value	Calculation / Adjustment	Number of contacts	Demand for service	Base coverage 2019	Source
ES106	Total expected fever cases (Annual Blood Examination rate)	National Malaria control strategy 2016-20	3.5% of total population excluding under 5 children	226,374	1	226,374	99	National Malaria control strategy 2016-20
ES107	Total expected fever cases (Annual Blood Examination rate)	National Malaria control strategy 2016-20	3.5% of total population	6,595	1	6,595	97.6	National Malaria control strategy 2016-20
ES108	Number of p.f. cases	Health System data, Laos	6,595	22,081	1	22,080	97.6	National Malaria control strategy 2016-20
ES109	Number of p.v. & mixed infection cases	Health System data, Laos	22,081	21,220	1	21,220	100	National Malaria control strategy 2016-20
ES110	Number of p.v. cases	Health System data, Laos	21,220	250,915	1	250,915	99	National Malaria control strategy 2016-20
ES111	Percentage of severe malaria cases	National Malaria control strategy 2011-15	1,721	1,721	1	1,720	100	National Malaria control strategy 2016-20

Table 21: Assumptions and data sources related to Tuberculosis services

Tuberculosis	Indicator (s) used for demand estimation	Source	Indicator Value	Calculation / Adjustment	Number of contacts	Demand for service	Base coverage 2019	Source
ES112	Total population Chest symptomatic patients	Estimation based on trend from National Strategic Plan for Tuberculosis 2016-2020	348,413	348,413	1	348,413	12	National TB programme, Laos PDR, 2018
ES113	Percentage of presumptive tested patients	National Strategic plan for Tuberculosis 2016-2020	62%	348,413	2	696,827	12	National TB programme, Laos PDR, 2018
ES114	Incidence of Tuberculosis	168 cases in total population (2017)	National TB Programme, Lao PDR 2018	27,873	1	27,873	63	National TB programme, Laos PDR, 2018
ES115	Prevalence of IPT in under 5 children	6.69% of total population	Global Burden of disease 2017	1,865	1	1,865	35.45	Global Burden of disease, 2017
ES116	Incidence of Tuberculosis	168 cases in total population (2017)	National TB Programme, Lao PDR 2018	27,873	1	27,873	100	National TB programme, Laos PDR, 2018
ES117	Prevalence of Comorbidities (MDR cases)	6 cases	Global burden of disease, 2017	6	1	5.8	100	National TB programme, Laos PDR, 2018

Annexure 2: Cost data analysis (Expanded Program on Immunization)

Steps followed in the computation of costs for delivering immunization services is as follows:

Estimation of Target Population (2019-2025): The target population (number of beneficiaries) has been estimated separately for each vaccine e.g., for Tetanus-diphtheria (Td) vaccine, the target population is the total number of pregnant and non-pregnant women in the childbearing age-group (15–49 years). For BCG, Hepatitis B, Polio, Pentavalent, measles, rotavirus vaccine, the target population is all live births in the country (i.e. complete expulsion from the mother, regardless of duration of pregnancy, showing any evidence of life). Details of different population cohorts used in estimating costs is provided in Table 1.

Estimation of Current and Target Immunization Coverage (2019-2025): Details of vaccines included in different years along with their target coverage rates are given in Table 2. Coverage rates for 2019 are official country estimates those reported by Laos Health System. These are derived from most recent coverage surveys in Laos.(26) Coverage of each vaccine has been increased gradually from 2019-2025 using logarithmic interpolation using assumption that coverage will increase sharply first then stagnate over a period of time. Finally, it will reach 95% coverage levels by 2023. Health system targets to be achieved by the end of 2025 have been derived from cMYP document for Laos. For baseline year, all vaccines included in Expanded Program on Immunization in, Laos i.e. BCG, Hepatitis B, DTP, OPV, Measles, vaccine for children and tetanus diphtheria (Td) for pregnant women were considered. In third quarter of 2019, rota vaccine and HPV were incorporated in the schedule.

New vaccine to be introduced: Typhoid (2020 onwards)

Estimation of Target beneficiaries (2019-2025) site wise:

Fixed site: Utilization rates for target beneficiaries were estimated site wise, i.e. getting immunized at fixed site or during outreach services by health system. The proportion was derived using previous year site wise and level wise immunization data from Laos.

Table 22: Vaccines to be included in immunization program in different years, 2019- 2025

	2019	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Td to CBAW	0	41	65	82	95	95	95
Tetanus toxoid in ANC	38	63	77	87	95	95	95
BCG	79	86	90	93	95	95	95
Hepatitis B at birth	70	75	79	81	83	84	85
DPT-Hep3- Hib3 coverage	85	87	89	91	93	94	95
Polio IPV	60	75	84	90	95	95	95
Polio OPV	85	87	89	91	93	94	95
MR	80	80	83	86	89	92	95
PCV3	83	88	91	93	95	95	95
JE	60	73	80	86	90	90	90
Rotavirus	0	41	65	82	95	95	95
HPV	0	41	65	82	95	95	95
Typhoid	0	41	65	82	95	95	95
Supplemental activity	Yes			Yes			Yes

Expected number of services were calculated by the tool, by multiplying the expected utilization rate per service with number of doses for particular vaccine, reported/ expected coverage and target population.

Outreach/ Mobile: Based on the population estimates derived using different assumptions, we estimated the annual expected beneficiaries to be given services through outreach. Total beneficiaries like children were estimated on the basis of birth rate. Firstly, expected demand of services in an area was computed based on population numbers, utilization rates derived from census, latest surveys, health system targets. Services to be delivered were estimated on annual basis as it is difficult to segregate the inputs per session.

Annual Vaccine and consumable requirement per beneficiary: For fixed site immunization, vaccine and consumable inputs have been determined per beneficiary. However, for outreach vaccine and consumables the number of vials required annually is based on the appropriate target population (births, surviving infants, women of childbearing age) combined with expected coverage levels. Number of doses per beneficiary (child/ adolescent/ pregnant women have been derived from document having details of Laos microplaning

guide.(27) Information regarding number of doses per vial is also derived from the same document. (Table 16)

Table 23: Vaccine and supply for target population <1 year

VACCINE	DOSES	VIALS
BCG	20 dose vial	1 dose
Hep B	single dose vial	1 dose
Penta	single dose vial	3 doses
PCV	4 dose vial	3 doses
b OPV	10 dose vial	3 doses
IPV	5 dose vial	1 dose
MR	10 dose vial	2 doses
Td	10 dose vial	2 doses
JE	5 dose vial	1 dose
Rota vaccine	1 dose vial	
HPV	5 dose vial	
Typhoid	5 dose vial	
AD SYRINGES	**Type of vaccine**	
AD 0.5 ml	HepB, Penta, PCV, IPV, Td, MR,JE	
AD 0.05 ml(BCG)	Total BCG doses	
AD 5 ml	Total BCG vials	
AD 2 ml	Total MR, JE vials	

Outreach: As it is difficult to identify the beneficiary mix by session, annual calculations were derived. e.g., number of doses of vaccines per year in a defined area (villages) which in turn is derived using birth rate, annual pregnancies and adolescent girls in a village in a year. For annual vaccine utilization estimation, number of doses that were required per beneficiary were added to the tool based on national guidelines (given in Table 3).

Human Resource utilisation:

Fixed Site: Number and time spent per injection/ dose administered by each staff working for delivering immunization services at different levels in health system was provided by technical working groups. The minutes spent were multiplied by minutised salary costs. The human resource time varied by level as well as by vaccine type.

Table 24: Time in minutes spent per dose/ injection administered

	Time				
	Health Centre	District Hospital A	District Hospital B	Provincial	Central
BCG	15	5	15	10	10
Hep B	10	10	10	5	5
Penta	15	5	15	10	10
PCV	15	5	15	10	10
b OPV	15	5	15	10	10
IPV	15	5	15	10	10
MR	15	5	15	10	10
Td (adolescents and child bearing age women)	5	5	5	5	5
Td (pregnant women)	5	5	5	5	5
JE	15	5	15	10	10
Rota vaccine	15	5	15	10	10
HPV	15	5	15	10	10
Typhoid	15	5	15	10	10

Outreach: The Human Resource cost estimation for outreach session were based on the assumption that if any outreach session is planned, then the whole day of the involved human resource (HR) will be totally devoted for that specific service. e.g immunization outreach session. Therefore, cost of the HR were estimated per session. Human resource cost estimation thus included proportion allocation of annual average base salary towards each session, per diem/incentive (per session/per beneficiary) / travel allowance and stay cost as provided.

Other consumables: The costs of consumables other than injection supplies was based on specific unit prices collected from government rate documents. The overall cost of session was estimated for each service according to the estimates of service utilization, production of services, i.e. number of doses administered and ambulatory visits in a year. The costs were estimated separately from resources directly linked to a single session (e.g., number of supervisory checklists).

Adjusting for wastage of vaccine and consumables: Wastage rate, which is the proportion (%) of vaccine and other supplies that are wasted due to a variety of reasons to that which was appropriately used (i.e.

number of beneficiaries vaccinated was used as reported in immunization microplan. Wastage multiplication factor was derived using recommended mathematical equation. Using same principle as for fixed site immunization, according to the estimated beneficiaries, annual doses required will be estimated by taking into consideration the wastage factor for each vaccine. Thereby, annual cost of vaccines utilized will be estimated using assumption that all the beneficiaries are immunized and coverage is as per current (for year 2019) or target year coverage percent.

Table 25: Wastage rate and wastage multiplication factors used

VACCINE	**Wastage Rate**	**Wastage Multiplication Factor**
BCG	80%	4
Hep B	5%	1.05
Penta	5%	1.05
PCV	10%	1.11
b OPV	25%	1.33
IPV	5%	1.25
MR	50%	2
Td	25%	1.33
JE	20%	1.25
Rota vaccine	5%	1.25
HPV	5%	1.25
Typhoid	5%	1.25
AD SYRINGES		
AD 0.5 ml	10%	1.11
AD 0.05 ml(BCG) (WMF 1.11)	10%	1.11
AD 5 ml (WMF 1.11)	10%	1.11
AD 2 ml (WMF 1.11)	10%	1.11

Actual weighted average price in 2019 per dose (USD): Vaccine dose prices used for baseline year were procurement prices as reported by Laos health system. These are GAVI procurement prices. For subsequent years, the price has been adjusted at 2% inflation rate from previous year price.

Estimation of Unit Costs: The unit cost estimates were based on a mix of actual estimates and few assumptions related to population numbers, expected number of services, quantities of supplies/ commodities used in sessions.

Fixed Site: Unit cost is sum of vaccine costs (calculated by multiplying price per dose, coverage rate of the first dose, target population size, number of doses per child in the schedule and the vaccine wastage factor), Human resource cost and consumables used per dose administered. The unit cost has been calculated for each vaccine separately level wise. The average cost for each vaccine is estimated as average of unit costs of all the health levels.

Outreach: It was estimated separately for sessions delivered at different sites. Unit cost estimation for outreach sessions was based on different matrices of costing (per session and annual use of resource). The cost of vaccines, injection consumables was estimated on annual basis. HR cost, other consumables, social mobilization costs were estimated on per session basis. Overall annual costs of the sessions in an area were prepared on the basis of number of sessions to be given as per national guidelines. The per-session costs were multiplied by 4 (national guidelines regarding number of sessions to be held in each village). These were added to costs estimated on annual basis. While some service consumables like banner, registers are used for more than one session, then average number of sessions for which it may be used is reported and accordingly the cost is estimated. Then, adding per session costs of various commodities and multiplying with number of sessions planned gives the estimated annual cost of the service rendered.

Cost of supervision, monitoring, coordination: Costing of supervision, monitoring, and coordination costs per annum are sum of respective cost incurred in actual by Laos in year 2019.

Estimation of Total Costs:

Fixed site: Total cost is derived by multiplying level wise unit cost of each vaccine by beneficiaries receiving vaccines at the respective level.

Outreach: Total cost of outreach services was derived by multiplying annual cost of conducting 4 sessions in a village per year by number of villages.

Estimation of Future Costs: Driven by changes in key drivers of cost on yearly basis, an increase in immunization costs are expected for the country. Firstly, introduction of new vaccines in the immunization

programme increases the cost. Secondly government targets to increase vaccination coverage to the targets in the 5-year plan. Third, Inflation, vaccine price changes and fluctuating exchange rates will also affect the future costs. A modest population growth rate of 1.5% is also bound to add a larger cohort of infants each year requiring immunization services, especially with strengthened health system wherein infant mortality rate is decreasing. To estimate costs of immunization services in years 2020- 2025 following key Assumptions were used:

1. Fixed site immunization services increase from 40% in 2019 to 80% in 2025. Increase has been calculated using logarithmic interpolation.
2. Newer vaccine introduction is not causing any change in the number of health professionals.
3. Average GAVI prices were used for vaccines introduced in consecutive years for which health system from Laos had no previous estimates.
4. Per Diem for outreach vaccinations, supervision, monitoring costs were assumed to remain constant throughout the baseline and projection years.

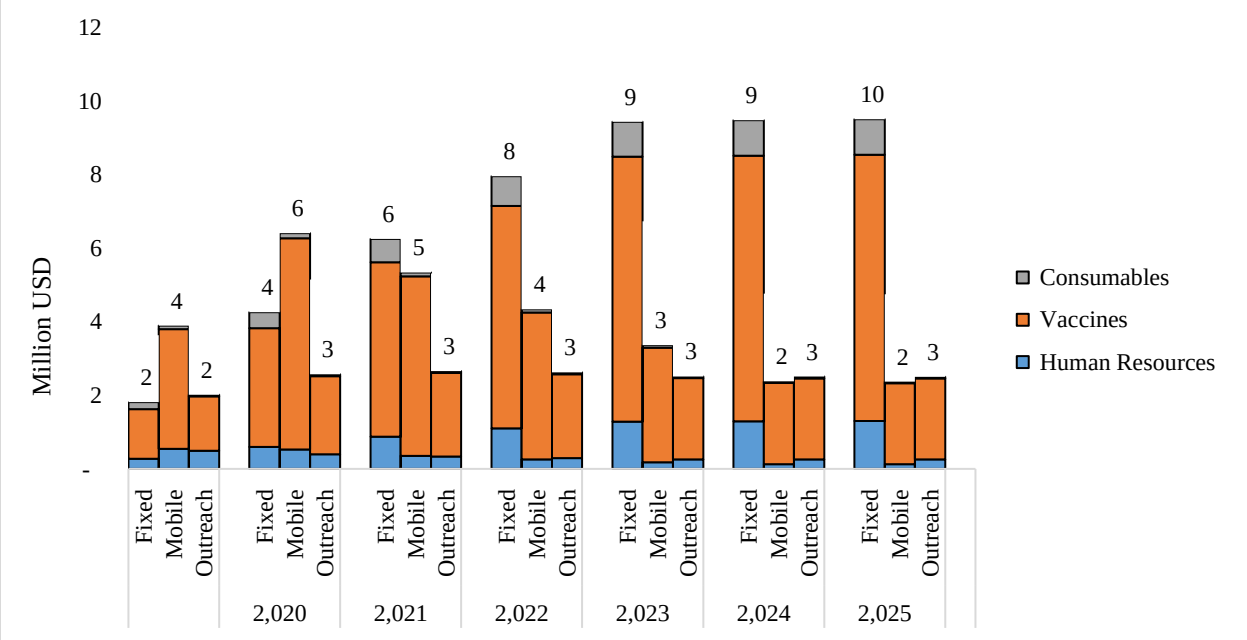
Annexure 3: Unit Cost and Total Annual Cost of different services

Total Cost

Immunization

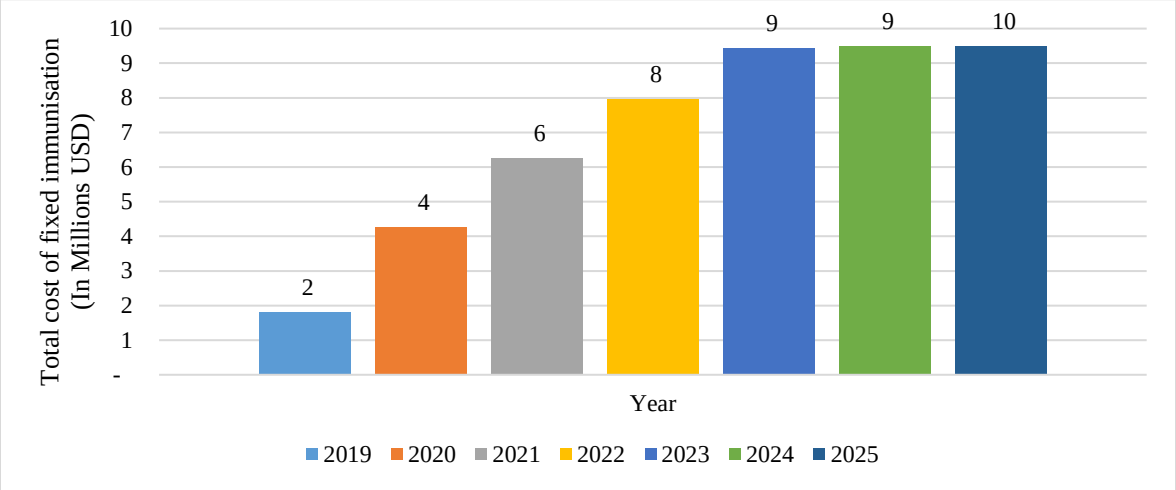
The total cost for immunization from 2019 to 2025, including the costs to maintain the existing immunization system, is estimated to be USD $99 million using the existing funding pattern, wherein GAVI Alliance supports the procurement of vaccines. Current immunization efforts in 2019 cost USD $8 million for human resource time, vaccines and consumables. The costs from 2020-2025 range between USD $13.2 to USD $14.3 million depending upon the coverage and number of vaccines included in the year.

Figure 20: Head wise distribution of cost by site of Immunization (without scale up cost), 2019



Graph represents the year wise cost of vaccine delivery per beneficiary (Childhood vaccine) that increases from 2019-2025 due to increase in coverage from 80% to 95% and addition of new vaccines over the years.

Figure 21: Total cost of fixed site immunization in USD 2019-2025 (total for all facility levels)



The bar graph depicts that total cost of fixed site immunization increased as shifting of priority from outreach sessions to fixed site vaccination (from current coverage of 40% to 80 %) along with addition of new vaccines. Cost of year wise average cost of vaccine delivery at each health facility level for childhood vaccinations increases over years with maximum increase in Provisional and District Hospital B followed by Health center and District Hospital A. Total costs of vaccine delivery at each health facility level for childhood vaccinations will cost a minimum of USD $40 million over six years (2020-2025). Total costs by year are shown in Table 6 above. Costs of immunization service increases from year 2019 to 2023 for all health facilities level for childhood vaccinations and then remains constant or decrease slightly.

Table 26: Year wise total cost of vaccine delivery at each health facility level for childhood vaccinations

	2019	2019	2020	2020	2021	2021	2022	2022	2023	2023	2024	2024	2025	2025
	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD
HC	9,808	1.1	21,421	2.4	30,708	3.5	38,538	4.4	45,386	5.2	45,387	5.2	45,315	5.2
DH A	1018	0.1	2,264	0.3	3,265	0.4	4,110	0.5	4,850	0.5	4,850	0.5	4,843	0.5
DH B	3354	0.4	7,131	0.8	10,164	1.2	12,694	1.5	14,899	1.7	14,885	1.7	14,845	1.7
PH	1282	0.2	2,872	0.3	4,164	0.5	5,248	0.6	6,197	0.7	6,194	0.7	6,182	0.7
CH	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	15,463	1.7	33,688	3.8	48,301	5.5	60,589	6.9	71,331	8.1	71,316	8.1	71,185	8.1

₭(M): Lao kip (Million)

Table 27: Year wise total cost of vaccine delivery at each health facility level for all vaccinations

	2019	**2019**	**2020**	**2020**	**2021**	**2021**	**2022**	**2022**	**2023**	**2023**	**2024**	**2024**	**2025**	**2025**
	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD
HC	10,202	1.1	2,547	2.8	36,290	4.1	46,386	5.2	55,115	6.2	55,418	6.3	55,657	6.3
DH A	1,047	0.1	2,497	0.2	3,681	0.4	4,696	0.5	5,576	0.6	5,599	0.6	5,615	0.6
DH B	3,383	0.3	7,365	0.8	10,583	1.2	13,283	1.5	15,629	1.7	15,638	1.7	15,621	1.7
PH & RH	1,289	0.1	2,922	0.3	4,252	0.4	5,372	0.6	6,351	0.7	6,353	0.7	6,346	0.7
Central	2	0.0	17	0.0	30	0.0	42	0.0	52	0.01	53	0.01	55	0.01
Total	15,924	1.8	37,347	4.2	54,836	6.2	69,778	7.9	82,721	9.4	83,061	9.4	83,294	9.5

₭(M): Lao kip (Million)

- **Inclusive of Td vaccination, HPV**

Table projected the total cost incurred at different health facility levels over the years.

Table 28: Year wise total cost of vaccine delivery for each vaccine (total for all facility levels), USD

	2019	2019	2020	2020	2021	2021	2022	2022	2023	2023	2024	2024	2025	2025
	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD
Td CBAW	130	2	2,980	39	5,716	74	8,274	108	10,382	135	10,753	140	11,137	145
Td ANC	331	4	679	9	819	11	915	12	1,009	13	992	13	973	13
Hep. B at birth	324	4	522	7	652	8	747	10	826	11	822	11	816	11
BCG	704	9	1,149	15	1,427	19	1,645	21	1,818	24	1,788	23	1,754	23
MR	20,20	26	3,097	40	3,812	50	4,411	57	4,928	64	5,010	65	5,074	66
DPT-Hep3- Hib3	2,999	39	4,611	60	5,595	73	6,390	83	7,050	92	7,008	91	6,946	90
Polio IPV	1,048	14	1,970	26	2,612	34	3,135	41	3,566	46	3,508	46	3,440	45
Polio OPV	1,478	19	2,272	30	2,757	36	3,149	41	3,474	45	3,454	45	3,423	45
PCV3	6,378	83	10,177	133	12,486	163	14,274	186	15,685	204	15,426	201	15,129	197
JE	512	7	935	12	1,224	16	1,458	19	1,651	21	1,623	21	1,592	21
Rotavirus	0	0	2,215	29	4,164	54	5,869	76	7,356	96	7,235	94	7,095	92
HPV	0	0	6,740	88	13,065	170	18,795	245	24,078	314	24,559	320	25,050	326
Typhoid	0	0	0	0	508	7	716	9	898	12	883	11	866	11

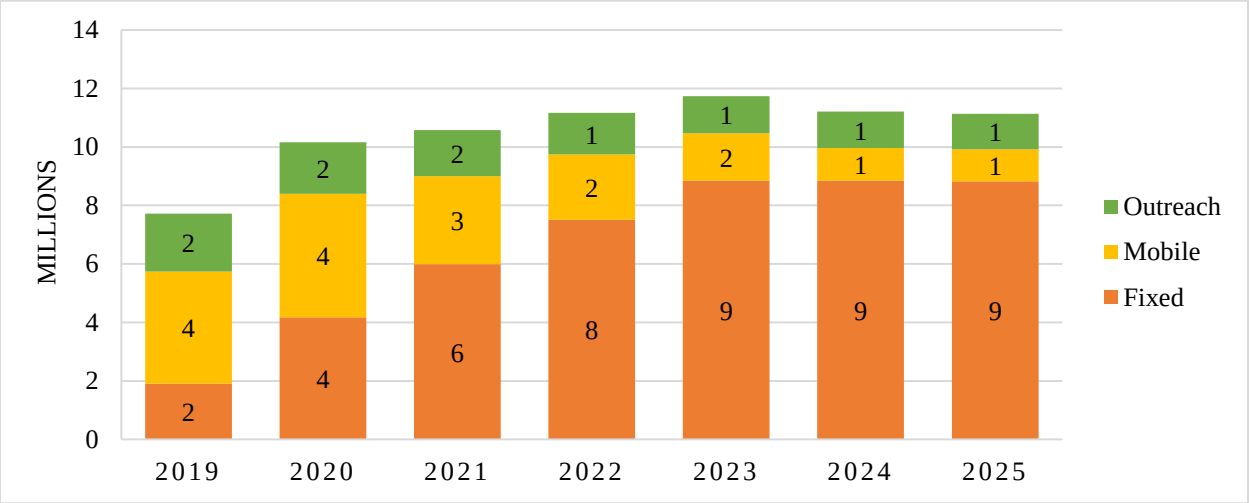
₭(M): Lao kip (Million)

Table 29: Total Cost of routine immunization for Childhood immunization by site, 2019-2025 (USD)

	2019	2019	2020	2020	2021	2021	2022	2022	2023	2023	2024	2024	2025	2025
	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD
Fixed	15,924	1.8	37,347	4.2	54,836	6.2	69,778	7.9	82,721	9.4	83,061	9.4	83,294	9.5
Mobile	34,129	3.8	56,153	6.4	46,821	5.3	38,014	4.3	29,490	3.3	20,865	2.3	20,797	2.3
Outreach	17,675	2.0	22,561	2.5	23,288	2.6	22,968	2.6	22,042	2.5	22,001	2.5	21,943	2.5
	67,727		116,061		124,944		130,760		134,253		125,927		126,034	

₭(M): Lao kip (Million)

Figure 22: Total Cost of Routine Immunization for childhood immunization by site, 2019-2025 (USD)



The total cost of routine immunization should be higher at a higher level hospital, because the higher level hospitals should have more complex services and higher average base salary, whereas in case of immunization is total cost of delivery service is higher in health center as major proportion of population is catered by these health level facilities. Based upon the assumption that 60% In subsequent years (2020-2025), the total cost follows the same trend whereas the proportion of increase in cost is higher in health facilities due to shift in from outreach sessions to fixed site sessions.

Table 30: Total cost of routine immunization at each health facility level for childhood vaccinations (USD)

	2019	2019	2020	2020	2021	2021	2022	2022	2023	2023	2024	2024	2025	2025
	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD
HC	9,808	1.1	21,421	2.4	30,708	3.5	38,538	4.4	45,386	5.2	45,387	5.2	45,315	5.2
DH A	1,018	0.1	2,264	0.3	3,265	0.4	4,110	0.5	4,850	0.6	4,850	0.6	4,843	0.6
DH B	3,354	0.4	7,131	0.8	10,164	1.2	12,694	1.5	14,899	1.7	14,885	1.7	14,845	1.7
PH	1,282	0.2	2,872	0.3	4,164	0.5	5,248	0.6	6,197	0.7	6,194	0.7	6,182	0.7
CH	1,282	0.2	2,872	0.3	4,164	0.5	5,248	0.6	6,197	0.7	6,194	0.7	6,182	0.7
Mob_HC	29,838	3.4	34,227	3.9	24,303	2.8	17,976	2.1	13,076	1.5	8,735	1.0	8,502	0.9
Mob_DH	3,688	0.4	2,822	0.3	2,127	0.2	1,572	0.2	1,106	0.1	1,080	0.1	1,051	0.1
OR_HC	15,487	1.8	13,770	1.6	12,266	1.4	11,063	1.3	9,956	1.1	9,746	1.1	9,521	1.1
OR_DH	1,914	0.2	1,702	0.2	1,516	0.2	1,367	0.2	1,230	0.1	1,205	0.1	1,177	0.1
Total	67,673	7.7	89,080	10.2	92,677	10.6	97,815	11.2	10,2896	11.7	98,276	11.2	97,617	11.1

₭(M): Lao kip (Million)

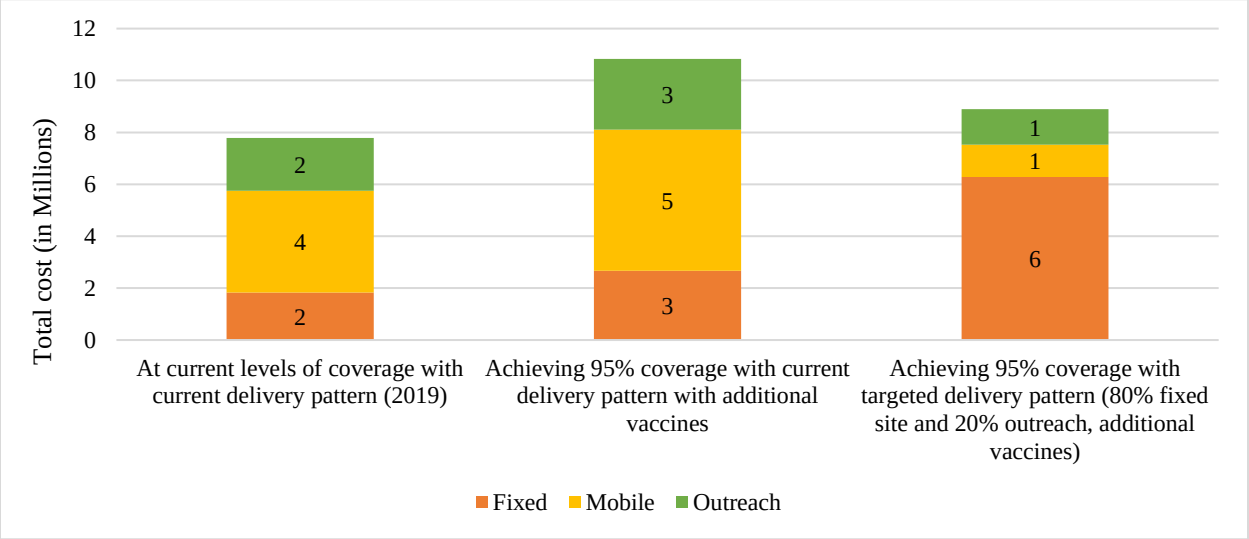
Total cost of routine immunization at each health facility level for childhood vaccinations is highest in mobile and outreach sessions due to higher proportion of population is covered in these sessions. Same trend is followed in the projection over years.

Table 31: Total cost of routine immunization at each health facility level for all vaccinations

	2019	2019	2020	2020	2021	2021	2022	2022	2023	2023	2024	2024	2025	2025
	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD
HC	10,202	1.2	24,547	2.8	36,290	4.1	46,386	5.3	55,115	6.3	55,418	6.3	55,657	6.4
DH A	1,047	0.1	2,497	0.3	3,681	0.4	4,696	0.5	5,576	0.6	5,599	0.6	5,615	0.6
DH B	3,383	0.4	7,365	0.8	10,583	1.2	13,283	1.5	15,629	1.8	15,638	1.8	15,621	1.8
PH	1,289	0.1	2,922	0.3	4,252	0.5	5,372	0.6	6,351	0.7	6,353	0.7	6,346	0.7
CH	2	0.0	17	0.0	30	0.0	42	0.0	52	0.01	53	0.01	55	0.01
Mob_HC	30,374	3.5	51,876	5.9	43,053	4.9	34,958	4.0	27,190	3.1	18,570	2.1	18,509	2.1
Mob_DH	3,754	0.4	4,277	0.5	3,768	0.4	3,057	0.4	2,301	0.3	2,295	0.3	2,288	0.3
OR_HC	15,731	1.8	20,080	2.3	20,726	2.4	20,442	2.3	19,617	2.2	19,581	2.2	19,529	2.2
OR_DH	1,944	0.2	2,482	0.3	2,562	0.3	2,527	0.3	2,425	0.3	2,420	0.3	2,414	0.3
Total	67,727	7.7	116,061	13.2	124,944	14.3	130,760	14.9	134,253	15.3	125,927	14.4	126,034	14.4

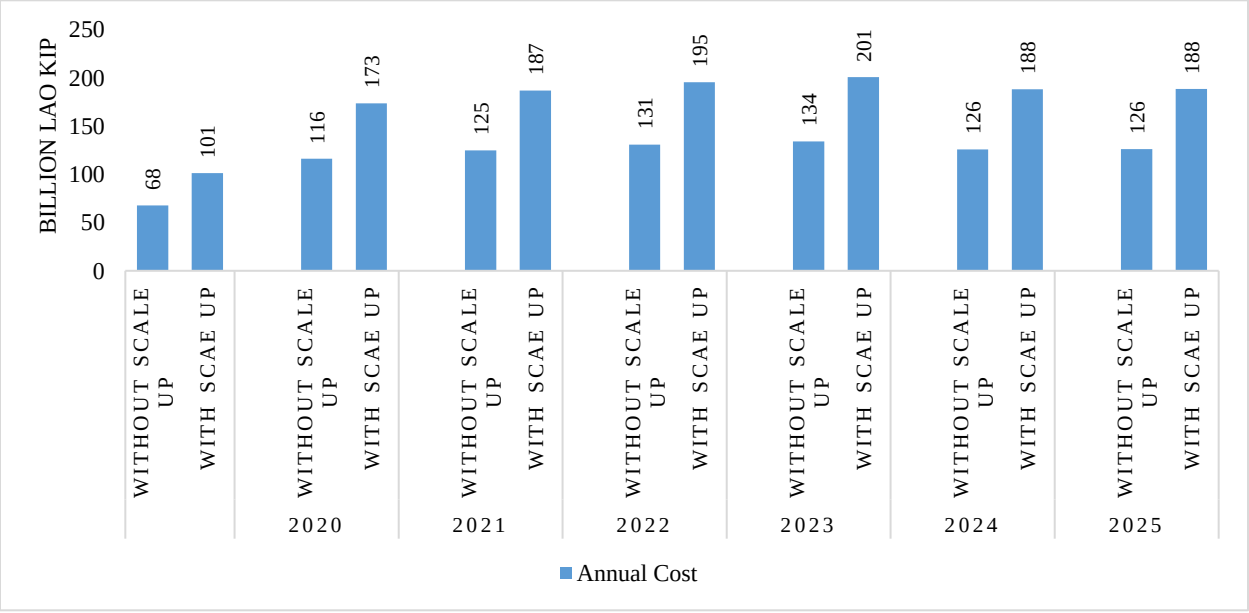
₭(M): Lao kip (Million)

Figure 23: Total cost of routine immunization by level, 2019-2025



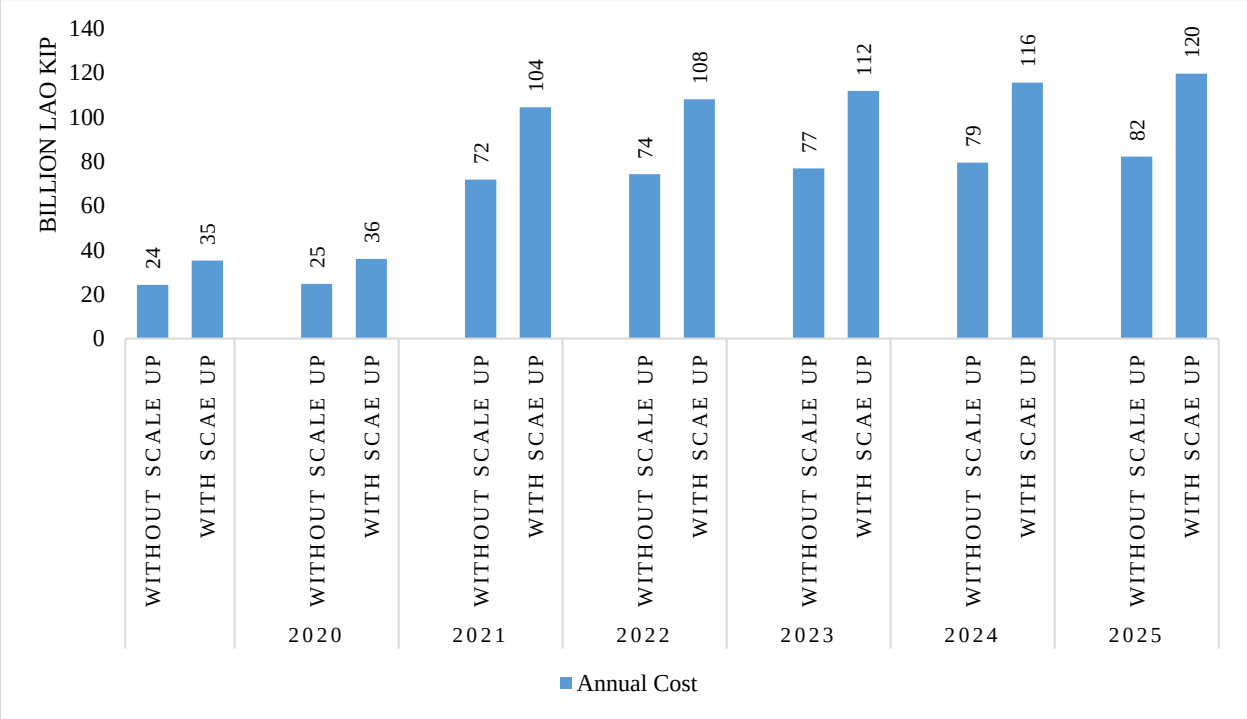
Fixed site service delivery cost increases in achieving 95% coverage along with shifting the site of immunization from outreach to fixed site. The share of session cost is equal in all the settings in the year 2019. The total cost of achieving 95% coverage using strategy of 80% fixed site immunizations is almost equal to baseline year costs. Incremental costs (2020- 2025) needed to scale up immunization coverage, including routine delivery and campaigns, and to introduce a finite set of new vaccines.

Figure 24: Total Cost of Routine Immunization without and with scale up



Malaria

Figure 25: Total Costs of Malaria Control Interventions without and with scale up



Tuberculosis

We have estimated the cost of implementing the Tuberculosis services in 2019 using National Tuberculosis plan in which estimates are given for 2035. Different cost scenarios were estimated for implementation of the tuberculosis services in Laos over the period 2019- 2025. Details of current and assumed future coverage level of tuberculosis are given in Table 29.

