Cost Determination of Health Programs

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PH3915 Course

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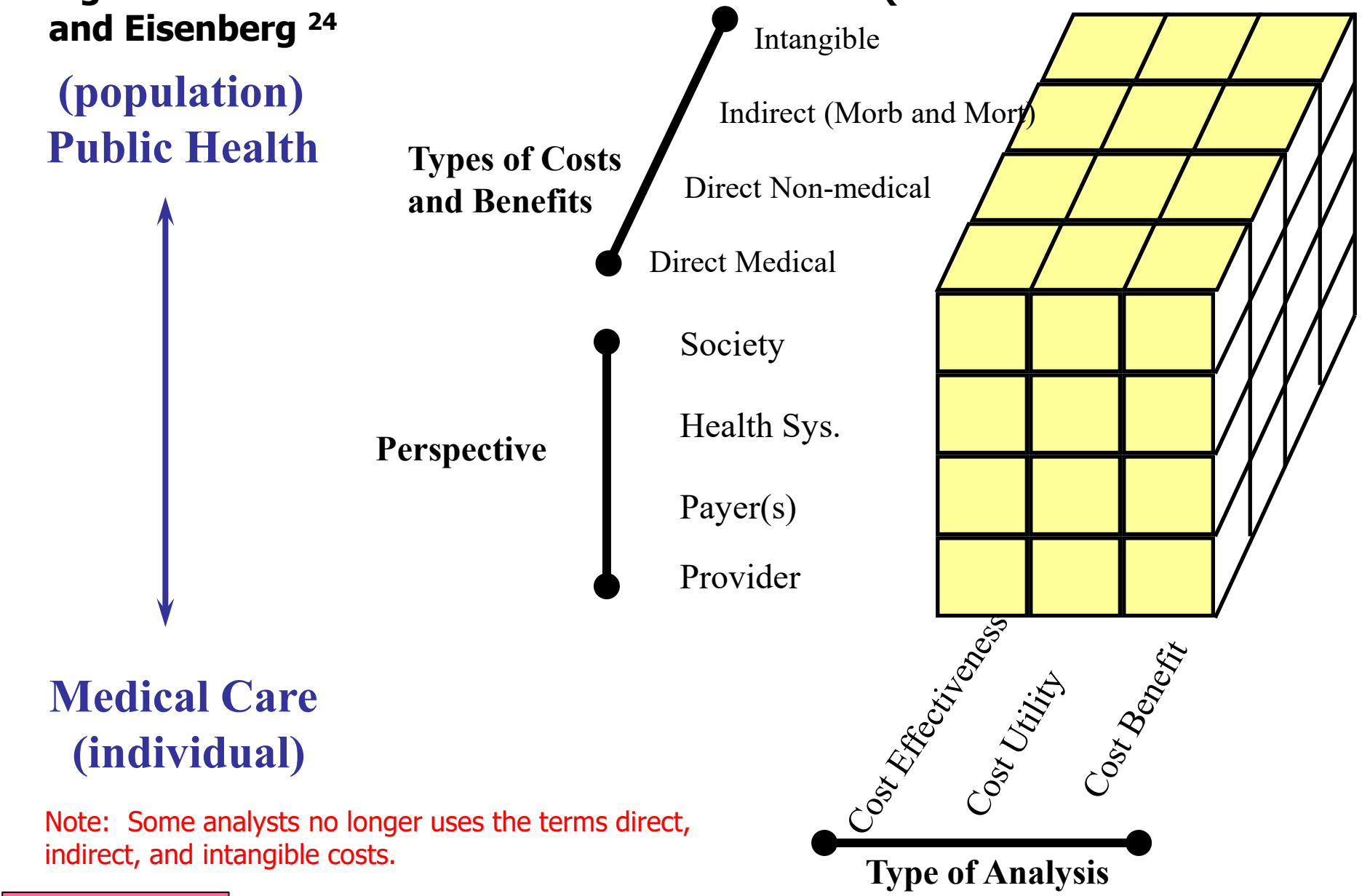
B. Cost Estimation for Health Programs

