Data Collection Training

Empirical Costing of the Health Insurance Benefit Package (HIBP) and Health Facility (HF) in Lao PDR

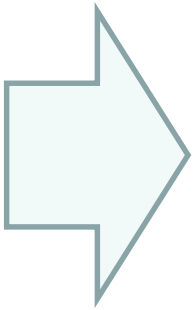
6 May 2019

National Health Insurance Bureau

Training objectives

- To make data collectors knowledgeable on concepts and methods of healthcare cost analysis
- To make data collectors understand and able to collect data for the project
- To improve data collection forms and data collection manual
- To provide capacity building on healthcare cost analysis for sustainable UHC development

The **cost (economic or opportunity cost)** of goods or services is the measure of the value of resources used or consumed to produce the goods or services.



Financial costs/ accounting cost : measurement of costs by the historical outlay of funds (actual monetary flows of the buyer).

(Creese and Parker, 1990)

Source: http://america.pink/payment_3445911.html

Component	Financial cost	Economic cost
Material cost	Value of material purchased by health facilities and supplied by the Ministry of Health	Financial cost including the value of donated material
Labor cost	Actual payment for the staff	Actual payment including the opportunity cost of volunteer
Capital cost	Depreciation cost (purchase price/ useful period) excluding items beyond the useful period	Annual economic cost (current price/ annuity factor) of all items in use including those beyond the useful period

Types of costing studies

- Hospital and unit cost of medical service analysis
- Cost of illness (CoI)
  - Cost of general (all) illnesses
  - Cost of specific illness
- Cost analysis of health care program/service e.g. prevention, mitigation, outbreak control, vaccine logistics
- Cost of risk factors eg smoking, alcohol drinking, obesity

Costing approach

Normative costing approach
estimates costs based on practice or standard guidelines

Empirical costing approach
estimates costs based on actual practice

Goal of the project

- National Health Insurance Bureau

- Cost of Health Insurance Benefit Package (HIBP).

- Ministry of Health/ Department of Finance

- Cost of Essential Health Service Package (EHSP)

- Health facilities (HF)

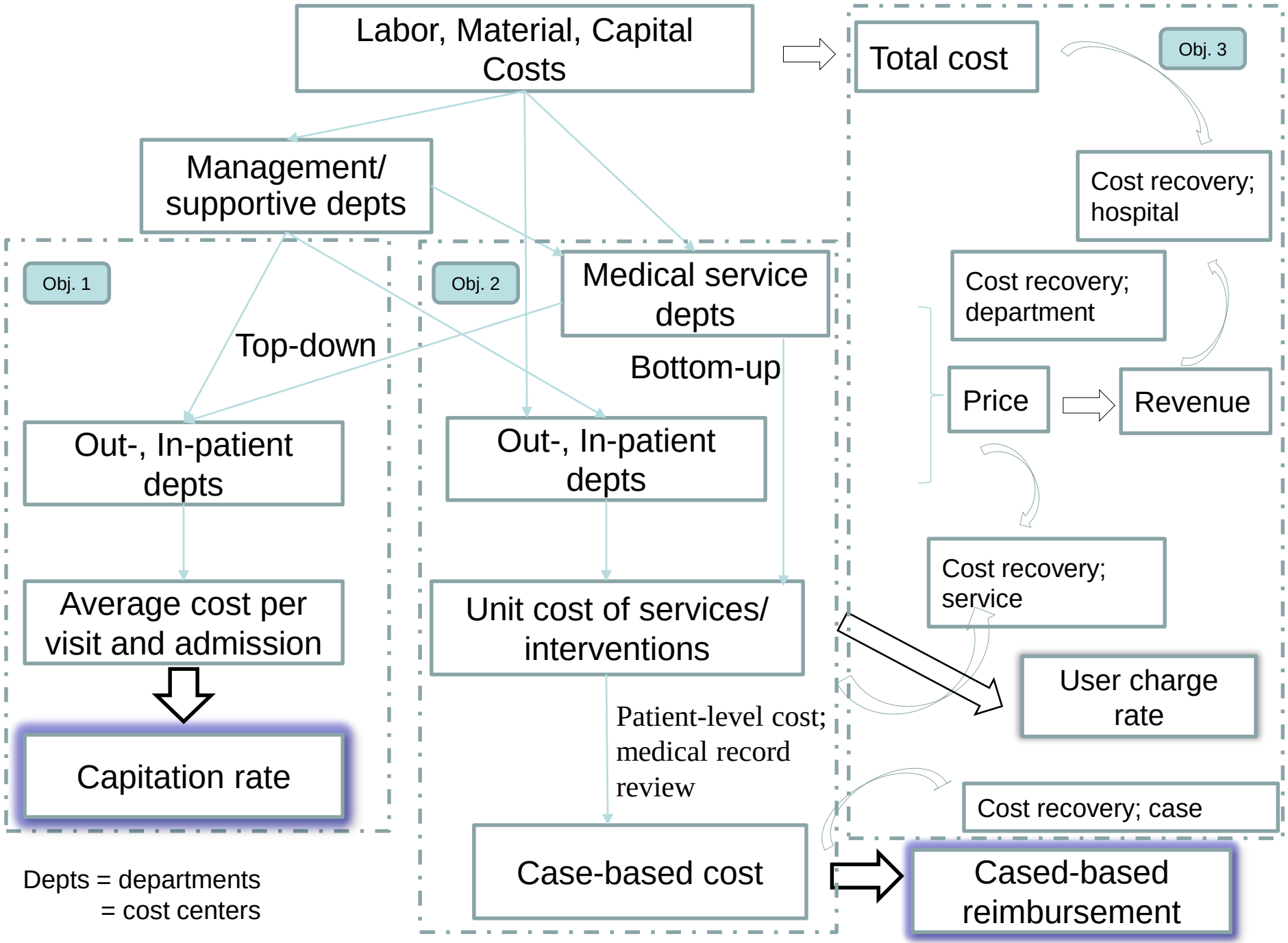
- cost of medical services

- cost recovery

- cost at zero utilization.

Analysis objectives

- Top-down costing- cost per visit and admission/ patient-day.
- Bottom-up costing- unit cost of all medical services, cost of pathology/ intervention in HIBP and ESP.
- Health facility financial analysis. Unit cost of medical services and cost recovery analysis.


Labor, Material, Capital Costs
Total cost
Obj. 3
Management/ supportive depts
Cost recovery; hospital
Obj. 1
Obj. 2
Medical service depts
Cost recovery; department
Top-down
Bottom-up
Price
Revenue
Out-, In-patient depts
Out-, In-patient depts
Cost recovery; service
Average cost per visit and admission
Unit cost of services/ interventions
User charge rate
Patient-level cost; medical record review
Capitation rate
Cost recovery; case
Case-based cost
Cased-based reimbursement
Depts = departments
= cost centers

Cost objects

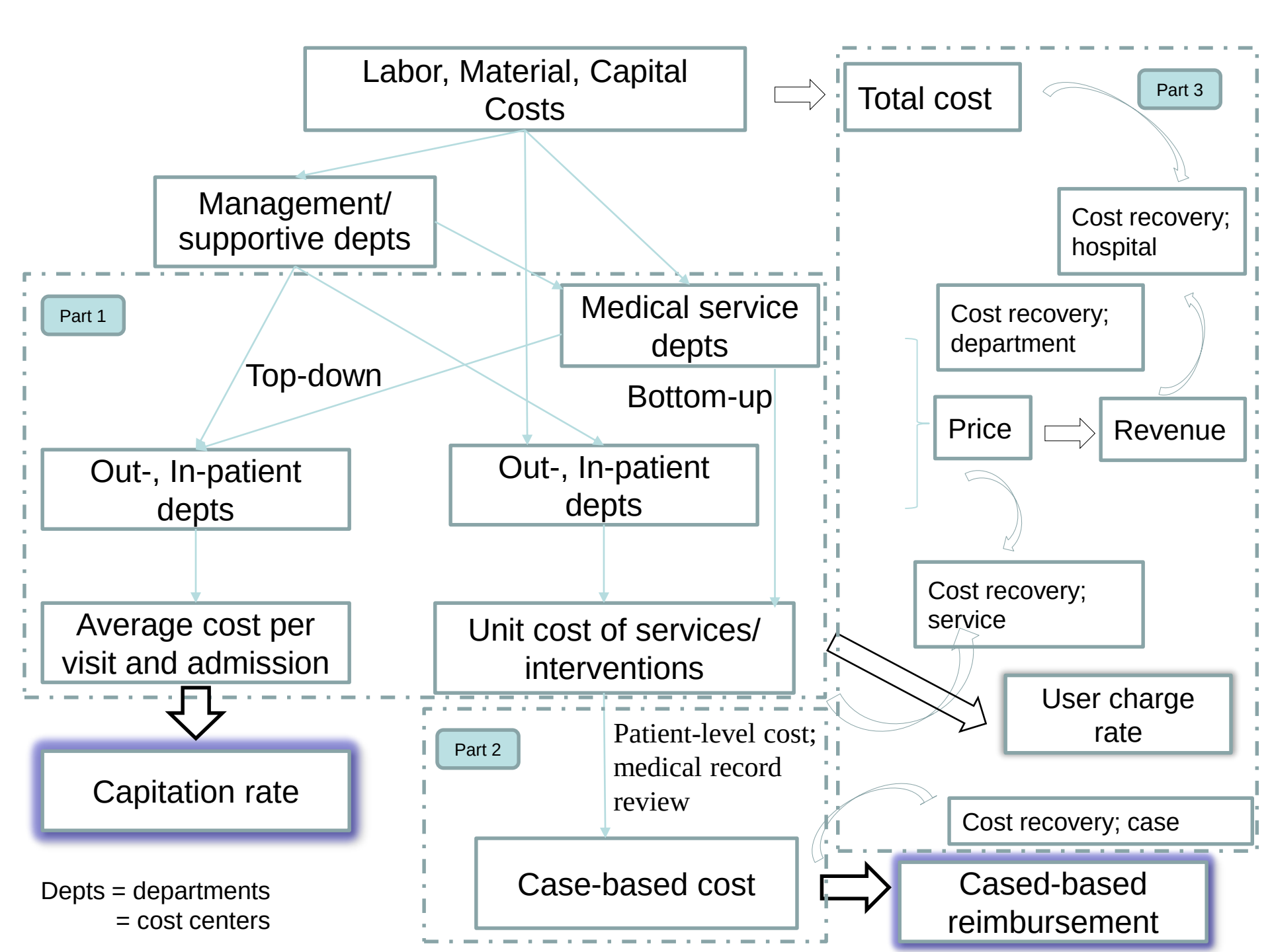
	Tracers	Sample by Level of service									Grand
	#	CH	Spec C	Pvte H	RH	PH	DHA	DHB	HC (urban)	HC (rural)	Total	Total
OPD												-
OPD general	1	From Top-down costing									-	-
OPD emergency (if have time)	1	30		30	30	30					120	**360**
OPD specialized												
Opthamology	1	Top-down costing									-	-
Dermatology	1	Top-down costing									-	-
Rehabilitation	1	Top-down costing									-	-
IPD											-	-
IPD general												
Hypertension	1	30	30	30	30	30	30	20	15	15	230	**920**
ARI	1	30	30	30	30	30	30	20	15	15	230	**950**
Diarrhea	1	30	30	30	30	30	30	20	15	15	230	**920**
Injury (trauma)	1	30	30	30	30	30	30	20	15	15	230	**920**
IPD acute with ICU (avg.)	1	Top-down costing									-	
Surgery											-	-
Surgery Minor	1	30	30	30	30	30	30	20			200	**710**
Surgery Medium												
Appendectomy	1	50	30	30	30	30	30				200	**510**
Lithiasis bladder	1	50	30	30	30	30	30				200	**510**
Hernia	1	50	30	30	30	30	30				200	**510**
Cataract (SICS or PHACO)	1	50	30	30	30	30					170	**450**
Surgery Major general												
Lithiasis renal	1	50	30	30	30	30					170	**420**
Laparotomy	1	50	30	30	30	30					170	**420**
Cancer	1	50	30	30	30	30					170	**540**

	Tracers	Sample by Level of service									Grand
	#	CH	Spec C	Pvte H	RH	PH	DHA	DHB	HC (urban)	HC (rural)	Total	Total
Surgery Major high costs												
Heart surgery	1	80									80	**150**
Brain surgery	1	80									80	**240**
Spine surgery	1	80		30	30						140	**390**
Orthopedic surgery	1	80		30	30						140	**390**
MNCH											-	**-**
ANC	1	From ESP Normative costing									-	**-**
PNC	1	From ESP Normative costing									-	**-**
Delivery												
Normal	1	50	30	30	30	30	30	20	15	15	250	**980**
Complication	1	50	30	30	30	30	30	20	15	15	250	**980**
Caesarean section											-	**-**
Normal	1	50		30	30	30	30				170	**510**
Complication (blood transfu	1		30									**30**
RH											-	**-**
Condoms	1	From ESP Normative costing									-	**-**
Oral contraceptives	1	From ESP Normative costing									-	**-**
Injectable contraceptives	1	From ESP Normative costing									-	**-**
Implant (insertion/extraction)	1	From ESP Normative costing									-	**-**
Intrauterine Device (IUD)	1	From ESP Normative costing									-	**-**
Vasectomy	1	30		30	30	30	30				150	**450**
Tubal ligation	1	30		30	30	30	30				150	**450**
Medical abortion intervention	1	30		30	30	30	30	20	15	15	200	**890**
Surgical abortion intervention (	1	30		30	30	30	30	20			170	**590**
											-	**-**
	37	1,120	450	660	660	600	450	180	105	105	4,300	**14,190**