Table 32: Current and target coverage level of different Tuberculosis services used in analysis

	2019	2020	2021	2022	2023	2024	2025
Population	7,169,000	7,279,403	7,391,505	7,505,335	7,620,917	7,738,279	7,857,448
Morbidity Rate Respiratory Illness (Fortnightly)	10%	10%	10%	10%	10%	10%	10%
Chest Symptomatic Patients	2%	2%	2%	2%	2%	2%	2%
Estimated Number of patients to be screened	329,774	334,853	340,009	345,245	350,562	355,961	361,443
Presumptive TB bacteriology tested #	329,774	334,853	340,009	345,245	350,562	355,961	361,443
Presumptive TB bacteriology tested	62%	67%	71%	76%	81%	85%	90%
Treatment coverage (%)	63%	70%	75%	80%	85%	90%	90%
Under 5 population	701,161	711,959	734,056	734,056	745,361	756,839	768,494
HIV testing in TB patients	100%	100%	100%	100%	100%	100%	100%
Number of MDR- TB patients	6	6	6	5	5	5	5
Prevalence of Tuberculosis	26,382	26,788	27,201	27,620	28,045	28,477	28,915
Screening Coverage	12.8	27.3	41.9	56.4	70.9	85.5	100
Presumptive TB bacteriology tested #	12.8	27.3	41.9	56.4	70.9	85.5	100
Treatment coverage (%)	63	70	75	75	85	90	90
Isoniazid treatment for children	6.69	6.69	6.69	6.69	6.69	6.69	6.69
HIV testing in TB patients	100	100	100	100	100	100	100

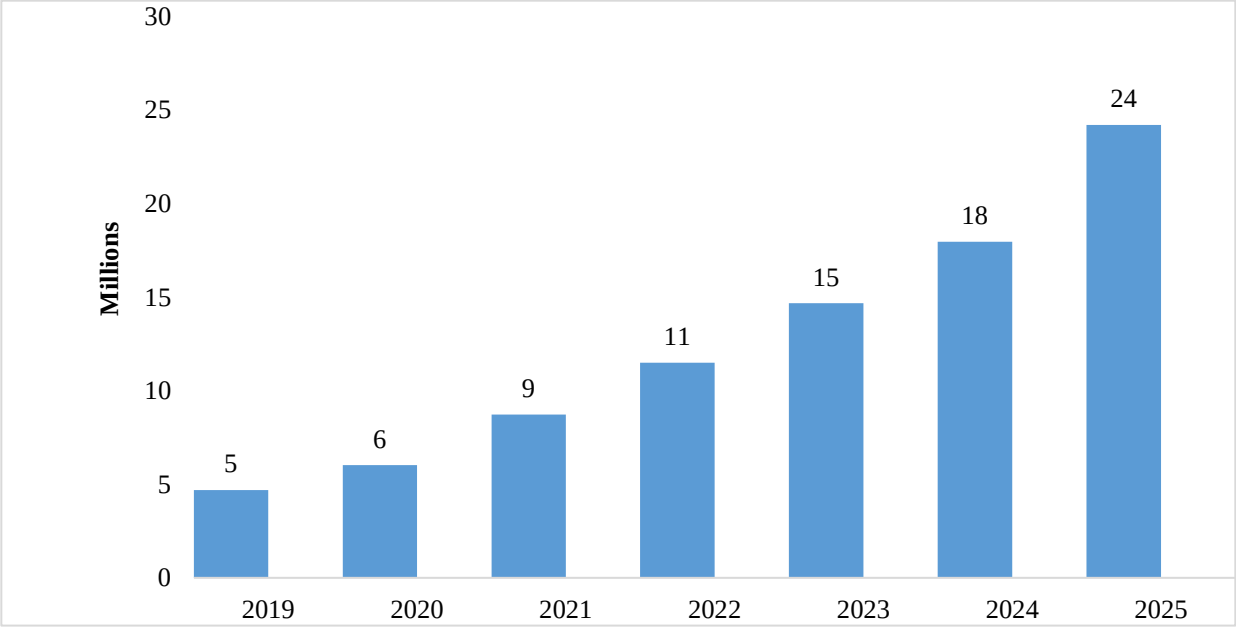
For tuberculosis control total cost of 84 million dollars will be required as per normative estimates to achieve targets set under National Strategic Action Plan, Laos.

Table 33: Year wise total cost of Tuberculosis service delivery at each health facility level

	2019	2019	2020	2020	2021	2021	2022	2022	2023	2023	2024	2024	2025	2025
	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD
HC	12,612	1.4	18,090	2.1	23,568	2.7	29,046	3.3	34,524	3.9	40,002	4.6	45,480	5.2
DH A	5,855	0.7	10,144	1.2	14,432	1.7	18,721	2.1	23,009	2.6	27,298	3.1	31,586	3.6
DH B	8,361	0.9	13,297	1.5	18,233	2.1	23,170	2.6	28,106	3.2	33,042	3.8	37,978	4.3
PH	7,408	0.9	14,377	1.6	21,349	2.4	28,315	3.2	35,284	4.0	42,253	4.8	49,222	5.6
CH	6,894	0.8	13,722	1.6	20,549	2.4	27,376	3.1	34,203	3.9	41,030	4.7	47,857	5.5
Total	41,131	4.7	69,630	7.9	98,128	11.2	126,627	14.5	155,126	17.7	183,625	20.9	212,124	24.2

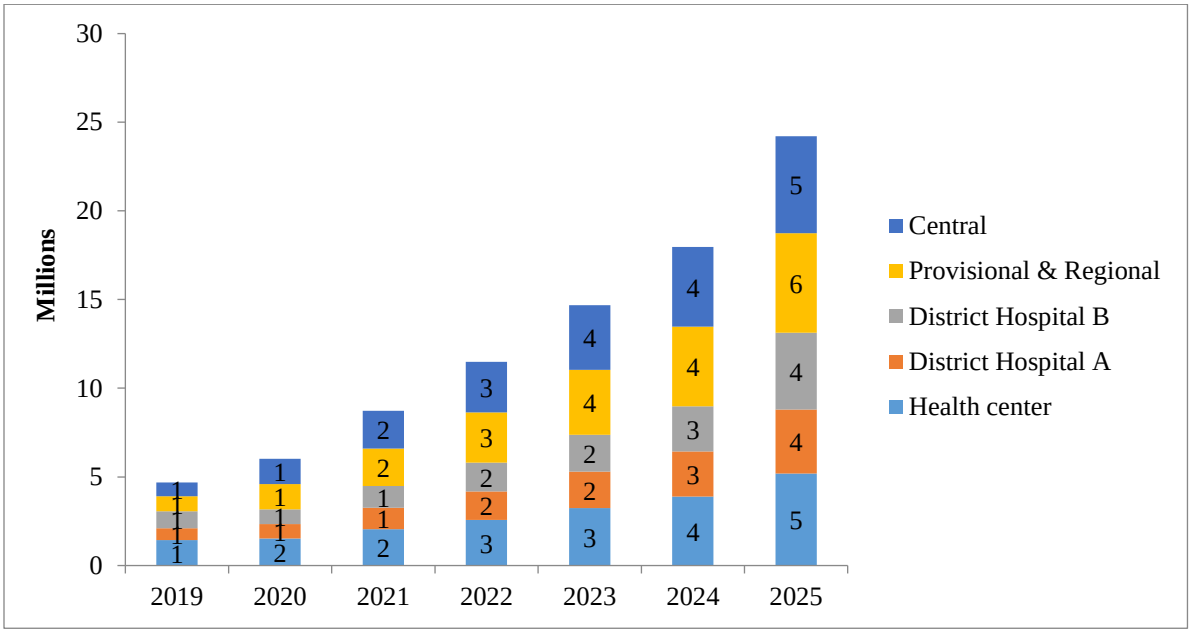
₭(M): Lao kip (Million)

Figure 26: Total cost for Tuberculosis from previous year, 2019-2025 USD



Percentage increase in cost of tuberculosis program from 2020- 2025 was uniform as most of the interventions have been selected to be added from 2020 (Figure 1). It increased from 5 million USD in 2019 to 24 million USD dollars 2025. In all the years, major share of cost was incurred at health centre level.

Figure 27: Total cost of service delivery by health facility level, 2019-2025



Non-communicable Diseases

We have estimated the cost of implementing the NCD services in 2019 using NCD action plan document which is for 2014- 2019. Different cost scenarios were estimated for implementation of the NCD services in Laos over the period 2019- 2025. Details of current and future coverage level of NCDs and their risk factors are given in Table 1. A linear increase in each year has been assumed to achieve desired coverage levels for preventive interventions such as counselling e.g., percentage counselled at different health facilities for NCD risk factors was 40% as per NCD risk factors survey. It was increased to 50%. Coverage of screening interventions was found to be low at baseline (10%). These were set at 100% and 80% for different screening interventions. The coverage at baseline for treatment of cases with diabetes, hypertension were 10 and 20 % respectively. These were set at 100% and 80% respectively for year 2025. For most of the interventions, for years in between 2019- 2025, a linear increase in treatment coverage targets was calculated (Table 1)

Table 34: Current and target coverage level of different NCDs and their risk factors used in analysis

	2019	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
% counselled at different health facilities for NCD risk factors	39.9	41.6	43.3	45.0	46.6	48.3	50.0
% of population above 40 years screened for cardiovascular risk factors	10.0	25.0	40.0	55.0	70.0	85.0	100.0
% of hypertensive effectively provided treatment	20.0	30.0	40.0	50.0	60.0	70.0	80.0
% of AMI patients provided aspirin and beta blocker treatment	10.0	21.7	33.3	45.0	56.7	68.3	80.0
% of CCF patients treated with ACE inhibitors,beta blocker and calcium channel blocker	10.0	21.7	33.3	45.0	56.7	68.3	80.0
% of Stroke patients treated with low dose aspirin	10.0	21.7	33.3	45.0	56.7	68.3	80.0
% of patients screened for Diabetes Mellitus	10.0	21.7	33.3	45.0	56.7	68.3	80.0
% of patients treated for cholesterol management	10.0	21.7	33.3	45.0	56.7	68.3	80.0
% of patients provided statine as treatment for hypercholestermia	10.0	21.7	33.3	45.0	56.7	68.3	80.0

% of patients diagnosed as diabetes mellitus	47.0	55.8	64.7	73.5	82.3	91.2	100.0
% of diabetic patients provided counselling on modification of diet	14.1	20.1	26.1	32.1	38.0	44.0	50.0
% of diabetic patients given metformin as treatment	40.3	46.9	53.5	60.2	66.8	73.4	80.0
% of diabetic patients given other antiglycemic if metformin is contraindicated	10.0	21.7	33.3	45.0	56.7	68.3	80.0
% of diabetic patients counselled for self care (Foot ulcers)	10.0	16.7	23.3	30.0	36.7	43.3	50.0
% of patients having diabetic complications(Retinopathy, Neuropathy , Nephropathy)	10.0	10.0	10.0	10.0	10.0	10.0	10.0
% of diabetic patient on insulin	0.0	18.1	30.8	43.6	56.3	69.0	80.0
% of patient provided beta2 agonists as bronchial asthma treatment	10.0	21.7	33.3	45.0	56.7	68.3	80.0
% of patients treated for severe bronchial asthma using steroids (inhalers)	10.0	21.7	33.3	45.0	56.7	68.3	80.0
% of patients treated for severe bronchial asthma using short acting bronchodilators inhalers	10.0	21.7	33.3	45.0	56.7	68.3	80.0
% of COPD patients in which inhaled corticosteroids are prescribed	10.0	21.7	33.3	45.0	56.7	68.3	80.0
% of COPD patients in which long acting bronchodilators are prescribed	10.0	21.7	33.3	45.0	56.7	68.3	80.0
% of women encouraged for self- breast examination (Health education)	10.0	21.7	33.3	45.0	56.7	68.3	80.0
% of patients diagnosed for different cancers	10.0	No information available further					
% of cancer patients requiring palliative care	10.0						
% of women covered for cervical cancer checkup	10.0	25.0	40.0	55.0	70.0	85.0	100.0
Number of all basic emergency services provided	10.0	No information available further					
Total of all operations/ surgeries done at different health facility levels	10.0						
% of patient provided treatment for dental cares	10.0	21.7	33.3	45.0	56.7	68.3	80.0
% of patient provided treatment for eye disease	10.0	21.7	33.3	45.0	56.7	68.3	80.0

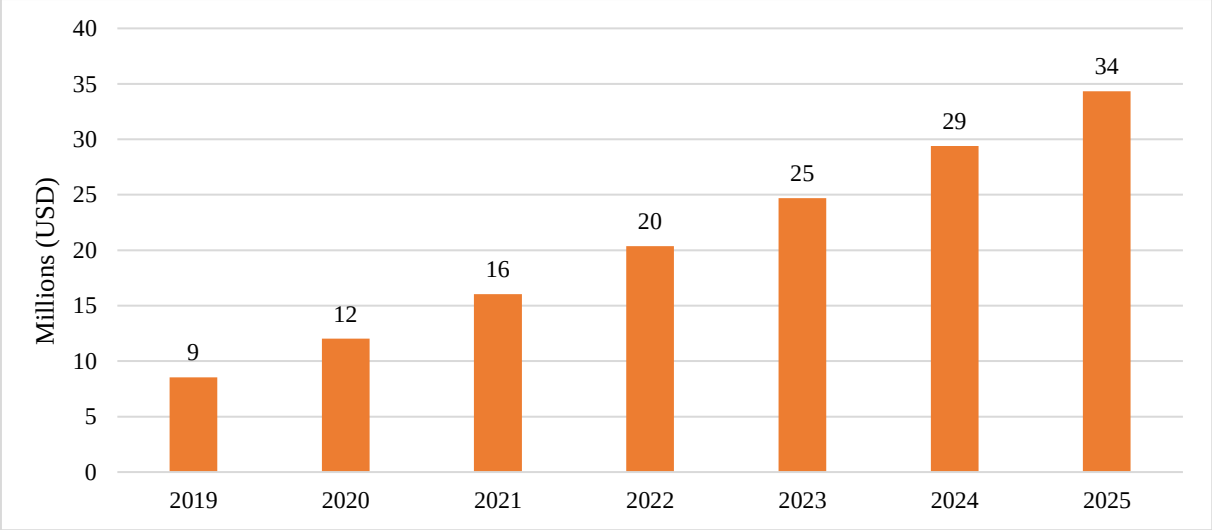
Total Costs estimates: NCD related interventions were found to cost 145 million USD from 2019- 2025. In 2019, the cost was 8.5 million USD which increased to 34.3 million US dollars in 2025. (Table 30, Figure 15)

Table 35: Year wise total cost of NCD service delivery at each health facility level

	2019	2019	2020	2020	2021	2021	2022	2022	2023	2023	2024	2024	2025	2025
	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD
HC	17,417	1.9	21,404	2.4	26,971	3.0	32,908	3.7	39,235	4.4	45,971	5.2	53,139	6.0
DH A	9,209	1.0	13,367	1.5	18,023	2.0	23,073	2.6	28,109	3.2	33,565	3.8	39,264	4.4
DH B	13,818	1.5	20,102	2.2	27,114	3.0	34,716	3.9	42,264	4.8	50,449	5.7	59,017	6.7
PH	22,274	2.5	32,457	3.7	43,855	5.0	56,201	6.4	68,519	7.8	81,864	9.3	95,848	10.9
CH	12,148	1.3	18,011	2.0	24,512	2.8	31,629	3.6	38,370	4.3	45,771	5.2	53,425	6.1
Total	74,865	8.5	105,342	12.0	140,475	16.0	178,527	20.3	216,497	24.7	257,620	29.4	300,693	34.3

₭(M): Lao kip (Million)

Figure 28: Total cost of Non communicable diseases with percentage increase from previous year, 2019-2025 USD



Percentage increase in NCD cost from 2019- 2025 was uniform (Figure 1). In addition, relative percentage change in total budget as compared to baseline year was calculated. It was found that in 2025 an increase in 302% as compared to 2019 will be required. In all the years, major cost on NCDs has been incurred at

provincial hospital level. It increased from 3 million dollars in 2019 to 11 million dollars in 2025 at PH level.

Figure 29: Total cost of service delivery by health facility level, 2019-2025

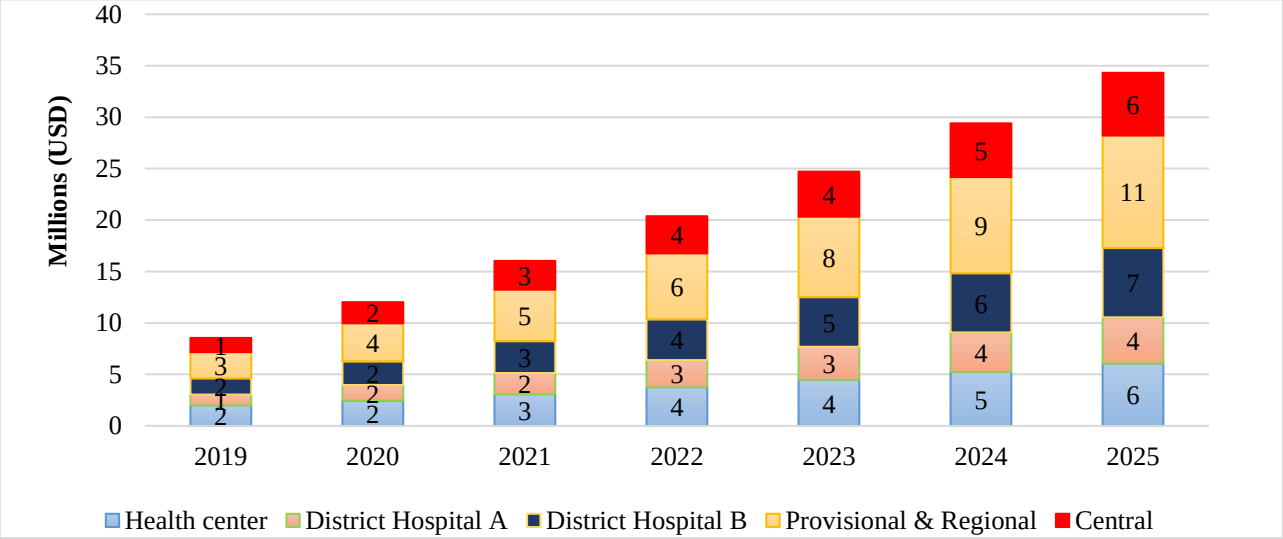


Table 36: Distribution of NCD costs by service

	2019	2019	2020	2020	2021	2021	2022	2022	2023	2023	2024	2024	2025	2025
	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD	₭ (M)	USD
Screening (CVD)	26,507	3.0	28,611	3.3	30,832	3.5	33,176	3.8	35,647	4.1	38,253	4.4	40,999	4.7
Counselling (CVD)	20,71	0.2	5,364	0.6	8,888	1.0	12,658	1.4	16,685	1.9	20,984	2.4	25,568	2.9
CVD	15,004	1.7	22,764	2.6	30,859	3.5	39,970	4.6	47,112	5.4	55,381	6.3	63,719	7.3
Stroke	26	0.0	59	0.01	93	0.01	131	0.01	170	0.02	213	0.02	258	0.03
Screening (Diabetes)	3,390	0.4	7,378	0.8	11,757	1.3	16,438	1.9	21,439	2.5	26,776	3.1	32,467	3.7
Diabetes	15,665	1.8	20,569	2.4	26,253	3.0	32,315	3.7	38,777	4.4	45,660	5.2	52,985	6.1
Counselling	820	0.1	1,173	0.1	1,577	0.2	2,008	0.2	2,468	0.3	2,958	0.3	3,481	0.4
Diabetes	3,067	0.4	6,269	0.7	91,46	1.0	12,221	1.4	15,504	1.8	19,006	2.2	22,490	2.6
COPD	3,870	0.4	8,684	0.9	13,800	1.6	19,347	2.2	25,233	2.9	31,515	3.6	38,213	4.4
Counselling (Cancer)	967	0.1	2,170	0.3	3,458	0.4	4,835	0.5	6,306	0.7	7,876	0.9	9,550	1.1
Cancer	3,478	0.4	2,300	0.3	3,811	0.4	5,427	0.6	7,154	0.8	8,997	1.0	10,962	1.3
Total	74,865	8.5	105,342	12.0	140,475	16.0	178,527	20.3	216,497	24.7	257,620	29.4	300,693	34.3

₭ (M): Lao kip (Million)

Majority of expenditures for all the years (2019-2025) is on treatment interventions (68%) specifically the treatment of cardiovascular diseases (22%). Screening (for all risk factors) accounted for around 28% of the total NCD costs.

Figure 30: Proportional share of NCD services by service type (2019- 2025)

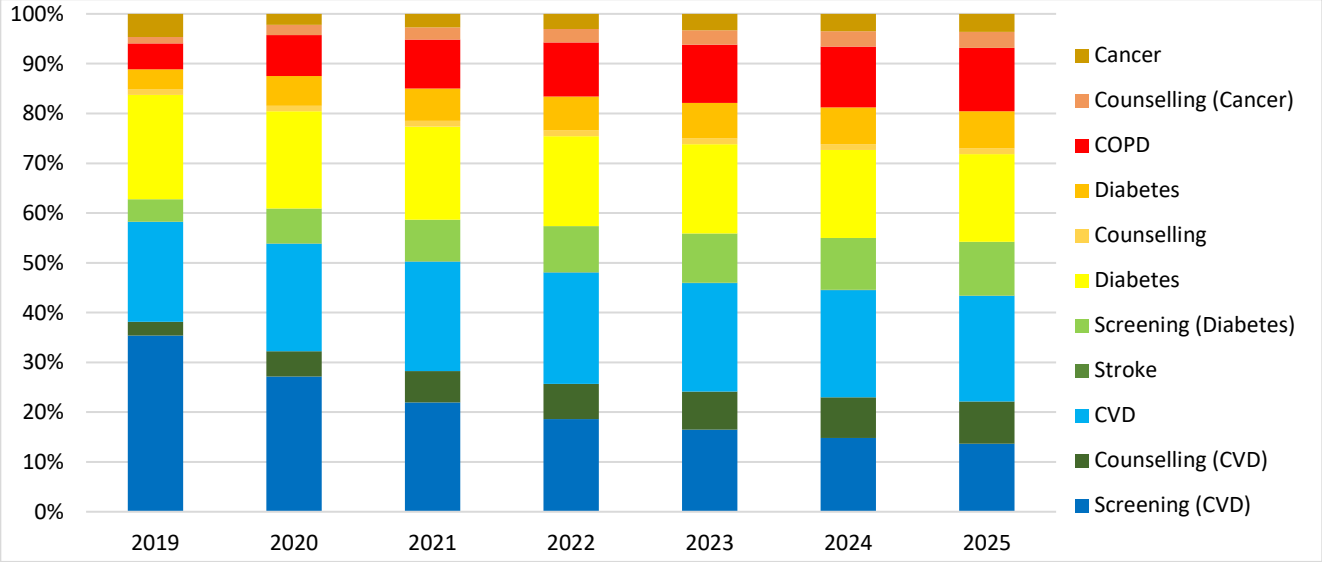


Figure 31: Proportional share of NCD services by service type (2019- 2025)

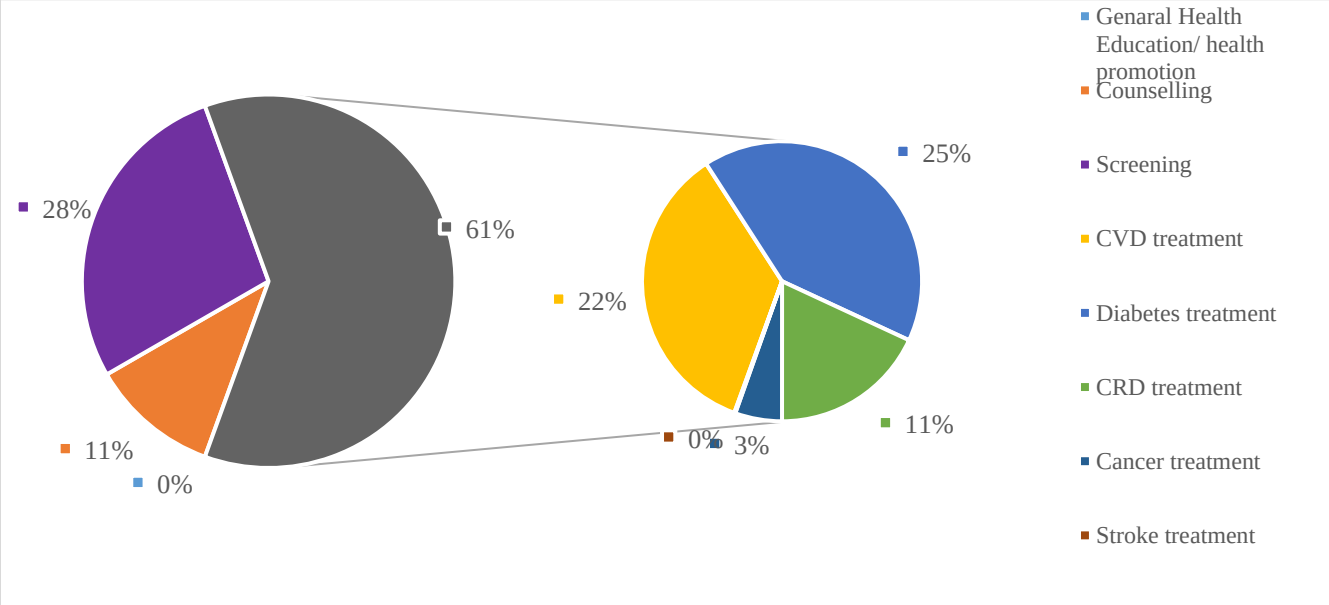
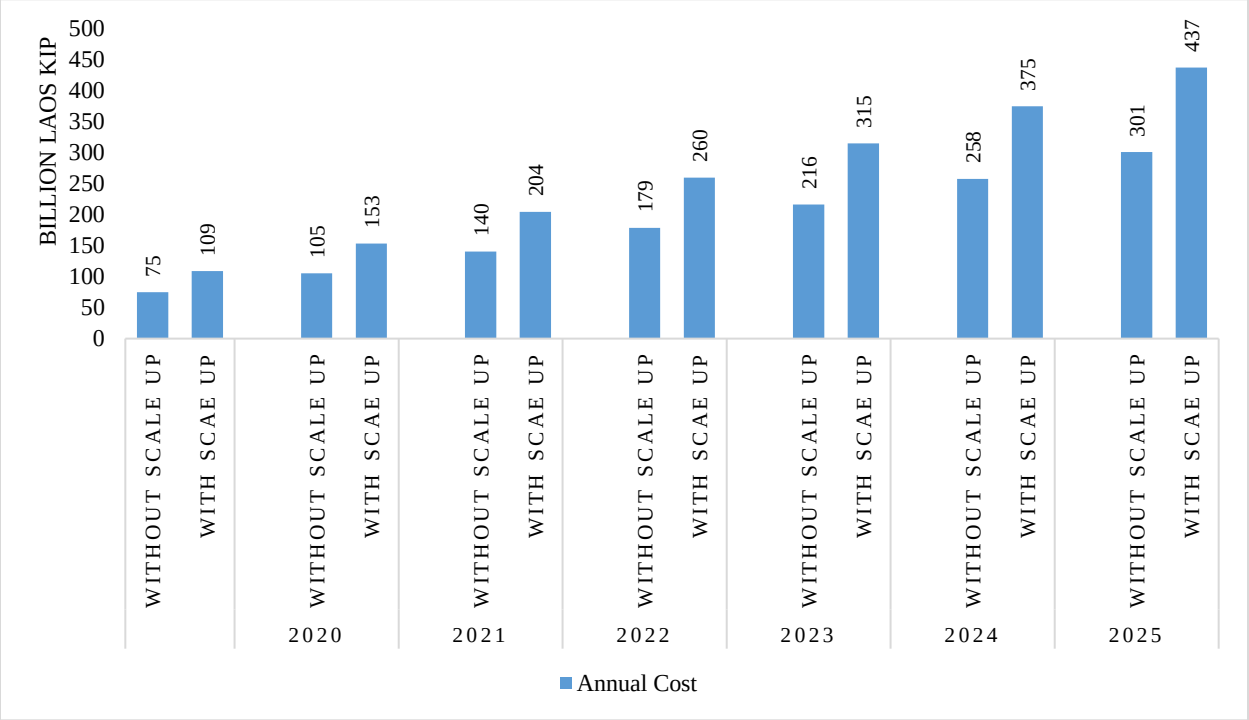


Figure 32: NCD Costs without and with scale up



Reproductive Maternal Newborn and Child Health (RMNCH)

Table 37: Annual cost (In millions Laos kip) for RMNCH service packages for Laos PDR

Service domain	Annual Cost Laos kip (USD)		Change (%)
	2019	2025	
SO1	9,784.9 (1.12)	23,880.0 (2.73)	144
SO2	63,097.1 (7.20)	169,734.7 (19.37)	169
SO3	40,279.1 (4.60)	91,549.0 (10.45)	127
SO4	19,486.6 (2.22)	39,412.5 (4.50)	102
SO5	66,139.5 (7.55)	583,400.3 (66.58)	782
SO7	130,696.5 (14.92)	208,537.2 (23.80)	60

*SO1: Family planning service, SO2: Antenatal care services, SO3: Abortion, intranatal and postnatal, services, SO4: Newborn care services, SO5: neonatal& child health services, SO7: ANC, reproductive & adolescent care services, Laos kip (In millions), USD (not In millions)

Table 38: Annual cost (In millions Laos kip) for RMNCH service packages by level of service for Laos PDR

Service domain	Outreach		Community		Health center		DH A		DH B		Provincial & Regional		Central	
	2019	**2025**	**2019**	**2025**	**2019**	**2025**	**2019**	**2025**	**2019**	**2025**	**2019**	**2025**	**2019**	**2025**
SO1					3,658.5	9,821.7	1,255.8	2,881.7	1,196.7	2,746.0	1,793.3	4,115.0	1,880.7	4,315.6
SO2	2,838.3	4,223.6	985.0	1,886.0	16,893.1	45,336.1	13,577.4	38,642.2	19,531.4	55,308.0	6,938.0	18,174.2	2,334.0	6,164.4
SO3	0.050	0.22	718.4	1,525.0	231.5	387.8	16,479.6	37,098.4	13,728.0	33,596.3	6,806.0	14,087.3	2,315.5	4,853.9
SO4	1,868.5	4,070.9	-	-	14,566.1	29,533.9	1,021.3	2,077.9	1,028.9	2,093.7	754.5	1,231.9	247.2	404.3
SO5	7,459.2	30,886.5	3,387.9	14,023.2	27,084.6	52,400.9	9,860.5	211,209	14,618.6	220,320	2,796.5	40,920.0	932.2	13,640.0
SO7	62,036	100,134.5	1,107.9	1,311.4	58,222.8	92,224.3	4,295.9	6,839.5	4,292.5	6,830.7	556.6	898.8	184.4	297.9

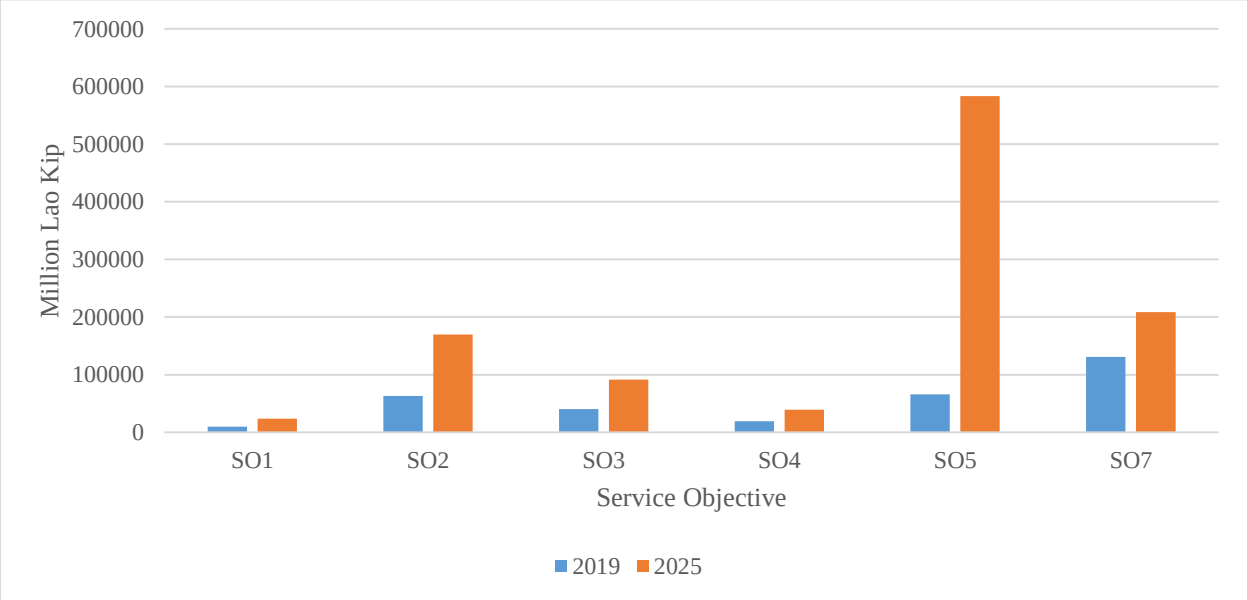
**SO1: Family planning services, SO2: Antenatal care services, SO3: Abortion, intranatal and postnatal services, SO4: Newborn care services, SO5: neonatal & child health services, SO7: ANC, reproductive & adolescent care services*

Table 39: Annual cost (In millions Laos kip) for RMNCH service packages Input wise

Service domain	Human Resource		Diagnostics		Drugs		Consumables		Annual cost	
	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025
SO1	2,058	5,579	-	-	6,829	16,240	898	2,061	9,785	23,880
SO2	22,660	62,472	33,507	92,234	1,177	1,961	5,752	13,068	63,097	169,735
SO3	9,681	18,831	16,366	37,314	10,173	26,964	4,058	8,440	40,279	91,549
SO4	7,631	15,470	-	-	7,429	14,340	4,426	9,602	19,487	39,413
SO5	13,245	44,721	13,239	25,350	22,233	302,811	17,423	210,518	66,140	583,400
SO7	60,909	91,953	-	-	69,788	116,584	-	-	130,696	208,537

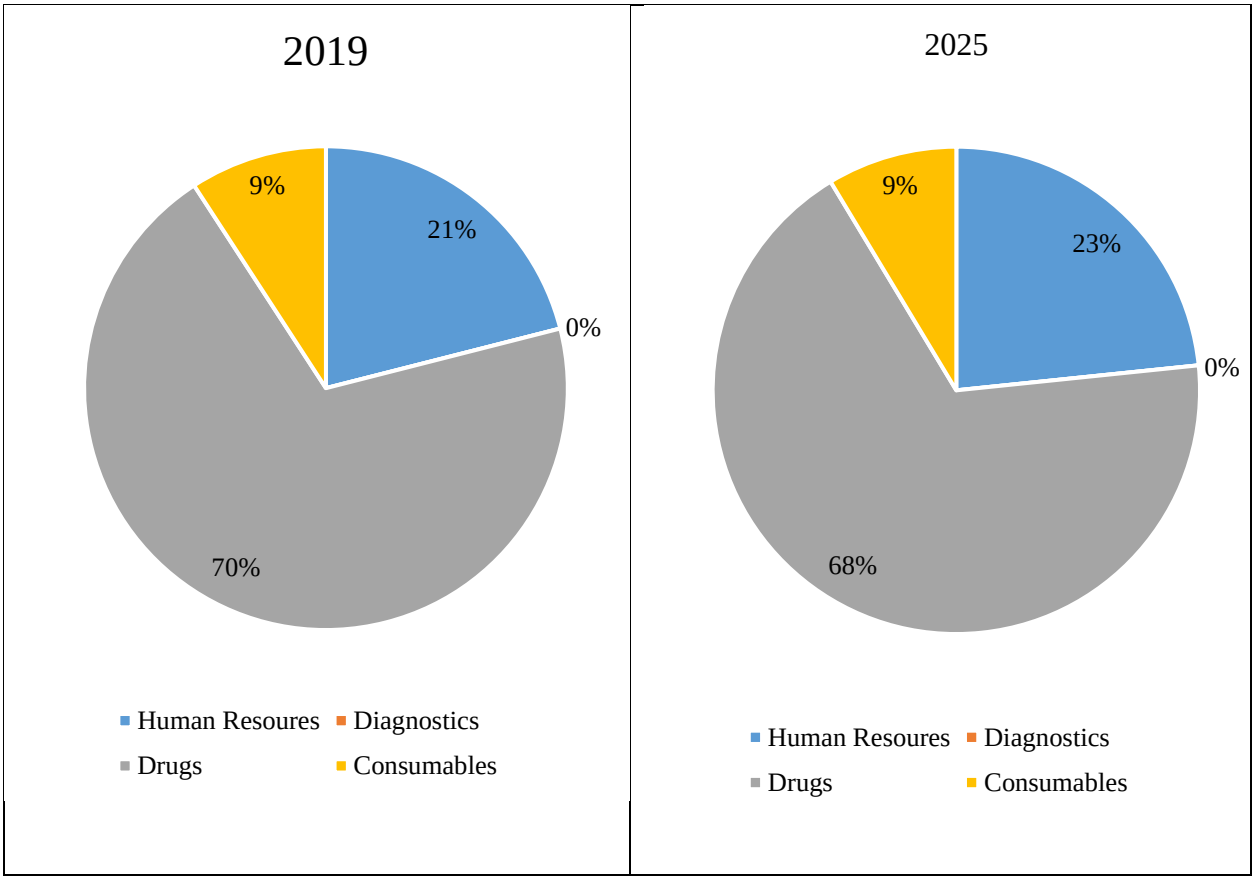
**SO1: Family planning services SO2: Antenatal care services, SO3: Abortion, intranatal and postnatal services, SO4: Newborn care services, SO5: neonatal & child health services, SO7: ANC, reproductive & adolescent care services*

Figure 33: Cost of delivering services under different service objectives



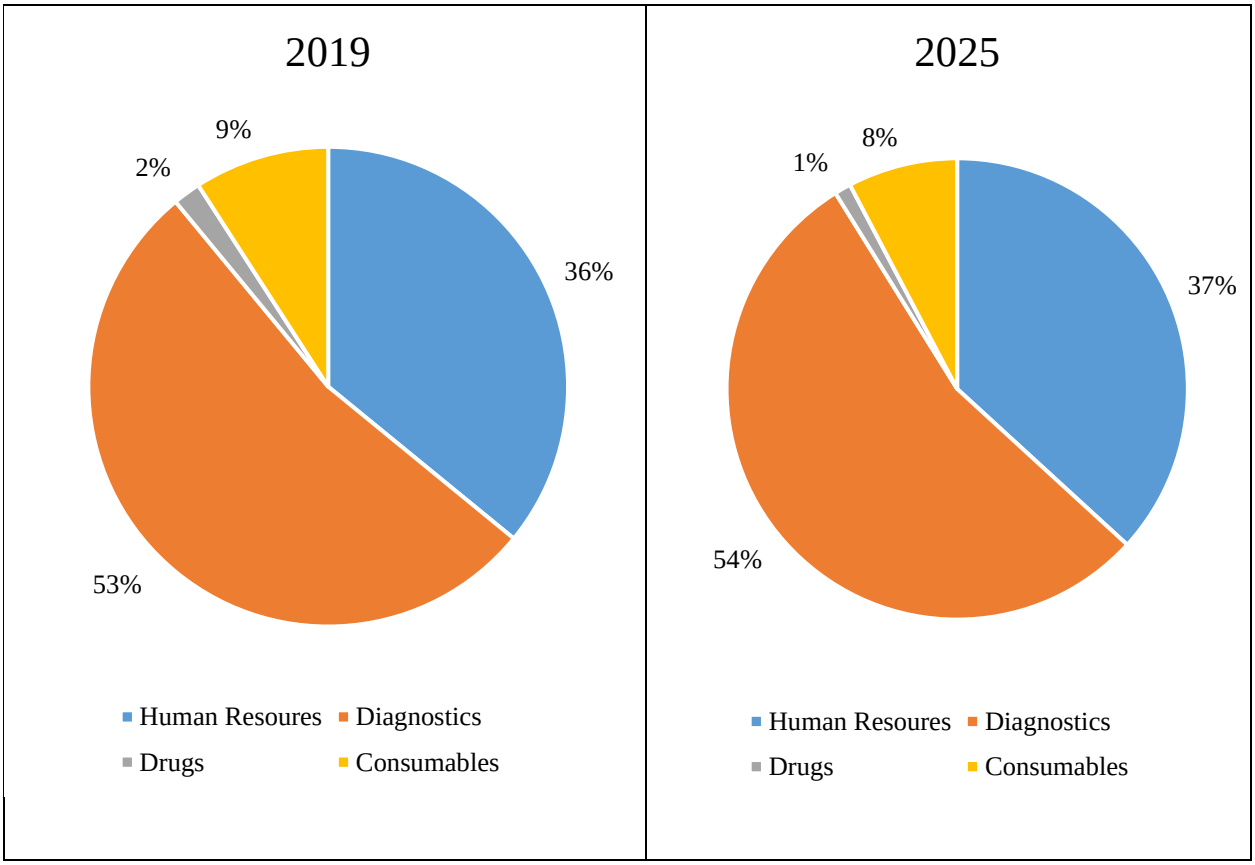
Service Domain: SO1

Figure 34: Distribution of cost by input resources for family planning services (SO1) for Laos PDR