Estimating **Δc**

Topics

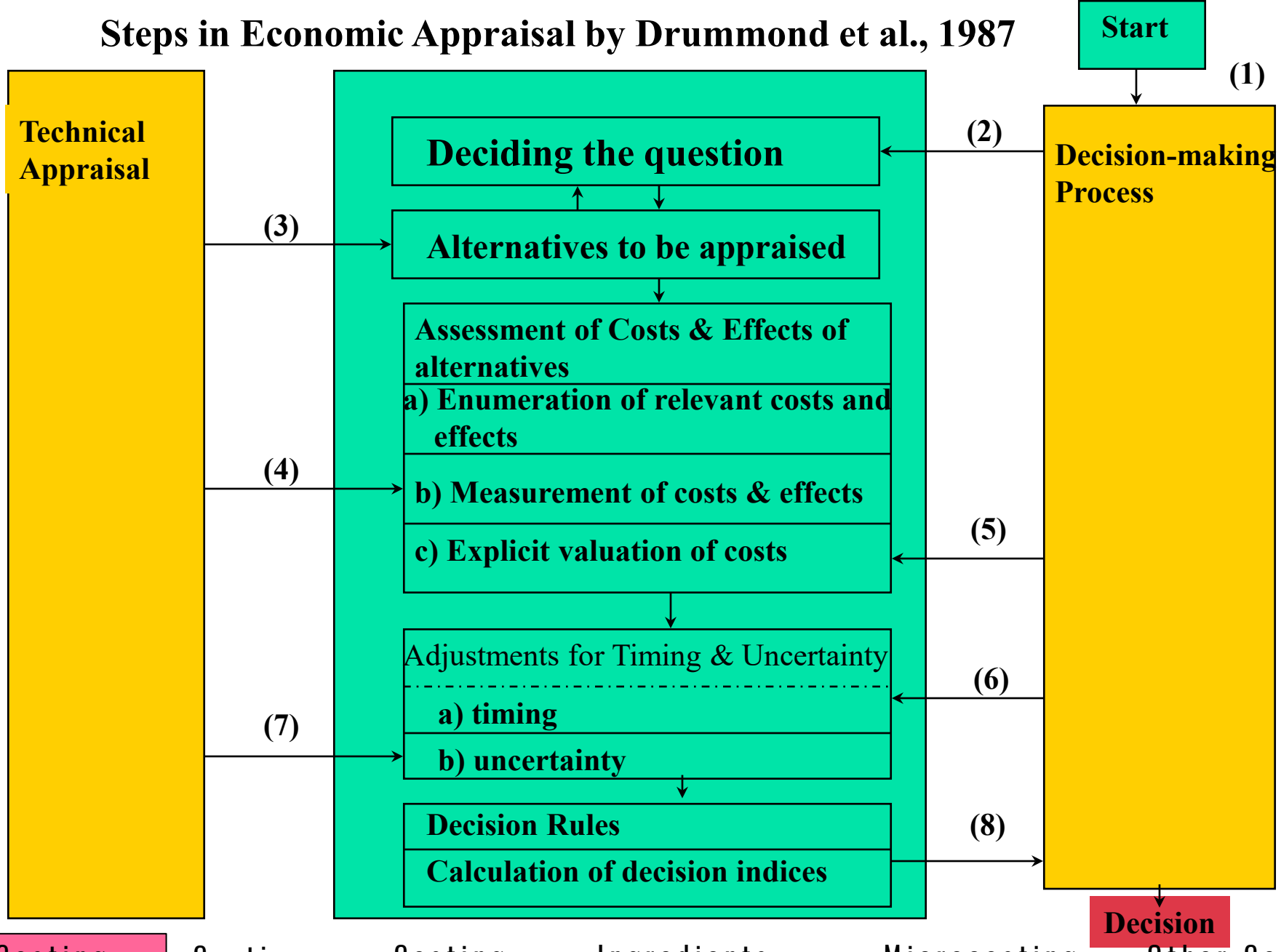
- Costing Theory and Measures
  - Average vs Marginal vs Incremental costs
- Costing Approach (Gross vs. Micro-Costing)
- Ingredients Method: Micro-costing
  - Components (e.g., personnel, equipment)
  - Market value and its limits
- Other Costing Concepts
  - Cost vs. charges
  - Joint production
  - Research & development vs. replication

Fig. 1 - Three Dimensions of Clinical Economics (Modified From Bombardier and Eisenberg [24]



Note: Some analysts no longer uses the terms direct, indirect, and intangible costs.