The operation

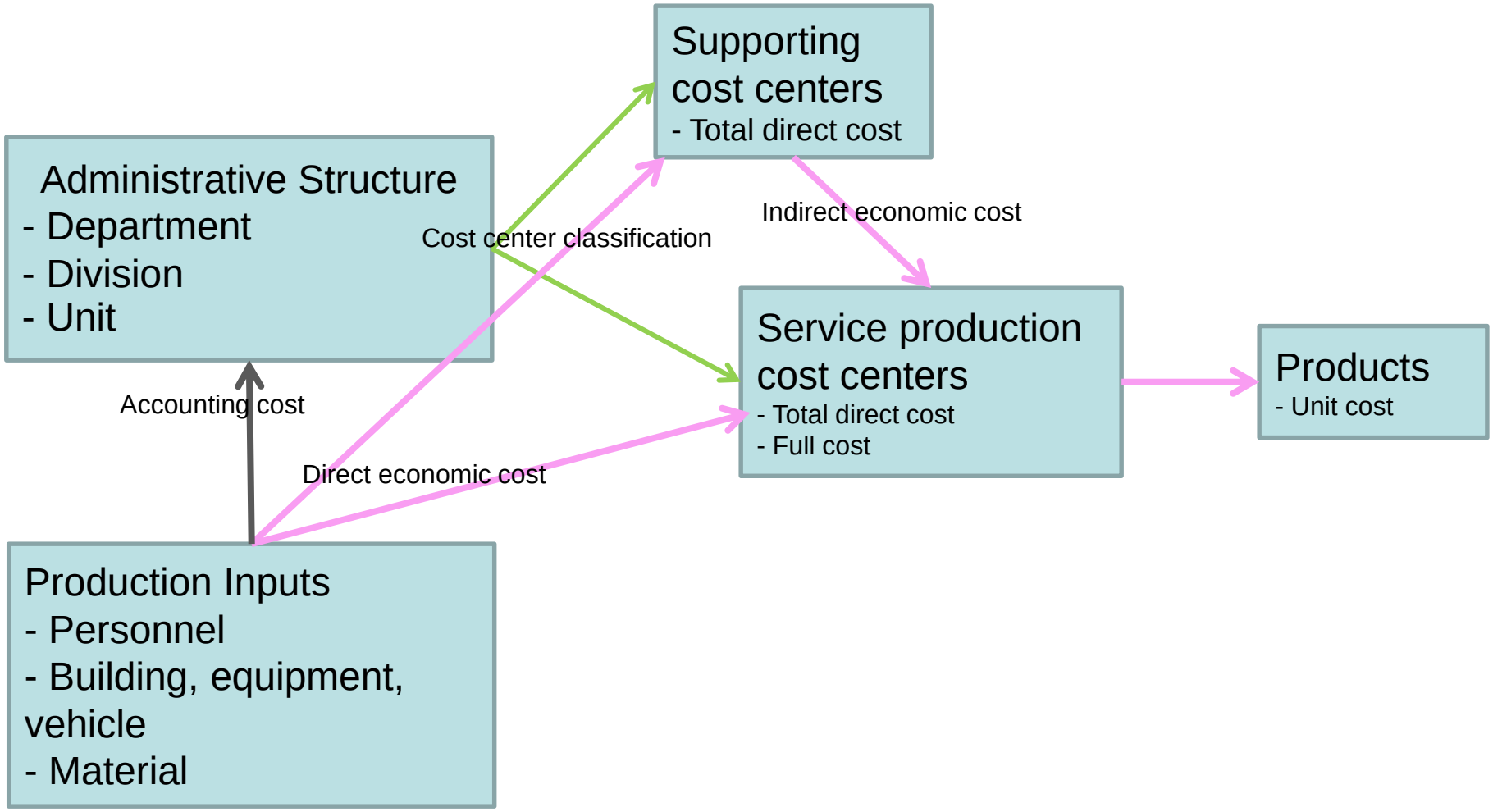
The project is composed of 3 parts.

- Part 1; analysis of unit cost of medical services,
- Part 2; case-based costing
- Part 3; health facility financial analysis

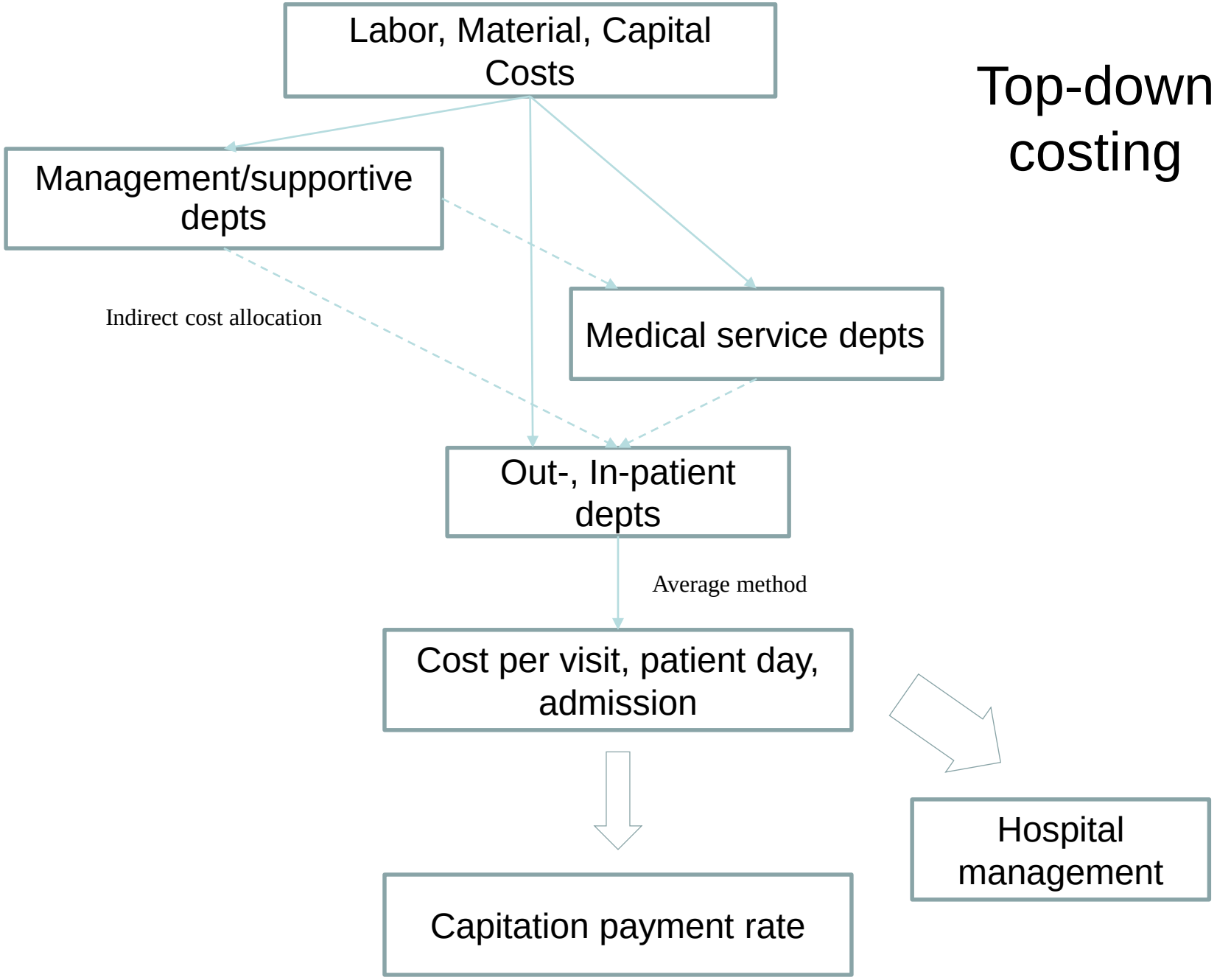

Labor, Material, Capital Costs
Total cost
Part 3
Management/ supportive depts
Cost recovery; hospital
Part 1
Medical service depts
Cost recovery; department
Top-down
Bottom-up
Price
Revenue
Out-, In-patient depts
Out-, In-patient depts
Cost recovery; service
Average cost per visit and admission
Unit cost of services/ interventions
User charge rate
Capitation rate
Part 2
Patient-level cost; medical record review
Cost recovery; case
Case-based cost
Cased-based reimbursement
Depts = departments
= cost centers

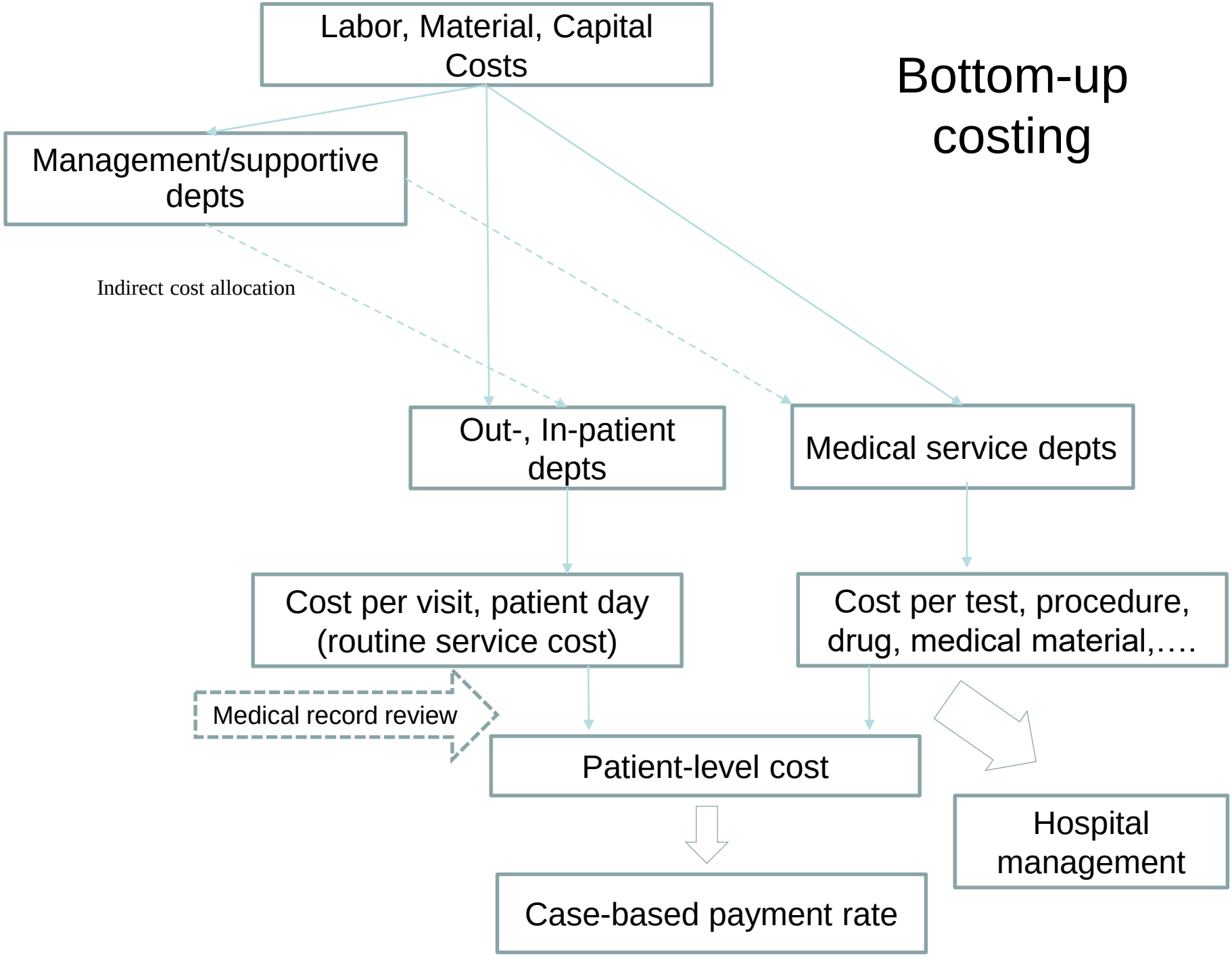
Unit Cost Analysis of Medical Services (Part 1)

Concept of Standard Costing

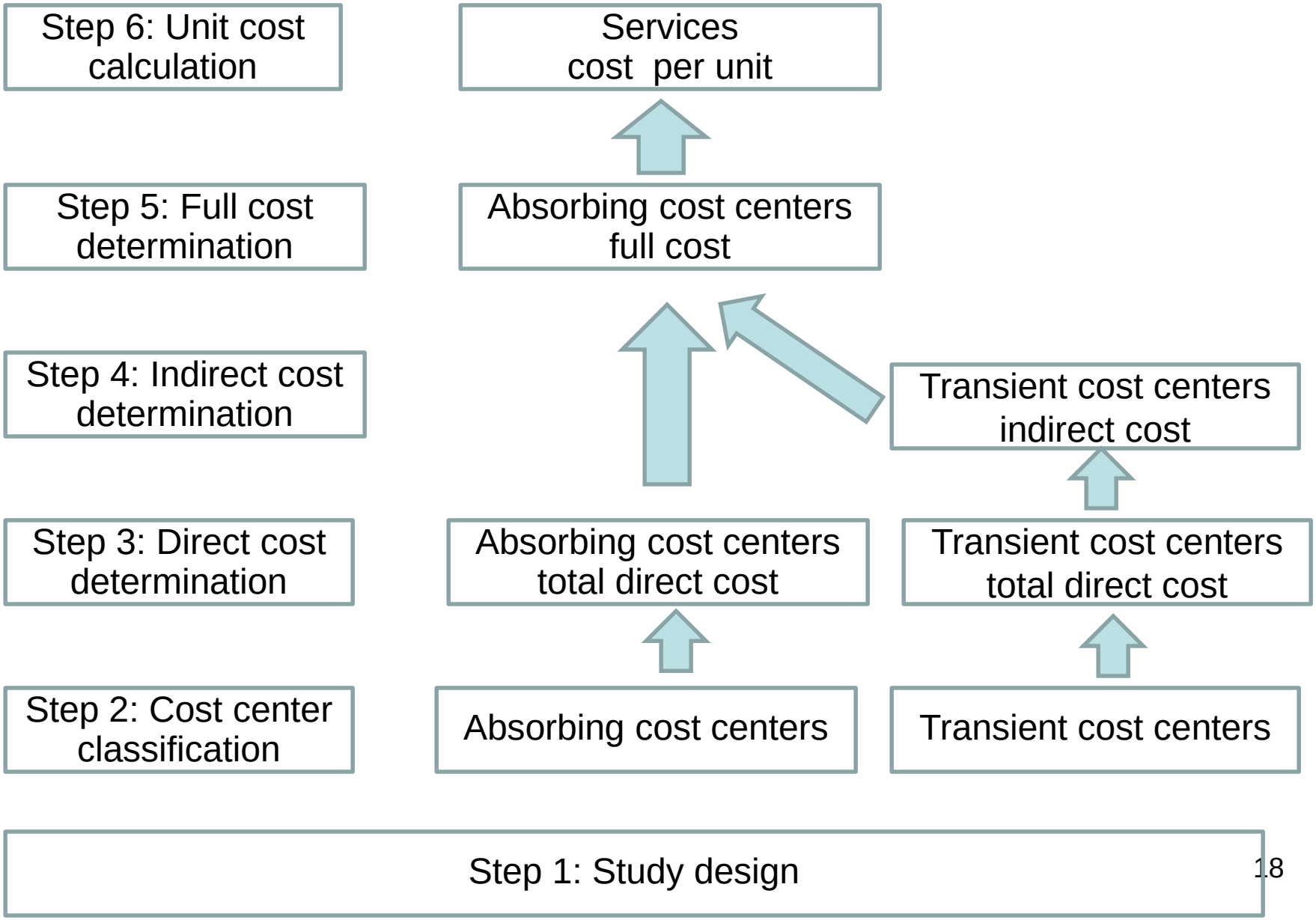


Top-down costing




Labor, Material, Capital Costs
Bottom-up costing
Management/supportive depts
Indirect cost allocation
Out-, In-patient depts
Medical service depts
Cost per visit, patient day (routine service cost)
Cost per test, procedure, drug, medical material,….
Medical record review
Patient-level cost
Hospital management
Case-based payment rate

Steps of unit cost analysis



Design and planning

- Objectives of the analysis
- Defining cost products
- Defining perspective
- Defining time horizon
- Defining levels of organization and sources of financing

Objectives of the analysis

- To negotiate performance-based budget, reimbursement rate, price setting
- To increase efficiency of health service production
- To negotiate prices of outsourced services

Defining cost objects

- Output that we want to know the cost per unit called a cost object or cost product.
- It is not necessary to define all outputs as cost products. This depends on the study objectives.
- To be comparable, we have to define characteristics of cost products. Same name of outputs might be composed of different detail.
- For instance;

  - visit (routine service vs routine service+lab+ drug)
  - admission (hotel cost+nursing care vs hotel cost+ nursing care+lab+drug)
  - lab tests
  - pharmacy (dispensing per prescription vs item)
  - food (meal vs day)

Defining time horizon

- Time horizon is defined as the year and period of time for which costs and outputs are measured.
- Normally, we perform cost analysis for the whole year to avoid the effect of seasonal variation of number of patients. The variation affects fixed cost per unit of service.
- We also have to define year of the analysis. To compare costs in different years focusing on resource consumption, the unit cost is needed to be adjusted by inflation rate before the comparison.