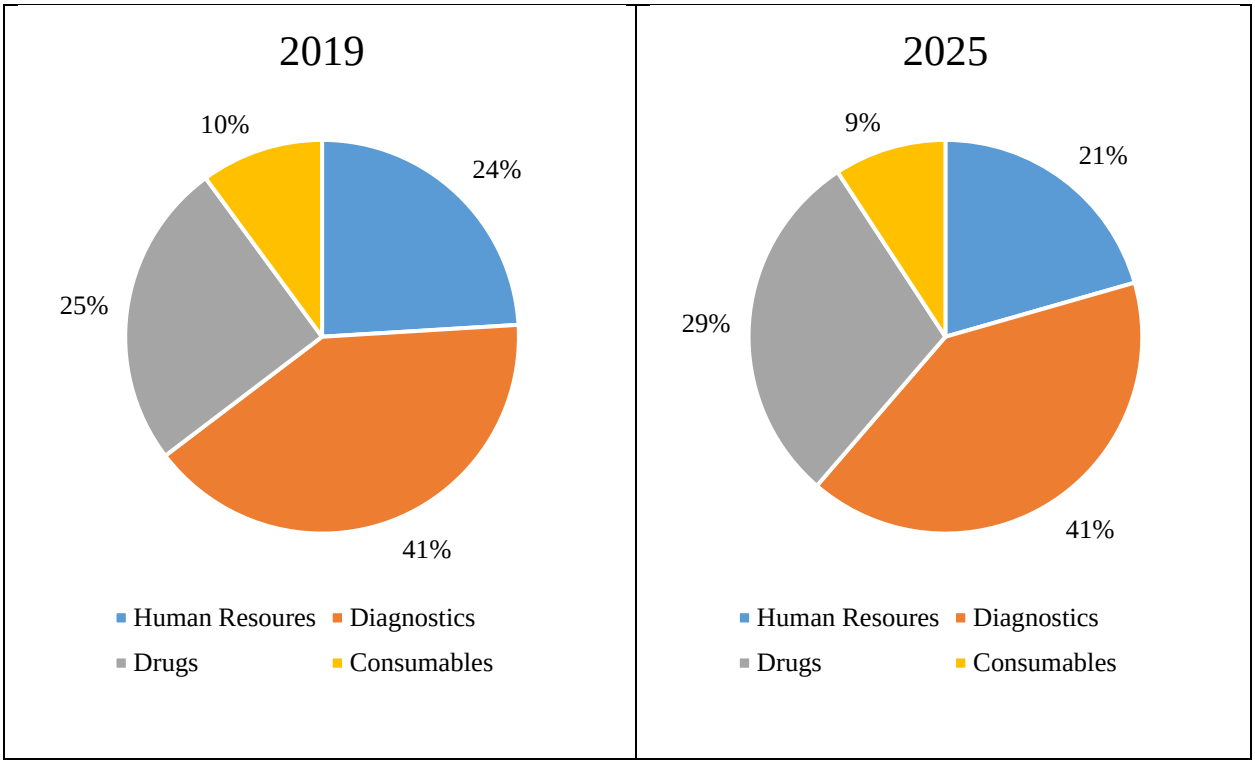
Service Domain: SO2

Figure 35: Distribution of cost by input resources for antenatal care services (SO2) for Laos PDR



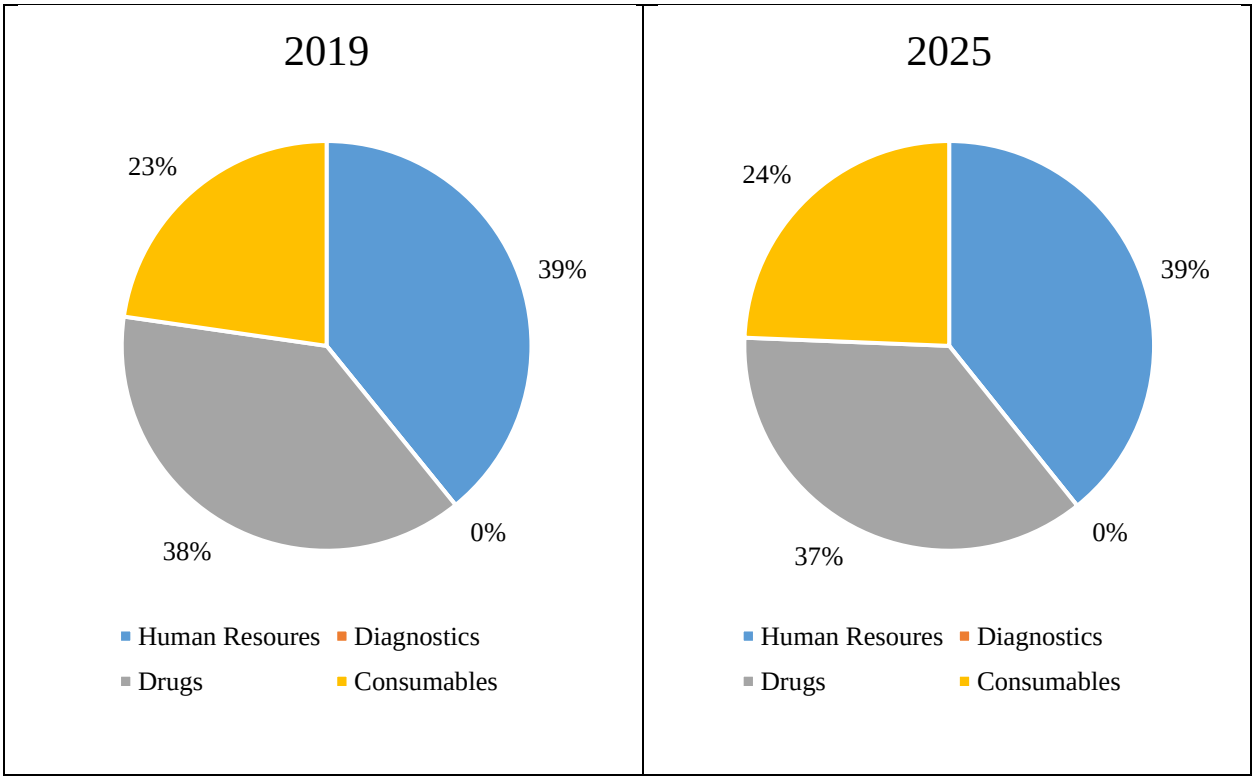
Service Domain: SO3

Figure 36: Distribution of cost by Input resources for abortion, intranatal and postnatal services (SO3) for Laos PDR



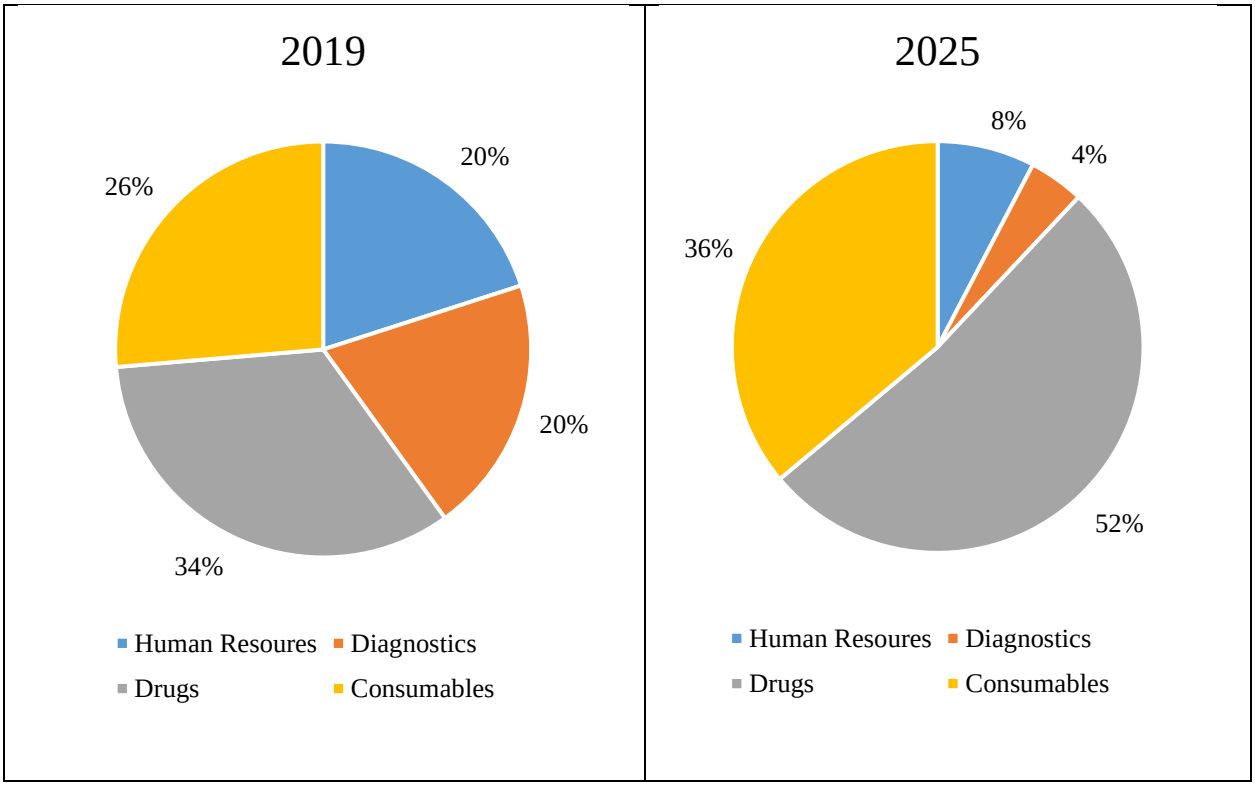
Service Domain: SO4

Figure 37: Distribution of cost by Input resources for newborn care services (SO4) for Laos PDR



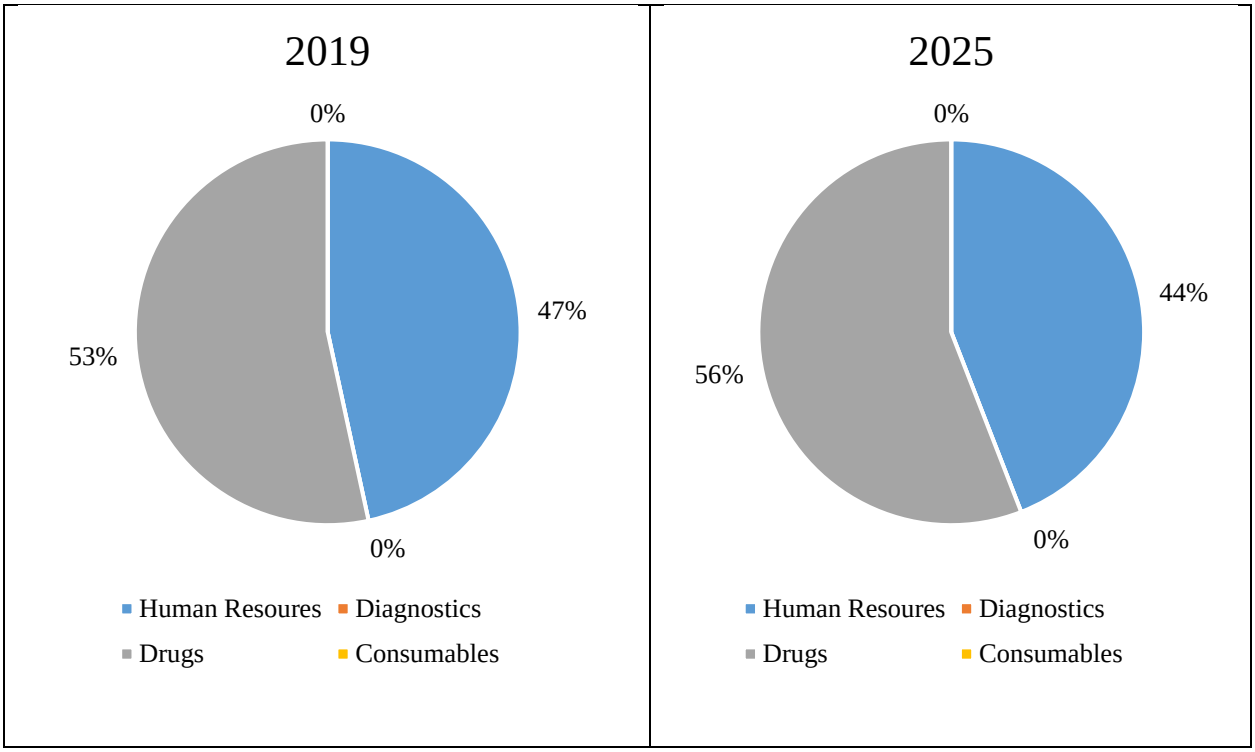
Service Domain: SO5

Figure 38: Distribution of cost by Input resources for neonatal & child health services (SO5) for Laos PDR



Service Domain SO7:

Figure 39: Distribution of cost by Input resources for ANC, reproductive & adolescent care services (SO7) for Laos PDR



HIV

Table 40: Annual cost for HIV service package for Laos PDR

Service domain	Annual Cost In million Laos kip (USD million)		Change (%)
	2019	2025	
HIV	76,625.7 (8.7)	150,437.1 (17.2)	96

Table 41: Annual cost (In millions Laos kip) for HIV service package by level of service for Laos PDR

Service domain	Outreach		Community		Health center		DH A		DH B		Provincial & Regional		Central	
	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025
HIV	20,105	38,287	-	-	14,889	28,621	27,297	54,914	855	1,644	10,141	20,290	3,339	6,681

Table 42: Annual cost (In millions Laos kip) for HIV service package by the resource input

Service domain	Human Resource		Diagnostics		Drugs		Consumables		Annual cost	
	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025
HIV	21,238	41,902	9,018	17,980	36,619	71,031	9,751	19,525	76,626	150,437

Figure 40: Annual cost at current coverage levels (2019) and at 80% coverage (2025) for HIV service package for Laos PDR

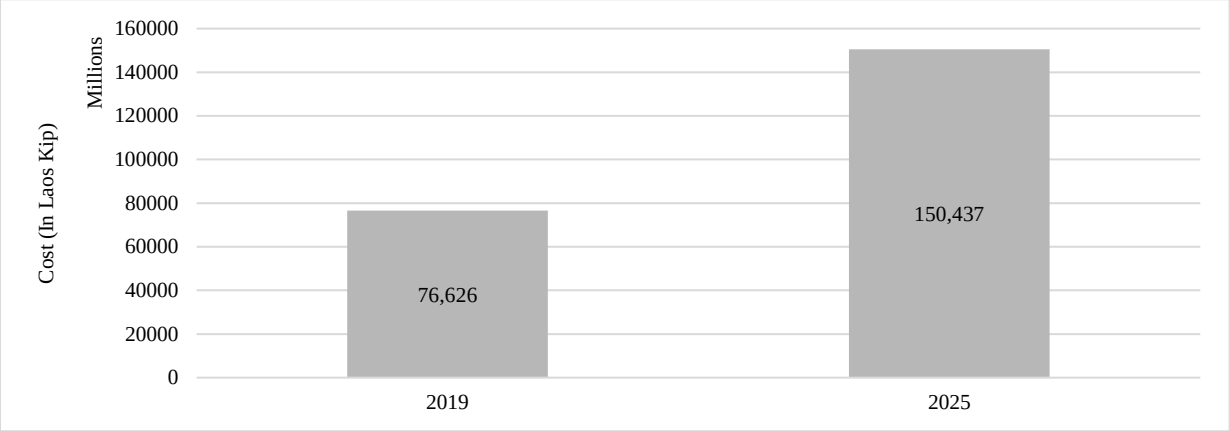
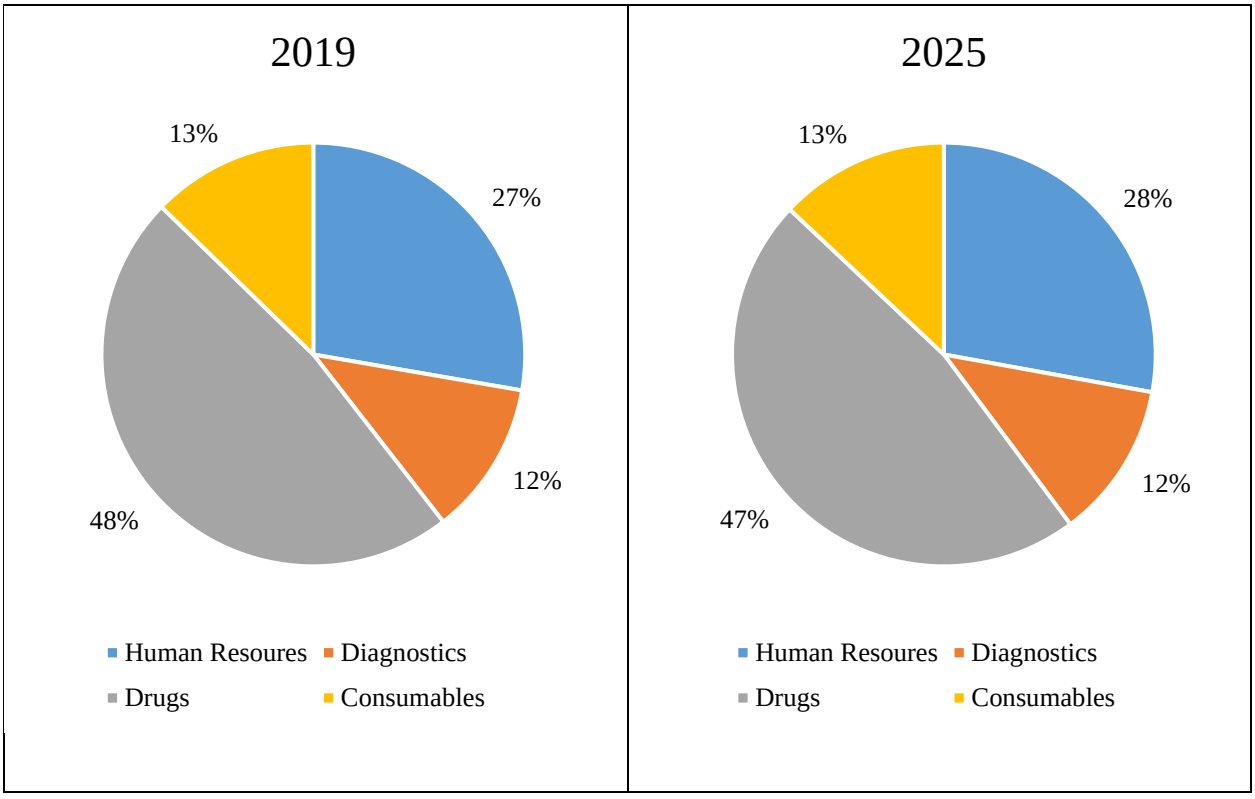


Figure 41: Distribution of cost by Input resources for HIV services for Laos PDR



DCDC Services

Table 43: Annual cost for DCDC service package for Laos PDR:

Service domain	Annual Cost In million Laos kip (USD million)		Change (%)
	2019	2025	
DCDC	68,873.4 (7.9)	171,325.2 (19.6)	149

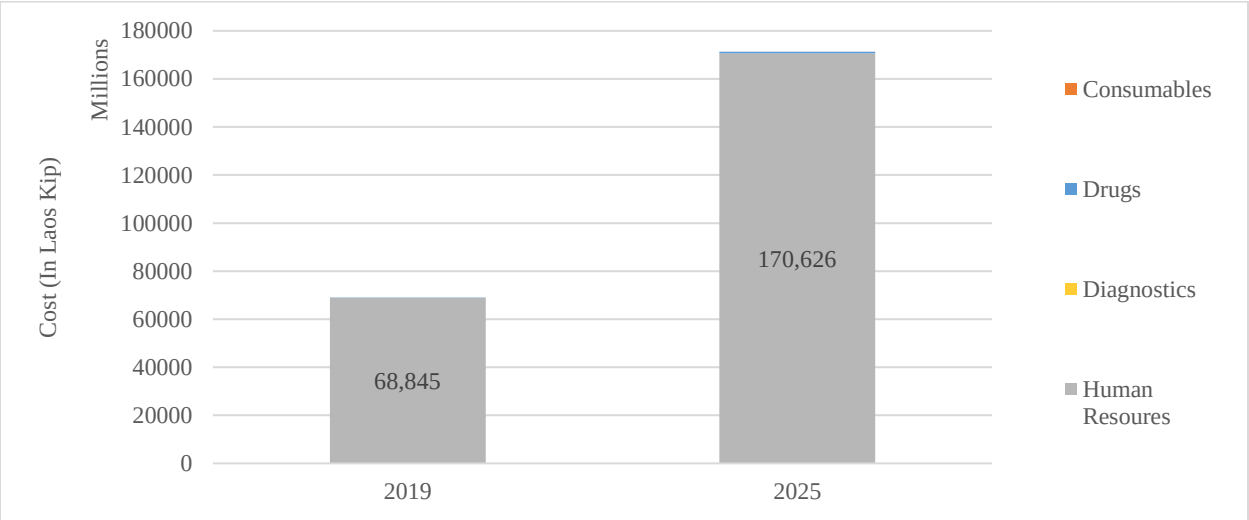
Table 44: Annual cost (In millions Laos kip) for DCDC service package by level of service for Laos PDR

Service domain	Outreach		Community		Health center		DH A		DH B		Provincial & Regional		Central	
	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025
DCDC	28,646	54,551	0.0	0.0	34,531	100,253	2,563	7,432	2,503	7,260	473	1,372	158	457

Table 45: Annual cost (In millions Laos kip) for DCDC service package by the resource input

Service domain	Human Resource		Diagnostics		Drugs		Consumables		Annual cost	
	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025
DCDC	68,845	170,626			28	699			68,873	171,325

Figure 42: Annual cost at current coverage levels (2019) and at 80% coverage (2025) for DCDC service package for Laos PDR



Family Planning

Table 46: Annual cost estimates (In millions Laos Kip) by the level of service delivery for family planning services (SO1) for Laos PDR

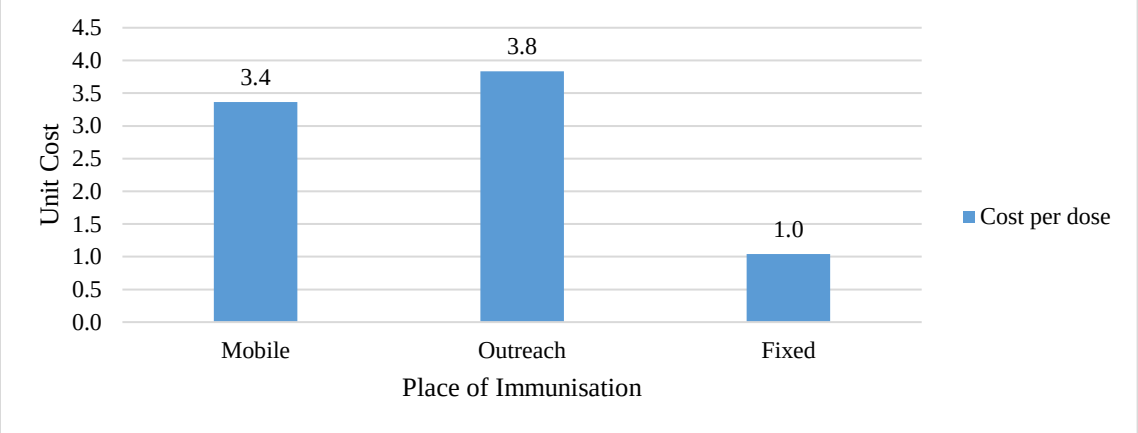
ESP No.	Health center		DH A		DH B		Provincial & Regional		Central	
	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025
ES3_1	18.4	42.3	3.8	8.7	3.4	7.9	3.4	7.9	3.3	7.5
ES3_2	529.3	2,641.2	233.8	536.4	233.8	536.4	350.6	804.6	438.2	1,005.6
ES4	-	-	393.6	903.3	334.8	768.4	502.3	1,152.5	502.3	1,152.5
ES5	1,555.4	3,569.1	312.3	716.7	312.3	716.7	468.5	1,075.0	468.5	1,075.0
ES6	1,555.4	3,569.1	312.3	716.7	312.3	716.7	468.5	1,075.0	468.5	1,075.0
ES7	-	-	-	-	-	-	-	-	-	-
Annual	3,658.5	9,821.7	1,255.8	2,881.7	1,196.7	2,746.0	1,793.3	4,115.0	1,880.7	4,315.6

Unit Costs

Immunization

Based on the data provided for 2019, the unit cost of immunization in Laos is estimated at USD $1.04 for fixed site, USD $3.84 for outreach site and USD $3.36 for mobile site.

Figure 43: Unit cost per dose by site of immunization, 2019



Tuberculosis

Figure 44: Total Cost of Tuberculosis Services Without and With Scale up

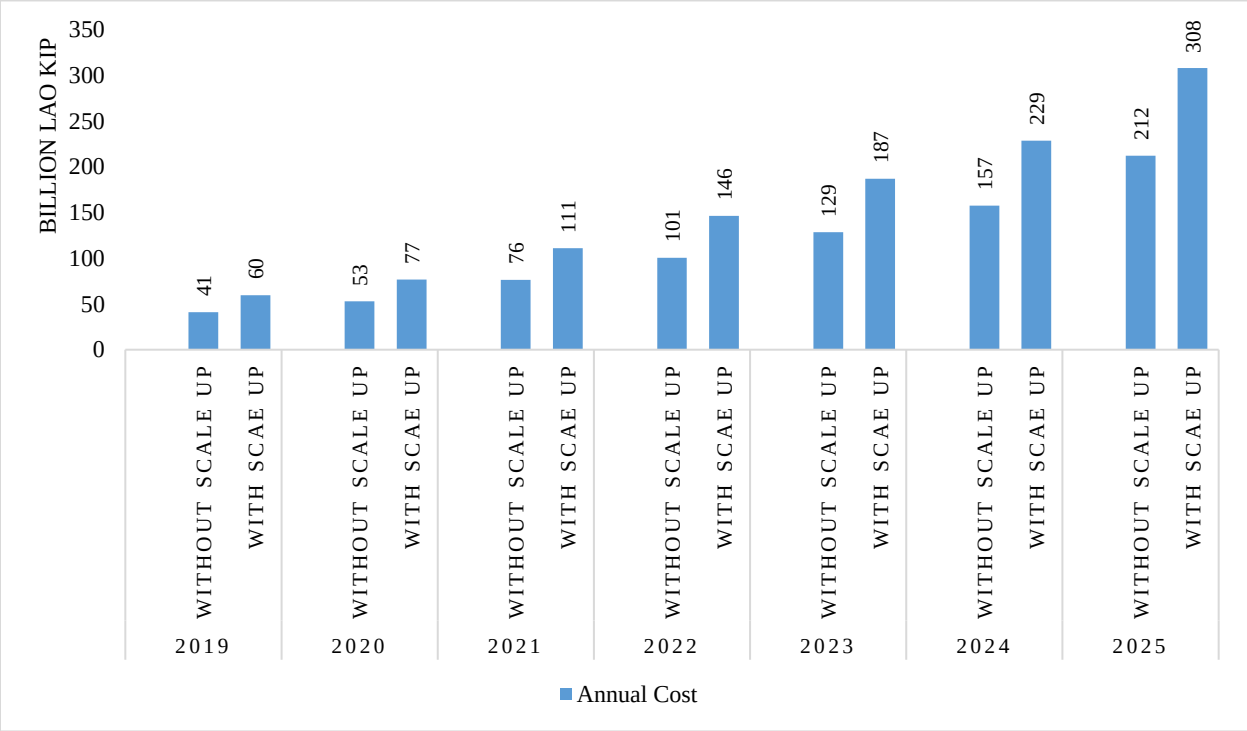
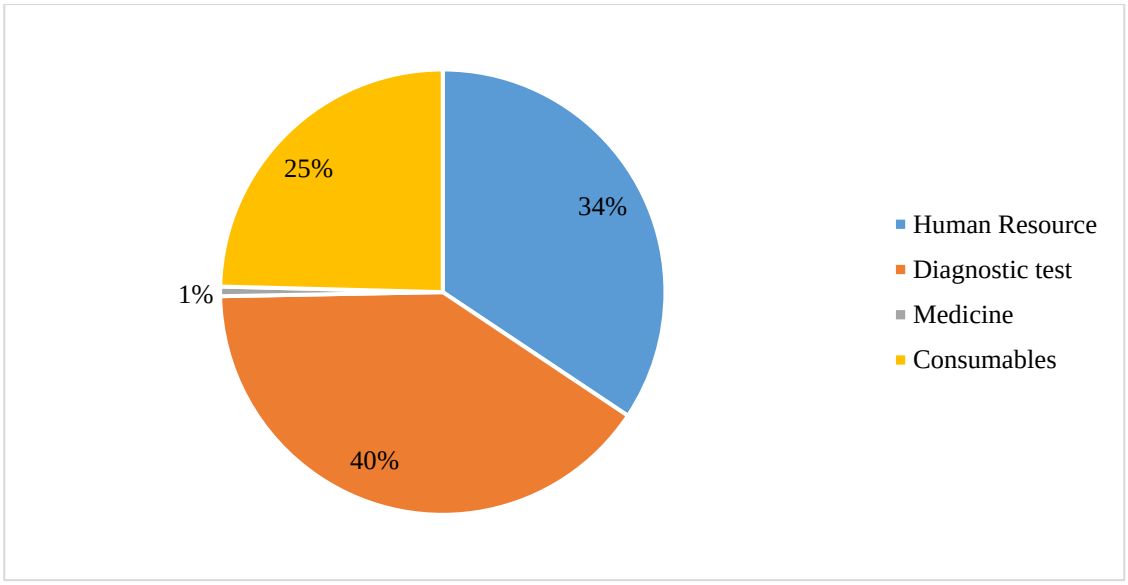


Figure 45: Percentage distribution of inputs of NCD service delivery



Maternal and Child Health Essential Service Packages (SO2, SO3, SO4, SO5 and SO7)

Table 47: Description of ESPs

Domain	ESP No.	Core service
SO1	**ES3_1**	Short acting contraceptive (Condom)
SO1	**ES3_2**	Short acting contraceptive (Oral contraceptives)
SO1	**ES4**	Short acting contraceptive (Injectavle)
SO1	**ES5**	Long-active reversible contraceptive
SO1	**ES6**	Intrauterine Device (IUD)
SO1	**ES7**	"Permanent contraceptive 1) Vesectomy"
SO2	**ES16**	Routine minimum Antenatal Care (Specified in the ANC guideline)
SO2	**ES17**	Screening of aneamia
SO2	**ES18**	Risk factor screening of gestational diabetes mellitus with past and family history, BMI (>30kg/m2). When positive in screening, glycosuria on dipstick testing
SO2	**ES19**	OGTT to diagnose gestational diabetes
SO2	**ES20**	Ultrasound scan before 24 weeks of gestation to estimate gestational age
SO2	**ES21**	Assist pregnant women at community level: Individual health education including their husbands, Detecting antenatal danger signs and refer to health facility, birth and emergency preparedness (ex. Plan for emergency transportation, prepare medical documents, or payment)
SO2	**ES25**	Provide counselling on STI including syphilis and HIV/ AIDS

SO2	**ES26**	Testing of STI (syphilis) and Testing of HIV/ AIDS
SO2	**ES27**	Antiretroviral medicines for HIV positive pregnant women
SO2	**ES30**	Distribute Long-lasting insecticidal nets (LLIN) to pregnant women at ANC in strata 2b (low Malaria burden but has location transmission) and strata 3 (high Malaria burden, mix of local transmission and imported case) districts
SO2	**ES48**	ARV for infants born to identified HIV positive mothers
SO2	**ES49**	Regular assessment of mother (blood pressure measurement, vaginal bleeding, uterine contraction, urine void, fundal height, temperature, heart rate (pulse), and breastfeeding routinely during the first 24 hours starting from the first hour after birth.)
SO2	**ES50**	Counselling to mothers on physiological recover, danger signs, nutrition, hygiene, malaria protection, mobilisation, family planning, breastfeeding
SO2	**ES51**	Regular assessment of newborn (feeding, history of convulsions, fast breathing, chest in-drawing, spontanous movement, fever, low body temperature, jaudice <24hrs, yellow palms and soles at any time, Dry cord care and assessment of signs of cord infection)
SO3	**ES11**	Counselling for women with unplanned, mistimed or unwanted pregnancies, including abortion services
SO3	**ES12**	Medical abortion intervention
SO3	**ES13**	Surgical abortion intervention
SO3	**ES14**	Routine post-abortion follow-up, including post-abortion contraceptives

SO3	**ES15**	Management of complications (ongoing pregnancy)
SO3	**ES28**	Antihypertensive drugs to treat high blood pressure
SO3	**ES29**	Low dose aspirin for high-risk women to prevent pre-eclampsia
SO3	**ES31**	Corticosteroids to prevent respiratory distress syndrome
SO3	**ES32**	Administration of a uterotonic to prevent postpartum hemorrhage
SO3	**ES33**	Augmentation (for prolonged labour)
SO3	**ES34**	Induction of labour (e.g. to manage prelabour rupture of membrane or prolonged pregnancies)
SO3	**ES35**	Administer parenteral antibiotics for cases with indication
SO3	**ES36**	Manual removal of placenta, Remove retained products (MVA)
SO3	**ES37**	Perform assisted vaginal delivery
SO3	**ES38**	Neonatal resuscitation with bag and mask
SO3	**ES39**	Comprehensive EmONC: Caesarean section
SO3	**ES40**	Minimum maternal and newborn care for unplanned home delivery (e.g. cord care, immediate and thorough drying, immediate skin-to-skin contact, initiation of exclusive breastfeeding)
SO3	**ES41**	Detect danger signs for mother and baby during unplanned home deliveries, and refer to health facility
SO3	**ES55**	Report suspected maternal deaths

SO4	**ES42**	Early essential newborn care (immediate and thorough drying, immediate skin-to-skin contact, delayed cord clamping, dry cord care, initiation of exclusive breastfeeding, infection prevention, eye prophylaxis)
SO4	**ES44**	Detect and refer low-birth weight (< 2000 g)
SO4	**ES45**	Kangroo Mother Care for low-birth weight infants
SO4	**ES46**	Management of newborns with sepsis
SO4	**ES47**	CPAP to manage respiratory distress syndrome
SO4	**ES53**	"Review of general well-being, micturition and urinary incontinence, bowel function, healing of any perineal wound, headache, fatigue, back pain, perineal pain and perineal hygiene, breast pain, uterine tenderness and lochia. Assessment and counselling on breastfeeding progress. Review of emotional wellbeing Observation for domestic abuse Counselling on family planning
SO4	**ES54**	Detecting postpartum danger signs and refer to health facility
SO5	**ES60**	Integrated management of newborn childhood illnesses (IMNCI)
SO5	**ES61**	Management of severe acute malnutrition without complication
SO5	**ES62**	Management of severe acute malnutrition with complication Penicillin (Amoxycillin/ Benzyl penicillin) / Gentamicin/ Chloramphenicol/ Cotrimoxazole/ Sulphamethoxazole / Trimethoprim/ Ciprofloxacin/ Tetracycline eye ointment / Mebendazole, Anti-malaria drugs, Paracetamol, Vitamin A/ Iron, ORS, Chlorpromazine, Gentian violet, ReSoMaL and oral potassium solution (chlorvescent)

SO5	**ES63**	Child curative care according to the WHO Pocketbook Epinephrine, Diazepam / Phenobarbital, Salbutamol for nebulizer / Corticosteroids, Opioids, Penicillin (ampicillin/ amoxicillin/ cloxacillin/ Augmentin)/ Cephalosporin/ Chloramphenicol/ Quinolone (ciprofloxacin/ ofloxacin) / Gentamicin/ Co-trimoxazole/ Doxycycline/ Mebendazole/ Albendazole, TB drugs, Anti-malaria drugs, Digoxin/ Furosemide, Caffeine /aminophylline, Iron / Vitamin-mineral mix/ Vitamin A/B1/K, ORS/Zinc
SO5	**ES64**	Community based case management of diarrhea (ORS and Zn)
SO5	**ES65**	Community based case management - of pneumonia (antibiotics)
SO5	**ES66**	Detect danger signs for severe child illness (e.g. severe acute malnutrition) and refer
SO7	**ES10**	Weekly iron & folic acid supplementation for reproductive women
SO7	**ES22**	Provide deworming for pregnant women after the first trimester
SO7	**ES23**	Daily Iron and folic acid to prevent maternal anemia, puerperal sepsis, low birth weight, and preterm birth
SO7	**ES52**	Provide Iron and folic acid supplementation and Vitamin B1 for postpartum/ lactating women
SO7	**ES57**	Vitamin A and deworming for under 5 children
SO7	**ES58**	Screening of nutrition status with MUAC for children under 5 years of age
SO7	**ES59**	Growth monitoring and counselling

Table 48: Annual cost estimates (In millions Laos Kip) by the level of service delivery for antenatal care services (SO2) for Laos PDR

ESP No.	Outreach		Community		Health center		DH A		DH B		PH & RH		Central	
	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025
ES16	2,838.3	4,223.6			4,641.8	6,907.5	6,723.1	10,004.6	6,128.9	9,120.4	1,479.5	2,201.6	501.9	746.9
ES17							1,259.6	3,280.3	6,859.7	17,863.9	1,266.4	3,297.9	420.5	1,095.1
ES18					2,391.6	6,197.2	500.5	1,296.9	500.5	1,296.9	123.7	320.6	41.5	107.5
ES19											2,536.5	6,572.5	845.5	2,190.8
ES20							2,301.4	5,963.4	2,258.5	5,852.1	409.9	1,062.2	137.7	356.8
ES21			985.0	1,886.0										
ES25					0.32	333.0	0.024	25.6	0.019	20.3	0.0038	4.0	0.0013	1.3
ES26							2,008.9	15,501.0	2,008.9	15,501.0	370.9	2,861.7	135.2	1,043.4
ES27											366.0	710.3	122.0	236.7
ES30					894.7	1,447.1	52.7	85.3	52.7	85.3	9.7	15.7	3.1	5.0
ES48											46.0	59.9	15.3	20.0
ES49					1,967.2	7,017.6	210.1	749.5	954.1	3,403.7	176.1	628.4	58.9	210.1
ES50					6,162.6	21,984.1	453.8	1,619.0	453.8	1,619.0	94.6	337.4	32.7	116.7
ES51					834.9	1,449.6	67.1	116.5	314.2	545.5	58.7	101.9	19.6	34.1
Annual	2,838.3	4,223.6	985.0	1,886.0	16,893.1	45,336.1	13,577.4	38,642.2	19,531.4	55,308.0	6,938.0	18,174.2	2,334.0	6,164.4