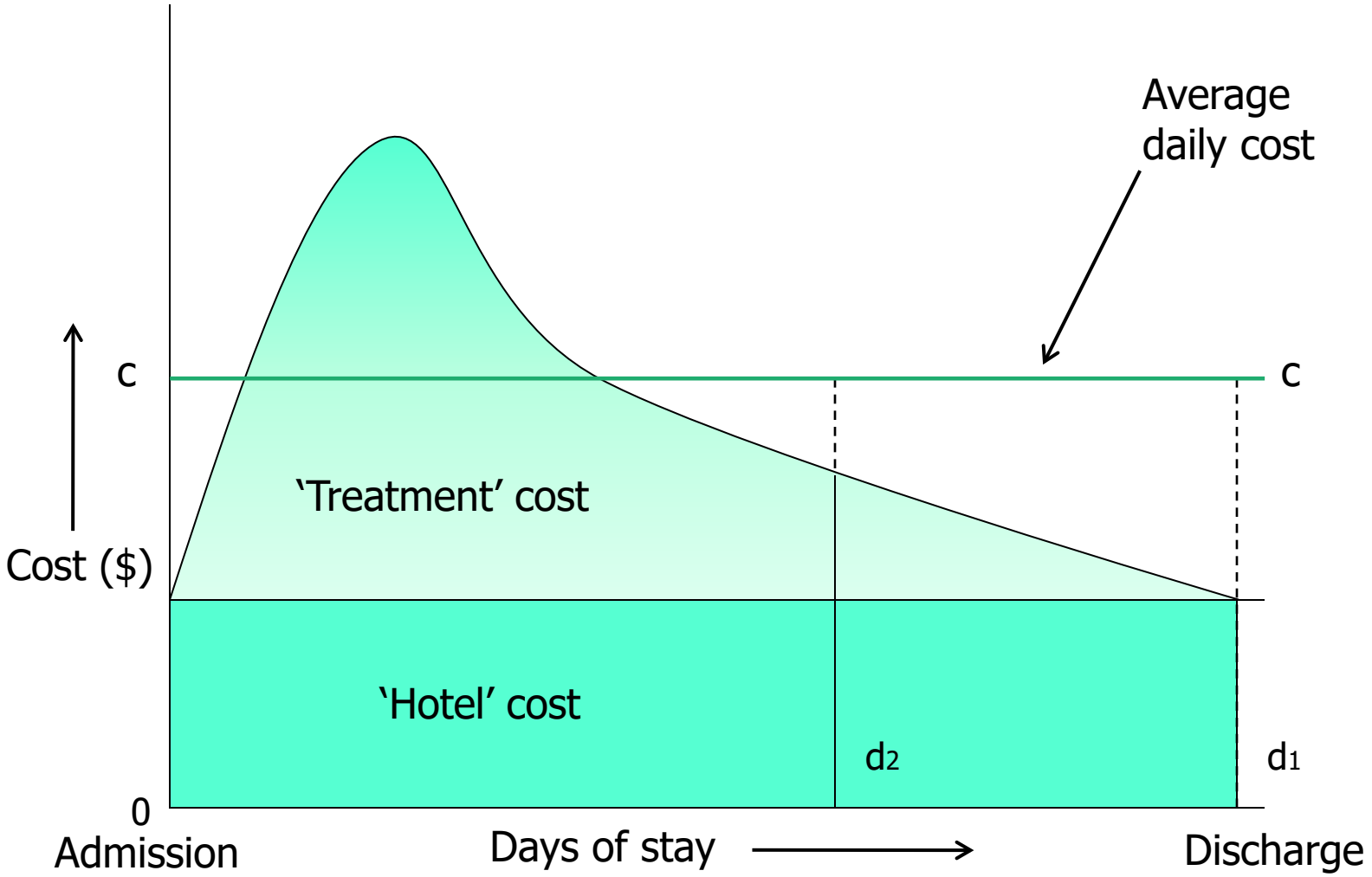
Steps in Economic Appraisal by Drummond et al., 1987