Step two: Organization analysis and cost center classification

- Define organization/ management structure
- Define jobs/service outputs
- Define customers of each department
- Define recording system of resource consumption
- Define cost centers (units with measurable outputs and resource consumption)
- Define types of cost centers

Organization	Output	Unit of output
Clerical works	letter sending/receiving	item
Personnel	personnel management	Full time equivalent
General financing	financing activity	transaction
Service charging	service charging	receipt
Maintenance	repair	request
Supply	material supply	request/dollar
Catering	meal	set
Laundry	clothes	kg.
Laboratory	lab tests	test
Dispensing	drug dispensing	prescription/ item
	counseling	case
Production	Skin preparation	gram
OPD	out-patient treated	visit
IPD	in-patient treated	admission/ pt-day

Cost center classification

Top-down Bottom-up

Department	Division	Cost center	Type	Analysis1	Analysis 2	Analysis 3
Administration	Clerical works, Personnel, Financing, Maintainance	Administration	Supporting	T1	T1	T1
Supply		Supply	Supporting	T2	T2	T2
Catering		Catering	Supporting	T3	T3	A1
Laundry		Laundry	Supporting	T4	T4	A2
Laboratory		Laboratory	Service production	T5	A1	A3
Pharmacy		Pharmacy	Service production	T6	A2	A4
OPD		OPD	Service production	A1	A3	A5
IPD	Male ward, Female ward	IPD	Service production	A2	A4	A6

T= Transient cost center, A = Absorbing cost center

Ref: Cost center.xls

In case we want to know cost of meal and laundry for making decision on outsourcing.

Cost center	Type	Service code	Analysis code	
			Top-down	Bottom-up
General admin	NRPCC	A1	TCC1	TCC1
Medical admin	NRPCC	A2	TCC2	TCC2
Laundry	NRPCC	A3	TCC3	TCC3
Pharmacy	RPCC	B1	TCC4	ACC1
Laboratory	RPCC	B2	TCC5	ACC2
Radiology	RPCC	B3	TCC6	ACC3
OR & Anesthesiology	RPCC	B4	TCC7	ACC4
Dentistry	PS	C1	ACC1	ACC6
Emergency	PS	C2	ACC2	ACC7
Observation room	PS	C3	ACC3	ACC8
OPD General	PS	C4	ACC4	ACC9
OPD Traditional medicine	PS	C5	ACC5	ACC10
OPD MCH (PP)	PS	C6	ACC6	ACC11
OPD Eye	PS	C7	ACC7	ACC12
OPD Ear Nose Throat	PS	C8	ACC8	ACC13
ICU	PS	D1	ACC9	ACC14
Ward Medicine	PS	D2	ACC10	ACC15
Ward Private	PS	D3	ACC11	ACC16
Ward OBGY	PS	D4	ACC12	ACC17
Health promotion/ disease prevention	PP	E1	ACC14	ACC19
Teaching	OS	E2	ACC15	ACC20

Group A = non-revenue producing cost centers which support to other cost centers

Group B = revenue-producing cost centers or medical service cost centers

Group C = Out-patient service cost centers

Group D = In-patient service cost centers

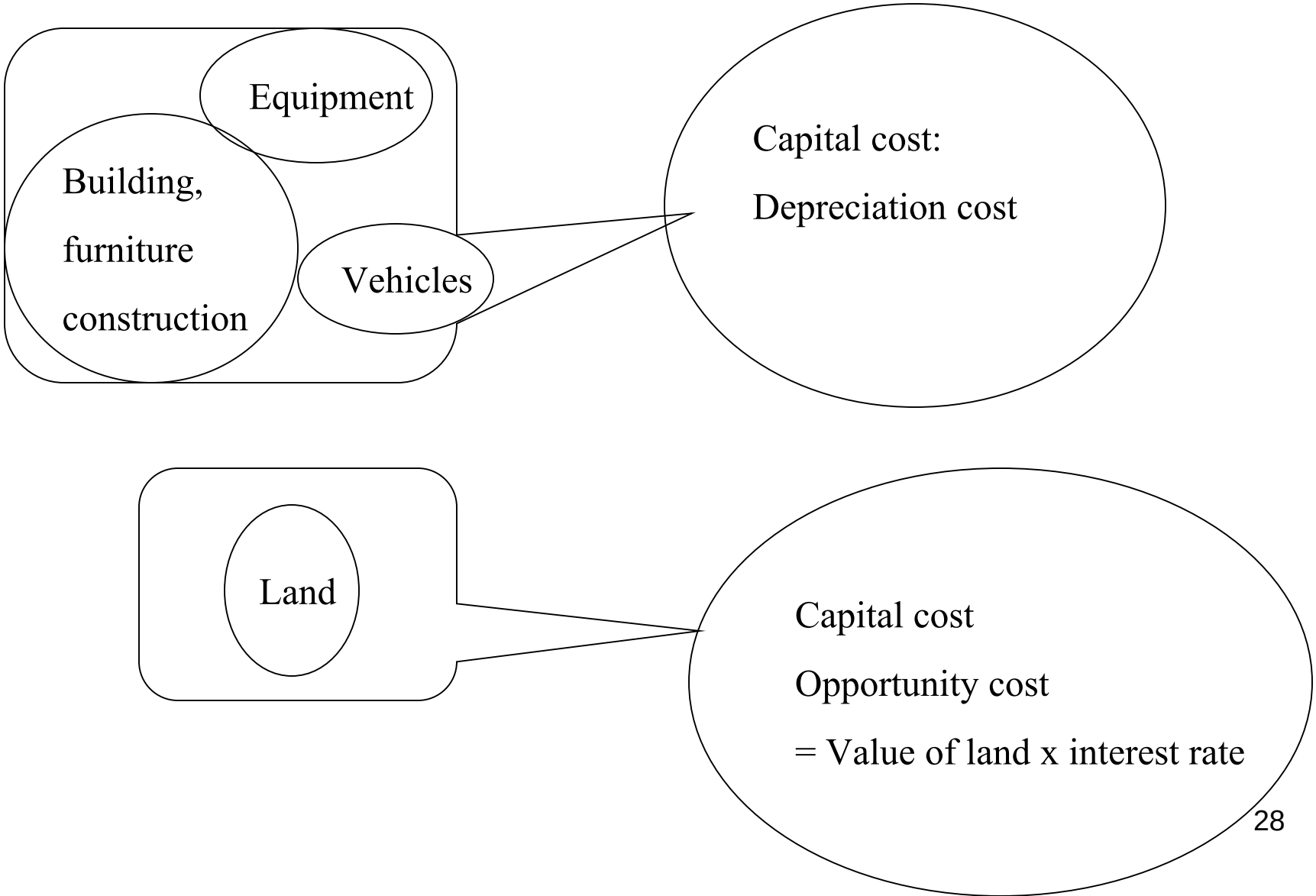
Group E = Health promotion & disease prevention service and other service (eg medical teaching)

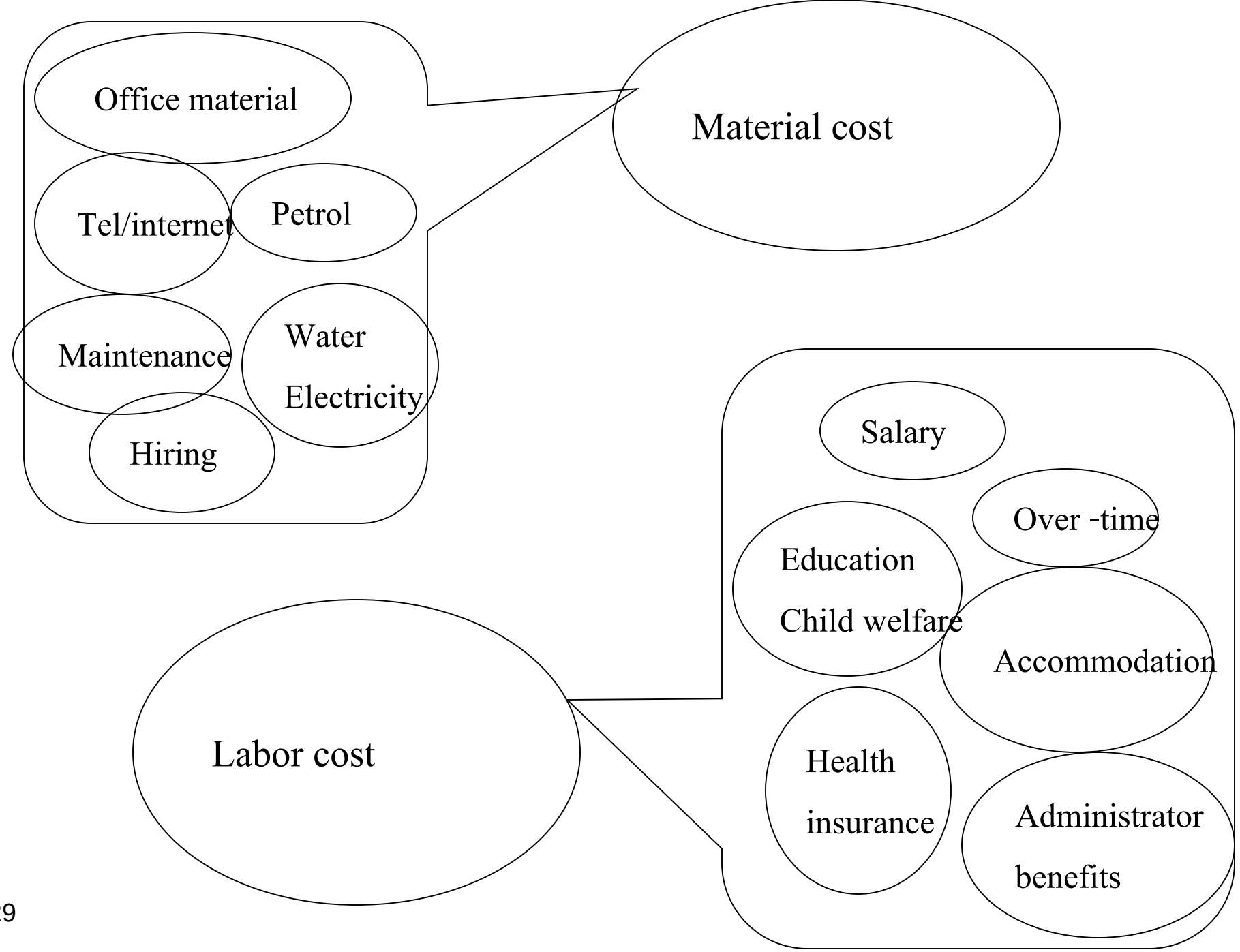
TCC = Transient cost center
ACC = Absorbing cost center (producing cost objects)

Step three: Direct cost determination

- Define scope of costs
- Define source of information
- Design data collection forms
- Collect quantity of resource used
- Convert to monetary value
- Allocate shared resources
- Calculate sum of direct costs

Category of costs




Office material
Tel/internet
Petrol
Maintenance
Water
Electricity
Hiring
Material cost
Salary
Over -time
Education
Child welfare
Accommodation
Health
insurance
Administrator
benefits
Labor cost

Material cost

Electricity	145,000
Water	45,000
Telephone	23,500
Mail	8,700

Cost center	Criteria; area	Electricity	Criteria; FTE	Water	Criteria; FTE	Telephone	Mail	Drug	Lab reagent	other material	Hiring cost	Outsourcing	Total
Administration	0.20	29,191	2.24	5,920	2.24	3,091	8,700	0	0	32,210	31,700	0	110,813
Supply	0.05	7,178	1.76	4,668	1.76	2,438	0	0	0	13,280	0	0	27,565
Catering	0.07	9,571	1.00	2,647	1.00	1,382	0	0	0	17,318	0	0	30,918
Laundry	0.04	5,743	1.00	2,647	1.00	1,382	0	0	0	34,890	0	0	44,662
Laboratory	0.07	9,571	2.00	5,294	2.00	2,765	0	0	482,486	53,240	0	0	553,356
Pharmacy	0.17	23,927	2.00	5,294	2.00	2,765	0	756,338	0	34,420	0	0	822,744
OPD	0.25	35,891	3.75	9,926	3.75	5,184	0	0	0	45,780	0	0	96,781
IPD	0.17	23,927	3.25	8,603	3.25	4,493	0	0	0	30,920	0	0	67,943
Total	1.00	145,000	17.00	45,000	17.00	23,500	8,700	756,338	482,486	262,058	31,700	0.00	1,754,782

Name	Salary	Admin subsidy	Over Time	Training	Medical welfare	Child welfare	Total
Director	336,000	10,000	-	-	5,882	529	352,412
Admin1	168,000	-	-	-	5,882	529	174,412
Admin2	126,000	-	-	-	5,882	529	132,412
Mechanic	33,600	-	-	-	5,882	529	40,012
Catering1	33,600	-	-	-	5,882	529	40,012
Catering2	33,600	-	-	-	5,882	529	40,012
Technician1	67,200	-	-	-	5,882	529	73,612
Technician2	50,400	-	-	-	5,882	529	56,812
Pharmacist1	168,000	-	-	1,000	5,882	529	175,412
Pharmacist2	126,000	-	-	-	5,882	529	132,412
Doctor1	280,000	-	-	2,000	5,882	529	288,412
Doctor2	280,000	-	-	-	5,882	529	286,412
Nurse1	108,000	-	10,000	-	5,882	529	124,412
Nurse2	106,000	-	10,000	-	5,882	529	122,412
Nurse3	106,000	-	10,000	1,000	5,882	529	123,412
Nurse4	84,000	-	10,000	-	5,882	529	100,412
Nurse5	84,000	-	10,000	1,200	5,882	529	101,612
Total	2,190,400	10,000	50,000	5,200	100,000	9,000	2,364,600