Table 49: Annual cost estimates (In millions Laos Kip) by the level of service delivery for abortion, intranatal and postnatal services (SO3) for Laos PDR

ESP No.	Outreach		Community		Health center		DH A		DH B		PH & RH		Central	
	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025
ES11	-	-	-	-	231.5	387.6	17.1	28.7	17.1	28.7	3.5	5.9	1.2	2.0
ES12	-	-	-	-	-	-	1,974.1	5,272.6	2,922.2	7,805.1	539.5	1,440.9	179.8	480.3
ES13	-	-	-	-	-	-	319.6	853.7	474.7	1,267.8	87.4	233.5	29.1	77.8
ES14	-	-	-	-	-	-	4,274.6	11,417.1	4,274.6	11,417.1	792.1	2,115.8	263.0	702.6
ES15	-	-	-	-	-	-	4,486.5	7,256.9	-	-	1,534.2	2,481.6	511.8	827.9
ES28	-	-	-	-	-	-	883.6	2,772.4	1,439.4	4,516.2	288.1	903.9	151.2	474.3
ES29	-	-	-	-	-	-	300.6	943.2	300.6	943.2	65.1	204.4	21.7	68.1
ES31	-	-	-	-	-	-	751.8	2,288.0	-	-	138.8	422.4	46.3	140.8
ES32	-	-	-	-	-	-	21.2	48.6	21.2	48.6	3.9	9.0	1.3	3.0
ES33	-	-	-	-	-	-	184.3	497.3	-	-	102.2	275.8	34.1	91.9
ES34	-	-	-	-	-	-	-	-	-	-	312.3	897.1	104.1	299.0
ES35	-	-	-	-	-	-	244.1	560.4	430.6	988.6	80.5	184.7	27.5	63.2
ES36	-	-	-	-	-	-	33.9	58.4	71.1	122.4	13.4	23.0	4.6	7.9
ES37	-	-	-	-	-	-	2,566.9	4,419.6	3,358.8	5,782.9	694.4	1,195.6	203.3	350.0
ES38	-	-	-	-	-	-	421.4	681.5	417.8	675.8	86.0	139.0	28.4	46.0
ES39	-	-	-	-	-	-	-	-	-	-	2,064.6	3,554.7	708.0	1,219.0
ES40	-	-	351.4	813.4	-	-	-	-	-	-	-	-	-	-
ES41	-	-	367.0	711.7	-	-	-	-	-	-	-	-	-	-
ES55	0.050	0.22	-	-	0.039	0.18	-	-	-	-	-	-	-	-
Annual	0.050	0.22	718.4	1,525.0	231.5	387.8	16,479.6	37,098.4	13,728.0	33,596.3	6,806.0	14,087.3	2,315.5	4,853.9

Table 50: Annual cost estimates (In millions Laos Kip) by the level of service delivery for newborn care services (SO4) for Laos PDR

ESP No.	Outreach		Community		Health center		DH A		DH B		PH & RH		Central	
	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025
ES42					2,053.7	4.057.3	146.9	290.3	150.7	297.7	27.1	53.6	9.0	17.9
ES44	57.0	64.5			101.3	114.5	9.9	11.2	9.9	11.2	1.9	2.2	0.6	0.7
ES45					1,931.3	2,184.8	125.4	141.9	125.4	141.9	23.4	26.5	7.8	8.8
ES46														
ES47											565.6	847.9	184.3	276.2
ES53	1,811.5	4,006.4			10,479.8	23,177	739.1	1634.5	742.9	1643.0	136.4	301.8	45.5	100.6
ES54														
Annual	1,868.5	4,070.9			14,566.1	29,533	1,021.3	2,077.9	1,028.9	2,093.7	754.5	1,231.9	247.2	404.3

Table 51: Annual cost estimates (In millions Laos Kip) by the level of service delivery for neonatal & child health services (SO5) for Laos PDR

ESP No.	Outreach		Community		Health center		DH A		DH B		PH & RH		Central	
	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025
ES60					27,041.7	51,780.4	4,740.1	9,076.4	9,498.2	18,187.4	1,843.5	3,530.1	614.5	1,176.7
ES61	1.1	15.7			42.9	620.5	2.5	36.8	2.5	36.8	0.5	6.8	0.2	2.3
ES62							4,635.0	201,171.5	4,635.0	201,171.5	857.1	37,200.4	285.7	12,400.1
ES63							482.9	924.7	482.9	924.7	95.4	182.7	31.8	60.9
ES64	6,868.6	28,619.2	3,120.1	13,000.4										
ES65	589.5	2,251.6	267.8	1,022.8										
ES66														
Annual	7,459.2	30,886.5	3,387.9	14,023.2	27,084.6	52,400.9	9,860.5	211,209.4	14,618.6	220,320.4	2,796.5	40,920.0	932.2	13,640.0

Table 52: Annual cost estimates (In Laos Kip) by the level of service delivery for ANC, reproductive & adolescent care services (SO7) for Laos PDR

ESP	Outreach		Community		Health center		DH A		DH B		PH & RH		Central	
No.	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025
ES10	47,523.3	79,587.6			41,570.9	69,619.1	2,825.5	4,731.9	2,825.5	4,731.9	363.2	608.3	119.9	200.9
ES22							440.1	711.9	428.7	693.4	93.3	150.9	31.5	50.9
ES23	1,443.7	2,193.1			1,573.8	2,390.7	94.2	143.1	94.2	143.1	13.1	19.9	4.4	6.6
ES52	1,407.0	2,442.8			1,505.8	2,614.2	91.1	158.1	91.1	158.1	13.0	22.5	4.3	7.5
ES57	5,676.7	8,825.7			4,135.9	6,430.2	254.2	395.2	254.2	395.2	26.0	40.5	8.7	13.5
ES58	2,438.9	2,886.9	1,107.9	1,311.4	2,519.8	2,982.7	156.5	185.2	159.8	189.2				
ES59	3,546.7	4,198.3			6,916.7	8,187.4	434.2	514.0	439.0	519.6	47.9	56.7	15.7	18.5
Annual	62,036.3	100,134.5	1,107.9	1,311.4	58,222.8	92,224.3	4,295.9	6,839.5	4,292.5	6,830.7	556.6	898.8	184.4	297.9

Figures

Service Domain: SO2

Figure 46: Distribution of Annual cost (In Laos Kip) by cost component for service ES16

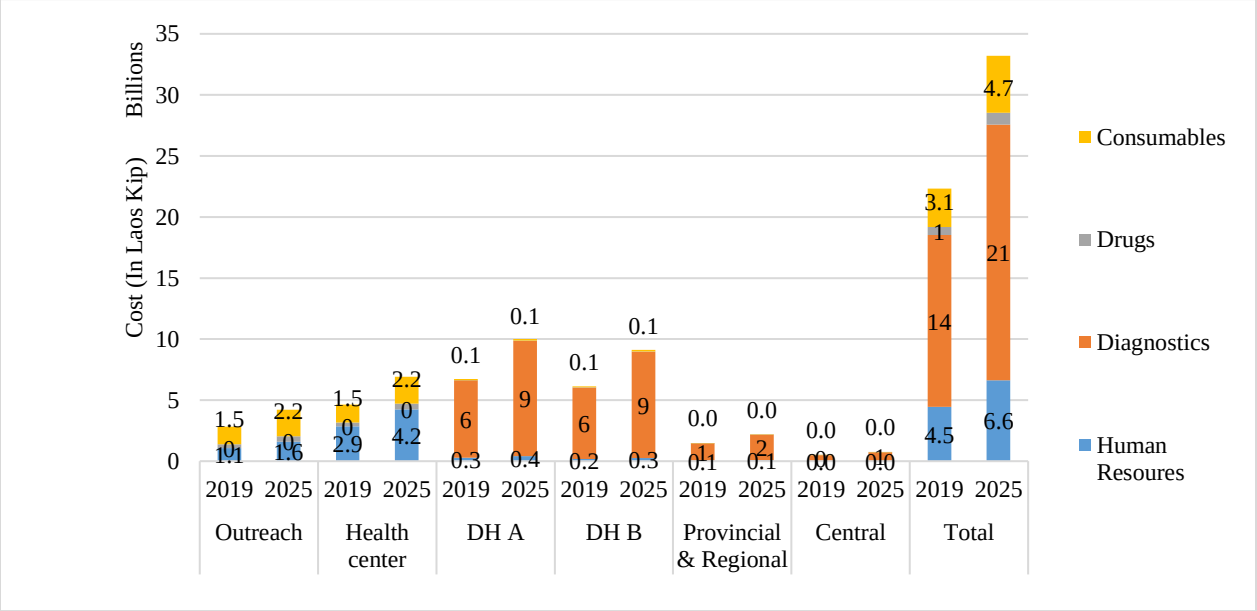


Figure 47: Distribution of Annual cost (In Laos Kip) by cost component for service ES17

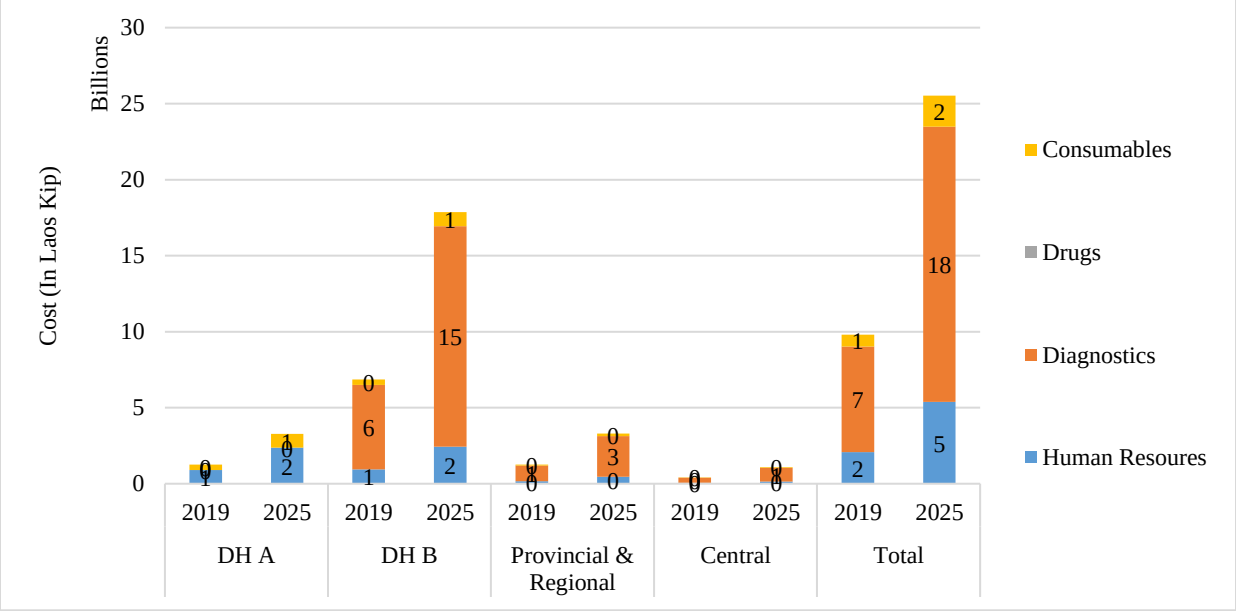


Figure 48: Distribution of Annual cost (In Laos Kip) by cost component for service ES18

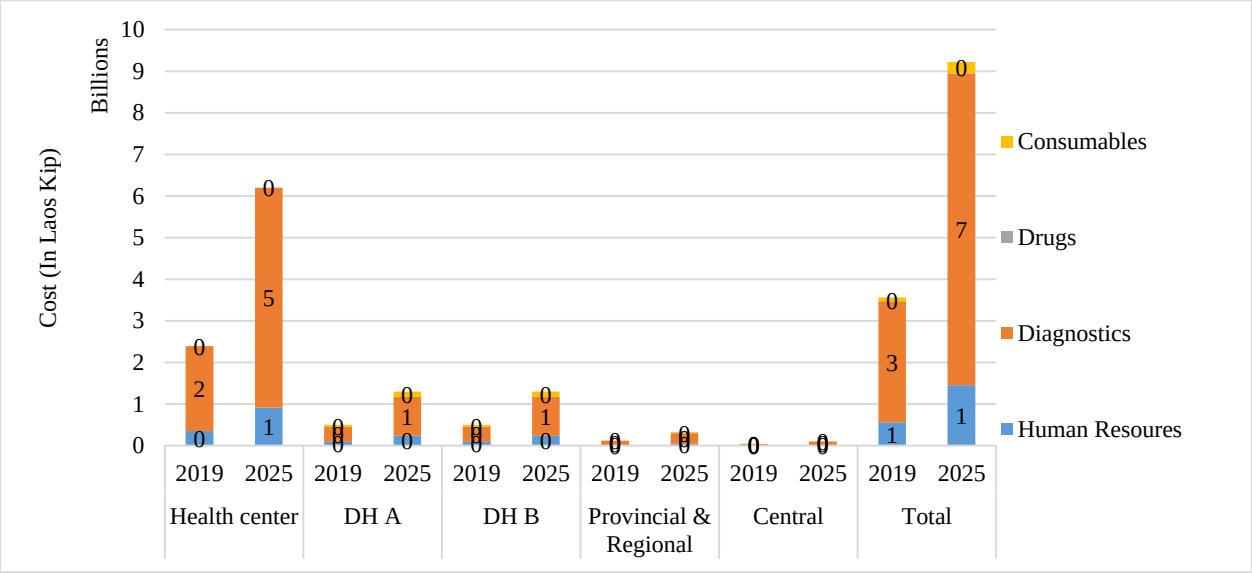


Figure 49: Distribution of Annual cost (In Laos Kip) by cost component for service ES19

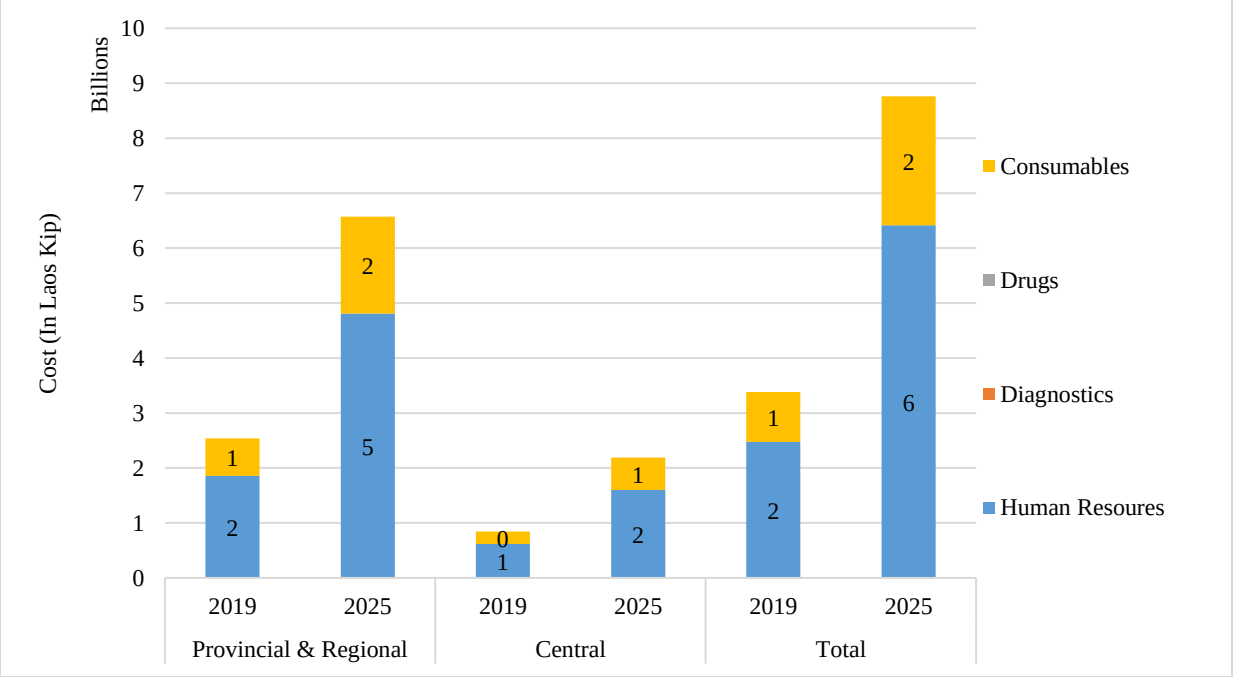


Figure 50: Distribution of Annual cost (In Laos Kip) by cost component for service ES20

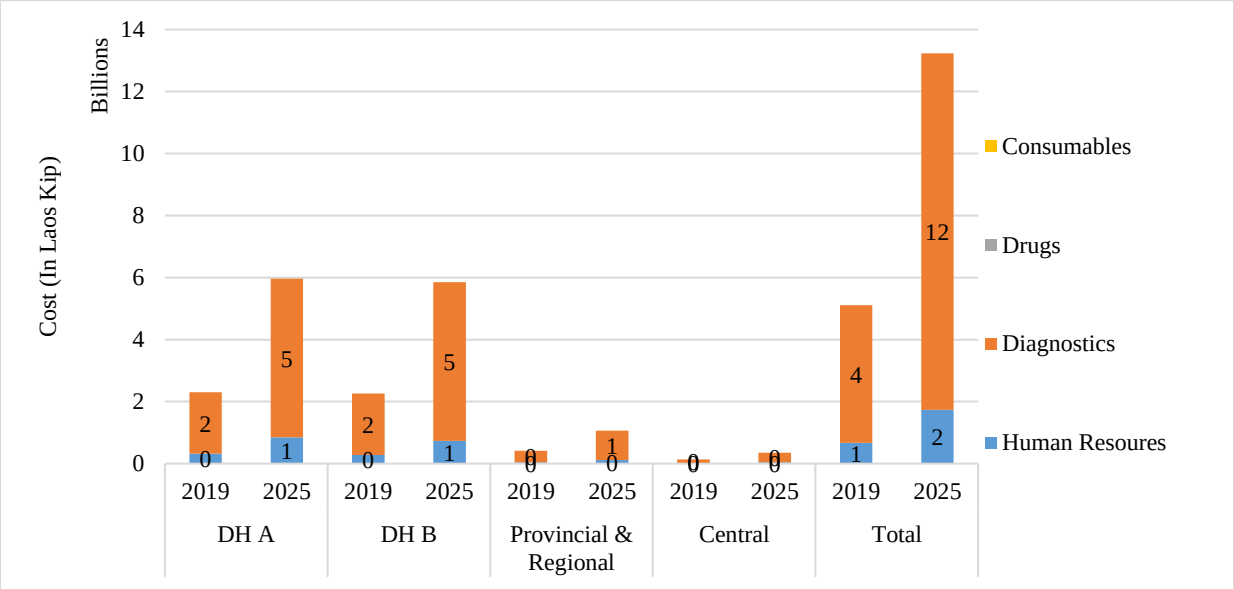


Figure 51: Distribution of Annual cost (In Laos Kip) by cost component for service ES21

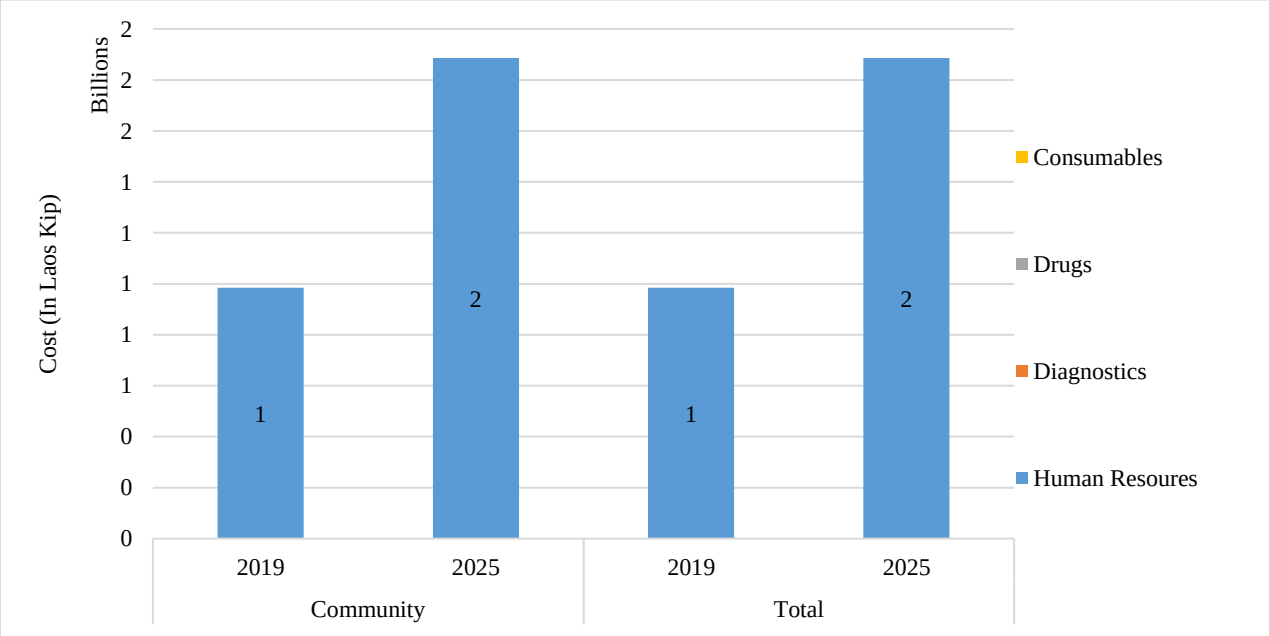


Figure 52: Distribution of Annual cost (In Laos Kip) by cost component for service ES25

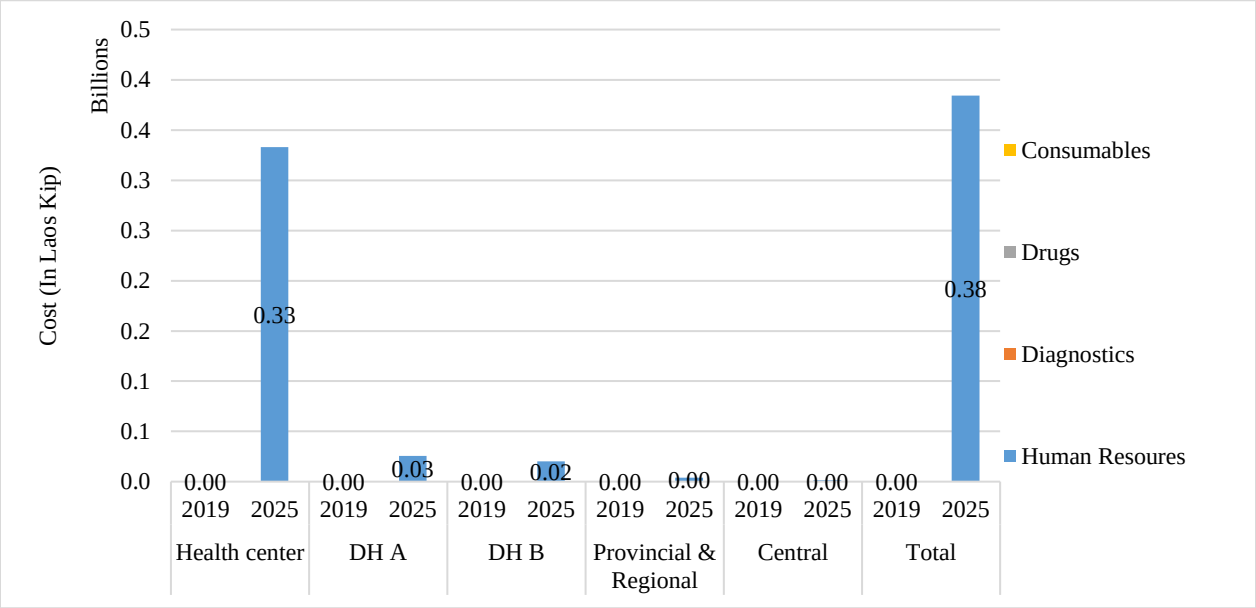


Figure 53: Distribution of Annual cost (In Laos Kip) by cost component for service ES26

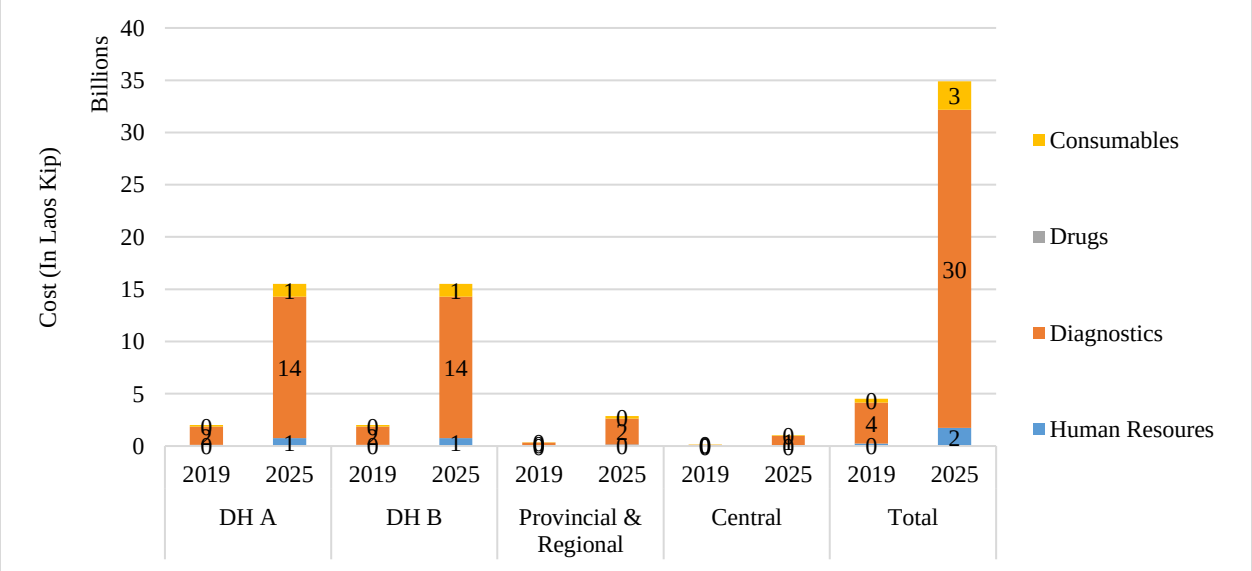


Figure 54: Distribution of Annual cost (In Laos Kip) by cost component for service ES27

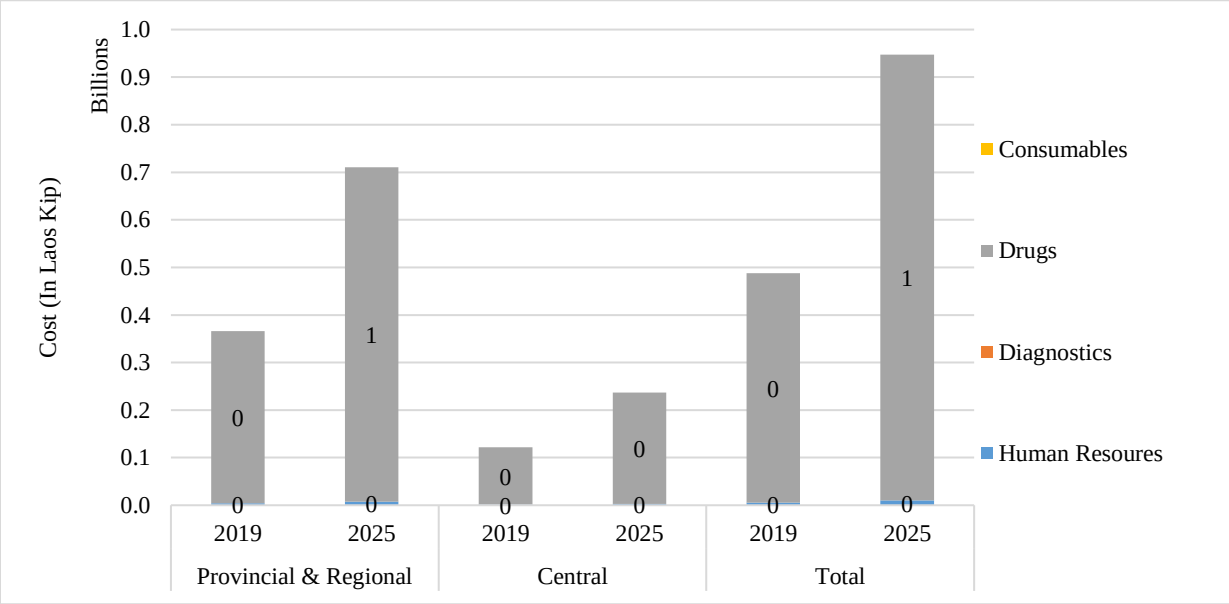


Figure 55: Distribution of Annual cost (In Laos Kip) by cost component for service ES30

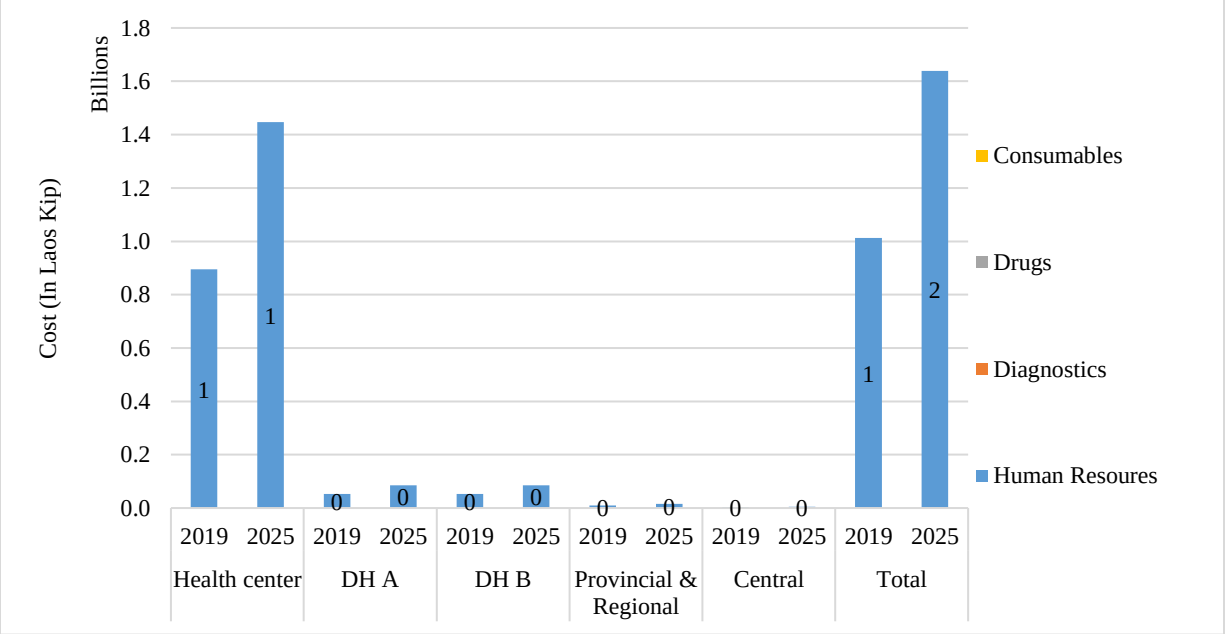


Figure 56: Distribution of Annual cost (In Laos Kip) by cost component for service ES48

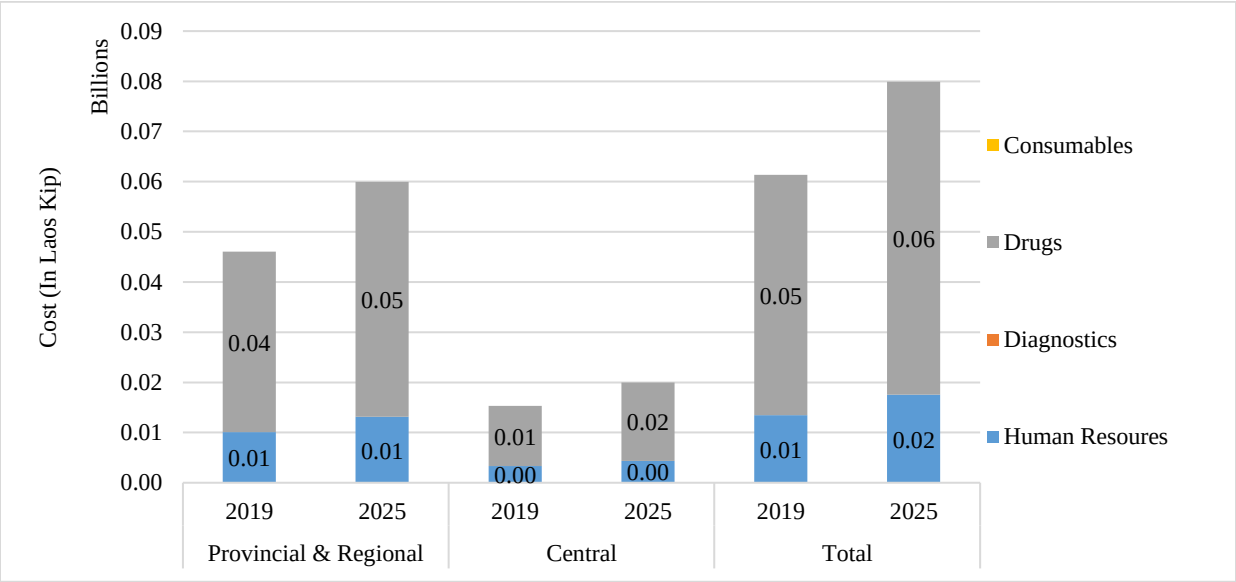


Figure 57: Distribution of Annual cost (In Laos Kip) by cost component for service ES49

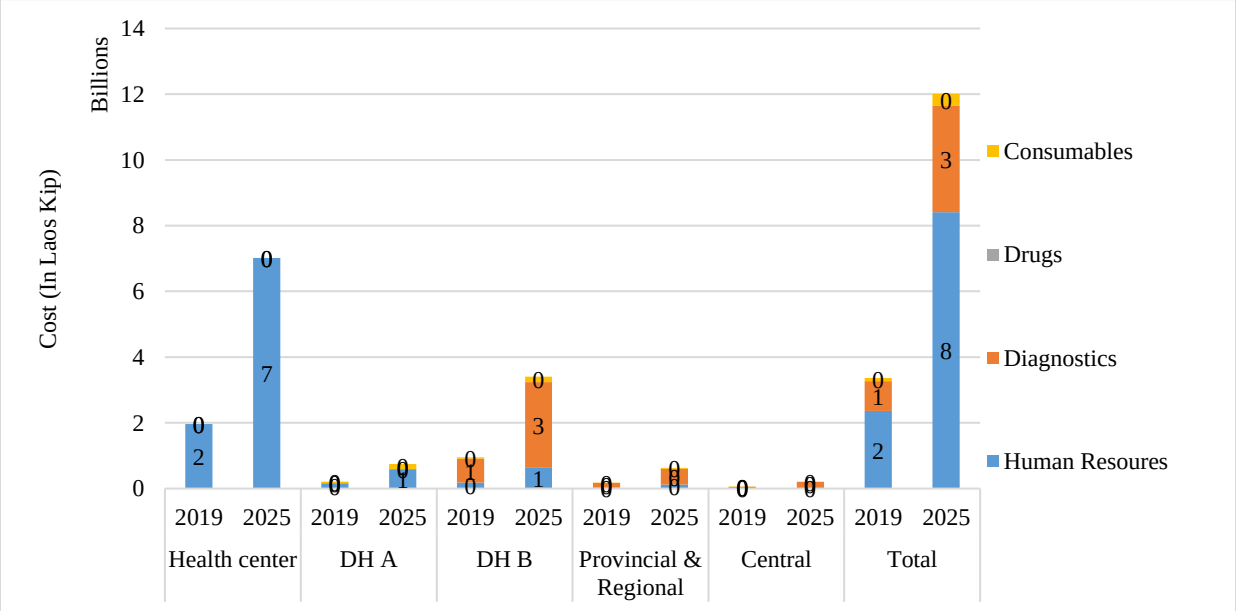


Figure 58: Distribution of Annual cost (In Laos Kip) by cost component for service ES50

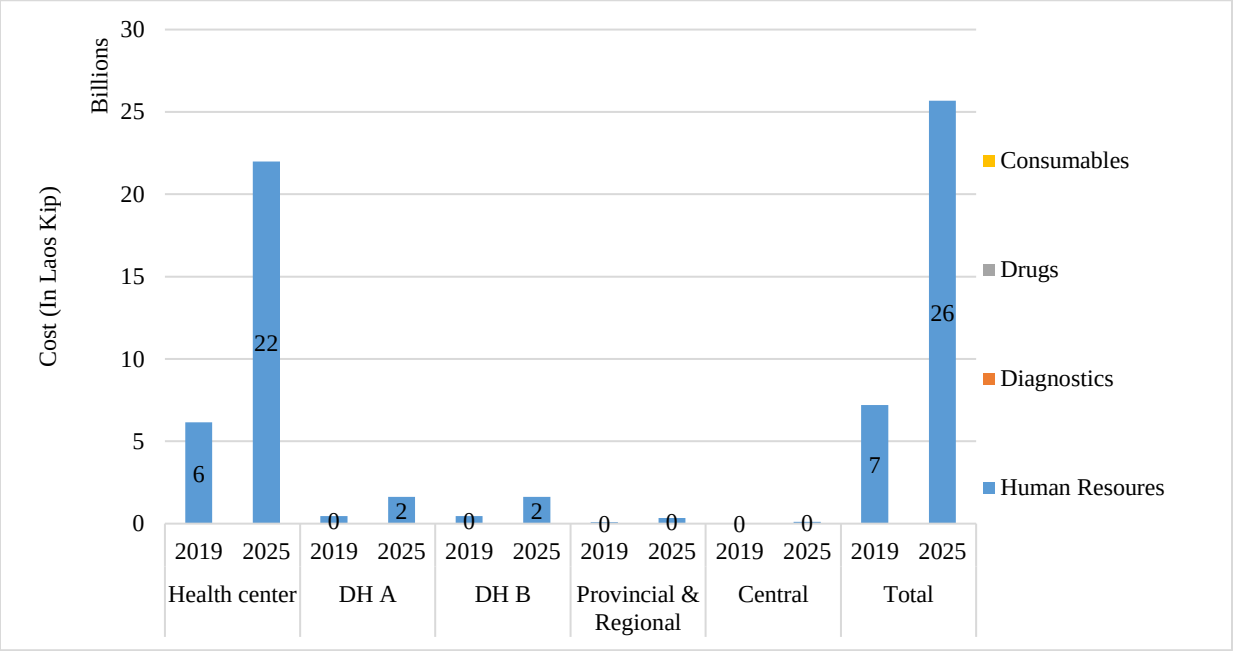
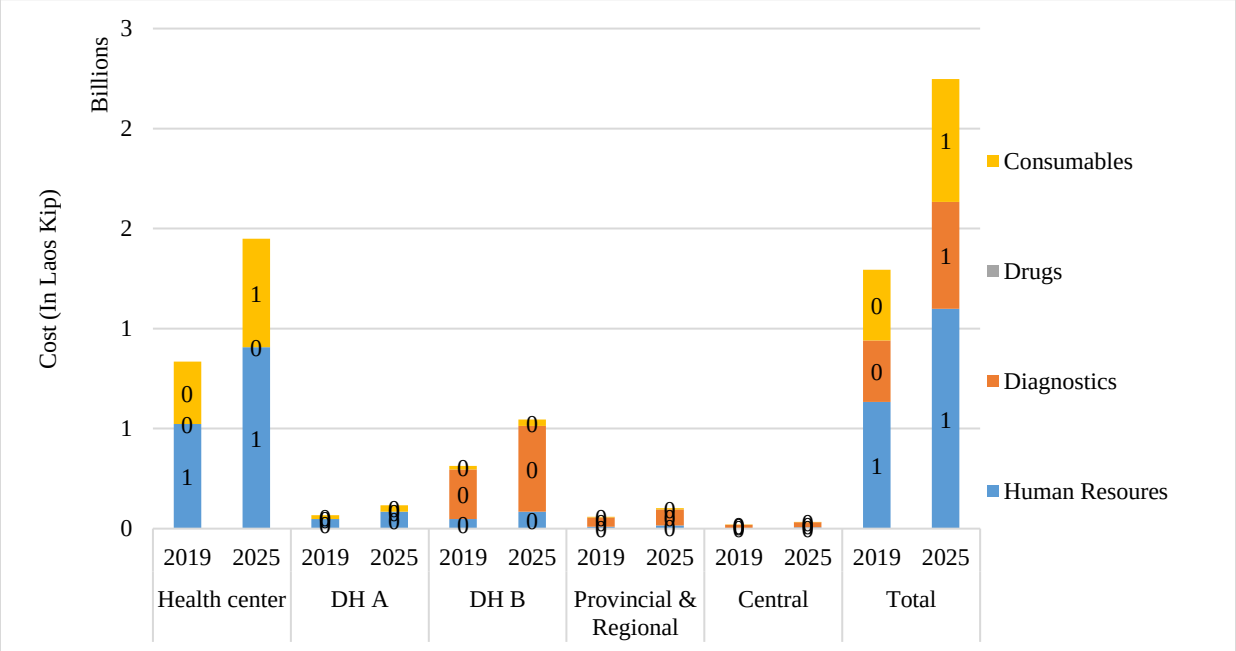