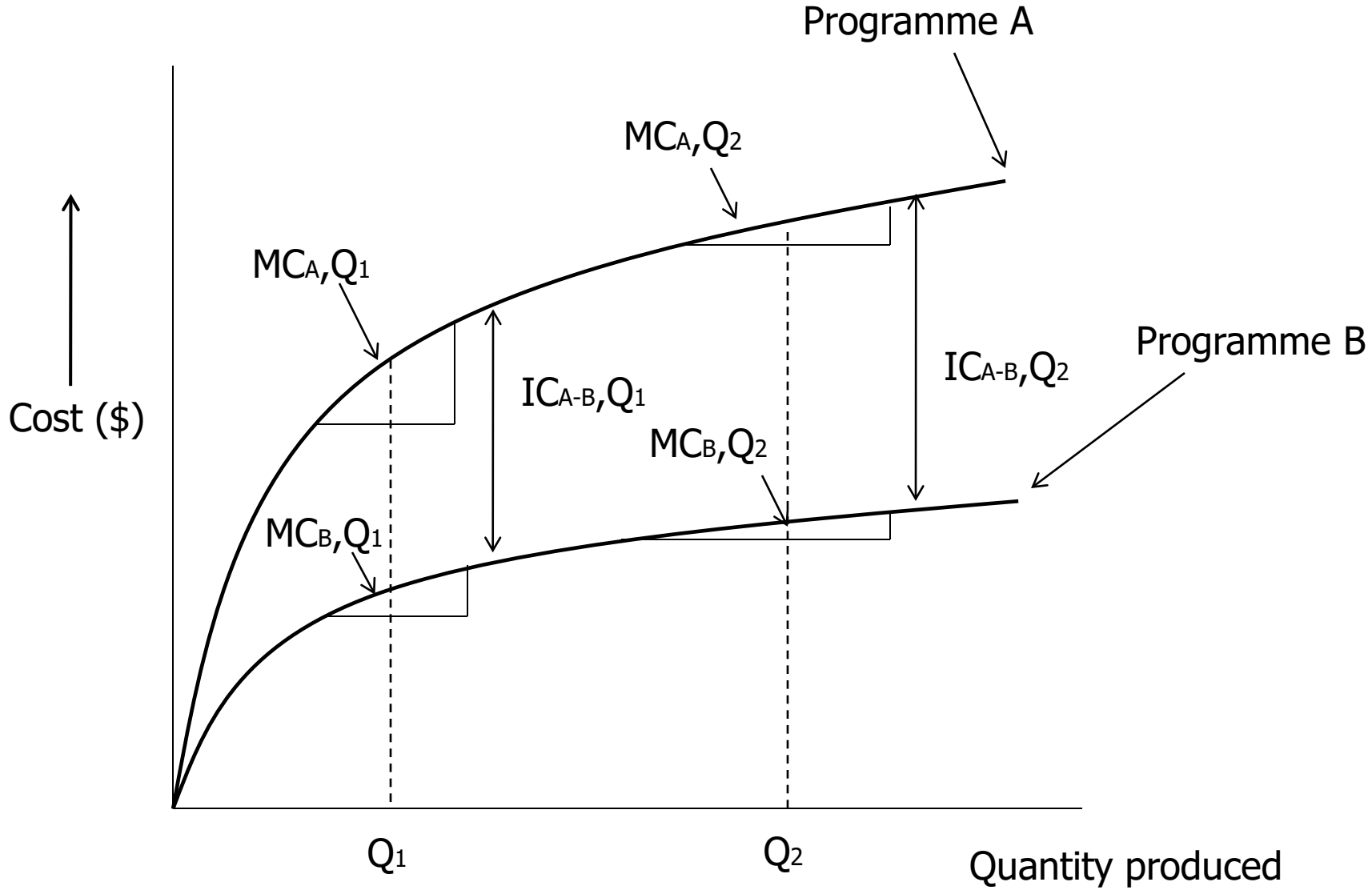
Cost Measures

- Average cost = total cost (TC) / quantity (Q).
- Marginal cost = TC of x+1 units of output minus the TC of x units. (see box 7.2)
- Incremental cost is the additional cost that one service or program imposes over another. (see box 7.2).