Proportion of shared working time

	Administration	Supply	Catering	Laundry	Laboratory	Pharmacy	OPD	IPD	Total
Director	1	0	0	0	0	0	0	0	1
Admin1	0.24	0.76	0	0	0	0	0	0	1
Admin2	0	1	0	0	0	0	0	0	1
Mechanic	1	0	0	0	0	0	0	0	1
Catering1	0	0	1	0	0	0	0	0	1
Laundry1	0	0	0	1	0	0	0	0	1
Technician1	0	0	0	0	1	0	0	0	1
Technician2	0	0	0	0	1	0	0	0	1
Pharmacist1	0	0	0	0	0	1	0	0	1
Pharmacist2	0	0	0	0	0	1	0	0	1
Doctor1	0	0	0	0	0	0	0.75	0.25	1
Doctor2	0	0	0	0	0	0	0.5	0.5	1
Nurse1	0	0	0	0	0	0	1	0	1
Nurse2	0	0	0	0	0	0	1	0	1
Nurse3	0	0	0	0	0	0	0	1	1
Nurse4	0	0	0	0	0	0	0	1	1
Nurse5	0	0	0	0	0	0	0.5	0.5	1
Total;FTE	2.24	1.76	1	1	2	2	3.75	3.25	17

Labor cost

	Administration	Supply	Catering	Laundry	Laboratory	Pharmacy	OPD	IPD	Total
Director	352,412	-	-	-	-	-	-	-	352,412
Admin1	41,225	133,187	-	-	-	-	-	-	174,412
Admin2	-	132,412	-	-	-	-	-	-	132,412
Mechanic	40,012	-	-	-	-	-	-	-	40,012
Catering1	-	-	40,012	-	-	-	-	-	40,012
Laundry1	-	-	-	40,012	-	-	-	-	40,012
Technician1	-	-	-	-	73,612	-	-	-	73,612
Technician2	-	-	-	-	56,812	-	-	-	56,812
Pharmacist1	-	-	-	-	-	175,412	-	-	175,412
Pharmacist2	-	-	-	-	-	132,412	-	-	132,412
Doctor1	-	-	-	-	-	-	216,309	72,103	288,412
Doctor2	-	-	-	-	-	-	143,206	143,206	286,412
Nurse1	-	-	-	-	-	-	124,412	-	124,412
Nurse2	-	-	-	-	-	-	122,412	-	122,412
Nurse3	-	-	-	-	-	-	-	123,412	123,412
Nurse4	-	-	-	-	-	-	-	100,412	100,412
Nurse5	-	-	-	-	-	-	50,806	50,806	101,612
Total	433,648	265,599	40,012	40,012	130,424	307,824	657,144	489,938	2,364,600

Capital cost calculation

- Economic annual capital cost = Current price/ annuity factor
- Current price (of new asset) in the year of analysis
- = Original purchasing price x Inflation adjustment factor
- Include all items in use.
-
- Inflation adjustment factor
- = Price index in the year of analysis/Price index in the year of purchasing
- Annuity factor = $[1 – (1 + r)^{-n}] / r$
- r = Interest rate or discount rate
- n = Useful life (years)
- Financial cost
- Deprecation cost = purchasing price/ useful year
- Only items not more than useful year

Building used

Building	Department	Cost center	Area (sq. meter)
One	Clerical works	Administration	24
	Personnel	Administration	24
	Finance	Administration	24
	Maintenance	Administration	50
	Supply	Supply	30
	Catering	Catering	40
	Laundry	Laundry	24
Two	Laboratory	Laboratory	40
	Pharmacy	Pharmacy	100
	OPD	OPD	150
Three	IPD	IPD	100
Coverway			
Fence			
Road			
Total			606

Measure only working room

Not included common area, eg. corridor, toilet

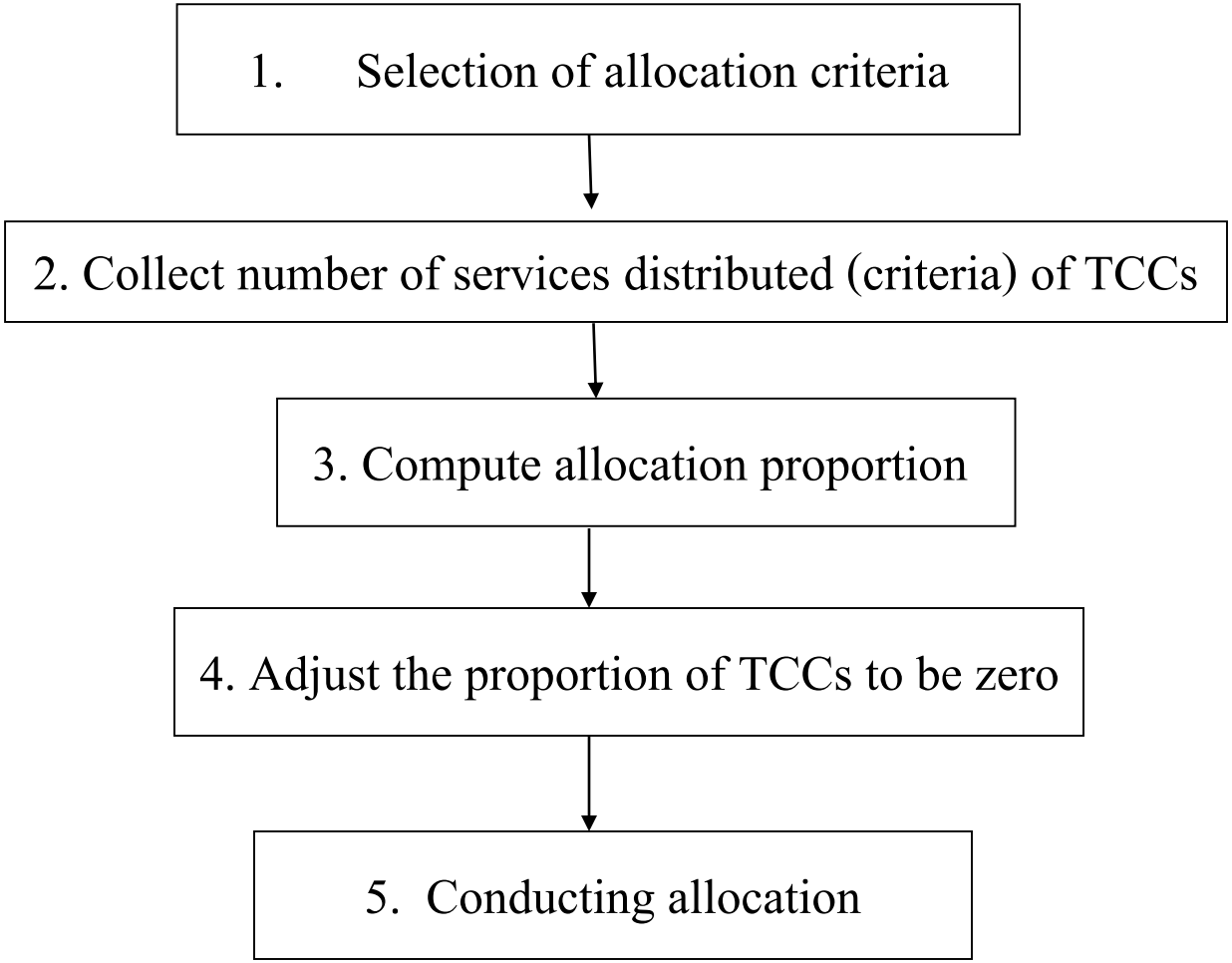
Capital cost: building

Cost center	Area (sq. meter)	Proportion	Equi. Annual cost
Administration	122	0.20	73,781.49
Supply	30	0.05	18,142.99
Catering	40	0.07	24,190.65
Laundry	24	0.04	14,514.39
Laboratory	40	0.07	24,190.65
Pharmacy	100	0.17	60,476.63
OPD	150	0.25	90,714.94
IPD	100	0.17	60,476.63
Total	606	1.00	366,488.37

Total direct cost

Cost center	Building	Equipment	Land	Capital	Labor	Material	Total
Administration	73,781	45,570	18,119	137,470	433,648	110,813	681,931
Supply	18,143	20,254	4,455	42,852	265,599	27,565	336,016
Catering	24,191	13,366	5,941	43,497	40,012	30,918	114,427
Laundry	14,514	28,504	3,564	46,583	40,012	44,662	131,257
Laboratory	24,191	53,959	5,941	84,090	130,424	553,356	767,870
Pharmacy	60,477	29,879	14,851	105,208	307,824	822,744	1,235,775
OPD	90,715	16,575	22,277	129,567	657,144	96,781	883,493
IPD	60,477	13,274	14,851	88,602	489,938	67,943	646,483
Total direct cost	366,488	221,382	90,000	677,871	2,364,600	1,754,782	4,797,253

Step four: Indirect cost determination



TCCs =transient cost centers

	Service providers/ out puts			
Customer	Administration			Supply
Cost center	personnel management(FTE)	service charging(receipt)	repair(request)	material supply($)
Administration	2.24	0	12	3,221.00
Supply	1.76	0	8	6,328.00
Catering	1.00	0	13	17,318.00
Laundry	1.00	0	14	6,489.00
Laboratory	2.00	12,744	5	2,324.00
Pharmacy	2.00	9,810	12	3,442.00
OPD	3.75	7,465	7	4,578.00
IPD	3.25	1,963	16	8,092.00
Total	17.00	31,982.00	87	51,792.00

Ref: Indirect cost allocation methods.xls

Allocation criteria

Cost center	Allocation criteria	Unit of output
Administration	personnel management	Full time equivalent
Supply	material supply	dollar
Catering	meal	set
Laundry	clothes	kg.

Quantity of services

Customer		Service provider			
Cost center	Code	T1	T2	T3	T4
Administration	T1	2.24	32,210.00	-	-
Supply	T2	1.76	13,280.00	-	-
Catering	T3	1.00	17,318.00	-	-
Laundry	T4	1.00	34,890.00	-	-
Laboratory	A1	2.00	53,240.00	-	-
Pharmacy	A2	2.00	34,420.00	-	-
OPD	A3	3.75	45,780.00	-	230.00
IPD	A4	3.25	30,920.00	7,450.00	3,120.00
Total		17.00	262,058.00	7,450.00	3,350.00

Allocation Table

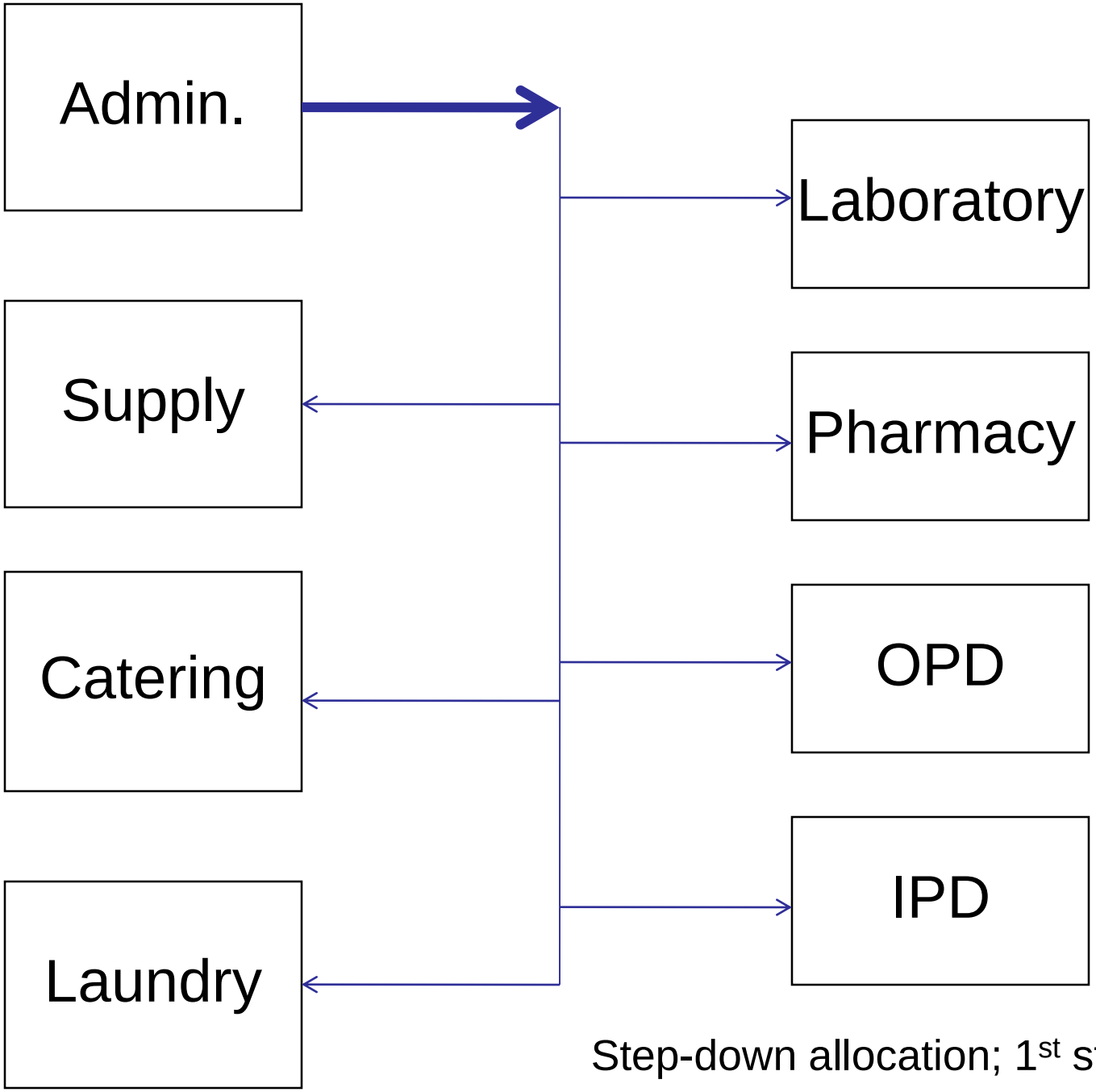
Cost center	Code	T1	T2	T3	T4
Administration	T1	0.1316	0.1229	0.0000	0.0000
Supply	T2	0.1037	0.0507	0.0000	0.0000
Catering	T3	0.0588	0.0661	0.0000	0.0000
Laundry	T4	0.0588	0.1381	0.0000	0.0000
Laboratory	A1	0.1176	0.2092	0.0000	0.0000
Pharmacy	A2	0.1176	0.1313	0.0000	0.0000
OPD	A3	0.2206	0.1747	0.0	
IPD	A4	0.1912	0.1180	1.0	
Total		1.0000	1.0000	1.0	

