

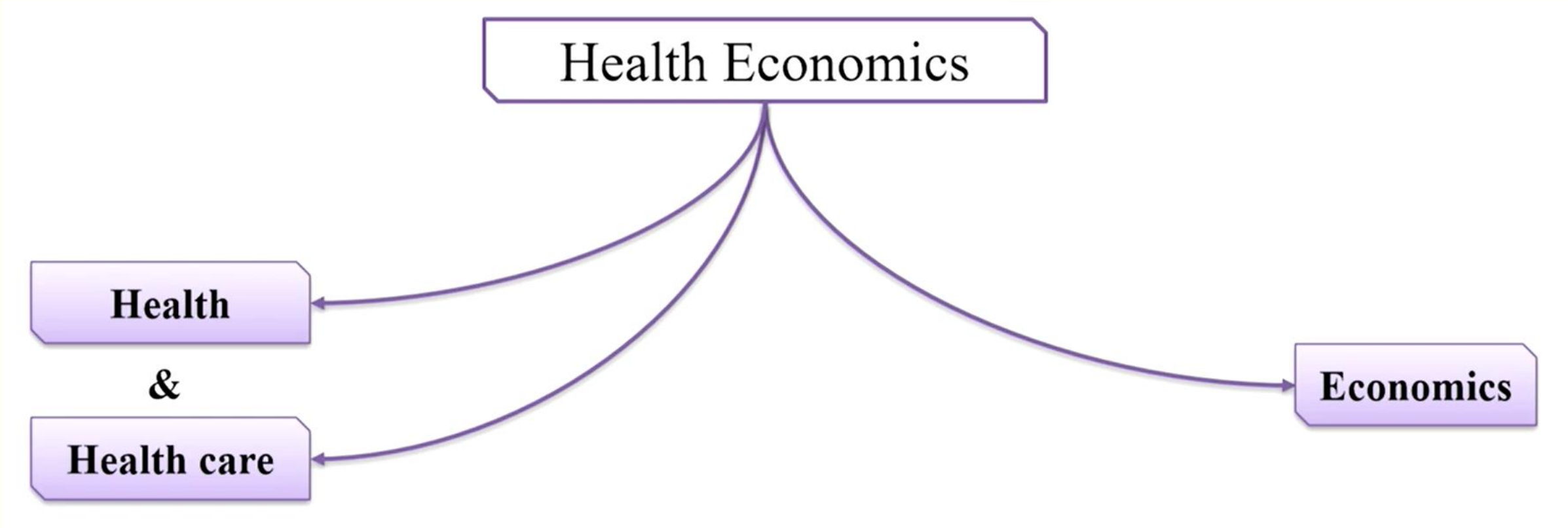
COURSE TITLE:
HEALTH ECONOMICS

Prepared and presented by:
Eman Elkhodary
Lecturer in the Department of Economics

Course Topics:



1	Introduction in Economic.
2	Introduction in Health.
3	Introduction in Healthcare system.
4	Introduction in Health Economic.
5	Economic Evaluation of Health Programs.
6	Decision Making in Medical Practice Using Economics.
7	Health Data and Policy Analysis.


Health Economics
Health
&
Health care
Economics

INTRODUCTION TO ECONOMICS



Introduction to Economics

- What is economics?
- Scarcity & Opportunity Cost
- Types of Economics (Micro vs Macro)
- Why doctors need basic economic thinking?
- Why resources are always limited—especially in healthcare?
- Basic economic concepts.
- Major tasks of economics.



What is Economics?

Definition: Economics is the study of how limited resources are allocated to meet human needs and wants.

Economics is not just about money; it includes time, effort, natural resources, and services.

Example: Choosing which hospital to provide a service depends on available resources (doctors, equipment, medicines).



Scarcity

Economics is the study of our responses to *scarcity*, and the consequences of those responses.

Scarcity – in economics – is the fact that we can't always get what we want.