Box 7.3 Cost saving associated with reductions in length of stay



Box 7.2 Marginal or Incremental Cost



Costing Approach: Gross vs. Micro-Costing

- Gross-costing: multiplies the quantity of goods and services (e.g. doctor visits) by their market or administered price and sums across these values to determine total cost.

- Micro-costing: multiplies the quantity of resources (e.g. doctor time) by their market price and sums across these values to determine total cost.

Sources of Medical Care Cost Data (gross costing methods)

- Public
  - Medicare (SEER-Medicare for Cancer) & Medicaid Reimbursement Data
  - Veterans Administration
  - National Center for Health Statistics Surveys
- Private
  - Blue Cross/ Blue Shield; Kaiser Permanente
  - Market Scan
  - Optum
- Electronic Medical Records (EMR)

Ingredients Method: Micro-costing

- "...Every intervention uses ingredients that have a value or cost. If the ingredients can be identified and their cost can be ascertained, we can estimate the total cost of the intervention..."

Levin, 1983

Program budgets are not adequate for cost estimation

- Lack information on all ingredients.
- Ingredients may be already paid for or included in some other agency's budget.
- Budget practices may distort cost.
  - For example, assigning cost of major renovation to one year.
- Budgets represent plans as opposed to actual expenditures.

Steps in Micro Cost Estimation

- Develop a detailed description & **production function** of the program
- List, describe, categorize, and quantify all ingredients of the program
- Determine market unit values of each resource.
- Prospectively collect cost data (time & other resources)
- Develop a **cost distribution worksheet**

Ingredients Method Step: Describe the Program

- Sources of information
  - Review reports
  - Discuss with professionals responsible for implementation
  - **Direct observation**
- Example: screening for diabetic retinopathy

Ingredients Method Example: Steps in Diabetic Retinopathy Screening Program

Training	Preliminary	Screening	Interpretation
	Intake/History Physical Exam Dilation	45° Photos by Nurse	Primary Phys.

These steps should be broken down further into individual activities required to carry out these functions.

Specification of Ingredients

- Personnel
  - Roles, qualifications, and time
- Facilities
  - Dimensions, characteristics, special features, joint uses
- Equipment and materials
- Other inputs (e.g. Training costs)
- Client inputs (time, transportation)

General Considerations

- Specify ingredients in detail sufficient to establish value.
- Use consistent cost categories.
- Relate degree of specificity to the overall contribution of the ingredient to the cost of the intervention.
- Include planning and recruitment costs if needed (e.g. outreach prevention programs).

Valuing Ingredients

- **Market prices.**
  - When markets for resources are competitive, their market price represents the value of that good or service.
- **Shadow prices.**
  - Are constructed when goods or services do not have prices derived from competitive markets.

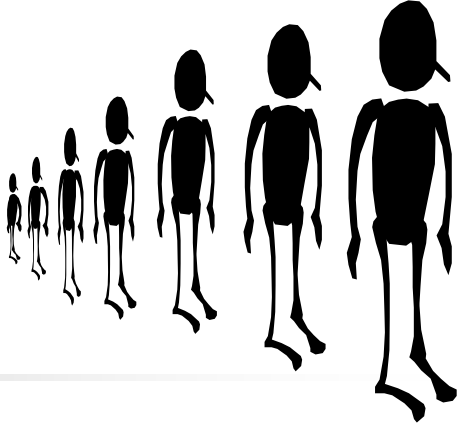
Limits to Market Values

- Nonexistence
  - Unpaid caregiver services
  - Value of leisure time
- Noncompetitive markets
- Tax distortions
- Externality distortions

Solutions to Market Value Problems

- Adjust market prices, for example:
  - Tax may be subtracted from fuel price
  - Adjust hospital charges by cost/charge ratio (available from Medicare Program)
- Impute market prices
  - Value of household production
    - Market wage for caretaker service
  - Patient's personal time
    - Person's wage rate or minimum wage