Zero-adjusted allocation table

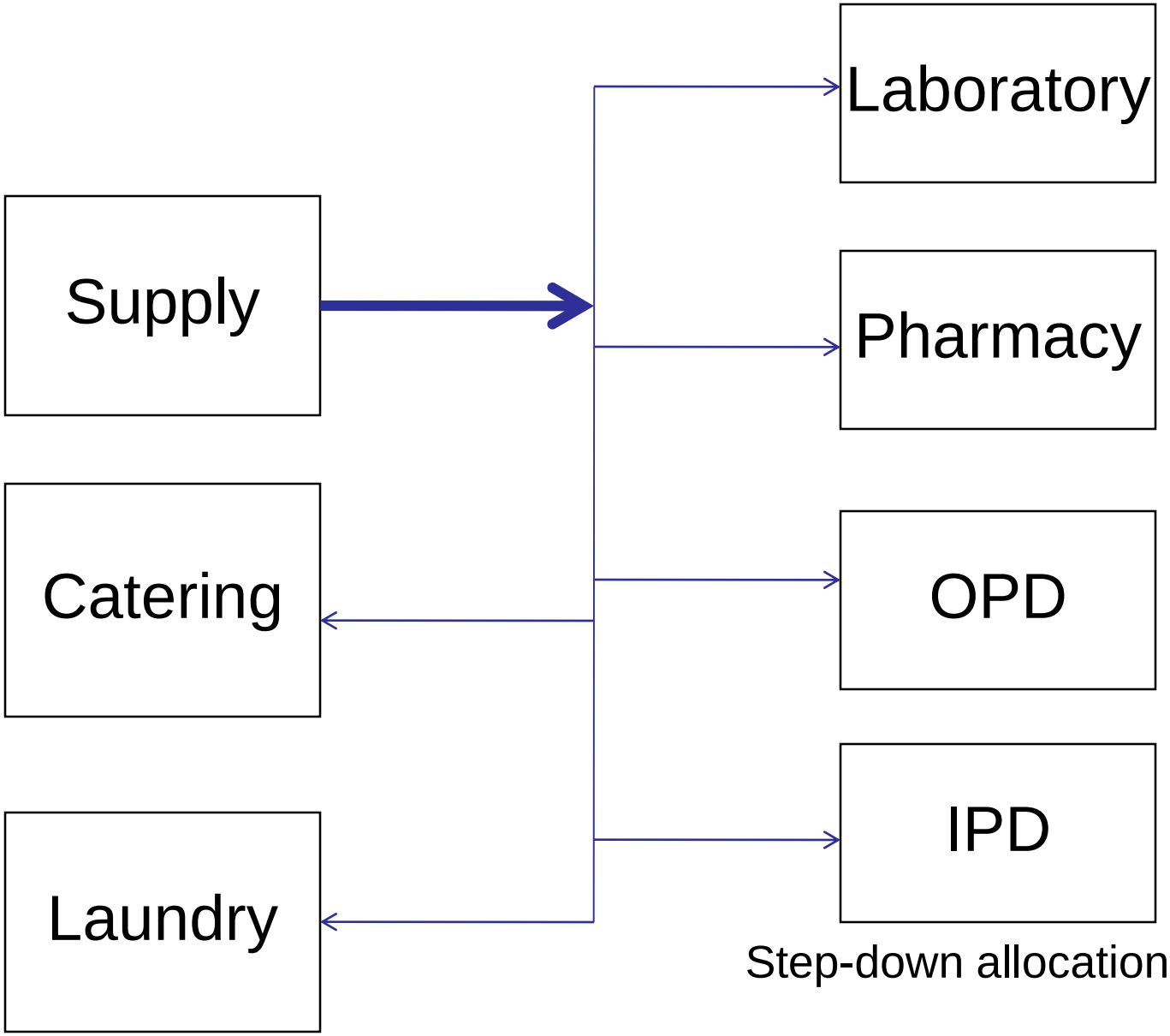
Cost center	Code	T1	T2	T3	T4
Administration	T1	0.0000	0.1295	0.0000	0.0000
Supply	T2	0.1195	0.0000	0.0000	0.0000
Catering	T3	0.0677	0.0696	0.0000	0.0000
Laundry	T4	0.0677	0.1402	0.0000	0.0000
Laboratory	A1	0.1355	0.2140	0.0000	0.0000
Pharmacy	A2	0.1355	0.1384	0.0000	0.0000
OPD	A3	0.2540	0.1840	0.0000	0.0687
IPD	A4	0.2201	0.1243	1.0000	0.9313
Total		1.0000	1.0000	1.0000	1.0000

Indirect cost allocation methods

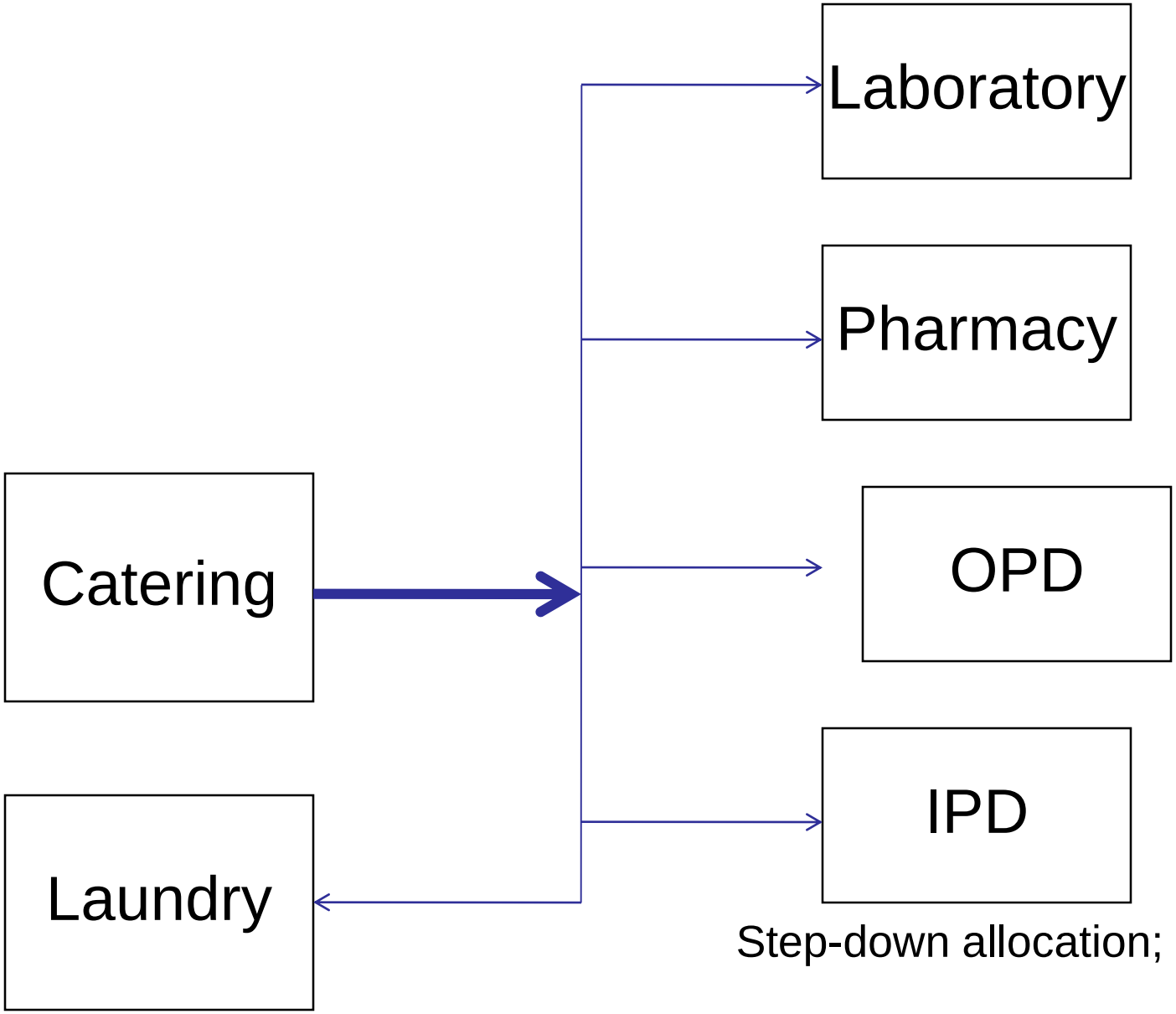
- Direct allocation
- Step-down allocation
- Double allocation
- Simultaneous allocation



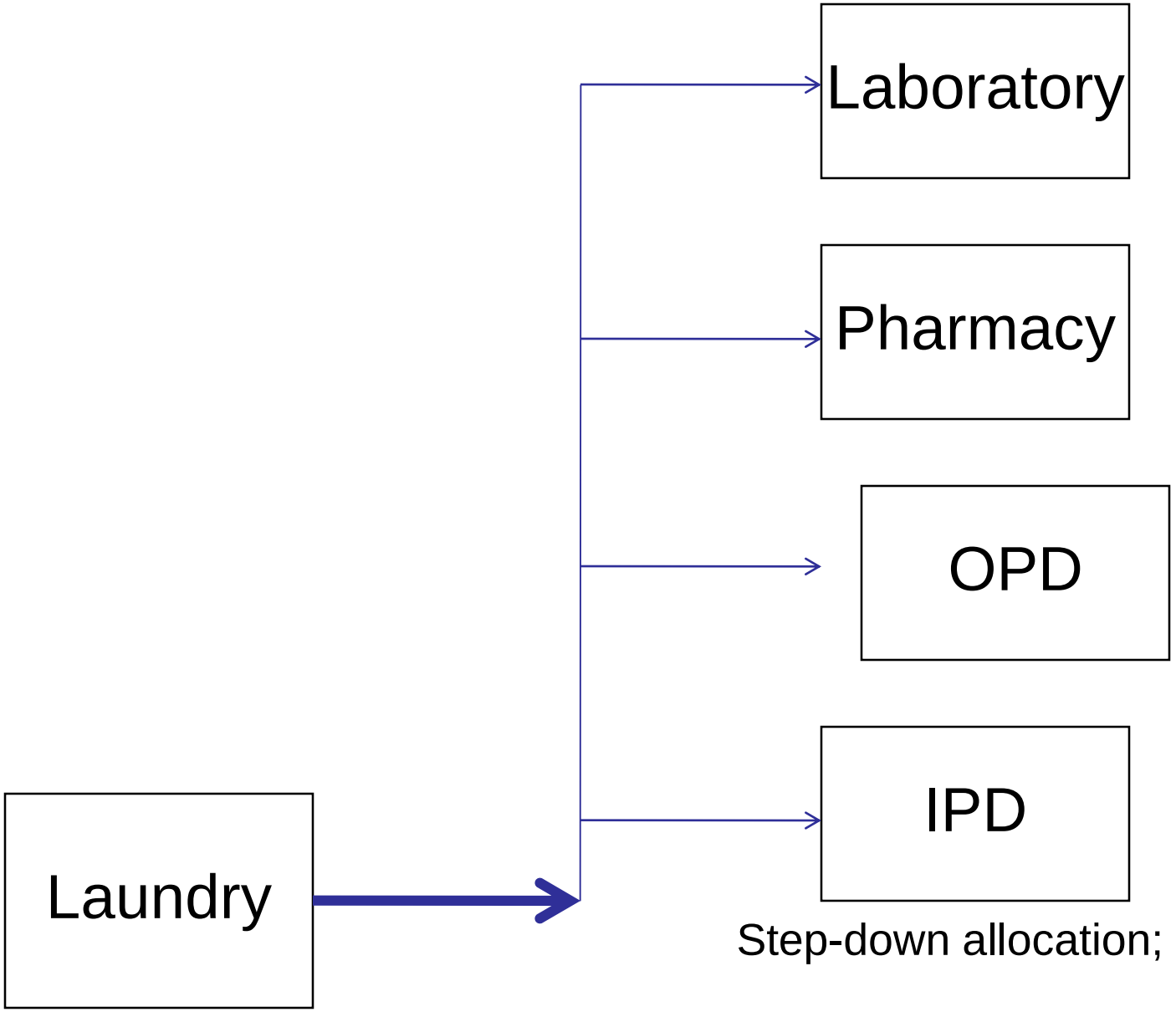
Step-down allocation; 1st step



Step-down allocation; 2nd step



Step-down allocation; 3rd step

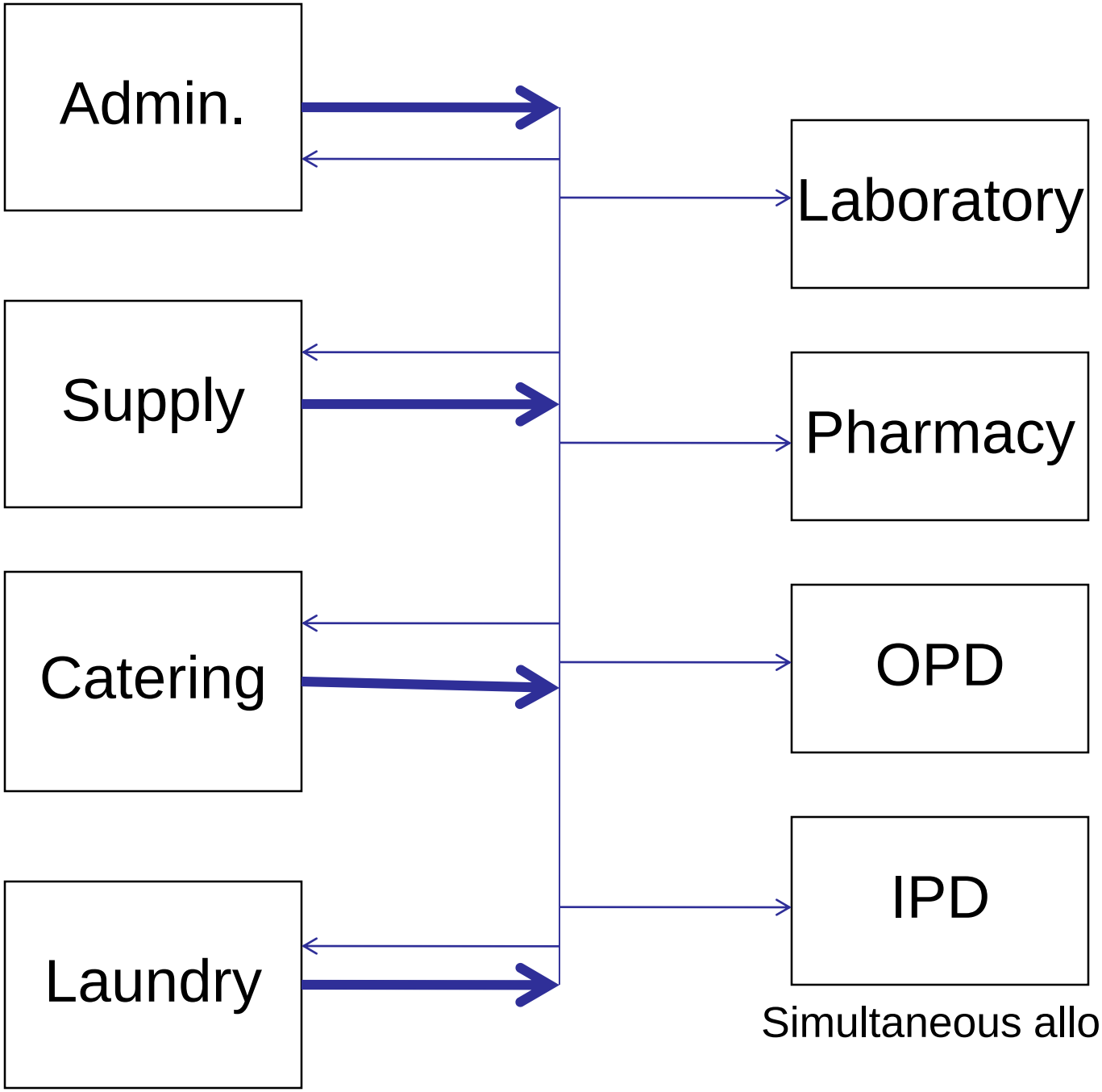


Step-down allocation; 4th step

Cost center	Code	T1	T2	T3	T4
Administrati	T1	0.0000	0.0000	0.0000	0.0000
Supply	T2	0.1195	0.0000	0.0000	0.0000
Catering	T3	0.0677	0.0800	0.0000	0.0000
Laundry	T4	0.0677	0.1611	0.0000	0.0000
Laboratory	A1	0.1355	0.2458	0.0000	0.0000
Pharmacy	A2	0.1355	0.1589	0.0000	0.0000
OPD	A3	0.2540	0.2114	0.0000	0.0687
IPD	A4	0.2201	0.1428	1.0000	0.9313
Total		1.0000	1.0000	1.0000	1.0000