Figure 59: Distribution of Annual cost (In Laos Kip) by cost component for service ES51



Service Domain: SO3

Figure 60: Distribution of Annual cost (In Laos Kip) by cost component for service ES11

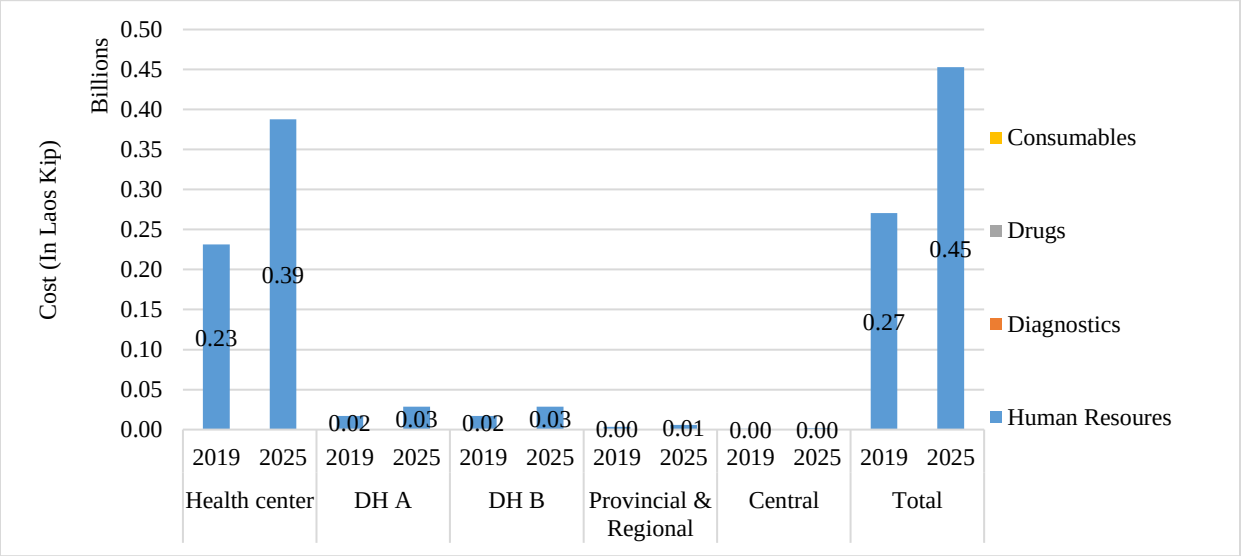


Figure 61: Distribution of Annual cost (In Laos Kip) by cost component for service ES12

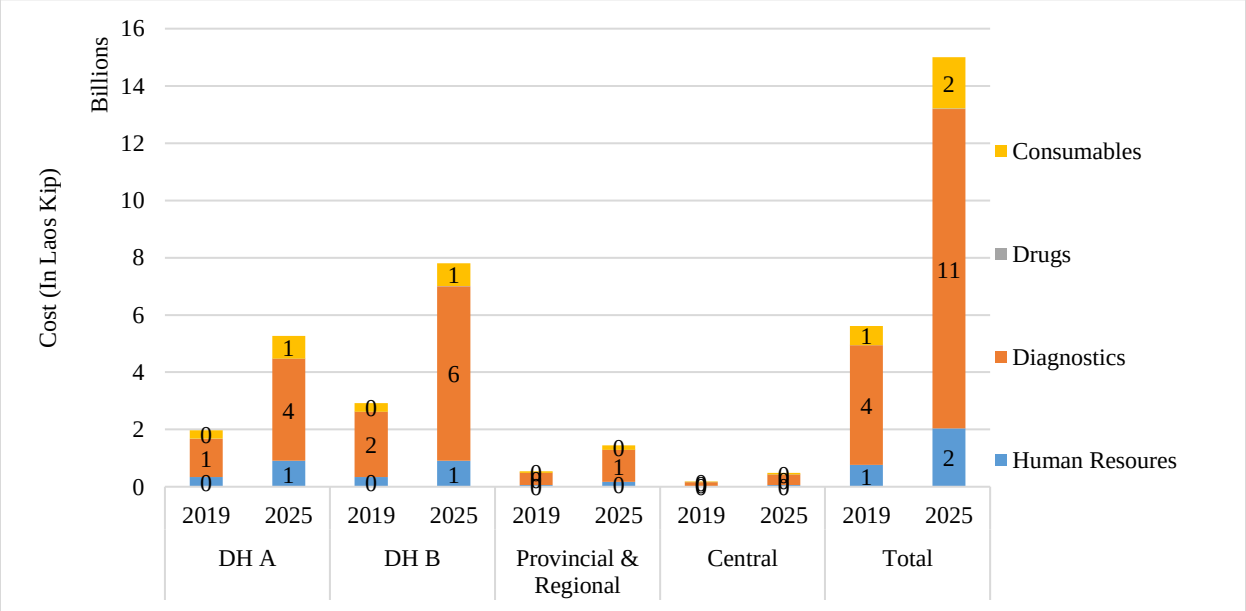


Figure 62: Distribution of Annual cost (In Laos Kip) by cost component for service ES13

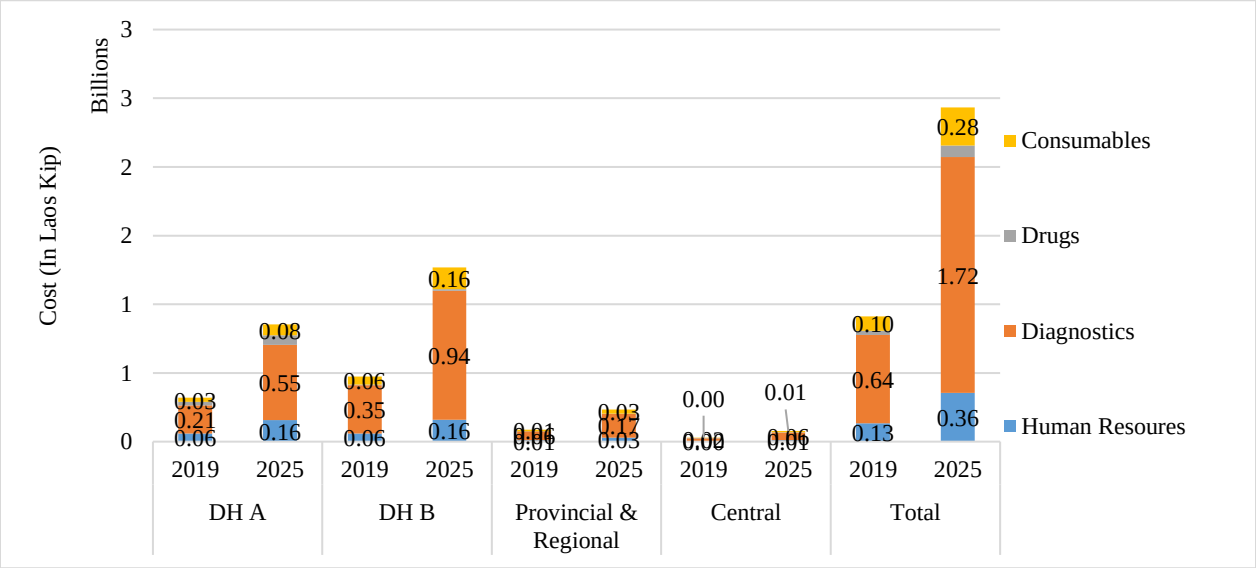


Figure 63: Distribution of Annual cost (In Laos Kip) by cost component for service ES14

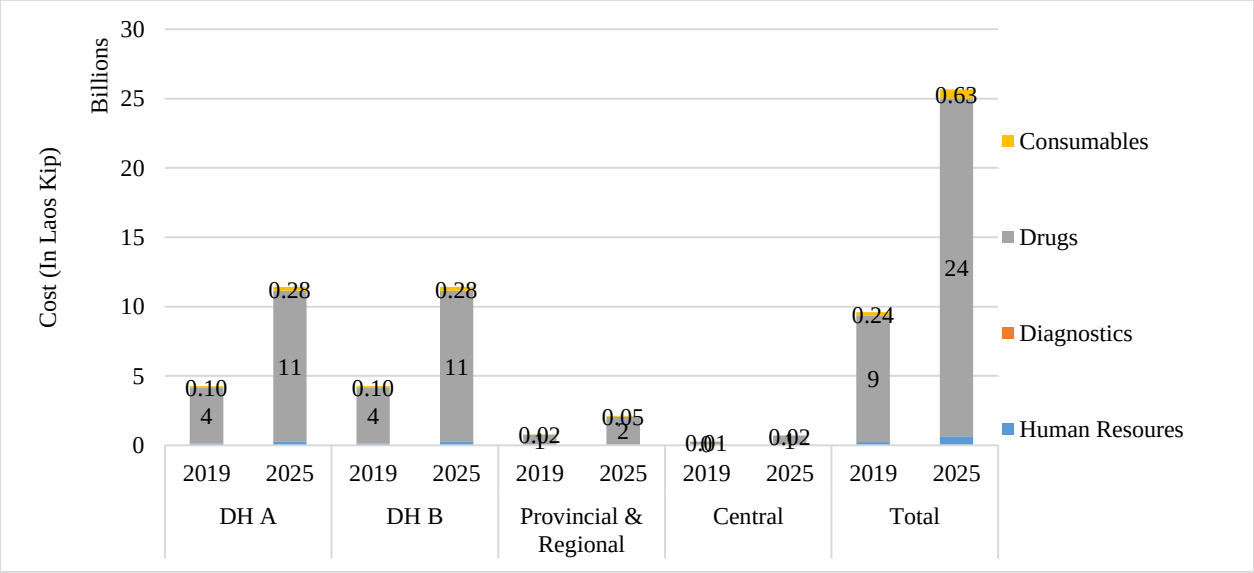


Figure 64: Distribution of Annual cost (In Laos Kip) by cost component for service ES15

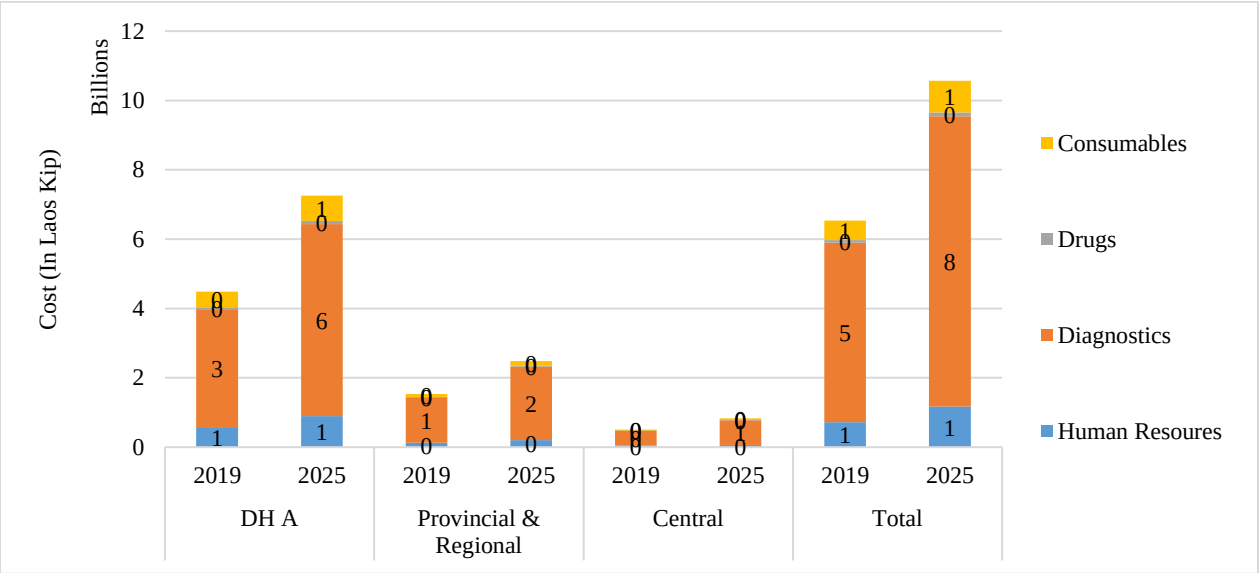


Figure 65: Distribution of Annual cost (In Laos Kip) by cost component for service ES28

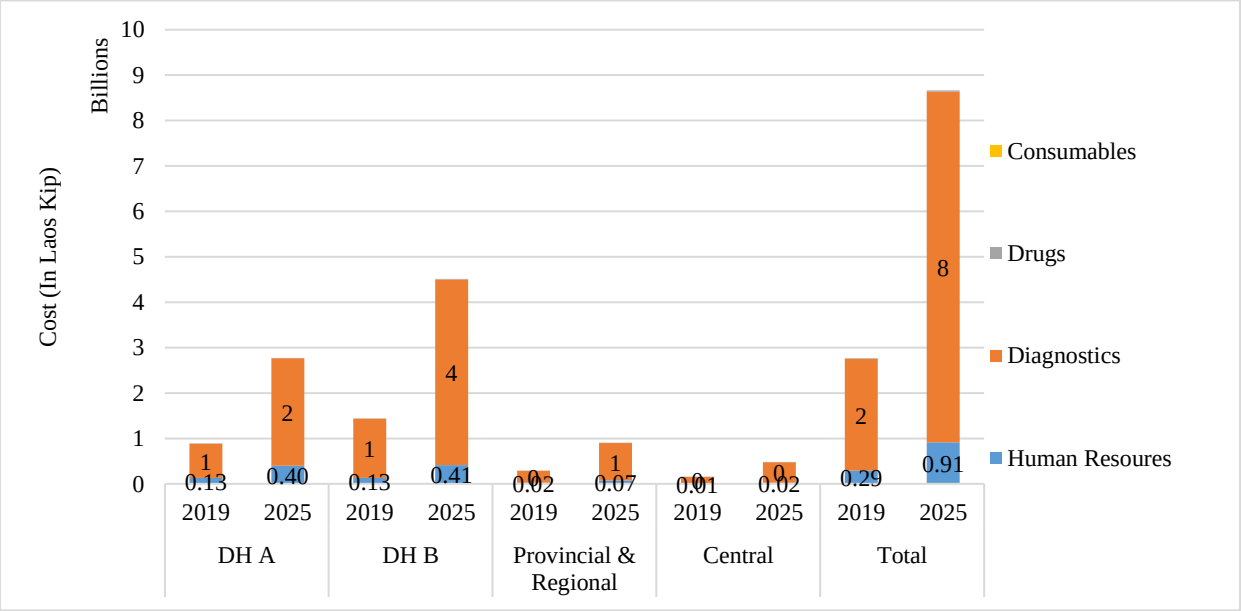


Figure 66: Distribution of Annual cost (In Laos Kip) by cost component for service ES29

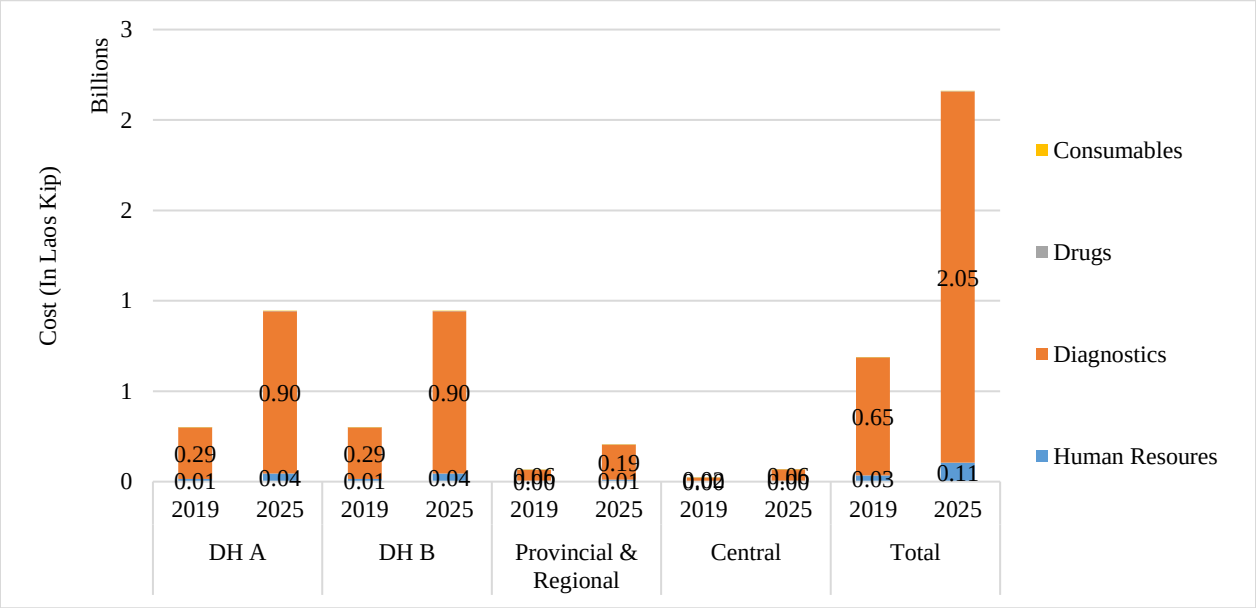


Figure 67: Distribution of Annual cost (In Laos Kip) by cost component for service ES31

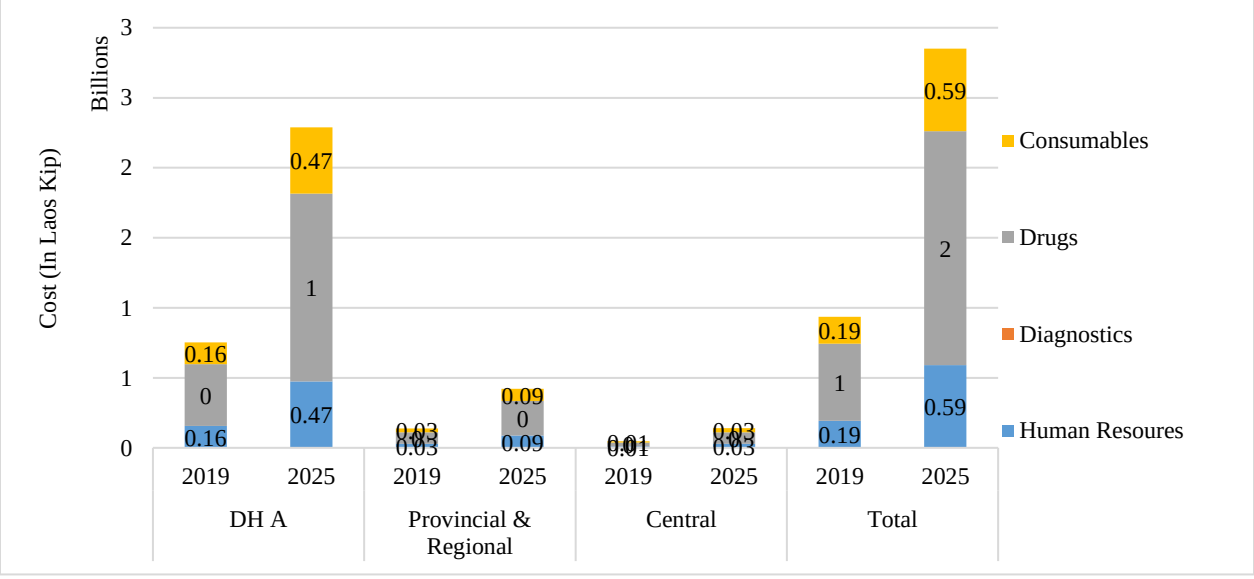


Figure 68: Distribution of Annual cost (In Laos Kip) by cost component for service ES32

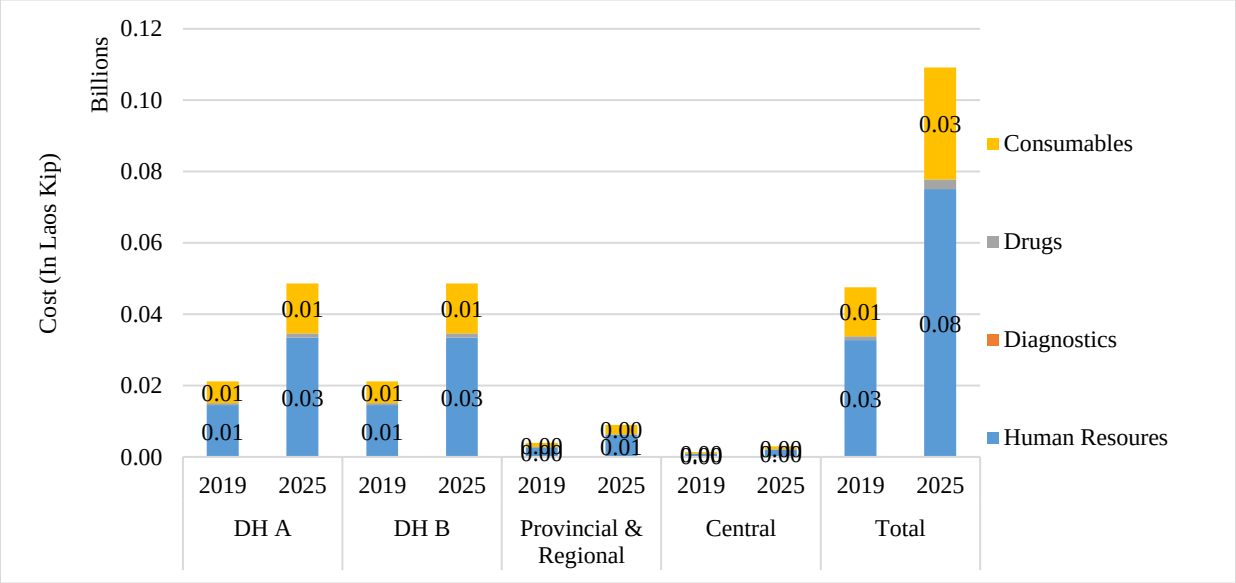


Figure 69: Distribution of Annual cost (In Laos Kip) by cost component for service ES33

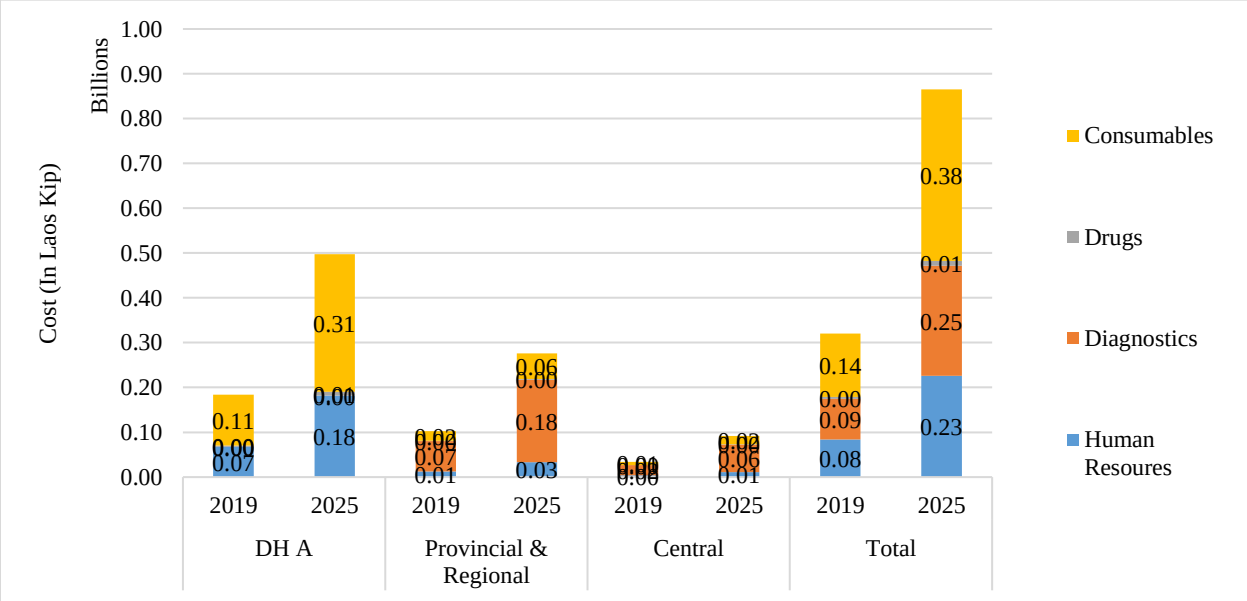


Figure 70: Distribution of Annual cost (In Laos Kip) by cost component for service ES34

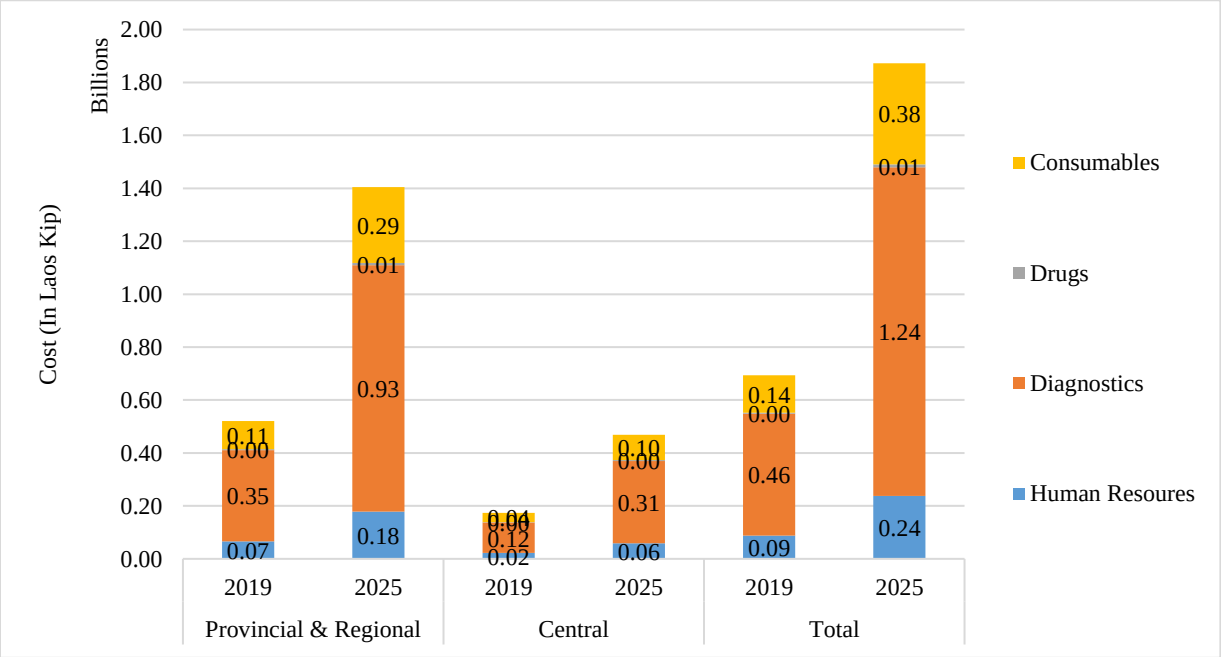


Figure 71: Distribution of Annual cost (In Laos Kip) by cost component for service ES35

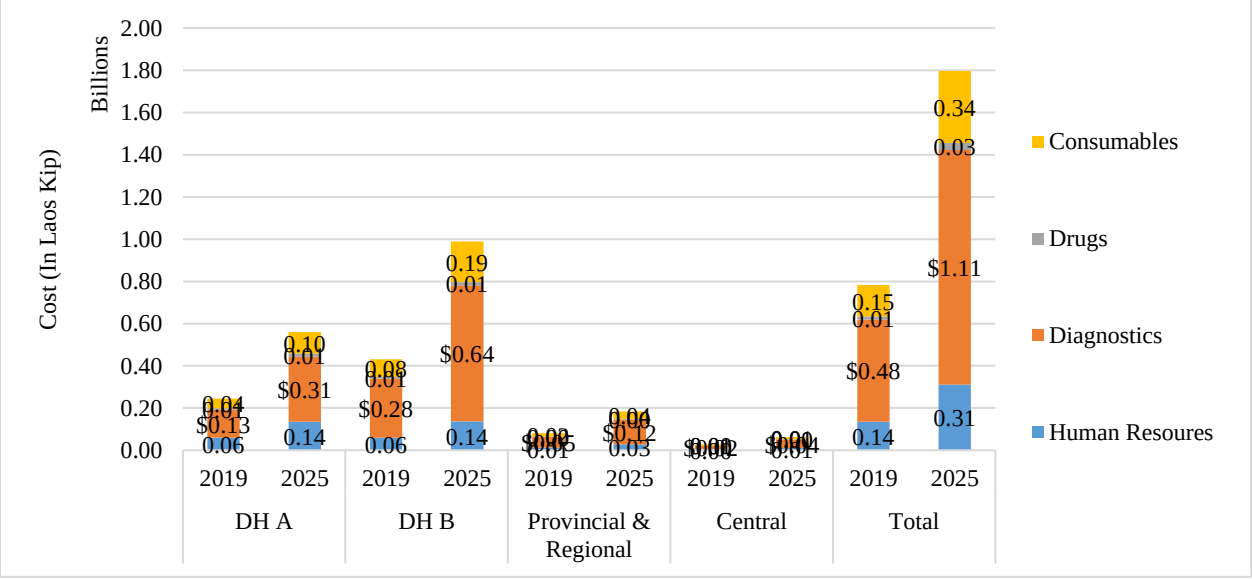


Figure 72: Distribution of Annual cost (In Laos Kip) by cost component for service ES36

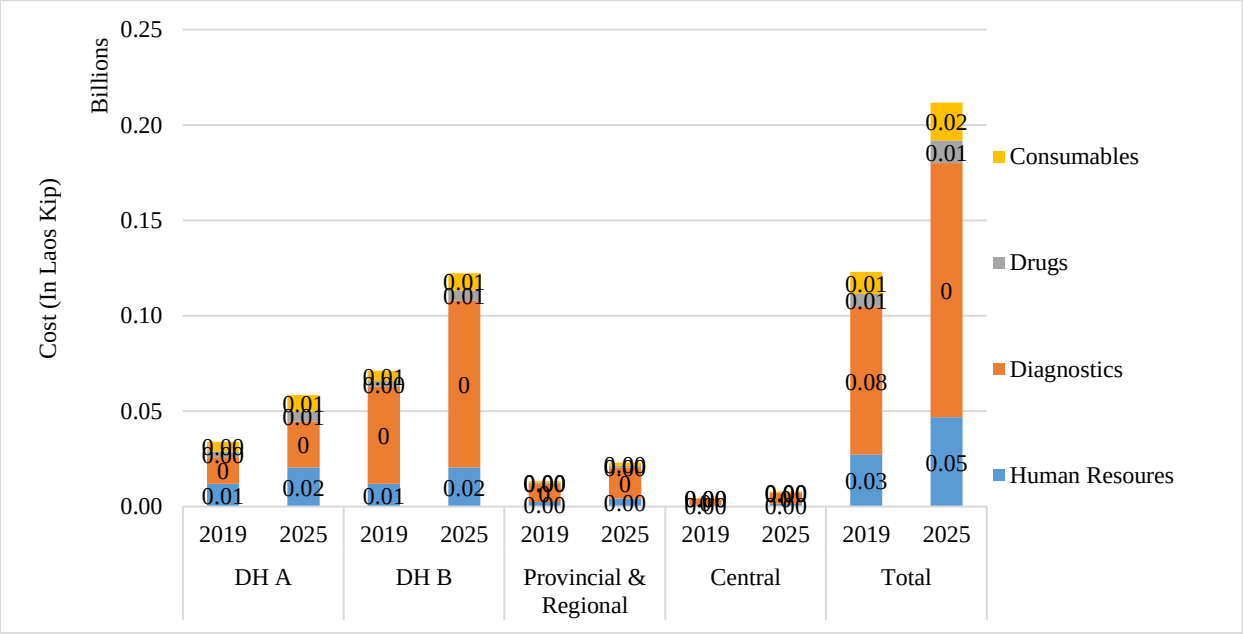


Figure 73: Distribution of Annual cost (In Laos Kip) by cost component for service ES37

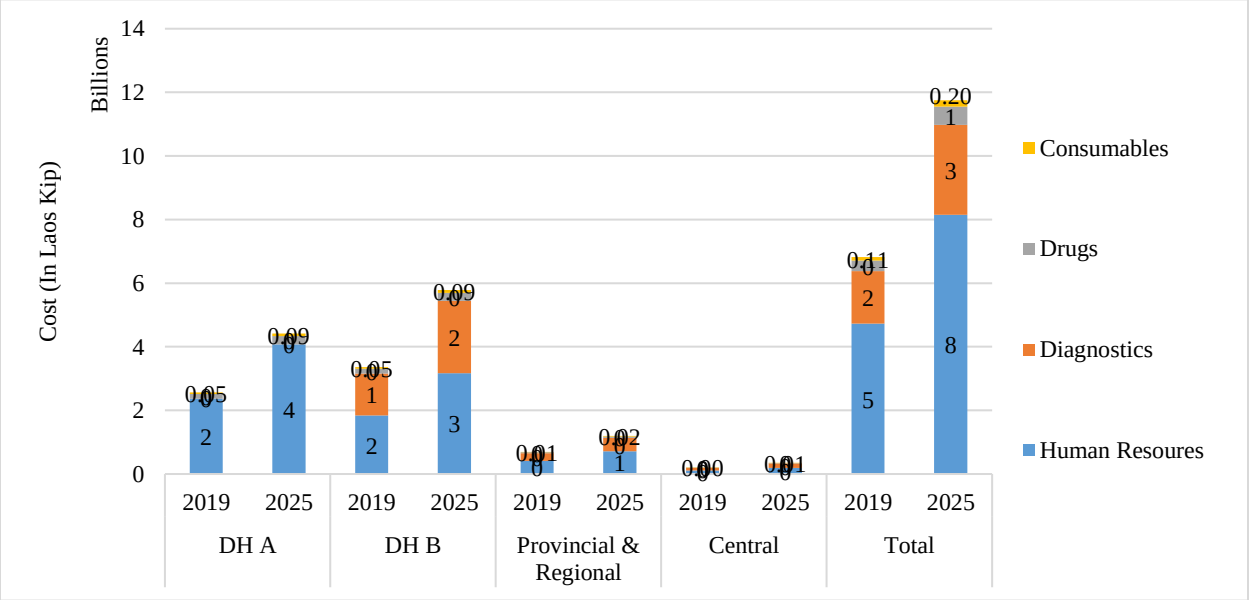


Figure 74: Distribution of Annual cost (In Laos Kip) by cost component for service ES38

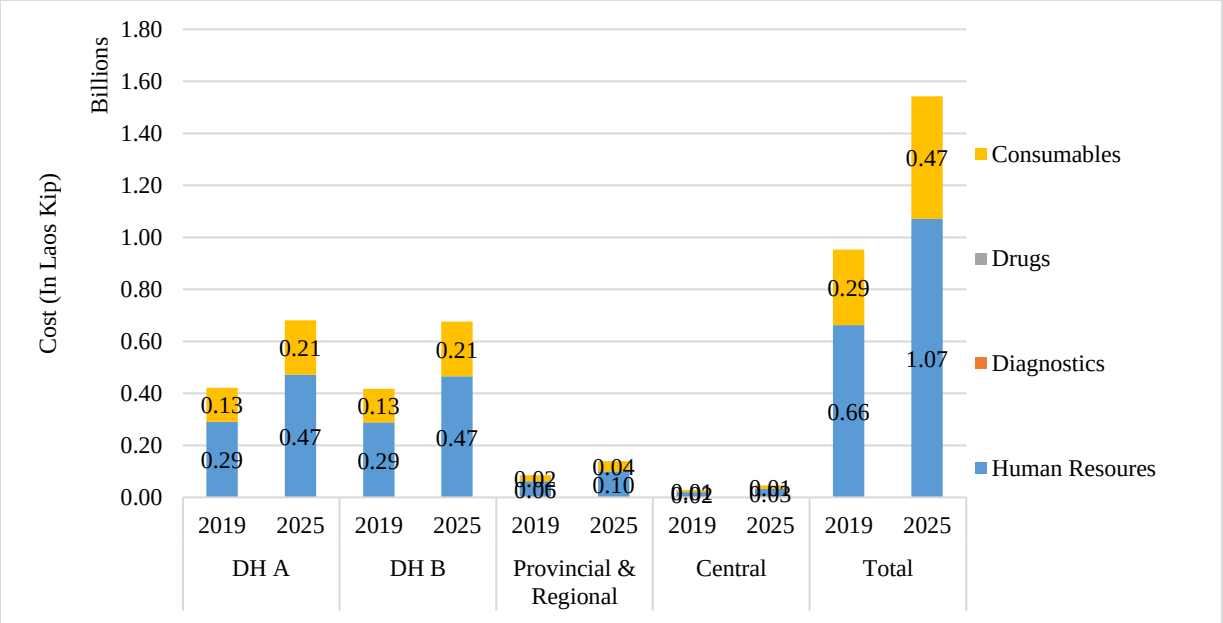


Figure 75: Distribution of Annual cost (In Laos Kip) by cost component for service ES39