Personnel Costs



- Accounts for large portion of health costs.
- Cost per unit of time is the monetary value of salary and fringe benefits.
- Salary and fringe benefits are usually available from administrative records or may be obtained by surveying the market.
- National wage data are available from the Bureau of Labor Statistics Wages by Area and Occupation

Personnel Cost (simple example)

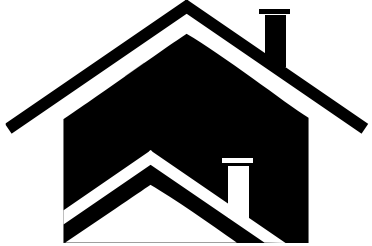
Activity	Person	Cost/Min* ($)	Minutes (mean)	Cost Per Service ($)
History	Clerk	0.1655	4.41	.73
Physical Exam	Nurse	0.3914	6.99	2.74
Eye Exam	Ophthal.	1.9000	6.52	12.39
Total				15.86

* Determined by dividing annual salary plus fringe benefits by 124,800 minutes. (52 wks/ yr. x 40 hrs. / wk. x 60 min. / hr.)

Computation of Personnel Cost Per Minute (more realistic example)

Name/Title (Activity)	Base Salary	Fringe Rate	Salary & Fringe	Salary per min.	Annual hours at work	Annual hours available for tasks	Proportion of Paid available for tasks	Adjusted salary per minute
Project Coordinator	$ 88,511	0.218	$ 107,806.40	$ 0.86	1850	1572.5	0.75601	$ 1.14
Finance Manager	$ 85,350	0.218	$ 103,956.30	$ 0.83	1850	1572.5	0.75601	$ 1.10
Admin. Assistant	$ 76,620	0.218	$ 93,323.16	$ 0.75	1850	1572.5	0.75601	$ 0.99
Project Investigator	$107,566	0.218	$ 131,015.39	$ 1.05	1850	1572.5	0.75601	$ 1.39
IT Manager	$ 94,650	0.218	$115,283.70	$ 0.92	1850	1572.5	0.75601	$ 1.22

Salary & Fringe Per Min. = Salary& Fringe / (Total Hours per Year*60)
Annual Hours at Work = Annual Hours per Year –Training –Meeting-Vacation-Holiday Hours
Annual Hours Available for Tasks = Annual Hours at Work * Productivity Rate of .85
Proportion of Paid Time Available for Tasks = Annual Hours Available for Tasks / Total Hours per Year
Adjusted Salary per Minute = Salary per Minute / Proportion of Paid Time Available for Tasks
Total Minutes Per Year 124,800 = (40hrs per wk. x 52 wk. per yr. x 60 min. per hour)



Facilities and Equipment

- Last more than one year and therefore it is important to **assign their cost to services produced during their life.**
- **Two methods.**
  - Rental or lease value.
  - Annualize depreciation plus opportunity cost of capital.

Rental or Lease Value

- Obtain **monthly lease or rental values** from the local real estate agents or equipment rental agencies.
- Values may need to be **adjusted for special amenities** required by health facilities, e.g. special venting for laboratory equipment.
- **Pro-rate the cost** for the time used by the program.

Annualized Equipment Cost: Example

- **Non-mydriatic fundus camera.**
  - **Replacement value (RV) = $12,000.**
  - **Scrap value (SV) = $1,500.**
  - **Interest rate (R) = .0824.**
  - **Useful life (N) = 7 years.**
  - **Annualization factor A(R,N) N years at interest rate R.**

FORMULA TO DETERMINE ANNUAL COST OF CAPITAL

Illustrated for wide angle camera equipment.

$$AC = [RV - (SV/(1+R)^N)] * \boldsymbol{A(R,N)}$$

$$= [\$12000 - (\$1500 / (1+0.0824)^7] * 0.1936$$

$$= \$2156$$

$$A(R,N) = [R(1+R)^N] / [(1+R)^N - 1]$$

$$A(0.0824,7) = [0.0824(1+0.0824)^7] / [(1+0.0824)^7 - 1]$$

$$A = 0.1936$$

Example: Applying Micro-Costing for the AMIGAS Project

Direct cost	
Recruitment	$30,998.50
Intervention (Staff)	$10,972.19
Intervention (Participant time)	$5,884.87
Travel	$14,810.23
Training	$10,562.50
Meeting	$4,937.50
Coordination	$5,562.50
Material	$4,687.50
Total Direct Cost	$88,415.79
Overhead is 35% of (Direct Cost –Travel Cost)	$25,761.95
Total cost	$114,177.74

Educational intervention delivered by lay health Workers or promotoras to promote cervical cancer screening (Pap test) for women ages 21 to 65.