Cost center	rect co	Direct cost	IDC: T1	Full cost	IDC:T2	Full cost	IDC:T3	Full cost	IDC:T4	Full cost
Administrati	T1	681,944								
Supply	T2	336,004	81,461	417,464						
Catering	T3	114,427	46,191	160,618	33,383	194,001				
Laundry	T4	131,257	46,191	177,448	67,255	244,703	0	244,703		
Laboratory	A1	767,870	92,382	860,252	102,627	962,879	0	962,879	0	962,879
Pharmacy	A2	1,235,775	92,382	1,328,157	66,349	1,394,507	0	1,394,507	0	1,394,507
OPD	A3	883,493	173,216	1,056,709	88,247	1,144,956	0	1,144,956	16,801	1,161,757
IPD	A4	646,483	150,121	796,604	59,603	856,207	194,001	1,050,208	227,902	1,278,110
Total		4,797,253	681,944	4,797,253	417,464	4,797,253	194,001	4,797,253	244,703	4,797,253

IDC= Indirect cost



Simultaneous allocation

Simultaneous allocation

Full cost equation

FC	=	TDC	+	Sum of indirect costs								
FCT1	=	681,931	+	0.0000	FCT1	+	0.1295	FCT2	+	0.0000	FCT3	+ 0.0000 FCT4
FCT2	=	336,016	+	0.1195	FCT1	+	0.0000	FCT2	+	0.0000	FCT3	+ 0.0000 FCT4
FCT3	=	114,427	+	0.0677	FCT1	+	0.0696	FCT2	+	0.0000	FCT3	+ 0.0000 FCT4
FCT4	=	131,257	+	0.0677	FCT1	+	0.1402	FCT2	+	0.0000	FCT3	+ 0.0000 FCT4
FCA1	=	767,870	+	0.1355	FCT1	+	0.2140	FCT2	+	0.0000	FCT3	+ 0.0000 FCT4
FCA2	=	1,235,775	+	0.1355	FCT1	+	0.1384	FCT2	+	0.0000	FCT3	+ 0.0000 FCT4
FCA3	=	883,493	+	0.2540	FCT1	+	0.1840	FCT2	+	0.0000	FCT3	+ 0.0687 FCT4
FCA4	=	646,483	+	0.2201	FCT1	+	0.1243	FCT2	+	1.0000	FCT3	+ 0.9313 FCT4

$$FCT1 = 681{,}944 + 0.0000\,FCT1 + 0.1295\,FCT2 + 0.0000\,FCT3 + 0.0000\,FCT4$$

$$FCT2 = 336{,}004 + 0.1195\,FCT1 + 0.0000\,FCT2 + 0.0000\,FCT3 + 0.0000\,FCT4$$

$$FCT3 = 114{,}427 + 0.0677\,FCT1 + 0.0696\,FCT2 + 0.0000\,FCT3 + 0.0000\,FCT4$$

$$FCT4 = 131{,}257 + 0.0677\,FCT1 + 0.1402\,FCT2 + 0.0000\,FCT3 + 0.0000\,FCT4$$

$$FCT1 = 681{,}944 + 0\,FCT1 + 0.1295\,(\,336{,}004 + 0.1195\,FCT1 + 0\,FCT2 + 0\,FCT3 + 0\,FCT4\,)$$

$$FCT1 = 725{,}447 + 0.0155\,FCT1$$

$$FCT1 = 736{,}843$$

$$FCT2 = 336{,}004 + 0.1195\ 736{,}843 = 424{,}022$$

$$FCT3 = 114{,}427 + 0.0677\ 736{,}843 + 0.0696\ 424{,}022$$

$$= 193{,}854$$

$$FCT4 = 131{,}257 + 0.0677\ 736{,}843 + 0.1402\ 424{,}022$$

$$= 240{,}634$$

FCT1 = 736,832

FCT2 = 424,037

FCT3 = 193,854

FCT4 = 240.635

FCA1 =	767,870	+	0.1355	FCT1	+	0.2140	FCT2	+	0.0000	FCT3	+	0.0000	FCT4	
FCA2 =	1,235,775	+	0.1355	FCT1	+	0.1384	FCT2	+	0.0000	FCT3	+	0.0000	FCT4	
FCA3 =	883,493	+	0.2540	FCT1	+	0.1840	FCT2	+	0.0000	FCT3	+	0.0687	FCT4	
FCA4 =	646,483	+	0.2201	FCT1	+	0.1243	FCT2	+	1.0000	FCT3	+	0.9313	FCT4	
FCA1 =	767,870	+	0.1355	736,832	+	0.2140	424,037	+	0.0000	193,854	+	0.0000	240,635	
FCA2 =	1,235,775	+	0.1355	736,832	+	0.1384	424,037	+	0.0000	193,854	+	0.0000	240,635	
FCA3 =	883,493	+	0.2540	736,832	+	0.1840	424,037	+	0.0000	193,854	+	0.0687	240,635	
FCA4 =	646,483	+	0.2201	736,832	+	0.1243	424,037	+	1.0000	193,854	+	0.9313	240,635	
FCA1 =	767,870	+	99,817		+	90,746		+	0		+	0		
FCA2 =	1,235,775	+	99,817		+	58,668		+	0		+	0		
FCA3 =	883,493	+	187,157		+	78,031		+	0		+	16,521		
FCA4 =	646,483	+	162,203		+	52,702		+	193,854		+	224,113		

FCA1 = 958,433

FCA2 = 1,394,261

FCA3 = 1,165,202

FCA4 = 1,279,356

Step six: Unit cost of services

- One or homogeneous cost products; average method
- Heterogeneous cost products;
    - Cost to charge ratio method
    - Relative value unit method
    - Micro-costing method

Average method

Cost center	Top-down		Buttom-up	
Administration	NRPCC	T1	NPCC	T1
Supply	NRPCC	T2	NPCC	T2
Catering	NRPCC	T3	NPCC	T3
Laundry	NRPCC	T4	NPCC	T4
Laboratory	RPCC	T5	PCC	A1
Pharmacy	RPCC	T6	PCC	A2
OPD	PS	A1	PCC	A3
IPD	PS	A2	PCC	A4

Cost center	Full cost_Top down	Full cost_Bottom-up			
OPD	2,748,606.14	1,174,700.52			
IPD	2,116,833.59	1,303,680.56			
	Out put	Unit of measurement	Quantity	Unit cost	
OPD	out-patient treated	visit	7,465	368.20	(Top-down)
	routine service	visit	7,465	157.36	(Bottom-up)
IPD	in-patient treated	admission	594	3,563.69	(Top-down)
		patient-day	1,963	1,078.37	(Top-down)
	hotel cost	patient-day	1,963	664.13	(Bottom-up)

Cost to charge ratio method

- Collect unit price
- Collect quantity of the services produced
- Calculate total charge (sum of expected revenue of all services)
- Calculate cost to charge ratio
  = total cost/total charge
- Calculate unit cost = unit price*cost to charge ratio

Full cost; Lab	980,136.68		
Ratio of cost to charge			
Test	Quantity	Price	Total charge
CBC	6,442	100.00	644,200.00
UA	6,302	80.00	504,160.00
Total			1,148,360.00
Ratio of cost to charge			0.85
Unit cost			
Test			Unit cost
CBC			85.35
UA			68.28

100x6,442

80x6,302

$$\frac{980,136.80}{1,148,360.00}$$

100x0.85

80x0.85

Micro-costing method

1. Collect quantity of the services produced
2. Calculate material cost of each service
3. Calculate labor cost of each service
4. Calculate capital cost of each service
5. Calculate total direct cost of each service
6. Calculate sum of total cost of all services
7. Calculate indirect cost (= full cost-sum of total cost of all services)
8. Allocate indirect cost to each service (direct allocation based on total direct cost of each service)
9. Calculate unit cost = total direct cost of each service + indirect cost to each service

Full cost; Lab	980,136.68						
Micro-costing method							
Test		quantity	capital	labor	material	Total direct cost	Sum of direct cost
CBC		6,442	3.97	11.37	2	17.34	111,727.56
UA		6,302	3.06	9.07	1.5	13.63	85,864.80
Total							197,592.36
Shared/ Indirect cost		782,544.32	←	980,136.68-197,592.36			
Direct cost is used as allocation criteria to distribute shared cost to the services.							
	Direct cost		In direct cost			Unit cost	
	197,592.36		782,544.32				
CBC	17.34		68.69			86.03	
UA	13.63		53.96			67.59	

(782,544.32/ 197,592.36)x17.34

(782,544.32/ 197,592.36)x13.63

Labor cost calculati		Total labor of the cost center		
		Professionals	Assistants	
		73,611.76	56,811.76	
Service	**Quantity**	**Time spent per service (test or activity) (minute)**		
	per year	Professionals	Assistants	
CBC	6,442	30	5	
UA	6,302	20	5	
Service		**Total time spent of each group (minute)**		
		Professionals	Assistants	
CBC		193,260	32,210	
UA		126,040	31,510	
Total		319,300	63,720	
Service		**Labor cost of each group per service**		**Total labor cost per service**
		Professionals	Assistants	
CBC		6.92	4.46	11.37
UA		4.61	4.46	9.07

=30 min x 6,442 tests

= 5 min x 6,442 tests

= (73,611.76THB/ 319,300 min)x30min

= (56,811.76THB/ 63,720min)x5min

Capital cost calculation for micro-costing

		Annual capital cost		
		Biochem analyser	Centrifuge	Microscope
		24,672.27	8,635.29	11,524.27
Service	**Quantity**	**Time spent per service (test or activity) (minute)**		
	per year	Biochem analyser	Centrifuge	Microscope
CBC	6,442	20	5	15
UA	6,302	15	5	10
Service		**Total time spent for each equipment per year (minute)**		
		Biochem analyser	Centrifuge	Microscope
CBC		128,840	32,210	96,630
UA		94,530	31,510	63,020
Total		223,370	63,720	159,650
Service		**Capital cost of each equipment per service**			**Capital cost per service**
		Biochem analyser	Centrifuge	Microscope	
CBC		2.21	0.68	1.08	3.97
UA		1.66	0.68	0.72	3.06

=20 min x 6,442 tests

=5 min x 6,442 tests

=15 min x 6,442 tests

= (8,635.29THB/ 63,720min)x5min

= (11,524.27THB/ 159,650min)x15min

= (24,672.27THB/ 223,370min)x20min

Cost of Illness Studies (Part 2)

Definition of Cost of Illness:

Cost of illness (CoI) is defined as total economic impact or cost of disease or health condition on society through the identification, measurement and valuation of all direct and indirect costs .

(Berger et al, 2003)

Steps of CoI analysis.

- First step: study design
- Second step: define cost component
- Third step: collect resources and services use.
- Fourth step: covert to monetary value.
- Fifth step: calculate the cost

(Kobelt, 2002; Riewpaiboon, 2014)

First step: study design

- Objective; Burden estimation/ prioritizing, Efficiency management, reimbursement, economic evaluation, Budget impact analysis (BIA)
- Definition and scope of the illness
- Approach (prevalence or incidence)
- Time horizon
- Type of treatment or health service facilities.
- Sample: health facilities, patients

Scope of the illness

- Primary illness and consequences; complications, sequelae/ not include co-morbidity
- Complication: A secondary disease, an accident, or a negative reaction occurring during the course of an illness
- Sequela: A pathological condition resulting from a prior disease, injury, or attack. / A secondary consequence or result of primary illness.
- Co-morbidity: a medical condition existing simultaneously but independently with another condition in a patient

Case definitions

Influenza/ ICD 10: J09.01-J11.8

Influenza like illness (ILI)/ J09.02, J09.12, J10.1, J11.1

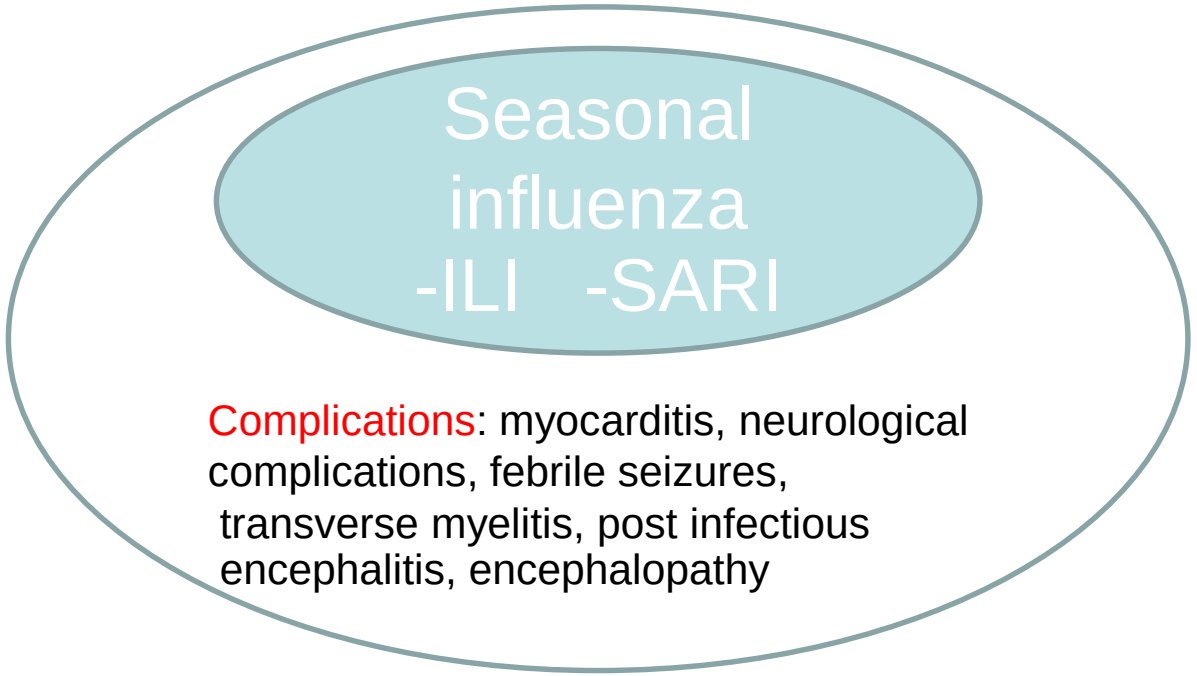
- An acute respiratory infection with fever ≥38◦C
- AND cough
- With onset within the last 10 days