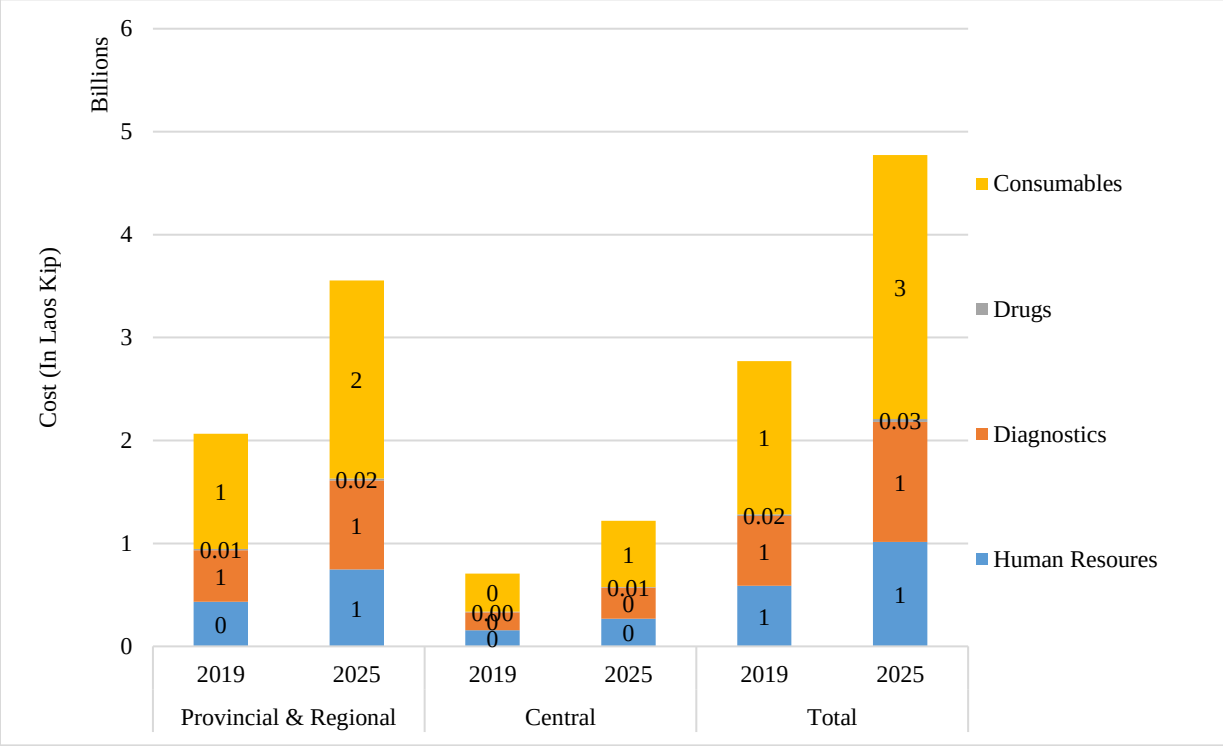


Figure 76: Distribution of Annual cost (In Laos Kip) by cost component for service ES40

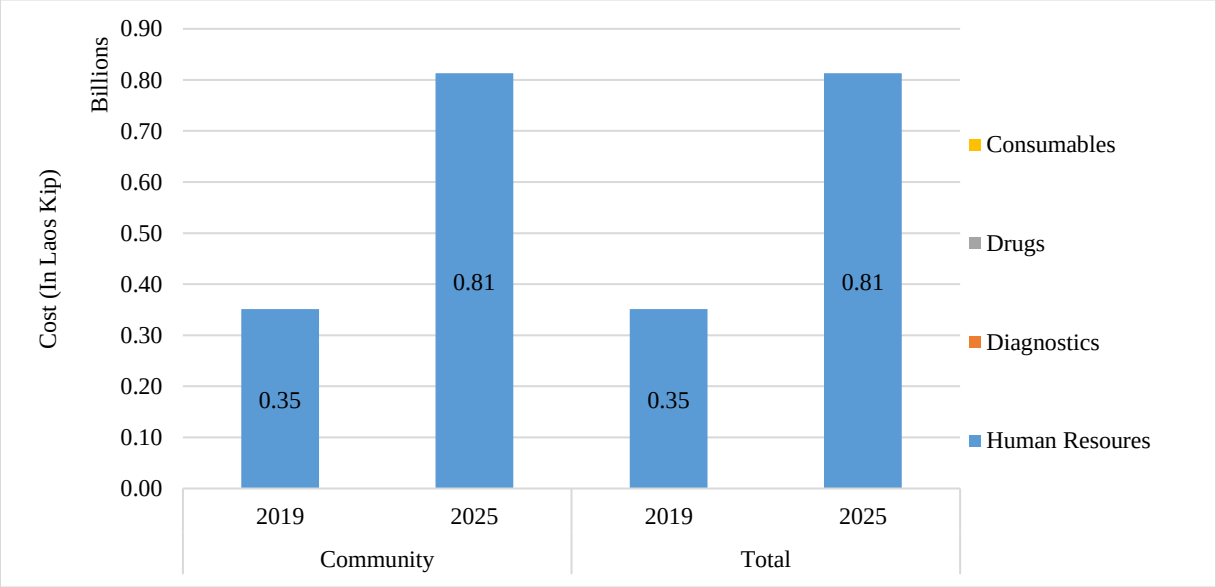


Figure 77: Distribution of Annual cost (In Laos Kip) by cost component for service ES41

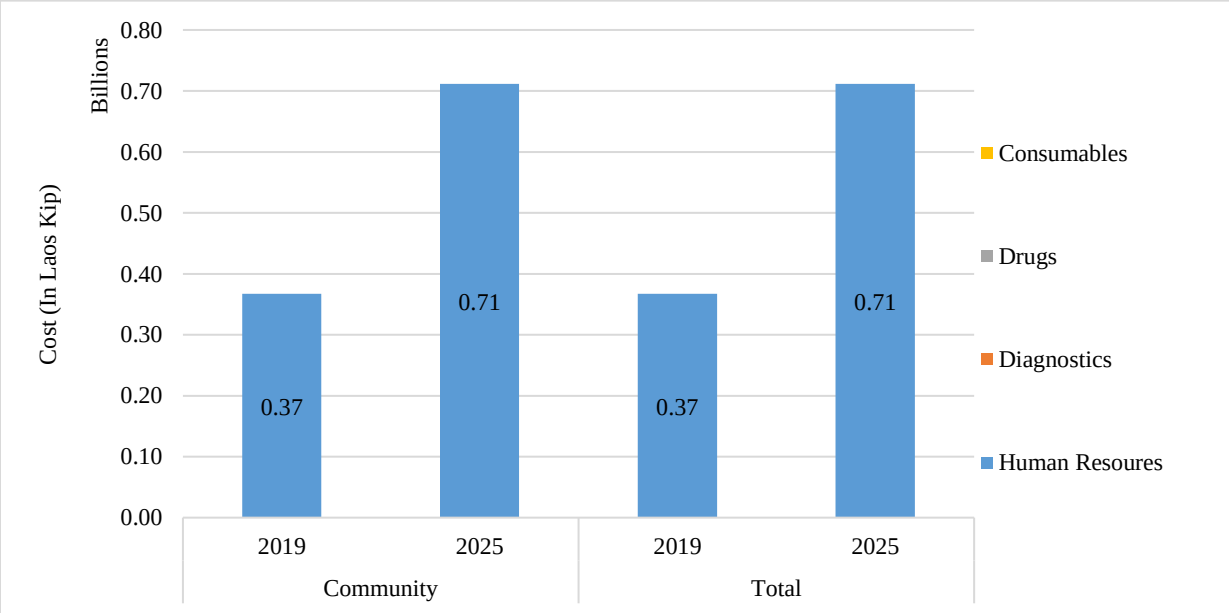
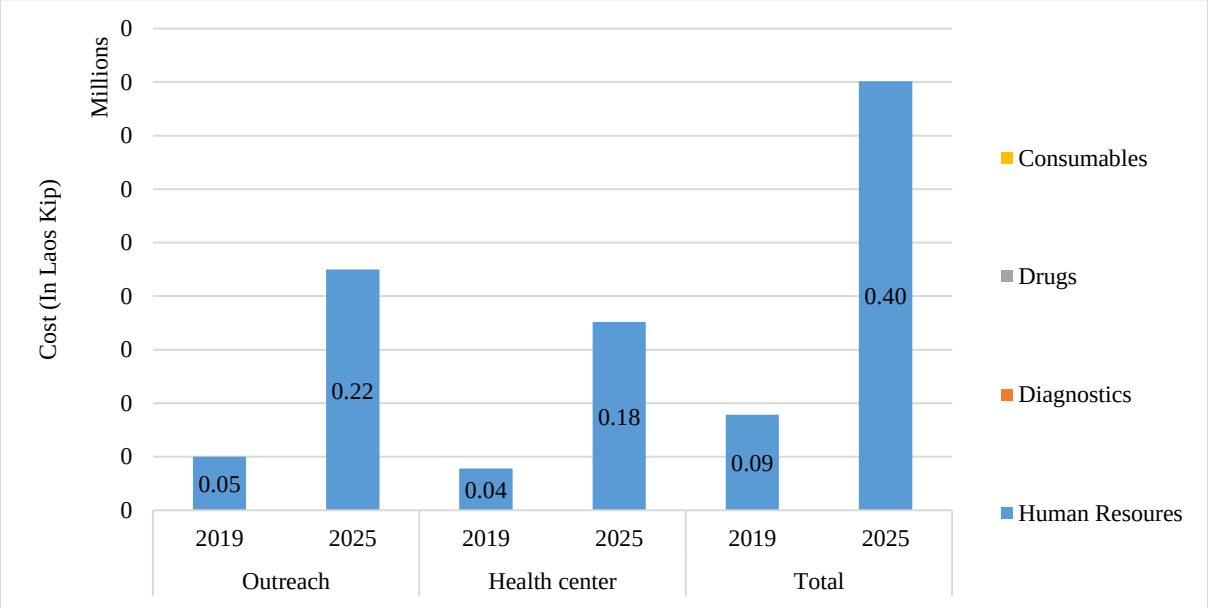


Figure 78: Distribution of Annual cost (In Laos Kip) by cost component for service ES55



Service Domain: SO4

Figure 79: Distribution of Annual cost (In Laos Kip) by cost component for service ES42

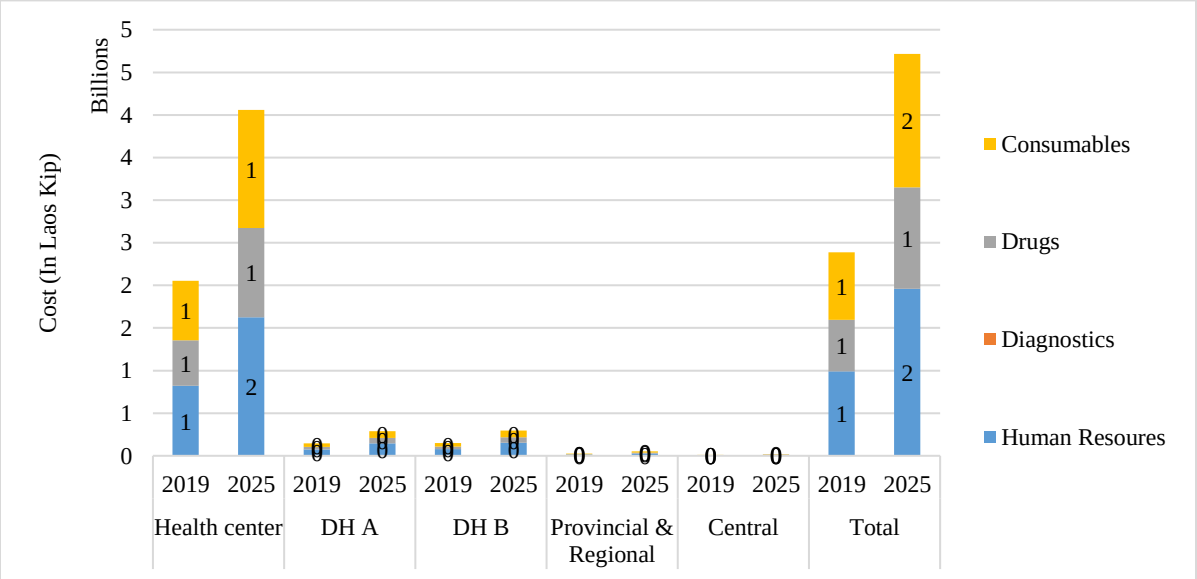


Figure 80: Distribution of Annual cost (In Laos Kip) by cost component for service ES44

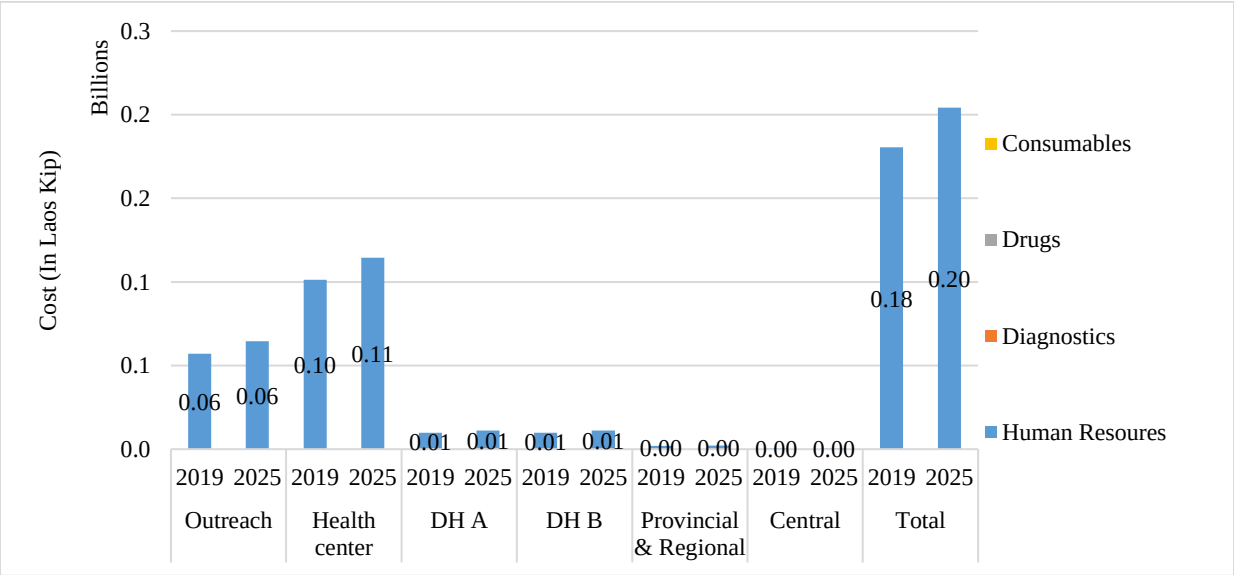


Figure 81: Distribution of Annual cost (In Laos Kip) by cost component for service ES45

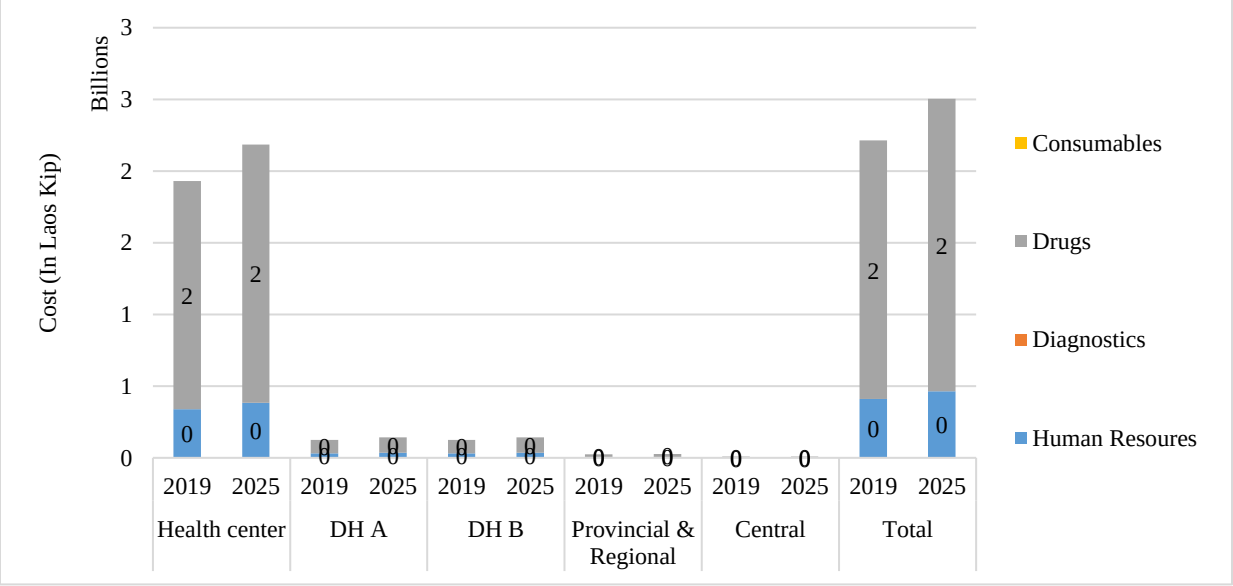


Figure 82: Distribution of Annual cost (In Laos Kip) by cost component for service ES47

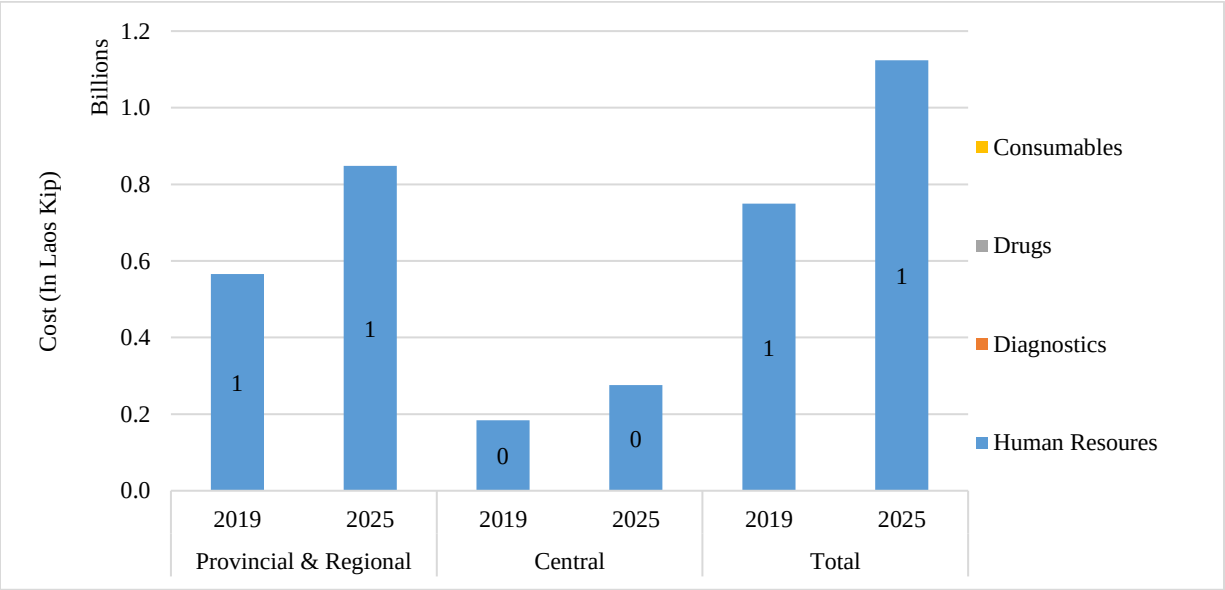
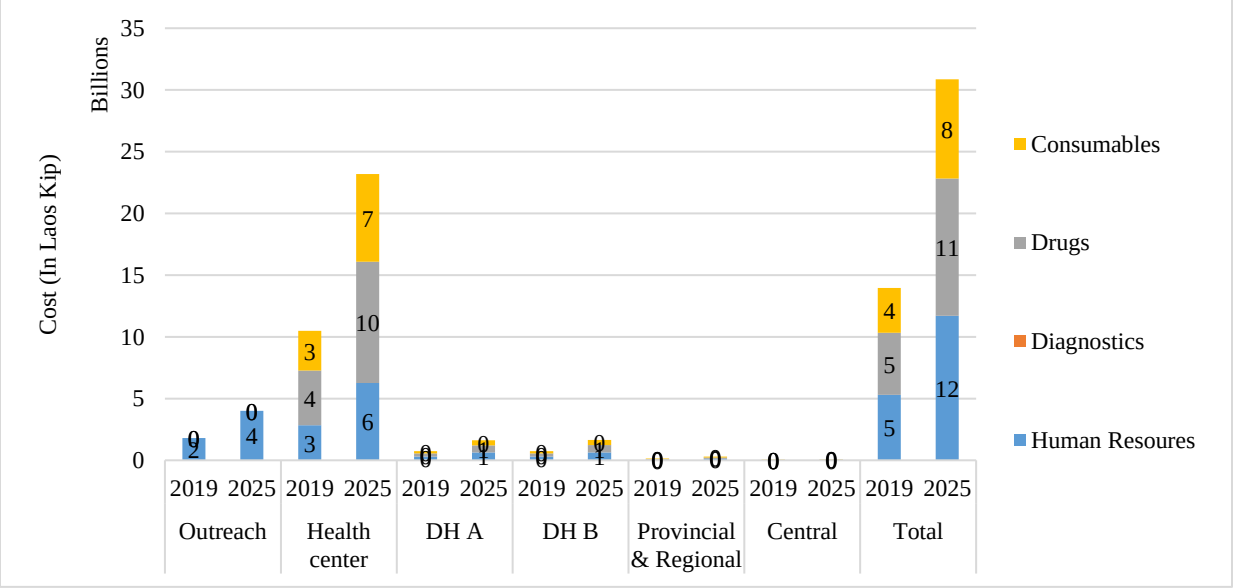


Figure 83: Distribution of Annual cost (In Laos Kip) by cost component for service ES53



Service Domain: SO5

Figure 84: Distribution of Annual cost (In Laos Kip) by cost component for service ES60

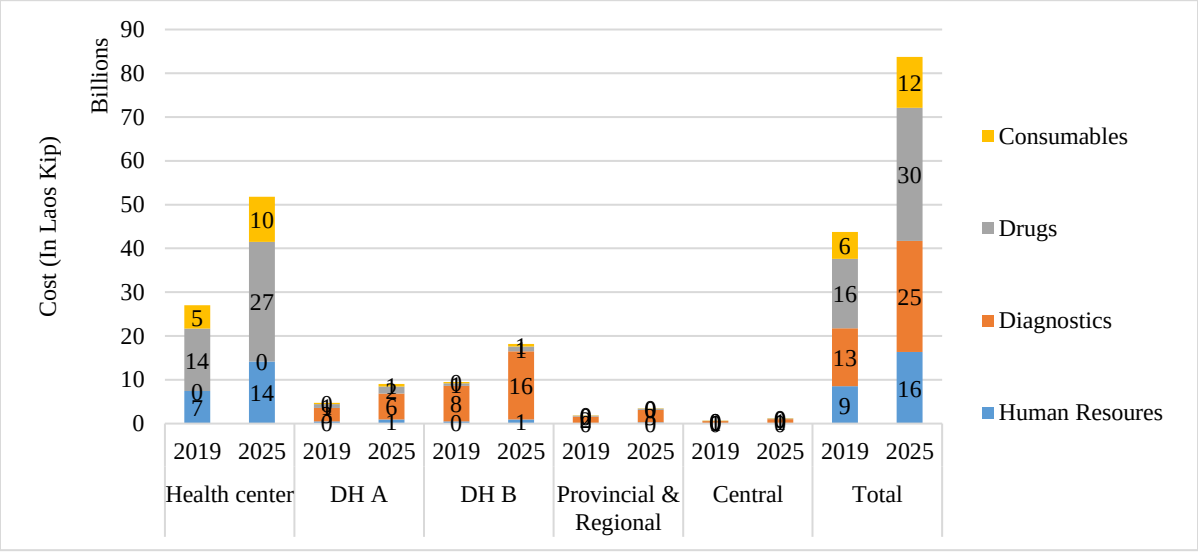


Figure 85: Distribution of Annual cost (In Laos Kip) by cost component for service ES61

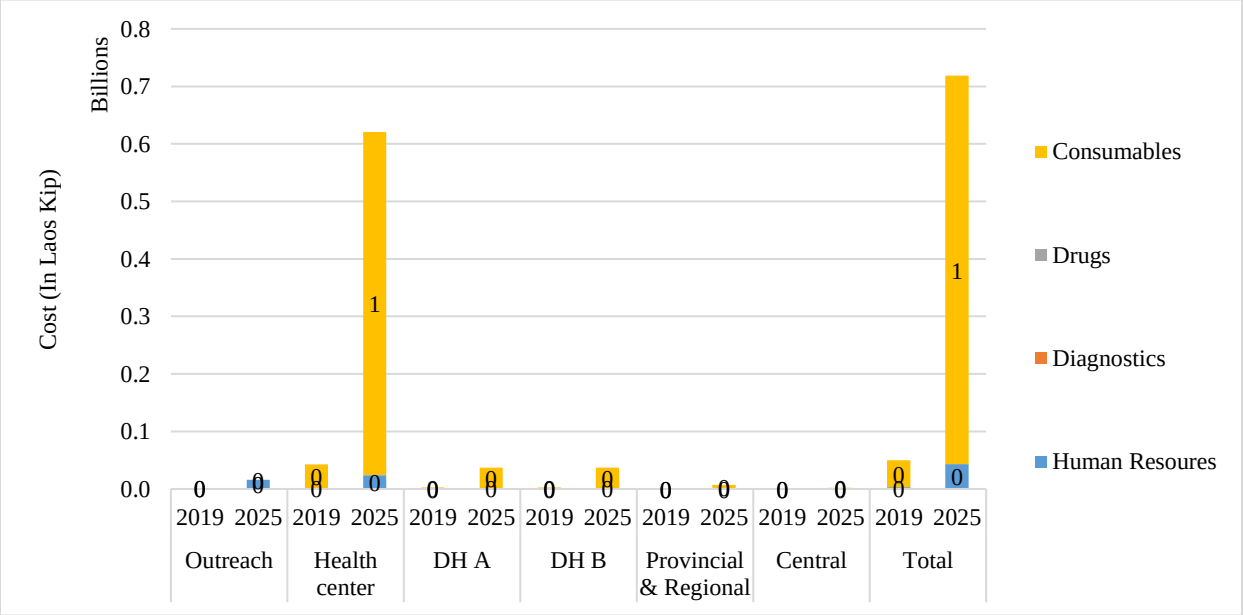


Figure 86: Distribution of Annual cost (In Laos Kip) by cost component for service ES62

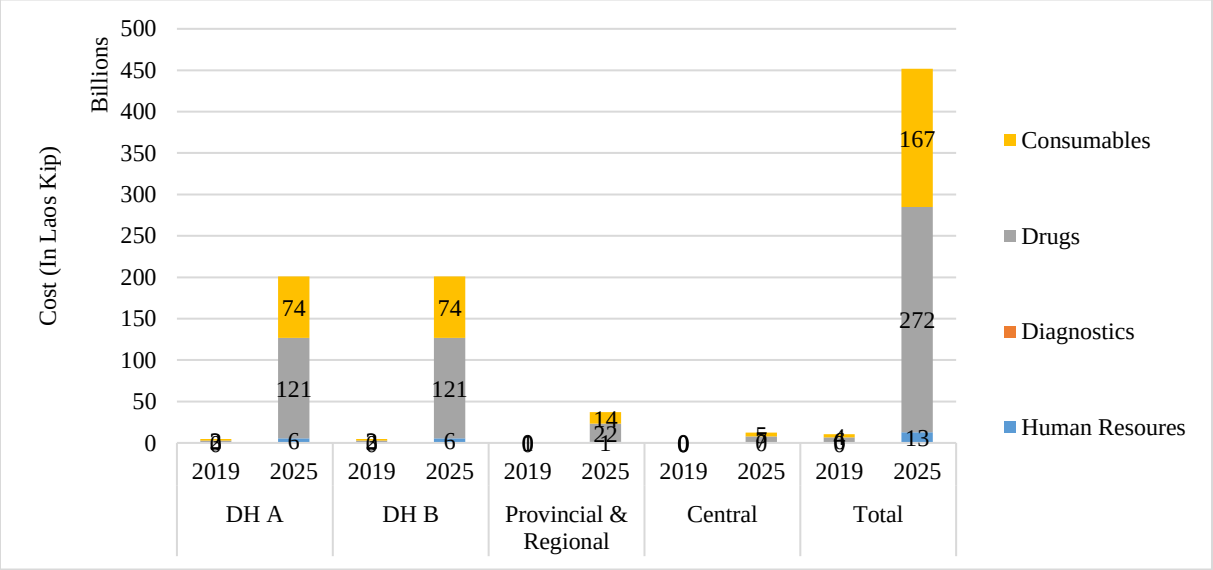


Figure 87: Distribution of Annual cost (In Laos Kip) by cost component for service ES63

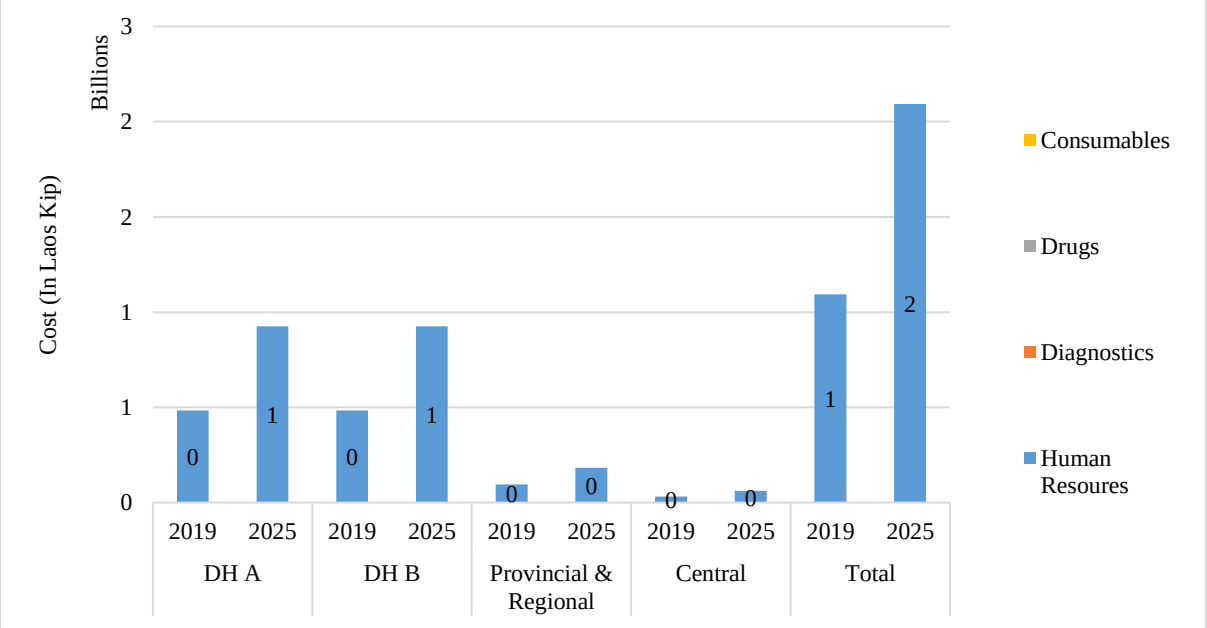


Figure 88: Distribution of Annual cost (In Laos Kip) by cost component for service ES64

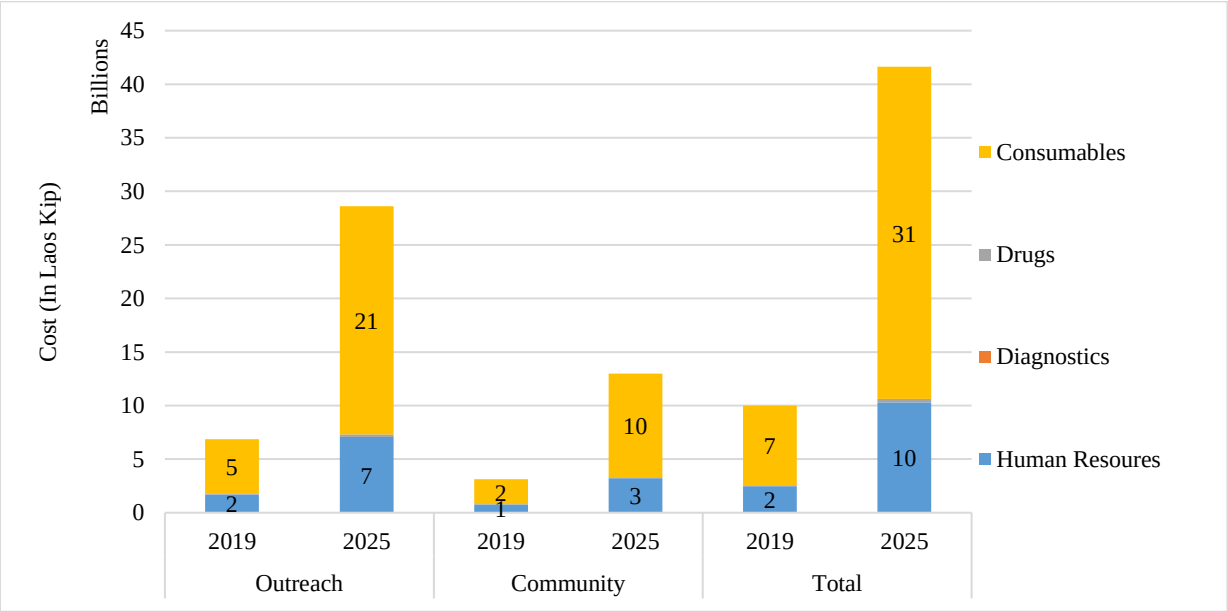
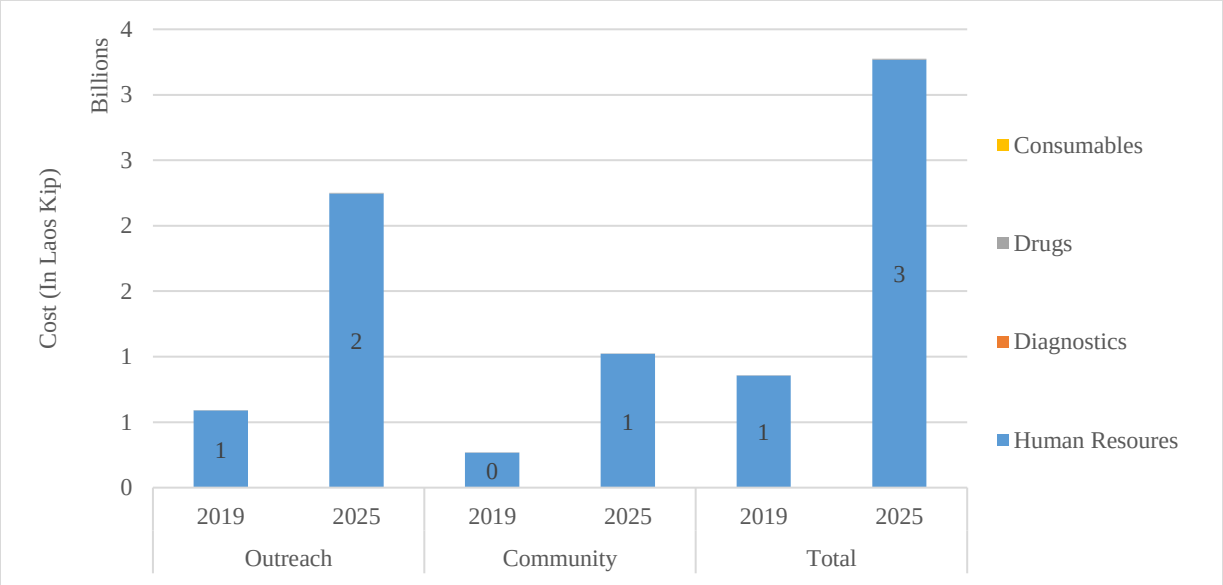


Figure 89: Distribution of Annual cost (In Laos Kip) by cost component for service ES65



Service Domain: SO7

Figure 90: Distribution of Annual cost (In Laos Kip) by cost component for service ES10

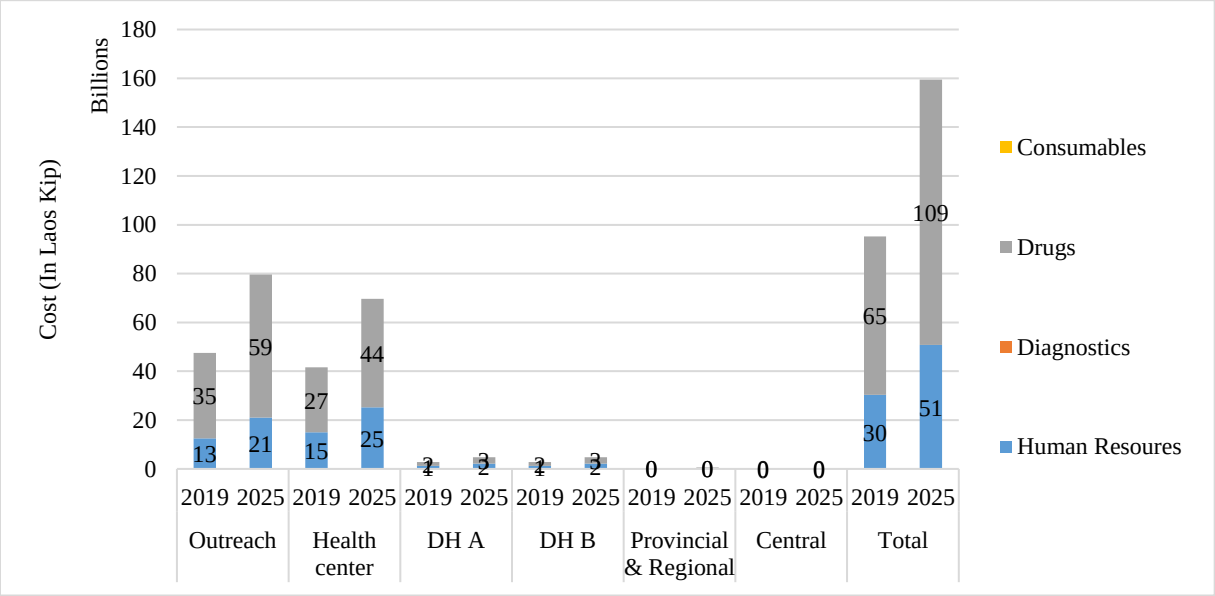


Figure 91: Distribution of Annual cost (In Laos Kip) by cost component for service ES22