Program was designed specifically for women of Mexican Descent that have never or have rarely had a pap test.

Cost Distribution Worksheet for the AMIGAS Project

Ingredients	Total Cost	Cost to Sponsor	Cost to Other Gov. Agencies	Contributed Private Inputs	Imposed Patient & Family Costs
Recruitment	$30,998.50	$30,998.50			
Intervention (Staff)	$10,972.19	$10,972.19			
Participant time	$ 5,884.87				$5,884.87
Travel	$14,810.23	$14,810.23			
Training	$10,562.50	$10,562.50			
Meeting	$4,937.50	$4,937.50			
Coordination	$5,562.50	$5,562.50			
Material	$4,687.50	$4,687.50			
OVERHEAD COST	$25,761.95	$22,811.95	$950	$2000	
TOTAL COST User Fees Other Cash Sub.	$114,177.74	$105,342.87 -2115	$950	$2000	$5,884.87 +2115
NET COSTS	$114,177.74	$103,227.87	$950	$2000	$7,999.87

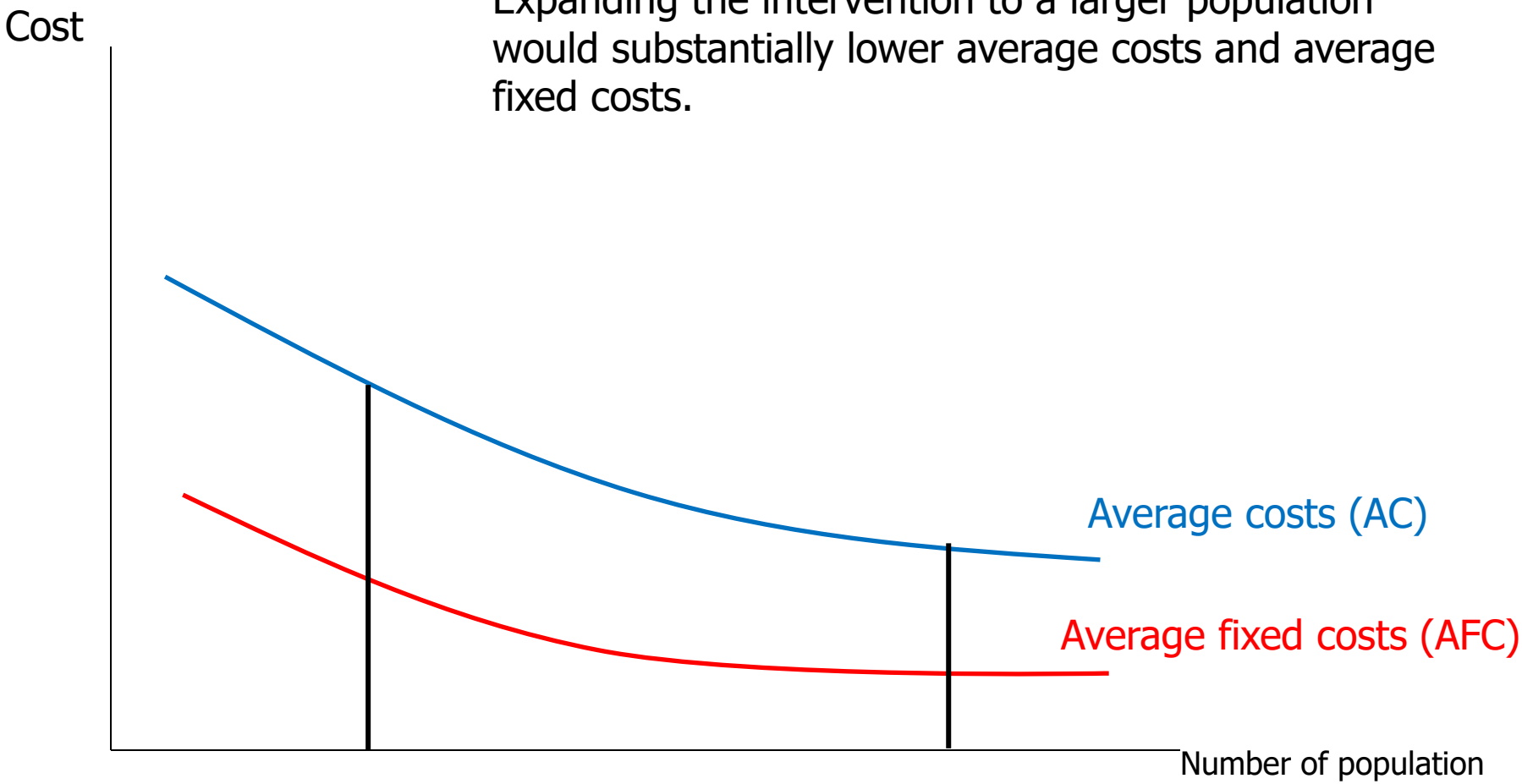
Time Horizon

- Short-run
  - Most cost are fixed
  - The cost of an intervention may be determined based on the variable elements
- Long-run
  - All economic elements may vary

Source: Guidebook Microcost Methods for Determining VA Healthcare Costs.2010

How average cost change in scale

Expanding the intervention to a larger population would substantially lower average costs and average fixed costs.



Summary (Micro Costing)

- Develop a detailed description & **production function** or **process map** of the program
- List, describe, categorize, and quantify all ingredients of the program

- Determine unit $ value of each resource
- Develop a plan for collecting resource data (e.g. personnel time and materials)
- Develop a cost distribution worksheet

Class Projects

- Apply or describe these cost estimation steps for your project.
- Identify the sources for cost data
- If cost data are available you can develop a cost estimate based on the literature and your own assumptions, but this is not required.

Additional Cost Issues

- Cost vs Charges
- Joint Products
- Research and Development
- Capacity Utilization

Costs, Charges, and Payments

- The Cost of a medical procedure is the sum of total of all resources needed to carry it out.
- A charge for a medical procedure is the fee assigned by the provider for the service.