Severe acute respiratory infections (SARI)/J09.01, J09.11, J10.0, J11.0

- An acute respiratory infection with history of fever or measured fever ≥38◦C
- AND cough
- With onset within the last 10 days,
- AND requires hospitalization

(WHO Global Influenza Programme, 2015)

Scope of the Seasonal Influenza



Co-morbidities/ Pre-existing conditions/ Risk factors:
pregnancy, diabetes, asthma, chronic liver disease, chronic kidney disease, chronic liver disease, COPD, HIV etc

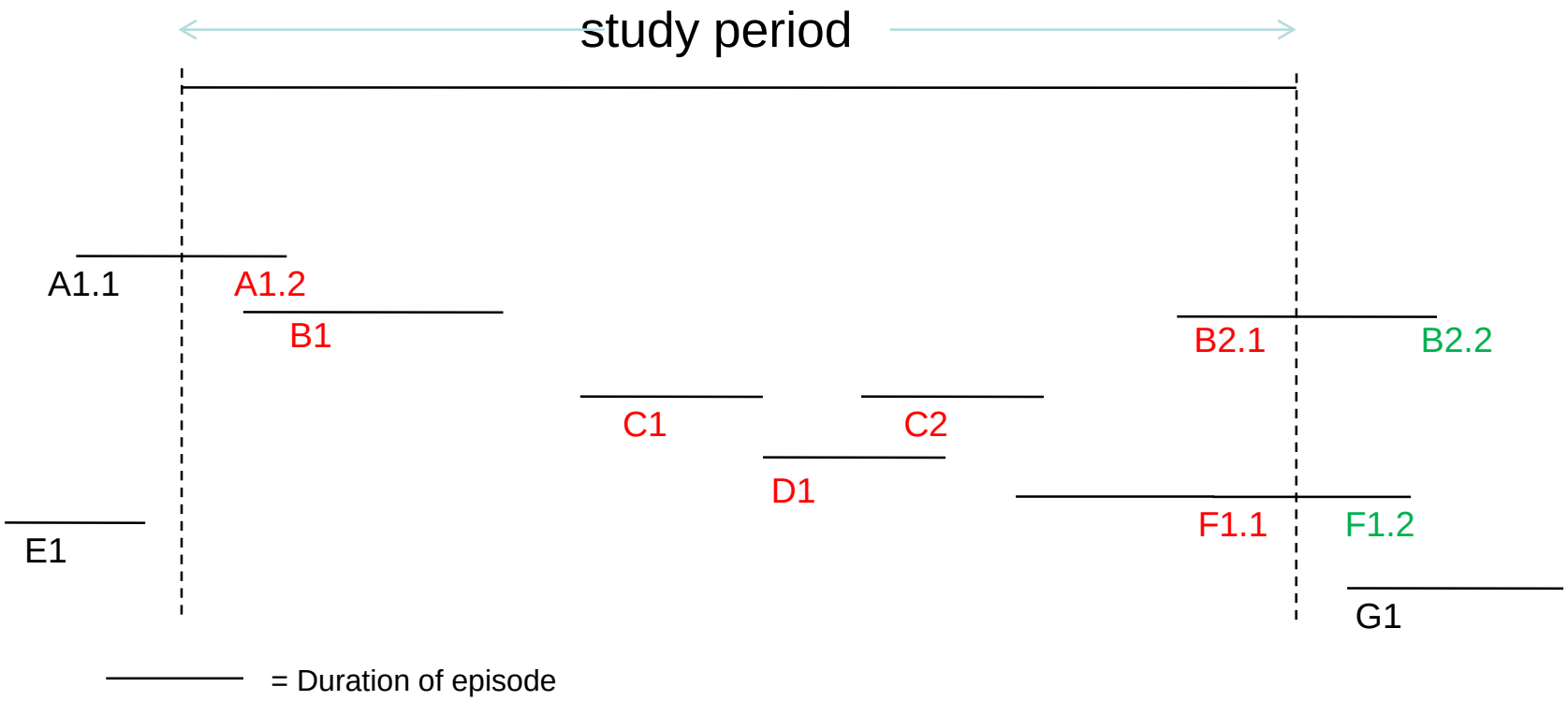
- **Prevalence-based approach**

Prevalence-based approach covers all patients during time horizon of the study. Time horizon is normally 1 year to avoid seasonal variation. The patients can start having the illness before or during the time horizon. Therefore, the patients included in the study have various levels of disease progress and severity. Study results are presented as cost per person per year (or time horizon).

- **Incidence-based approach**

Incidence-based approach covers new cases during a period of time designed (normally 1 year) until end of the illness (cure or death). This is also called life time cost. Study results are presented as cost per episode.

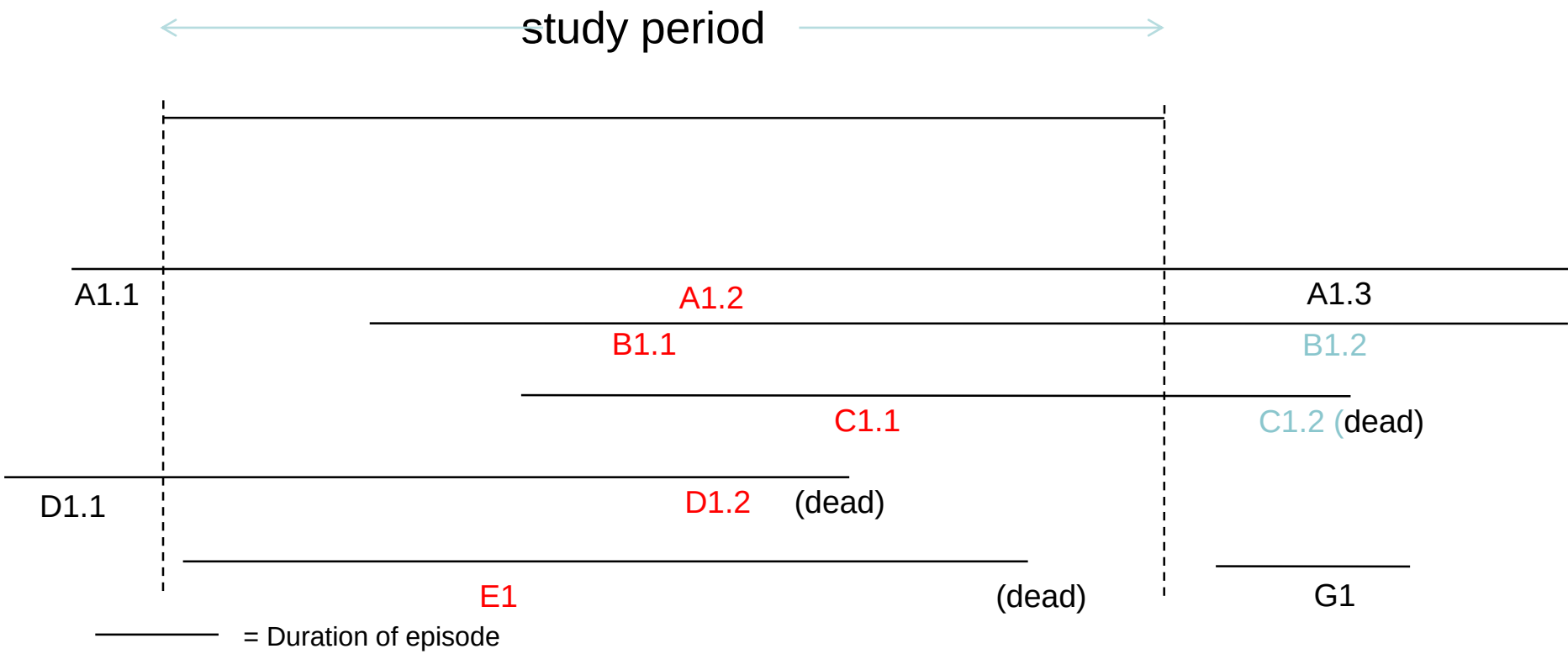
Prevalence vs incidence approaches; acute illness



Prevalence-based approach includes A1.2 , B1, B2.1, C1, C2, D1, F1.1

Incidence-based approach includes B1, B2.1+B2.2, C1, C2, D1, F1.1+F1.2

Prevalence vs incidence approaches; chronic illness



Prevalence-based approach includes A1.2 , B1.1, C1.1, D1.2, E1

Incidence-based approach includes B1.1+B1.2, C1.1+C1.2, E1

Second step: define cost component

- Perspective; patient , provider/ hospital, payer, societal (based on study objectives)

- Cost component

Costs in different perspectives (1)

Service	Cost by perspective (THB)		
	Patient	**Hospital**	**Society**
Drug store	40	0	40
Taxi	200	0	200
Meal	50	0	50
Treatment cost*	0	350	350
Drug not in HF	150	0	150
Wage loss	300	0	300
Total	**740**	**350**	**1,090**

* UC

HF= hospital formulary

(Ref: perspective.xlsx)

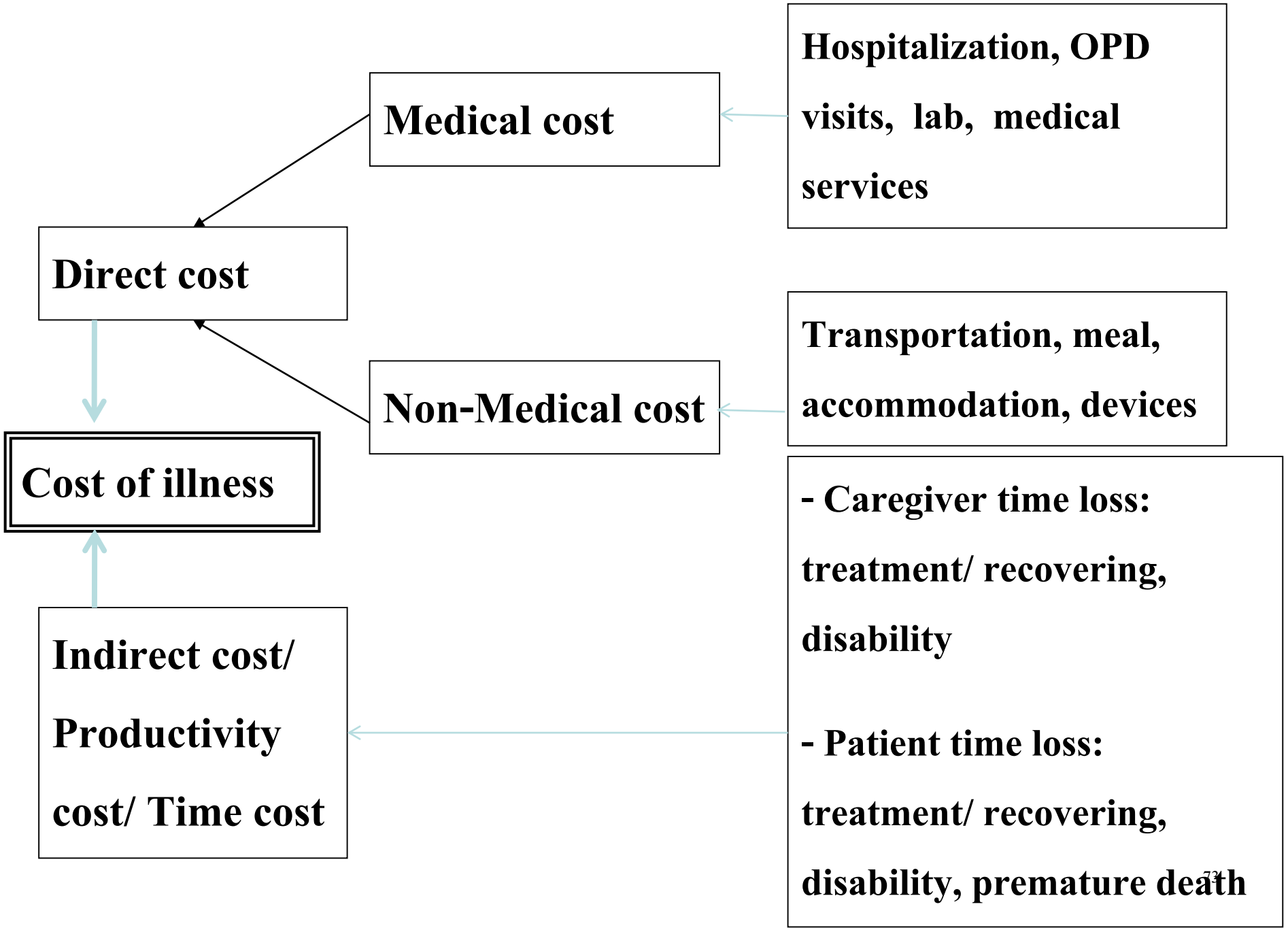
Costs in different perspectives (2)

Service	Cost by perspective (THB)		
	Patient	**Hospital**	**Society**
Drug store	40	0	40
Taxi	200	0	200
Meal	50	0	50
Treatment cost*	250	350	350
Drug not in HF	150	0	150
Wage loss	300	0	300
Total	**990**	**350**	**1,090**

* Out-of-pocket

HF= hospital formulary

(Ref: perspective.xlsx)


Medical cost
Hospitalization, OPD visits, lab, medical services
Direct cost
Non-Medical cost
Transportation, meal, accommodation, devices
Cost of illness
- Caregiver time loss: treatment/ recovering, disability
- Patient time loss: treatment/ recovering, disability, premature death
Indirect cost/ Productivity cost/ Time cost

Cost of caregiver time (informal care)

In formal care is the name given to the care provided by people from a care recipient's social network: family, friends, acquaintances or neighbors.

Providing informal care entails opportunity costs in various forms: e.g. giving up paid/unpaid work time, or leisure time; investing energy; and, in some cases, possibly even making fewer social contacts.

Category of informal care

- Health care activities: aiding patient in health care and rehabilitation
- Daily living activities: aiding patient with personal care, visiting the toilet, moving around within the house, eating and drinking

Category of informal care

- Household activities: preparation of food and drinks, shopping, house cleaning, washing, ironing or sowing, gardening, caring for and playing with own children.
- Instrumental activities: aiding patient in traveling outside the house, visiting and in excursions, financial matters.

Third step: collect resources and services use

Data	Source	Method
Medical service utilization for Direct Medical Cost	-Medical record for study hospital -Patient/ family for treatment from other facilities	-Chart review, hospital database/ prospective data collection - Interview
Meal, transportation, hotel for Direct non Medical Cost	-Patient/ family	Interview
Time of caregivers for cost of informal care	Care givers/ Patient	Interview
Patient time loss for Indirect Cost	-Patient/ family	Interview

Explanatory (predictor or independent) variables

Data	Source	Method
Demographics Gender, age, pregnancy	-Medical record/ CRF -Patient/ family	-Chart review/ prospective record - Interview
Clinical data Influenza type, risk factors (chronic medical conditions), complications	-Medical record/ CRF	-Chart review/ prospective record
Other factors: eg. health facility, insurance, outbreak period	-Medical record/ CRF	-Chart review/ prospective record - Interview

Fourth step: covert quantity of resources and services to monetary value.