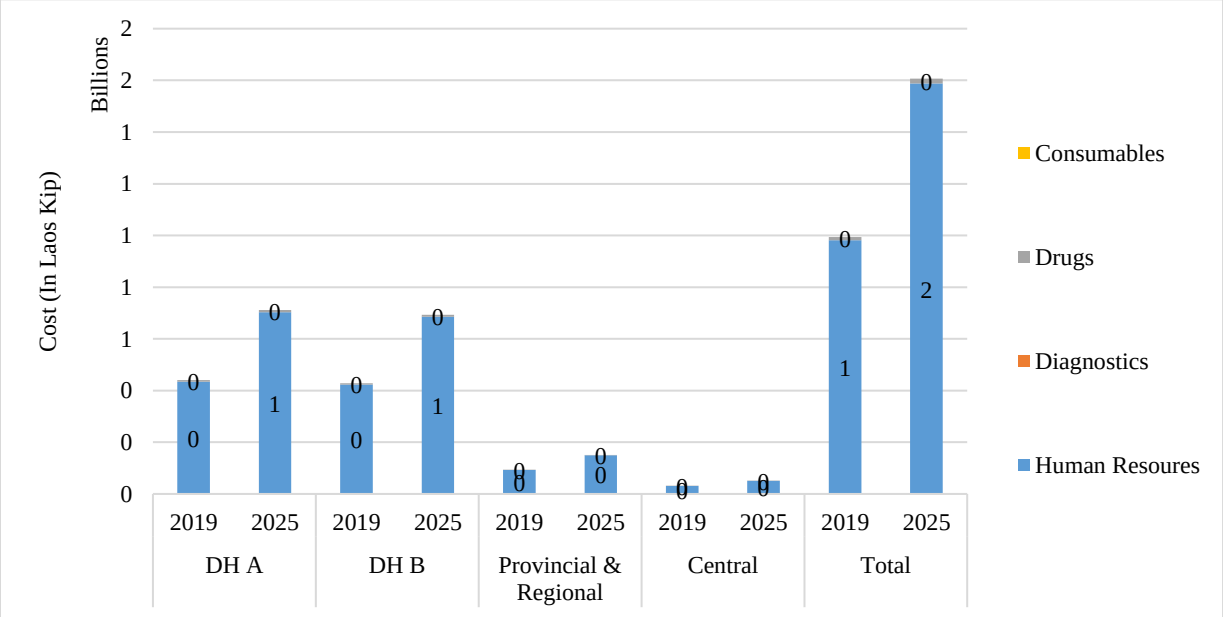


Figure 92: Distribution of Annual cost (In Laos Kip) by cost component for service ES23

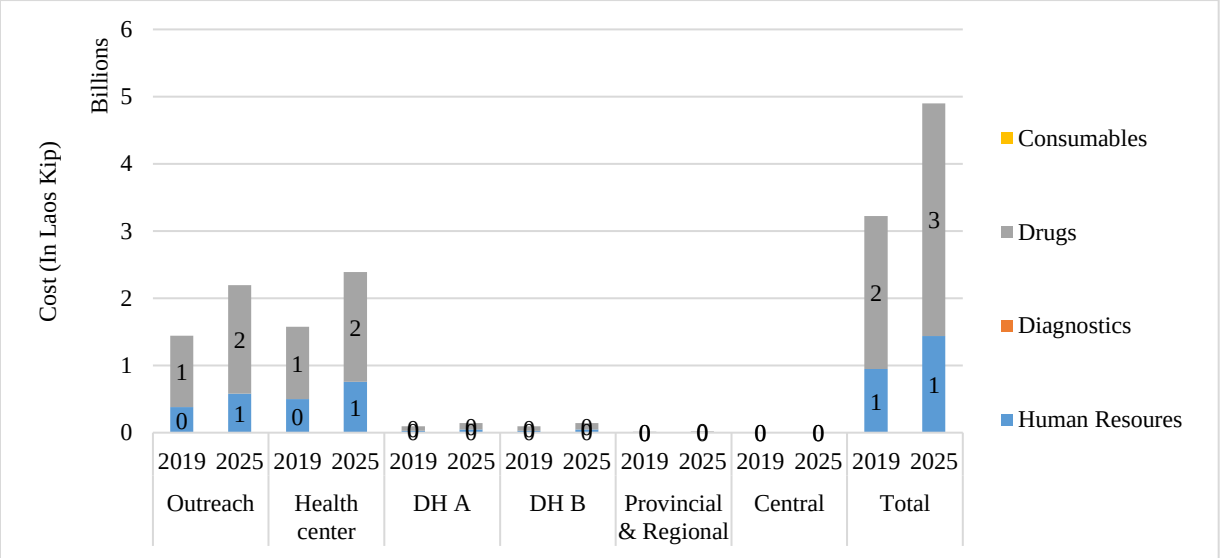


Figure 93: Distribution of Annual cost (In Laos Kip) by cost component for service ES52

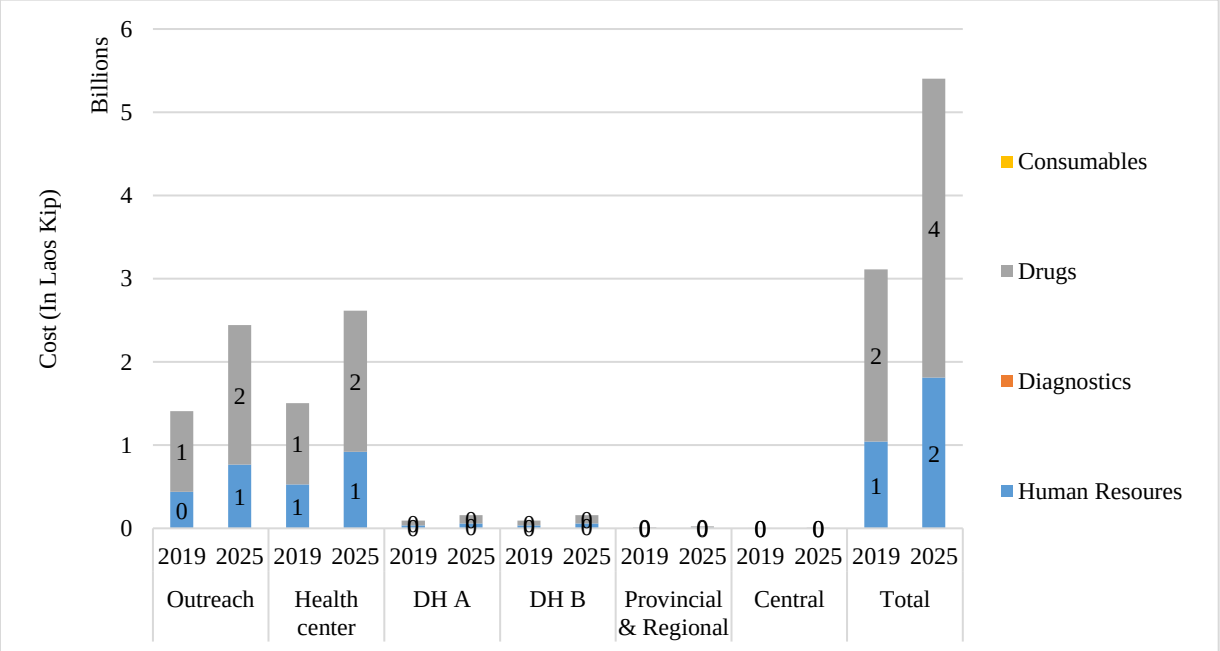


Figure 94: Distribution of Annual cost (In Laos Kip) by cost component for service ES57

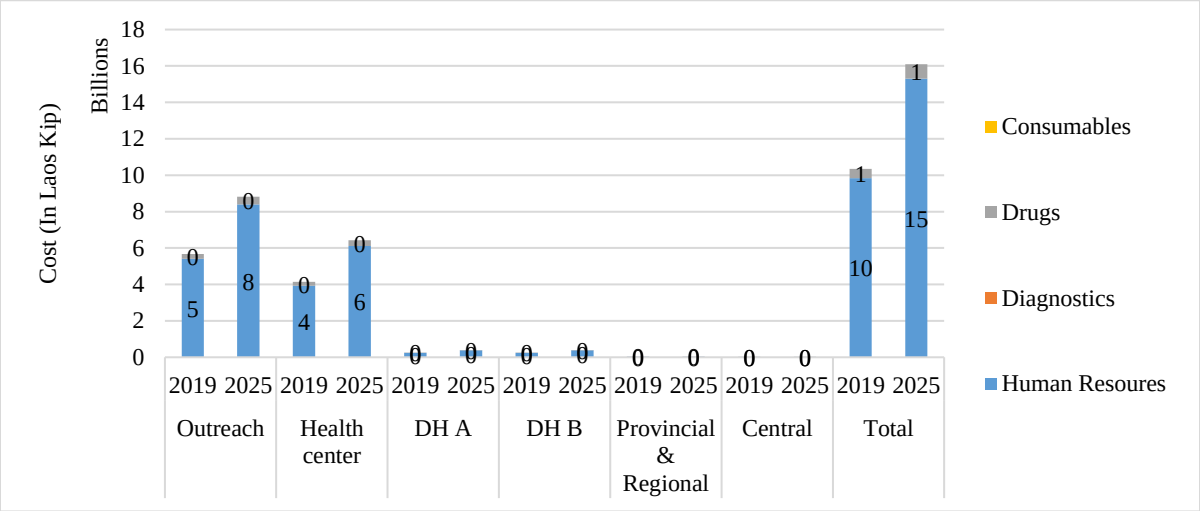


Figure 95: Distribution of Annual cost (In Laos Kip) by cost component for service ES58

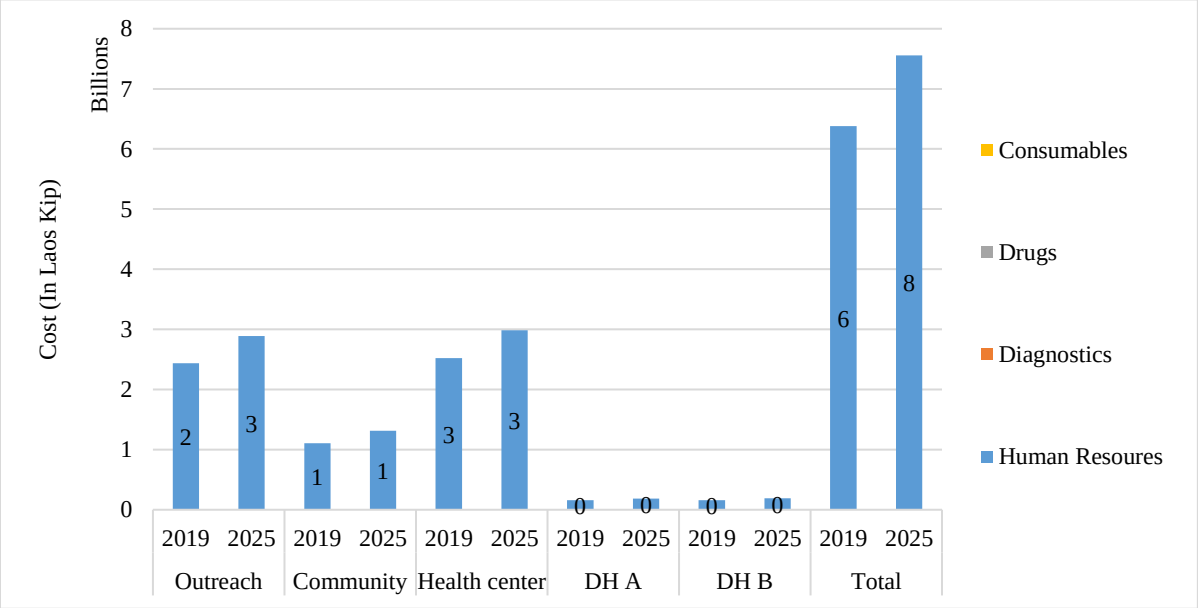
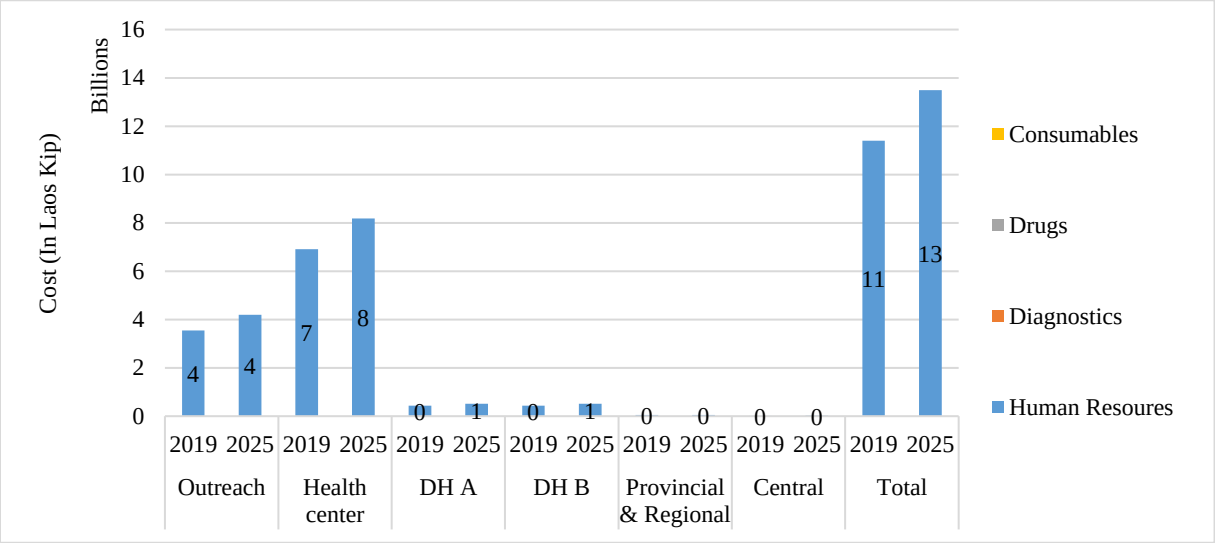


Figure 96: Distribution of Annual cost (In Laos Kip) by cost component for service ES59



HIV

Table 53: Description of ESPs

Domain	ESP No.	Core service
HIV	**ES99**	Peer education on STI including HIV
HIV	**ES100**	Free condom provision
HIV	**ES101**	HIV counselling and test
HIV	**ES102**	STI management: Syphilis 1) Detect suspected case 2) Refer 3) Diagnosis 4) Treatment
HIV	**ES103**	CD4 counting
HIV	**ES104**	ART for HIV positive
HIV	**ES105**	TB test for HIV positive

Table 54: Annual cost estimates (In millions Laos Kip) by the level of service delivery for HIV for Laos PDR

ESP No.	Outreach		Community		Health center		DH A		DH B		Provincial & Regional		Central	
	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025	2019	2025
ES99	1,077.9	2,052.6												
ES100	19,027	36,235	-	-	12,217	23,264	689	1,313	689	1,313	127	242	42	81
ES101	-	-	-	-	2,666	5,341	165	331	165	331	27	54	9	18
ES102	-	-	-	-	-	-	15,916	31,882	-	-	9,765	19,561	3,214	6,439
ES103	-	-	-	-	6	15	0	1	0	1	4	10	1	3
ES104	-	-	-	-	-	-	9,801	20,018	-	-	78	159	26	53
ES105	-	-	-	-	-	-	726	1,370	-	-	140	263	46	87
Annual	20,105	38,287.2	-	-	14,888.9	28,620.5	27,296.9	54,914.1	854.7	1,644.2	10,140.7	20,290.0	3,339.2	6,681.1

Figure 97: Distribution of Annual cost (In Laos Kip) by cost component for service ES99

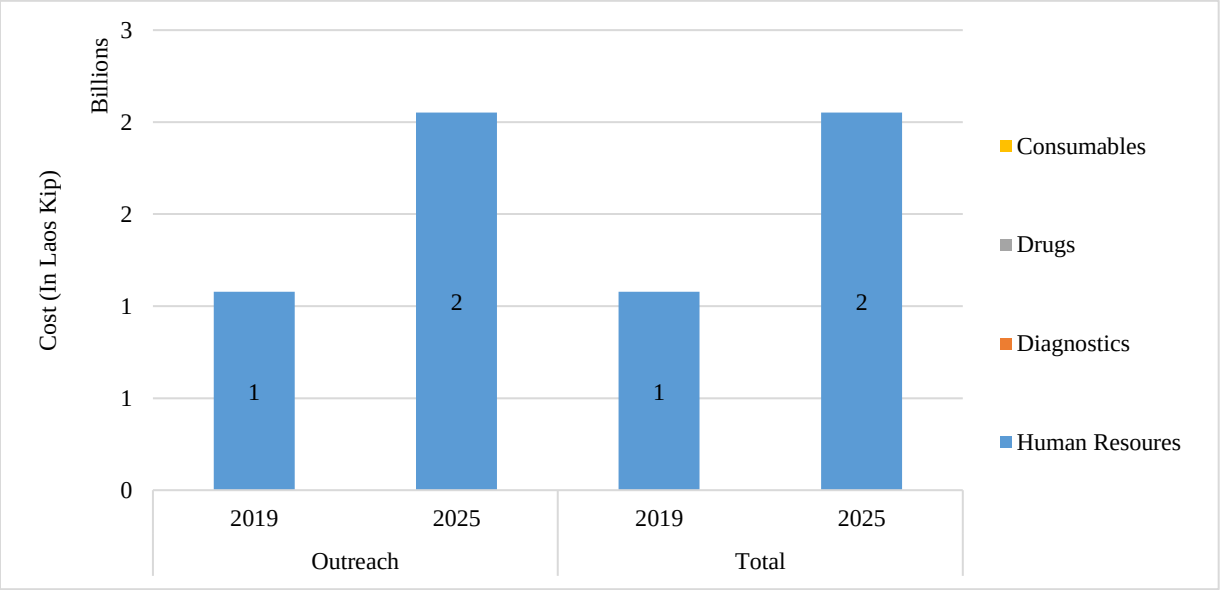


Figure 98: Distribution of Annual cost (In Laos Kip) by cost component for service ES100

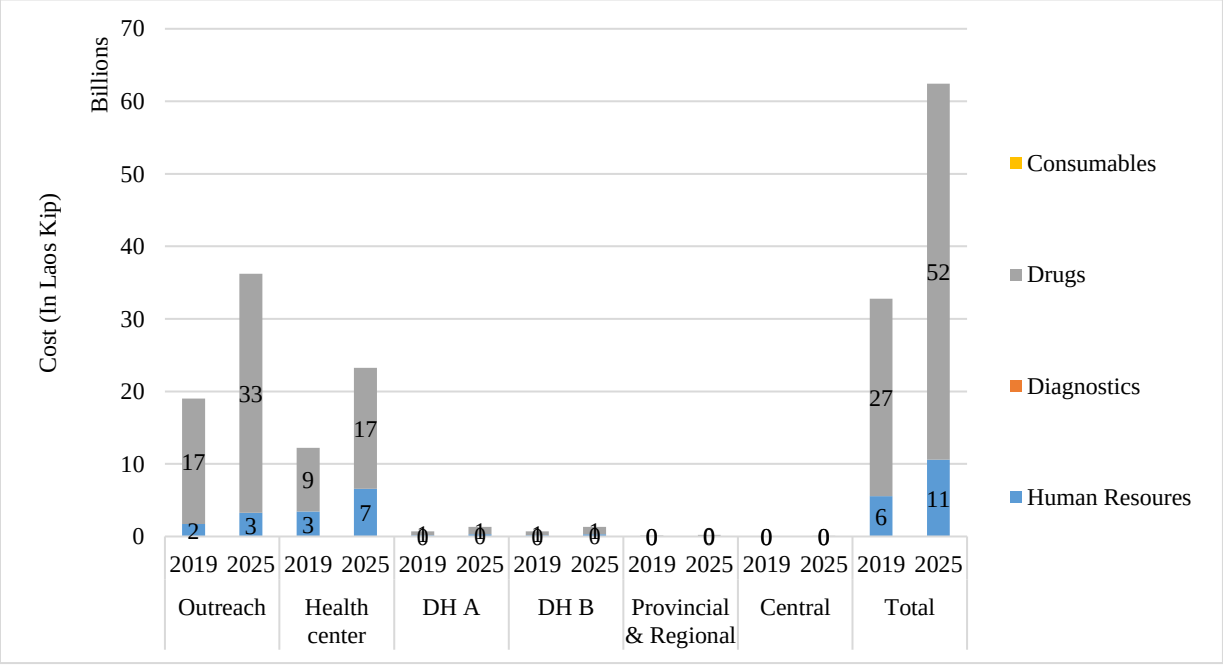


Figure 99: Distribution of Annual cost (In Laos Kip) by cost component for service ES101

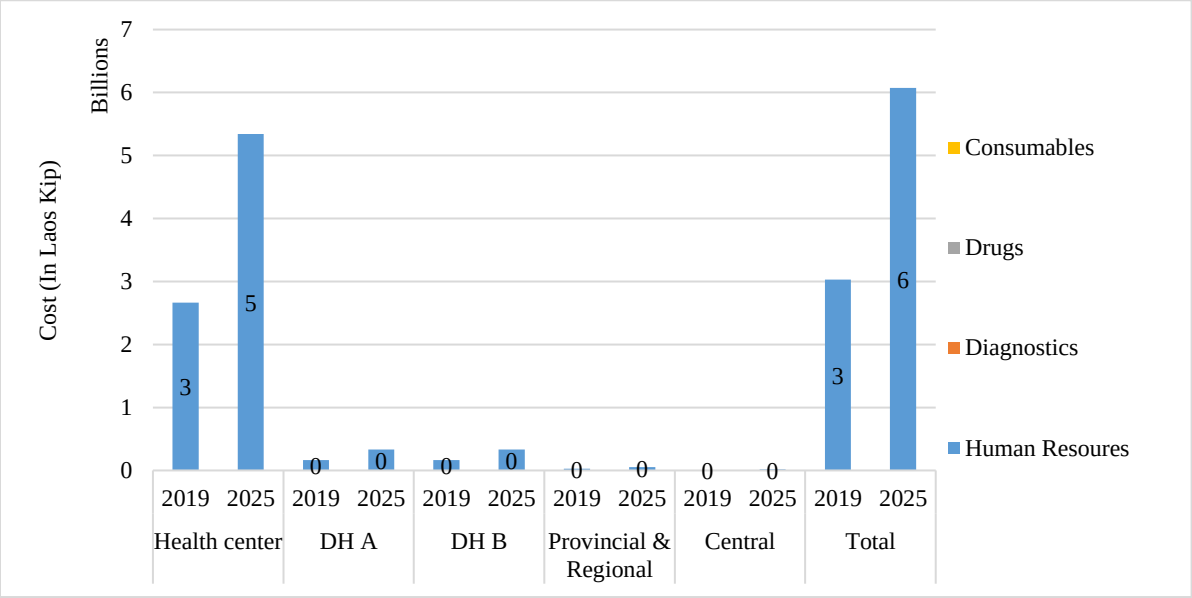


Figure 100: Distribution of Annual cost (In Laos Kip) by cost component for service ES102

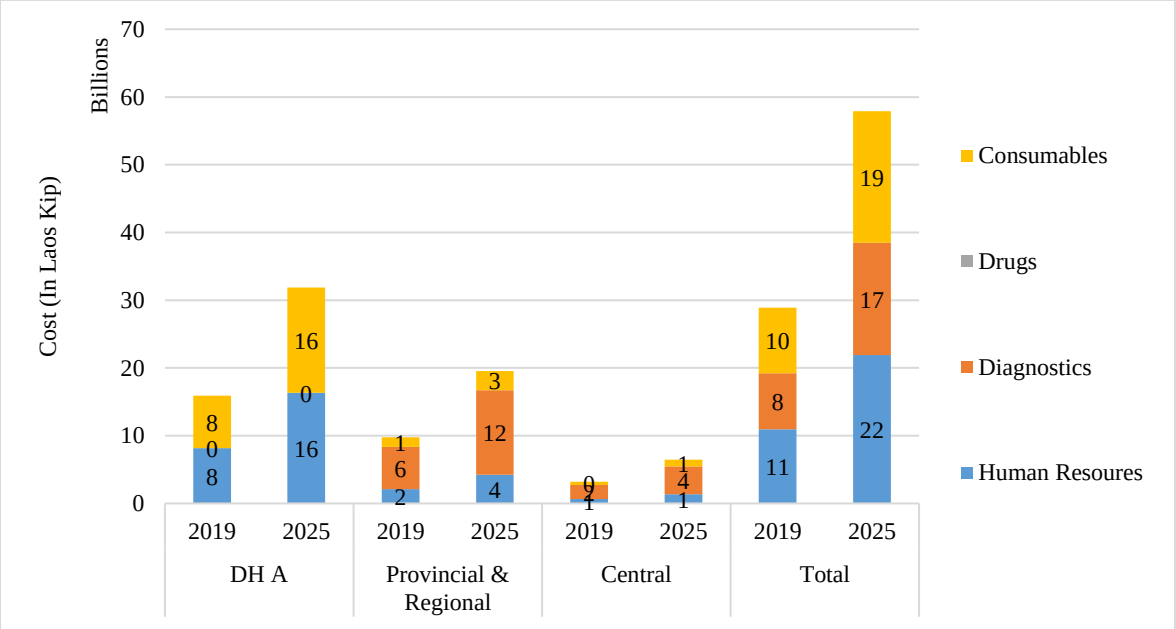


Figure 101: Distribution of Annual cost (In Laos Kip) by cost component for service ES103

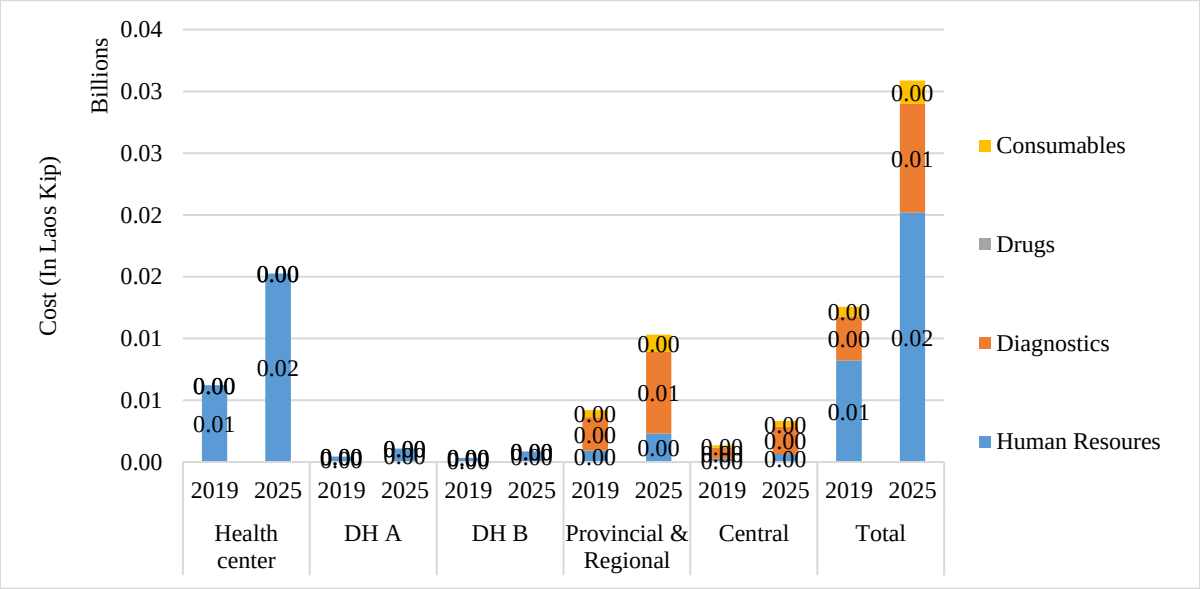


Figure 102: Distribution of Annual cost (In Laos Kip) by cost component for service ES104

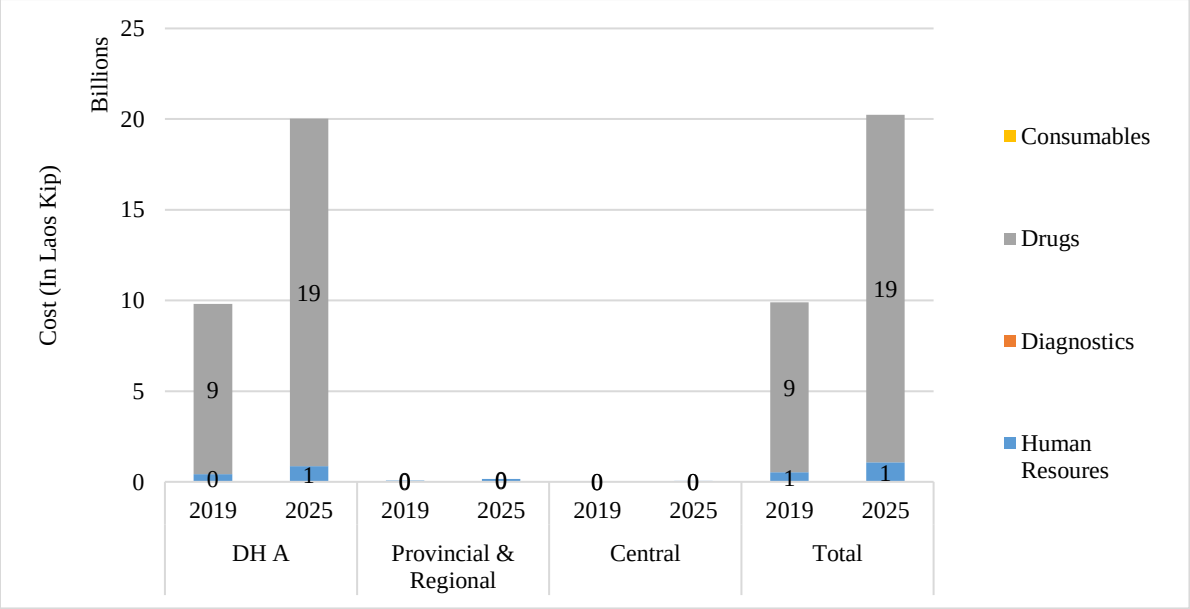
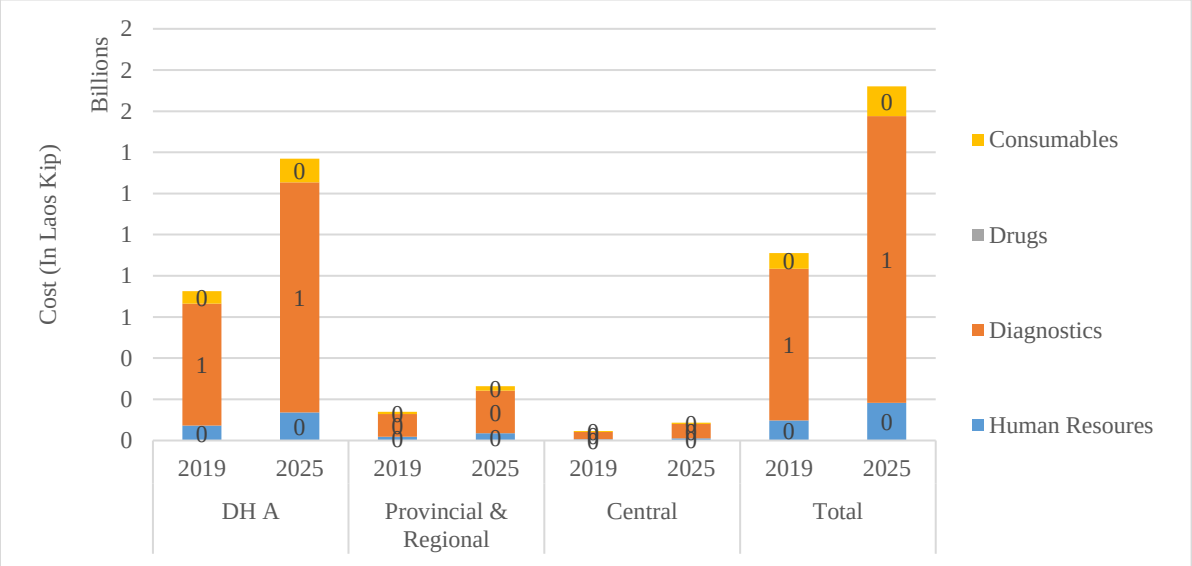


Figure 103: Distribution of Annual cost (In Laos Kip) by cost component for service ES105



Unit Cost

Figure 104: Distribution of Annual cost (In Laos Kip) by cost component for service ES99

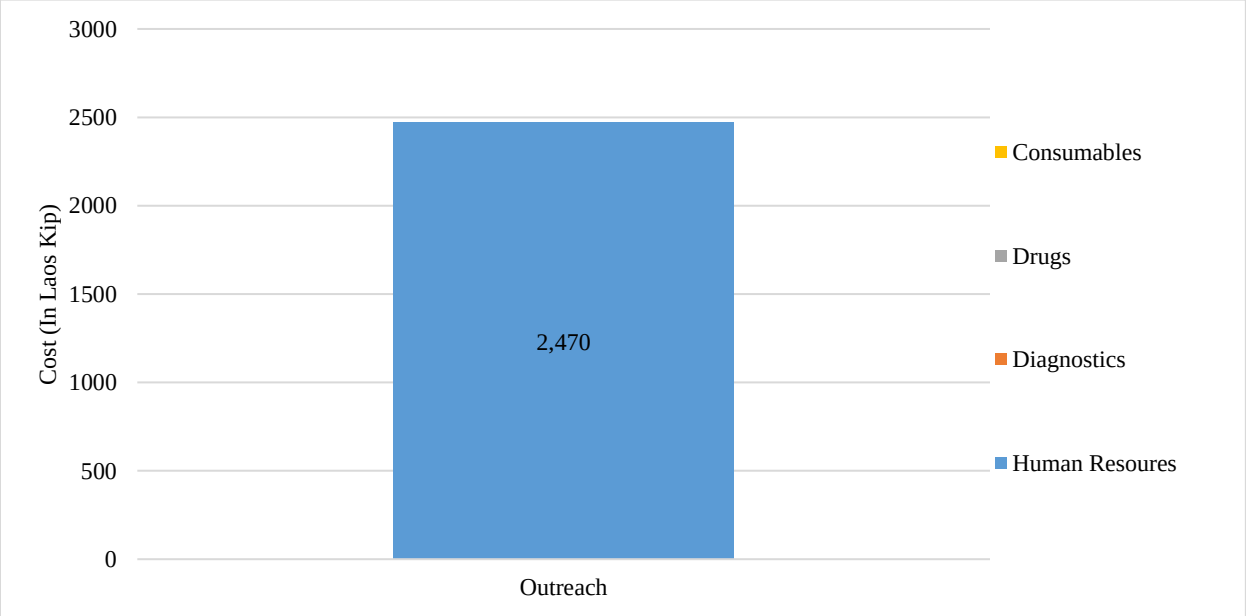


Figure 105: Distribution of unit cost (In Laos Kip) by cost component for service ES100

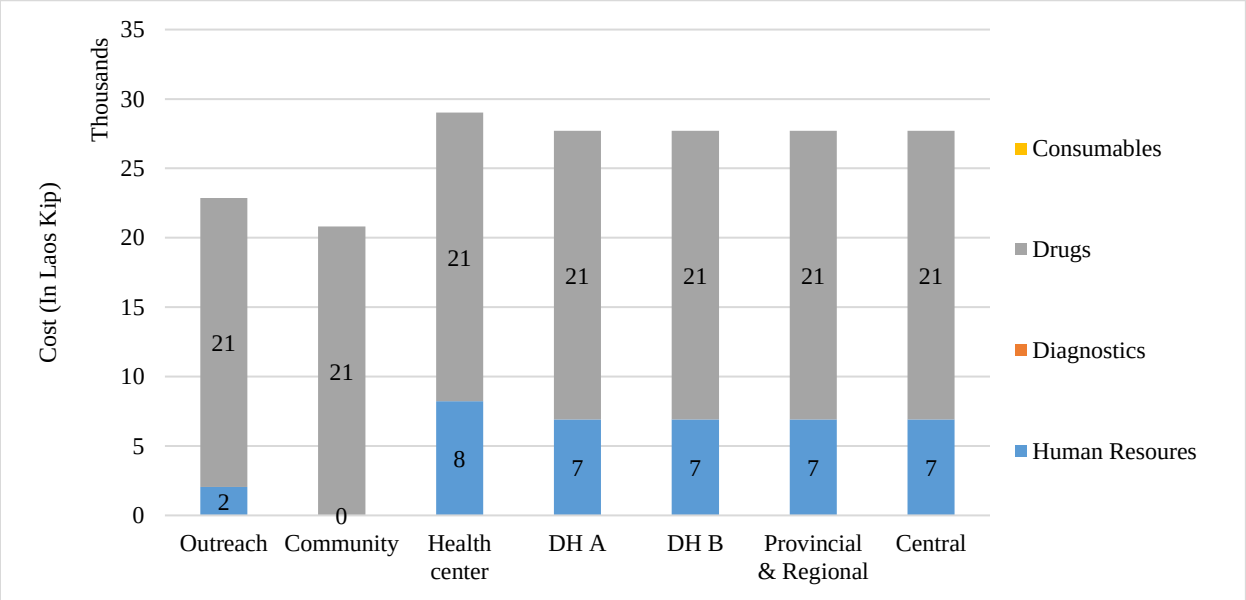


Figure 106: Distribution of unit cost (In Laos Kip) by cost component for service ES101

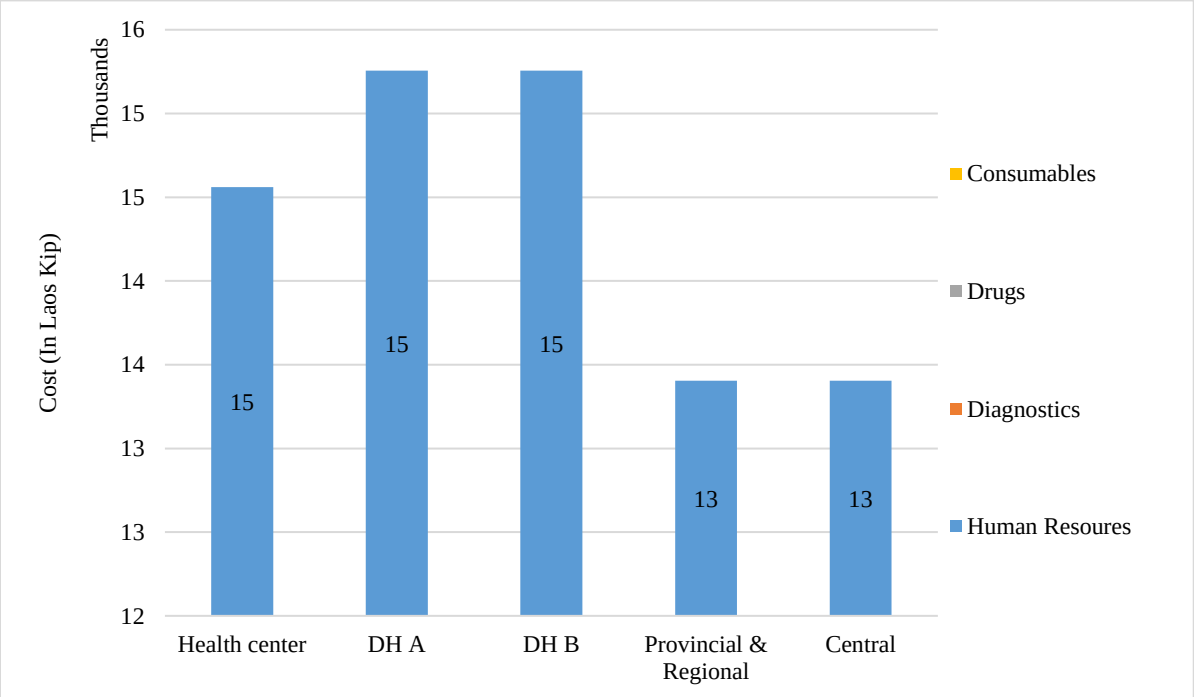


Figure 107: Distribution of unit cost (In Laos Kip) by cost component for service ES102