  - Usually charges exceed payments due to negotiated discounts b/w providers and payers
- The Payment is the total reimbursement to the provider for the procedure by all payers.

Source: Guidebook Microcost Methods for Determining VA Healthcare Costs.2010

Cost versus Charges

- Charges do not represent "true" economic cost or payments in the medical market
  - List prices are influenced by government reimbursement policy
  - Prices are set to cross subsidize less profitable services
- Resource costs should be obtained when possible
- If Charge data are used they should be adjusted by the cost/charge ratio available from Medicare and the Federal Register.

Joint Products
(e.g. diabetic retinopathy clinic)

Because healthcare services are often produced with shared resources, e.g. administrators and facilities, it is often necessary to allocate these costs among products or services.

Research & Development (R&D) (Example: development of web-based health education program to increase compliance with mammography screening guidelines)

- R&D costs are those incurred in developing the first copy of an item, independent of the units provided once the first copy is produced.
- Inclusion/exclusion of R&D depends on.
  - Perspective of the analysis.
    - Private firm vs. societal
  - When the decision is made.
    - Prior to vs. after investment in development?

Capacity Utilization & Occupancy Rate

- **Assumptions.**
  - Services should be provided with as little excess capacity as possible in order to use resources efficiently.
  - Literature suggests 80% is capacity utilization norm for health care facilities.
    - Sensitivity analysis may be applied to check the effect of this assumption on cost-effectiveness of the interventions.
    - Average cost will generally decline as fixed costs are spread over additional units of output

Summary

- Costing is measured the same way in each type of evaluation (CEA, CBA, CUA).
- Costing measurement
  - Average vs. marginal vs. incremental
- Costing approach
  - **Micro** vs. gross costing
- Key costing concepts:
  - Cost vs. charges
  - Joint production
  - Research & development vs. replication
  - Capacity utilization effect on average cost