Valuation of resource used

Total cost = Quantity of resource used x unit cost of the resource

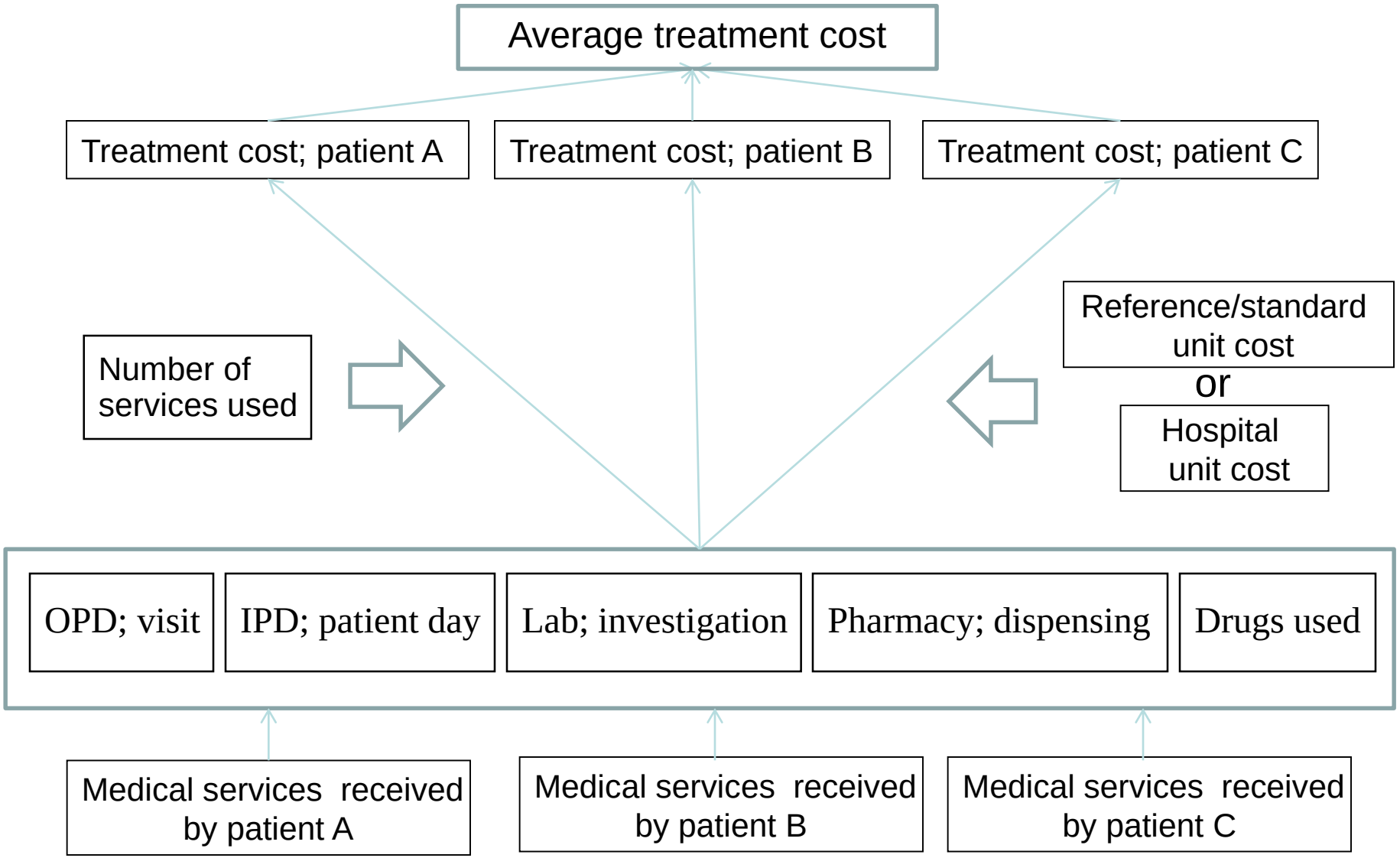
Direct medical cost

- Total outpatient(OP) visit cost:
  Number of visit (Q) x Cost per outpatient visit (P)
- Total bed-day cost:
  length of stay (Q) x cost per bed-day (P)
  (might be: ICU bed + general bed)
- Total medication/medical supplies cost:
  Number of units for each item (Q) x unit cost of item (P)
- Total diagnostic tests cost:
  Number of units for each item (Q) x unit cost of item (P)

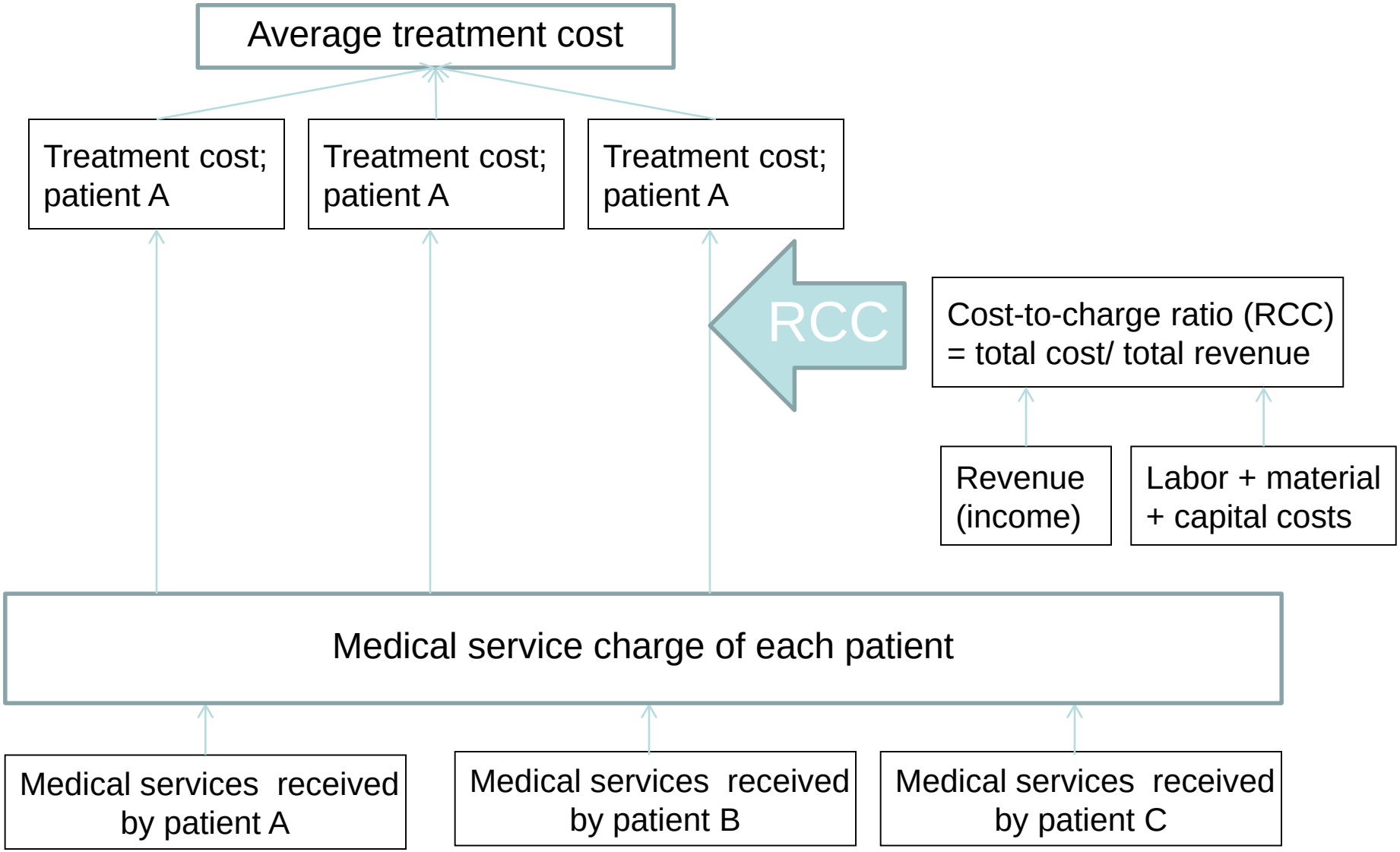
Total direct medical cost:

= Total OP visit cost+ total bed-day cost + total medication cost + total diagnostic cost + other relevant costs

Estimation of direct medical cost



Bottom-up (Micro costing) approach 2



Sources of unit cost

Medical services

- Unit cost from direct measurement at study hospital
- Standard or reference unit cost
- Unit price of hospital (cost at charge)
- Cost/visit, /patient day from WHO-CHOICE*
- Unit price from private services
- Estimated unit cost

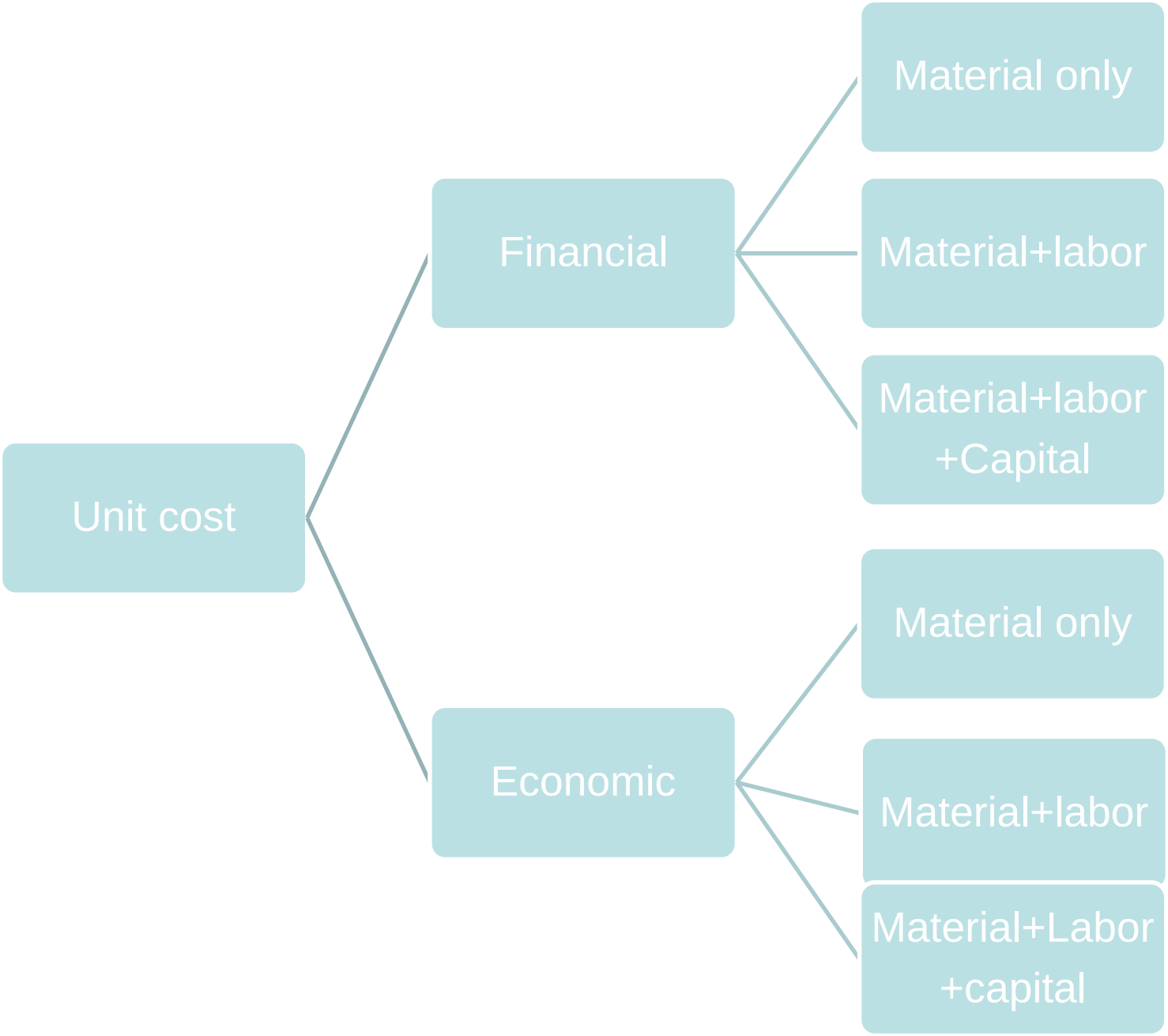
Non-medical services

- Traveling cost/ km
- Average income per day
- Per capita GDP

(*http://www.who.int/choice/cost-effectiveness/inputs/health_service/en/)

Fifth step: calculate the cost

- Resource use and unit cost
- Incidence approach: Cost/ episode
- Prevalence approach: Cost/ case/year
- Cost component
- Cost classified by independent variables
- Cost function analysis


Unit cost
Financial
Material only
Material+labor
Material+labor +Capital
Economic
Material only
Material+labor
Material+Labor +capital

Component of data to be collected (1)

- Structure of health facility, then cost centers
- Financial annual report – expense, revenue

- Inputs by cost centers
  - -Salary and all payments to full-time staff
  - -Detail of volunteer
  - -Proportion of working time of staff for each cost center
  - -Cost utilities (electricity, water, internet…..)
  - -Cost of drugs, medical material, office material used
  - -Equipment, furniture, vehicle,
  - -Building and construction
  - -Building space used

Component of data to be collected (2)

- Outputs by cost center group

  -Total services by types and customers

  -Unit prices

  -Resources (labor time, material, equipment time) used of each service

Component of data to be collected (3)

Medical record review – treatment costs

- In-patients; hypertension, ARI, diarrhea, trauma
- Surgery patients; minor
- Surgery patients; medium-appendectomy, lithiasis, hernia, cataract (SICS or PHACO)
- Surgery patients; major general-lithiasis renal, laparotomy, cancer
- Surgery patients; major high cost-heart, brain, spine, orthopedics

Component of data to be collected (4)

Medical record review – treatment costs

- Delivery; normal, complication
- Caesarean section; normal, complication
- RH; vasectomy, tubal ligation, medical abortion, surgical abortion (MVA)

คู่มือการเก็บข้อมูลต้นทุนโรงหมอและสุกสาลา

- หัวหน้าทีม ร่วมกับทีมเก็บข้อมูล ชี้แจงข้อมูลเบื้องต้นของโครงการแก่ผู้อำนวยการ และ/ หรือ ผู้บริหารของโรงหมอ และทีมผู้ประสานของโรงหมอ
- อธิบายหลักการและวิธีการวิเคราะห์ต้นทุนเบื้องต้น และกำหนดศูนย์ต้นทุนของโรงหมอ ร่วมกับทีมผู้ประสานของโรงหมอ
- ถ่ายเอกสารรายชื่อศูนย์ข้อมูลที่ปรับเป็นของโรงหมอแล้ว ให้ผู้เก็บข้อมูลทุกคน
- กำหนดแผนการเก็บข้อมูลกับผู้ประสานงาน
- ดำเนินการเก็บข้อมูล ส่วน Top-down
- จากรายการตรวจ บริการ และรายการยา ที่เก็บจากส่วน Top-down ให้กำหนดรหัสรายการ สำหรับใช้ในการเก็บข้อมูลแบบ Bottom-up
- ดำเนินการเก็บข้อมูลรายโรค ส่วน Bottom-up