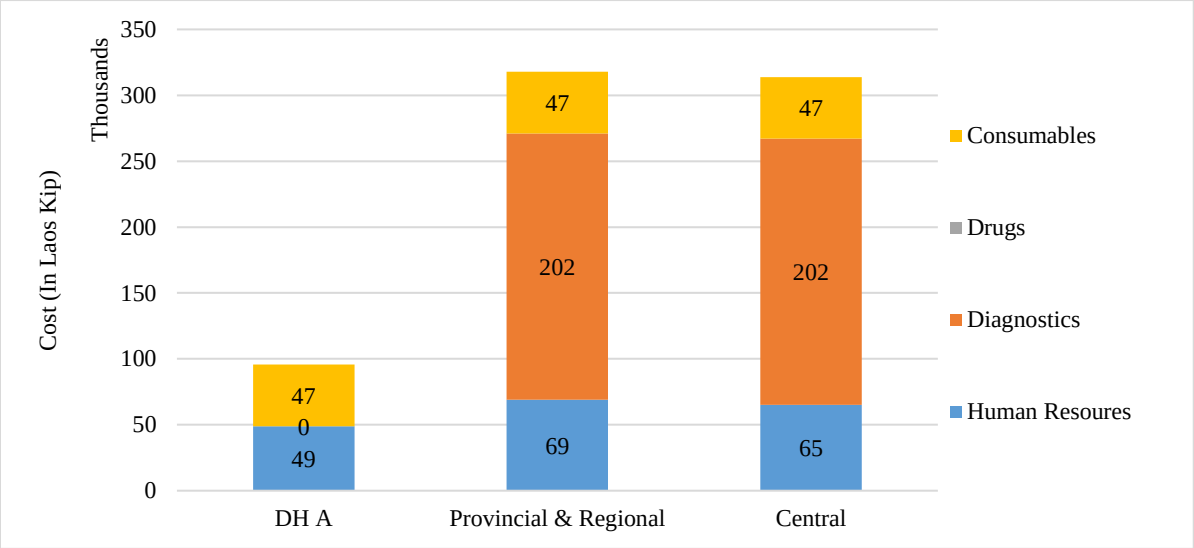


Figure 108: Distribution of unit cost (In Laos Kip) by cost component for service ES103

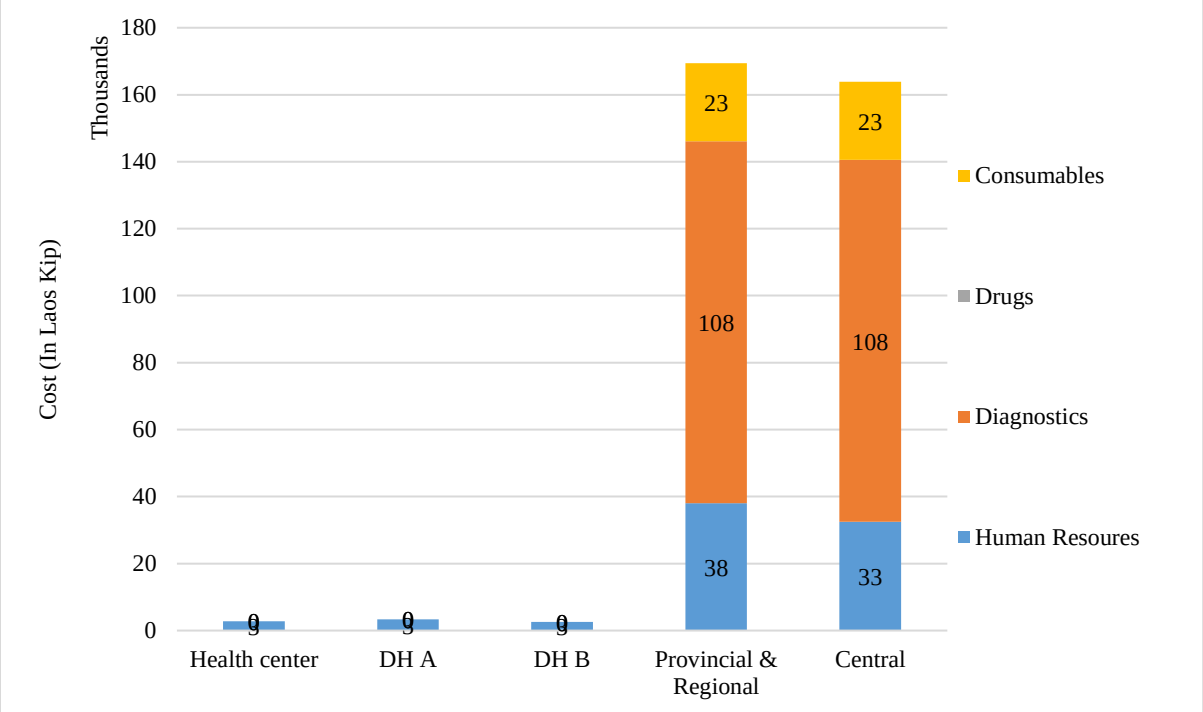


Figure 109: Distribution of unit cost (In Laos Kip) by cost component for service ES104

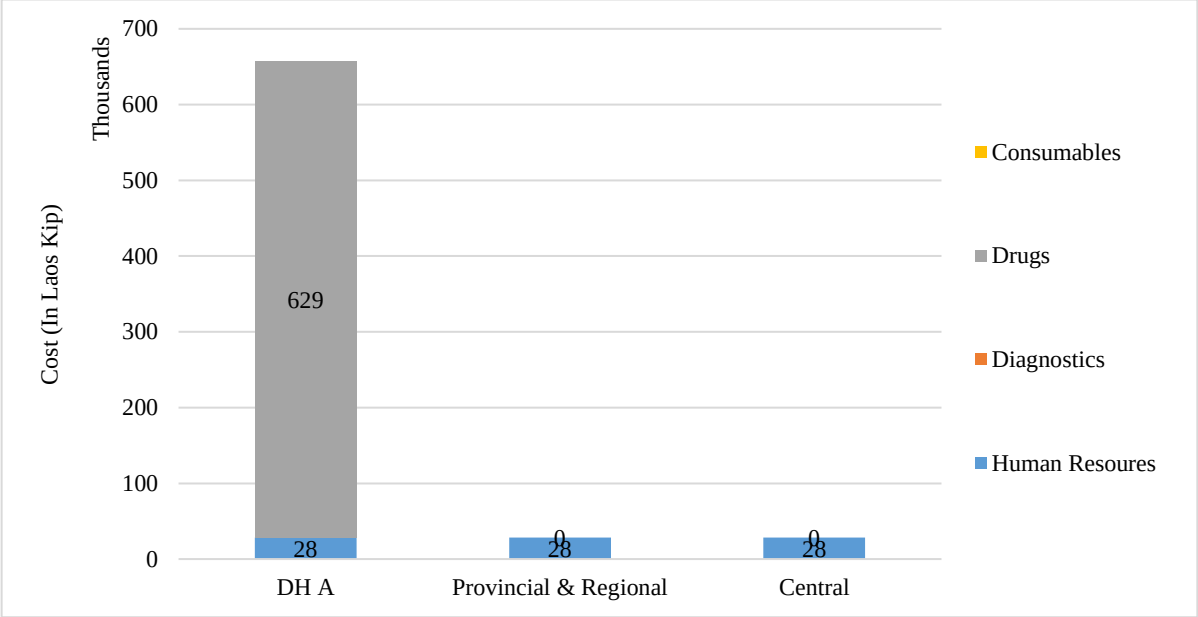
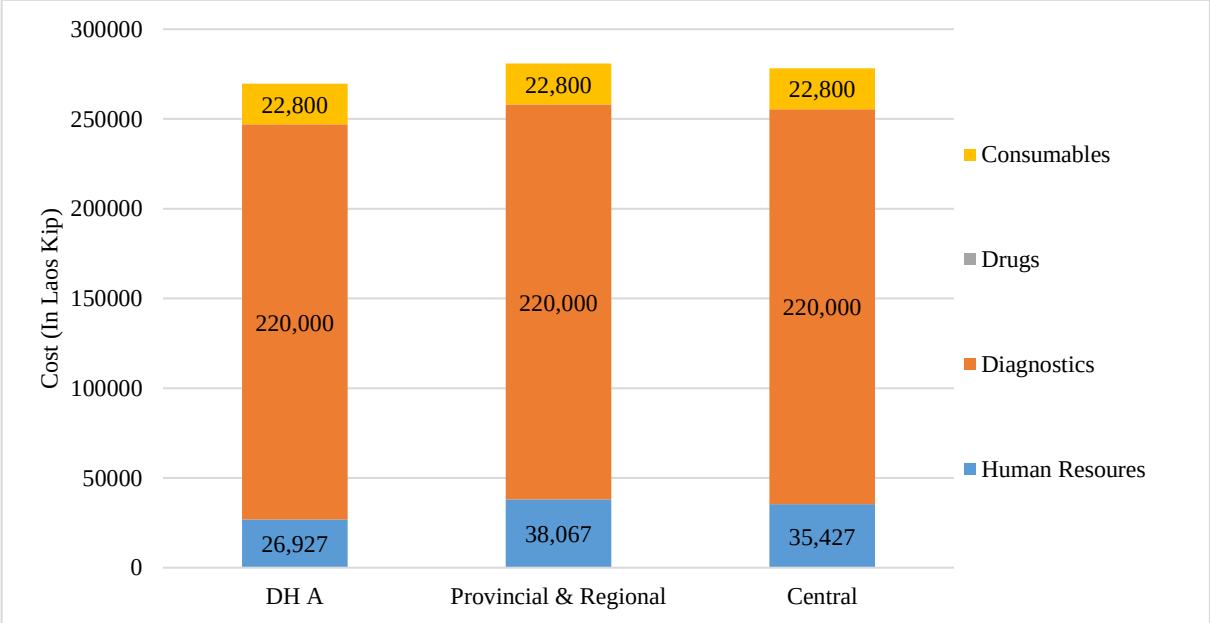


Figure 110: Distribution of unit cost (In Laos Kip) by cost component for service ES105



DCDC Services

Table 55: Description of ESPs

Domain	ESP No.	Core service
DCDC	**ES118**	Mass drug administration and treatment of parasitic disease
DCDC	**ES119**	Treatment of symptomatic dengue
DCDC	**ES120**	Detect, investigate and respond to suspected disease outbreaks and unusual health events
DCDC	**ES121**	Risk communication and health education on essential health behaviours for limiting disease transmission in the health-care setting and in the community

Table 56: Annual cost estimates (In millions Laos Kip) by the level of service delivery for DCDC for Laos PDR

ESP No.	Outreach		Community		Health center		DH A		DH B		PH & RH		Central	
	2019	**2025**	**2019**	**2025**	**2019**	**2025**	**2019**	**2025**	**2019**	**2025**	**2019**	**2025**	**2019**	**2025**
ES118	2,348	4,471			3,236	6,613	240	457	235	446	44.3	84.4	14.8	28.1
ES119					182	3,484	13.5	2,577	13.2	2,518	2.5	476	0.8	159
ES120														
ES121	26,298	50,080			31,113	59,249	2,309	4,398	2,256	4,296	426	812	142	271
Annual	28,646	54,551			34,531	100,253	2,563	7,432	2,503	7,260	473	1,372	158	457

Figure 111: Distribution of Annual cost (In Laos Kip) by cost component for service ES118

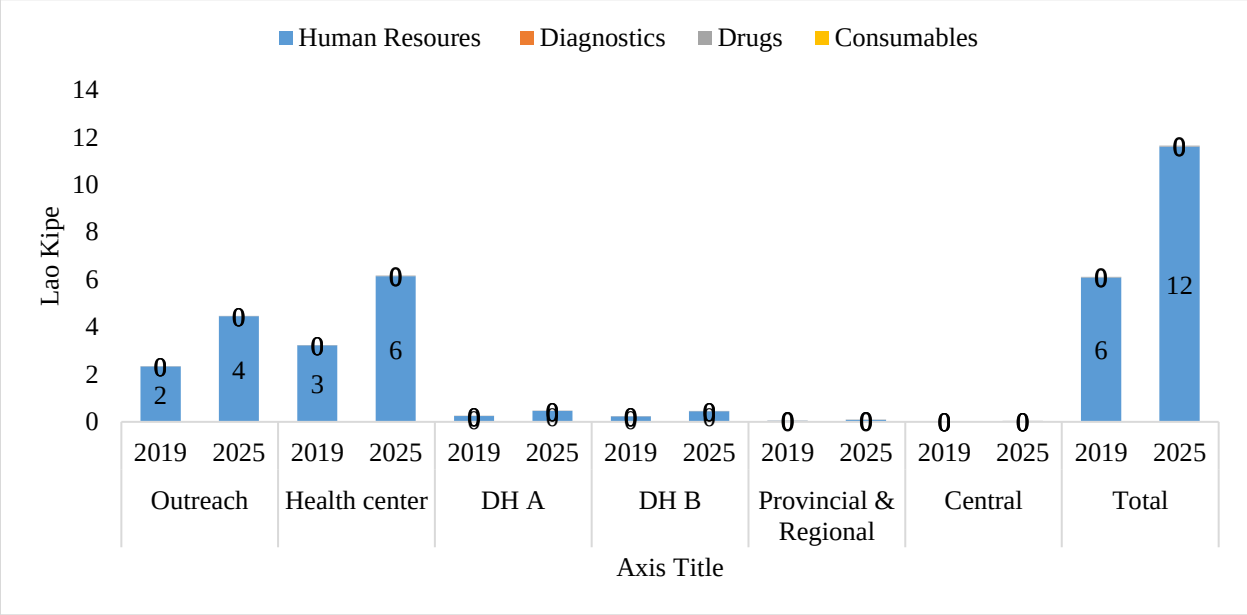


Figure 112: Distribution of Annual cost (In Laos Kip) by cost component for service ES119

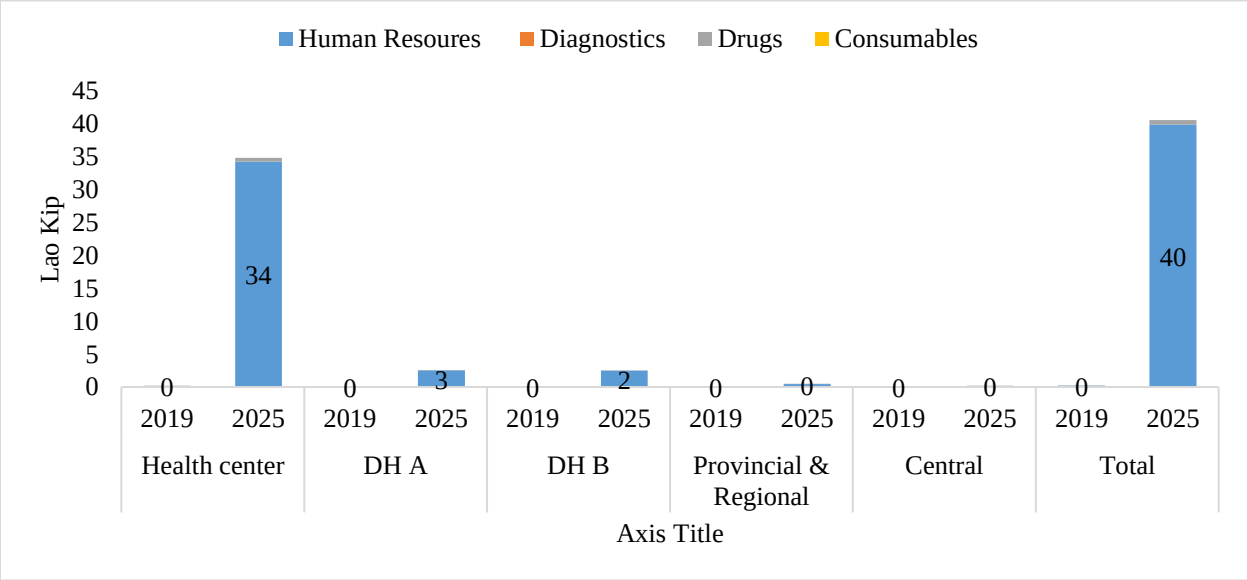
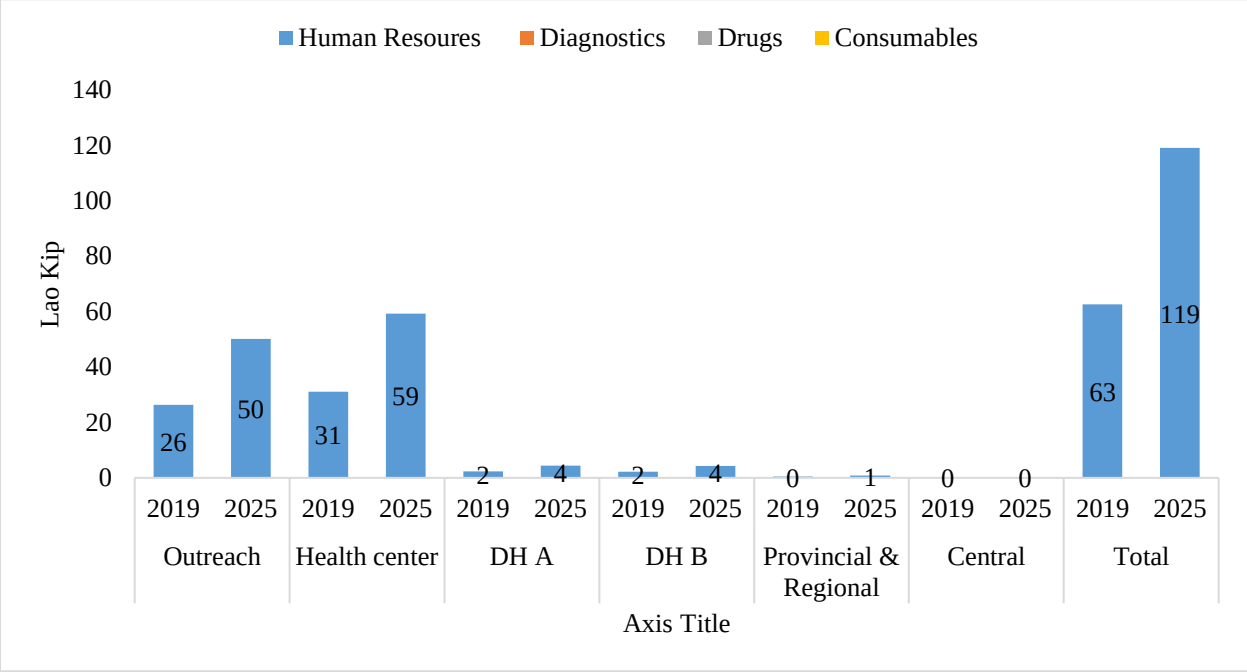


Figure 113: Distribution of Annual cost (In Laos Kip) by cost component for service ES121



Unit Cost

Figure 114: Distribution of unit cost (In Laos Kip) by cost component for service ES118

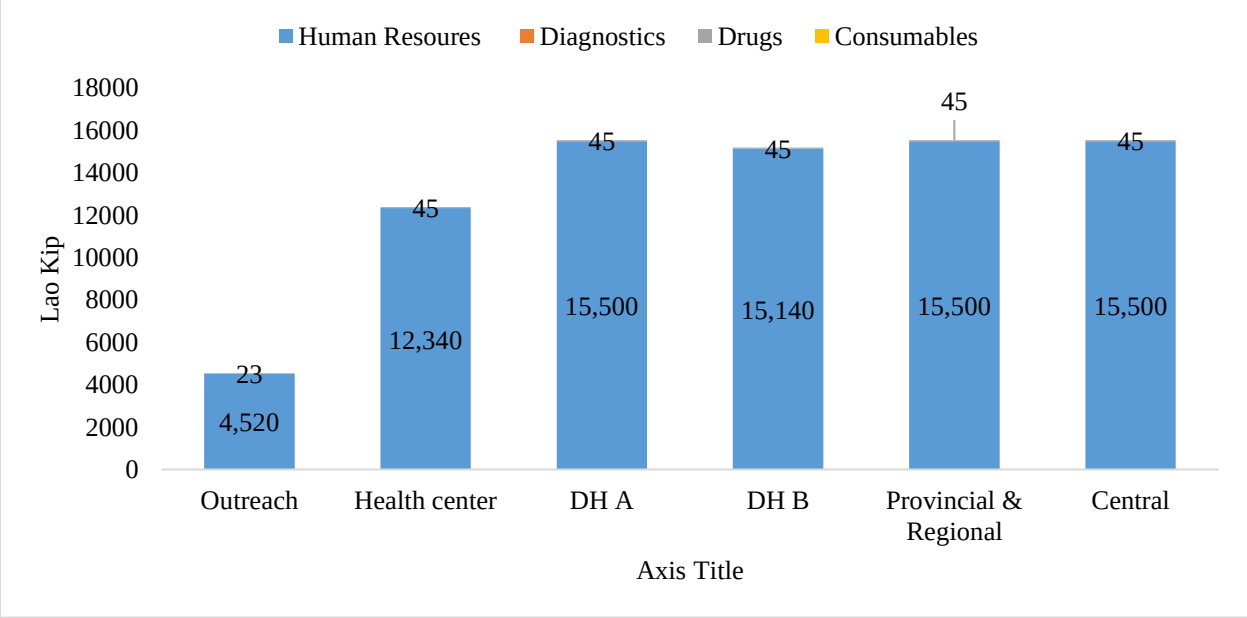


Figure 115: Distribution of unit cost (In Laos Kip) by cost component for service ES119

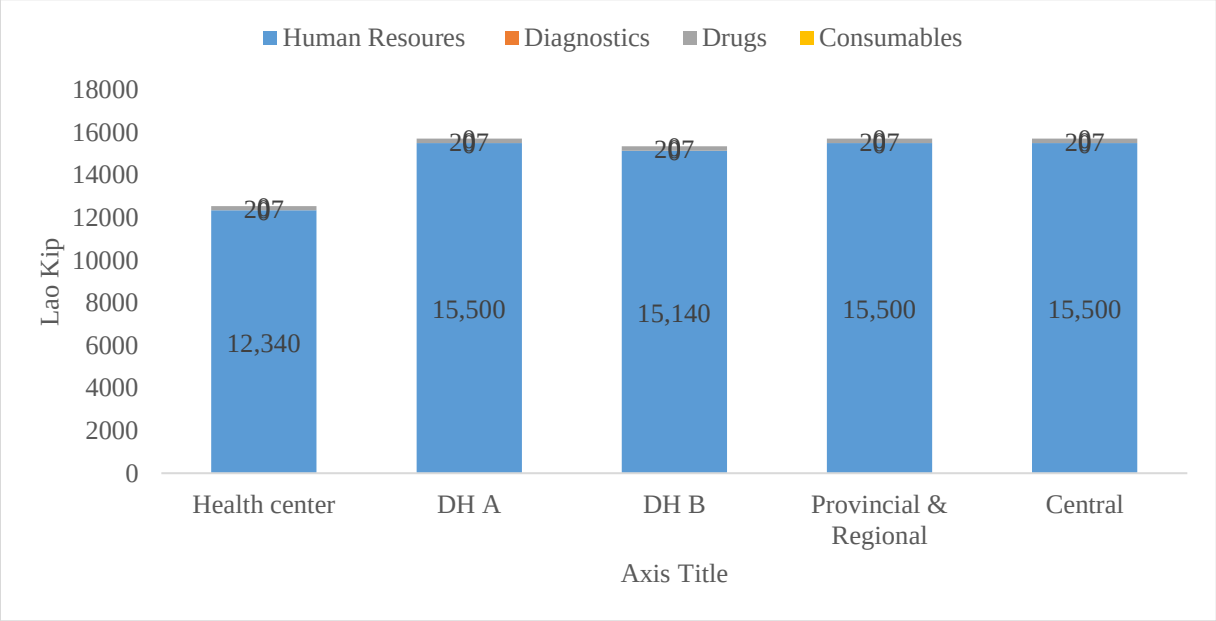


Figure 116: Distribution of unit cost (In Laos Kip) by cost component for service ES120

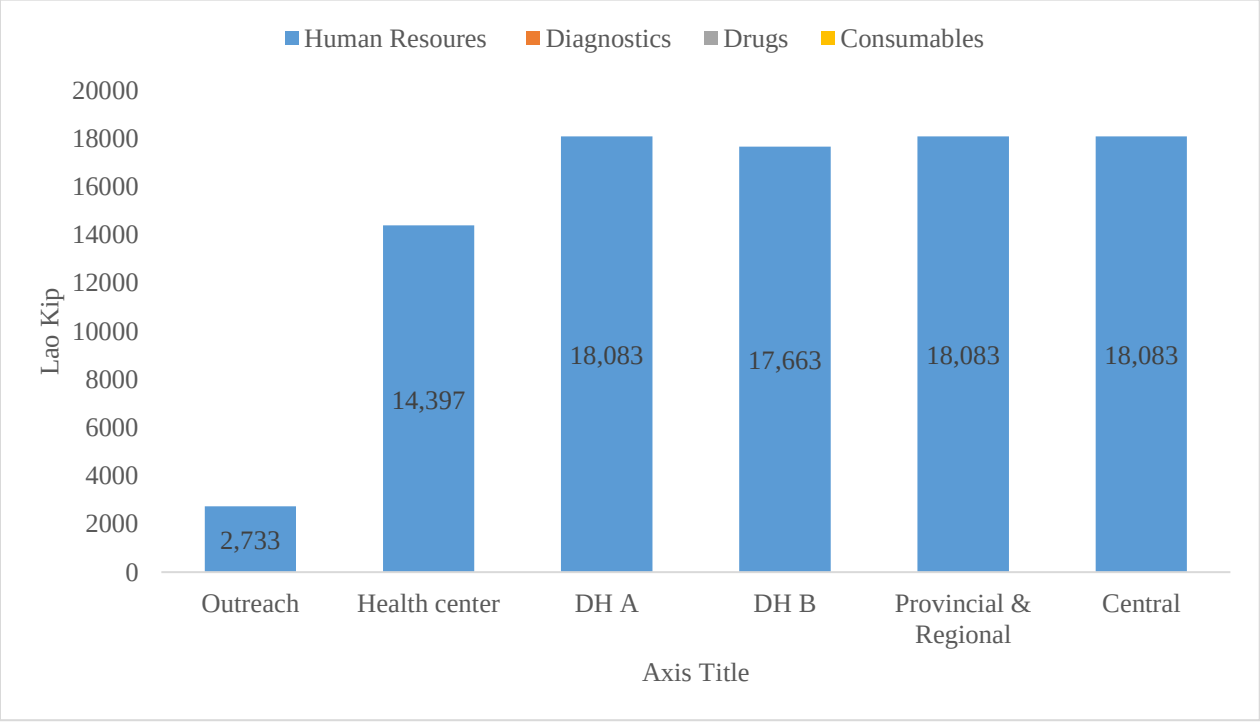
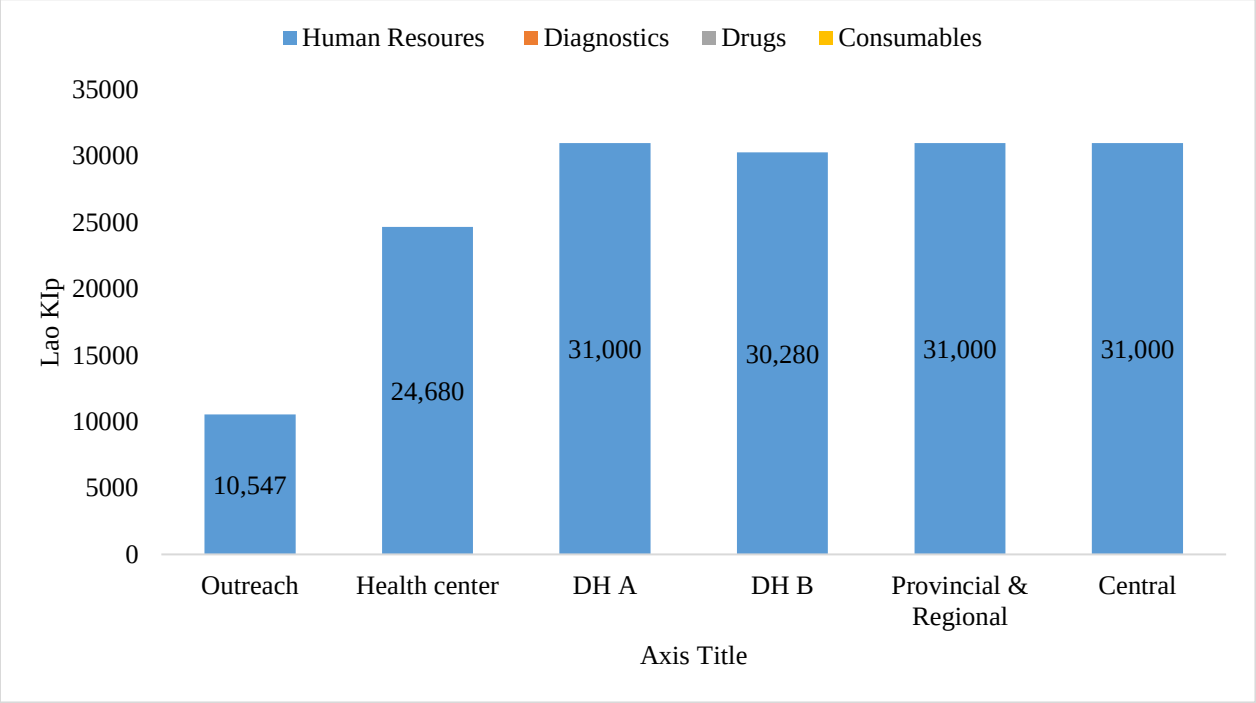


Figure 117: Distribution of unit cost (In Laos Kip) by cost component for service ES121

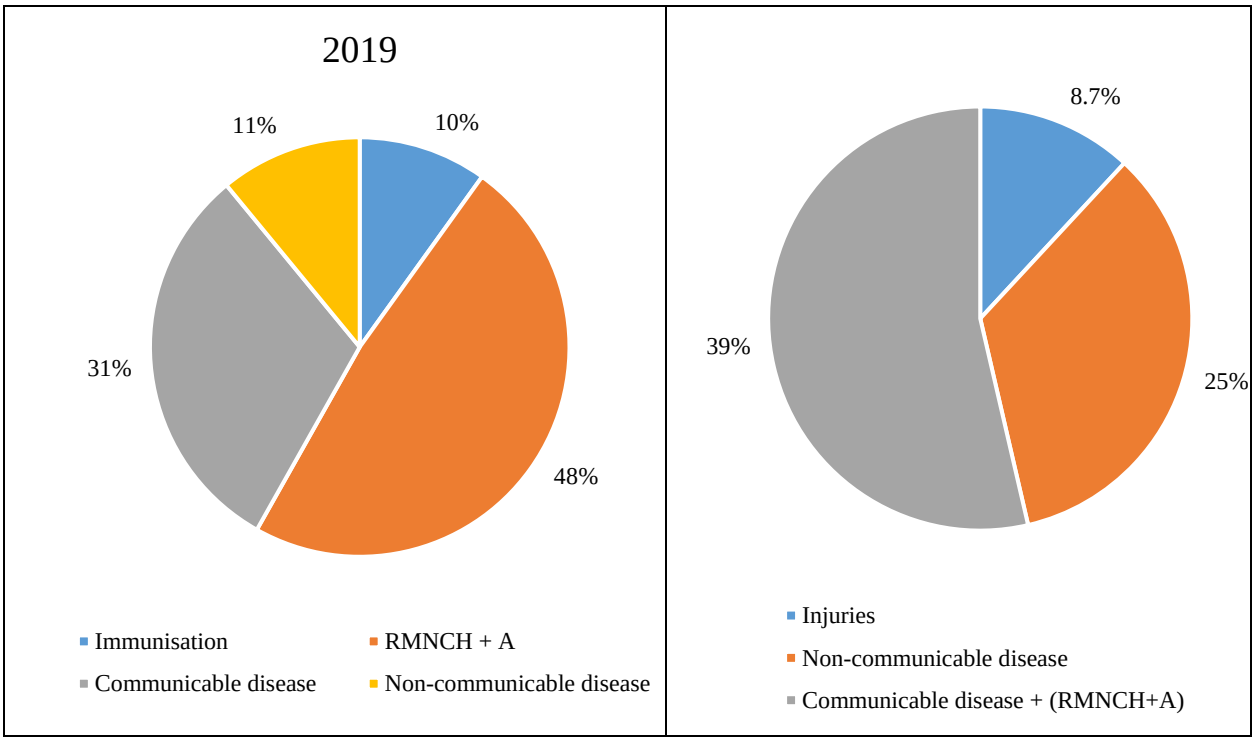


Family Planning

Table 57: Health facility wise cost of FP service delivery per beneficiary

Health Facility Level	HC	DHA	DHB	PH	CH
Reproductive Health information and contraception counselling/ generation of demand for contraceptives in particular for modern and long-term methods	2,987	7,638	7,280	7,638	10,763
Condoms	3,183	2,627	2,380	2,380	2,268
oral contraceptives	5,446	5,530	5,530	5,530	6,911
Injectable contraceptives	0	20,248	17,224	17,224	17,224
Implant	98,293	98,685	98,685	98,685	98,685
Intrauterine Device (IUD)	98,293	98,685	98,685	98,685	98,685
Vasectomy	0	7,638	7,638	7,638	10,763

Figure 118: Comparative Distribution of package cost and disease burden



References

1. World Health Organization Regional Office for the Western Pacific. Overview of Lao health system development 2009-2017. Manila, Philippines2018.
2. Chapko MK, Liu CF, Perkins M, Li YF, Fortney JC, Maciejewski ML. Equivalence of two healthcare costing methods: bottom-up and top-down. Health economics. 2009;18(10):1188-201.
3. Olsson TM. Comparing top-down and bottom-up costing approaches for economic evaluation within social welfare. The European journal of health economics : HEPAC : health economics in prevention and care. 2011;12(5):445-53.
4. Methodological Guide for Costing of Government Strategies: With Examples from Public Administration Reform Strategies. Montenegro Regional School of Public Administratio, 2018.
5. Kruk ME, Gage AD, Joseph NT, Danaei G, García-Saisó S, Salomon JA. Mortality due to low-quality health systems in the universal health coverage era: a systematic analysis of amenable deaths in 137 countries. The Lancet. 2018;392(10160):2203-12.
6. Government of Laos PDR. National TB strategic plan (2017-2020). Laos: Ministry of Health; 2016.
7. Government of Laos. World Health Organisation (western pacific region). National Multisectoral Action Plan for the Prevention and Control of Noncommunicable Diseases 2014-2020 (LAOSMAP- NCD). In: Health Mo, editor. Vientiane, Lao PDR: Ministry of Health; 2014.
8. Institute for Health metrics and Evaluation. Country profile- Laos. 2019.:9.
9. Government of Laos. National Strategic Plan for Malaria Control and Elimination 2016-2020. Laos: Ministry of Health; 2016.
10. Menon V, Silva R, Lang E, Iyer P, Mosime W. Estimated Resource Needs for Key Health Interventions Offered Under Botswana's Essential Health Services Plan 2013–2018. Washington, DC: Futures Group, Health Policy Project; 2015.
11. Bhatt P, Madge V, Mor N, Paul V, Jain N, Hira S, et al. Designing and Costing of an for Indian States Adaptable and Flexible Essential Health Package (EHP) New Delhi, India: Public Health Foundation of India, 2014.
12. Blaakman A. Health and Education Advice and Resource Team. Cost Analysis of the Essential Package of Health Serices (EPHS) in Somalia United Kingdom: 2014.
13. Blaakman AP, Salehi AS, Boitard R. A cost and technical efficiency analysis of two alternative models for implementing the basic package of health services in Afghanistan. Global Public Health. 2014;9(sup1):S110-S23.
14. Collins D, Gupta P, Sovannarith E. Ministry Of Health, Royal Government of Cambodia. Basic Support for Institutionalizing Child Survival (USAID/BASICS) for the United States Agency for International Development (USAID). Cost Projections For The Complementary Package of Activities for Referral Hospitals:. Arlington, Va., USA: Ministry Of Health, Royal Government of Cambodia, 2009.
15. Collins D. The cost of an essential health service package for northern Syria. Medford, USA: Management Sciences for Health, 2017.
16. Collins D, Jirrah Z. Costing the Basic Package of Health Services at Clinics and Health Centres in Liberia. Monrovia, Liberia: 2009.
17. Avenir Health. OneHealth model. 2016.
18. Government of Uganda. Health Sector Development Plan. Uganda: Minstry of Health, 2015.
19. Government of Ghana. World Bank, UNICEF. Ghana Health Sector Medium-Term Development Plan 2010-2013: Costing exercise report. Ghana: Ministry of Health; 2010. p. 53.
20. Government of Ethiopia. Essential Health Services Package of Ethiopia. Addis Ababa: Ministry of Health, 2019.

21. Bhatt P, Madge V, Mor N, Paul V, Jain N, Hira S, et al. Designing and Costing of an adaptable and flexible Essential Health Package (EHP) for Indian States. New Delhi: Public Health Foundation of India (PHFI) 2014.
22. Barker C. Costing of Malawi's second health sector strategic plan using the Onehealth tool. Washington, DC: : Palladium, Health Policy Plus, 2018.
23. Prinja S, Bahuguna P, Pinto AD, Sharma A, Bharaj G, Kumar V, et al. The cost of universal health care in India: a model based estimate. PloS one. 2012;7(1):e30362.
24. Ensor T, Firdaus H, Dunlop D, Manu A, Mukti AG, ayu Puspandari D, et al. Budgeting based on need: a model to determine sub-national allocation of resources for health services in Indonesia. Cost Effectiveness and Resource Allocation. 2012;10(1):11.
25. Flessa S, Moeller M, Ensor T, Hornetz K. Basing care reforms on evidence: the Kenya health sector costing model. BMC Health Serv Res. 2011;11:128-.
26. Arrow KJ. Uncertainty and the Welfare Economics of Medical Care. The American Economic Review. 1963;53(5):941-73.
27. Government of Laos. WHO. UNICEF. GAVI. Micro-Planning guide for Health Centres- Immunisation and integrated service delivery (English Version). Vientienne, Laos: Government of Laos; 2019.