Resources are limited compared to needs.

Example: There are only 5 X-ray machines in a hospital that serves the whole city. Not every patient can get an X-ray immediately, so waiting or shortages occur.



So, then the big two concepts are that:

- Resources are scarce!
- Society has unlimited needs and wants!

Economics decides the “best” way of providing one to the other



Opportunity Cost

Definition: The value of what you give up when you choose one option over another.

Example: If a hospital buys new medicines for one department, the opportunity cost is that it cannot use that money to buy new beds or equipment for another department.



The Economic Problem

- **Wants, desires: unlimited**
- **Resources: scarce**

Economics

How people use scarce resources to satisfy unlimited wants



Types of Economics

Microeconomics: Focuses on individuals and organizations, e.g., how a hospital allocates resources.

Macroeconomics: Looks at the economy as a whole, e.g., government health budgets, unemployment, national health statistics.

Examples:

Micro → A clinic decides how many vaccines to give to each patient per day

Macro → The government decides how many total vaccines to buy for the entire country.



Why Doctors Need Basic Economic Thinking?

- Use limited resources efficiently.
- Make ethical and effective medical decisions.
- Understand the impact of health policies on patients and hospitals.

Example: Choosing an effective treatment while considering the patient's ability to access it.



Why resources are always limited—especially in healthcare

- Financial, natural, and time resources are always limited.
- Medical needs are growing: chronic diseases, wars, disasters.
- **Gaza is a clear example:** shortages of hospitals, medicines, and doctors make economic planning essential.

Decision Making

Definition: Every economic decision involves choosing between multiple options.

Example: A doctor decides between giving an expensive treatment to one patient or using the same resources to treat several patients.



Cost

Definition: The total amount of resources (money, time, effort) needed to make a decision or perform an action.

Example: Buying a new ultrasound machine costs the hospital money, staff training time, and space in the clinic.



Benefits

Definition: The gain or advantage received from a decision.

Example: Using the expensive medication may cure the patient faster, improving their health significantly.



Efficiency

Definition: Using resources in a way that maximizes output with minimal waste.

Example: A hospital organizes the use of lab equipment so that the maximum number of tests can be done in a day without wasting staff time.



Effectiveness

Definition: Achieving the desired outcome or goal.

Example: A treatment plan successfully cures 90% of patients with a certain disease, showing that the treatment works as intended.



Three major tasks of economics?

- Descriptive economics.
- Explanatory economics.
- Evaluative economics.



Descriptive economics

Definition: Collecting and presenting facts about the economy.

Example: Recording the number of hospital beds, doctors, and patients in Gaza hospitals.



Explanatory economics

Definition: Explaining why things happen in the economy.

Example: Understanding why certain medicines are in short supply in hospitals.



Evaluative economics

Definition: Judging whether things are good or bad, or whether resources are used efficiently.

Example: Evaluating if the allocation of ICU beds maximizes patient care effectively.



INTRODUCTION TO HEALTH

Introduction to HEALTH

What is health?

Why Does Health Matter?

Dimensions of Health.

Determinants of Health.

Good health at low costs.

Health Improvement.

Health is not distributed equally.

What Makes Health Different from Other Goods?

What is health?

Health is more than just the absence of disease.

According to the **World Health Organization (WHO)**

Health is a state of complete physical and mental well-being and not merely the absence of disease or infirmity.

What is health?

Important part of human capital

- **Human capital:** value of learning, experience and ability embodied in workers which increases productivity and income.
- **Asset**: accumulates and depreciates

Individual or households can improve their health through use of health care, diet production, services and determinants

Why Does Health Matter?

Health is a foundation for every aspect of life:

- Healthy people are more productive
- Healthy children learn better
- Healthy societies grow economically
- Poor health slows development and increases poverty
- This is especially important in Gaza, where health challenges affect education, work productivity, and social stability.

Dimensions of Health

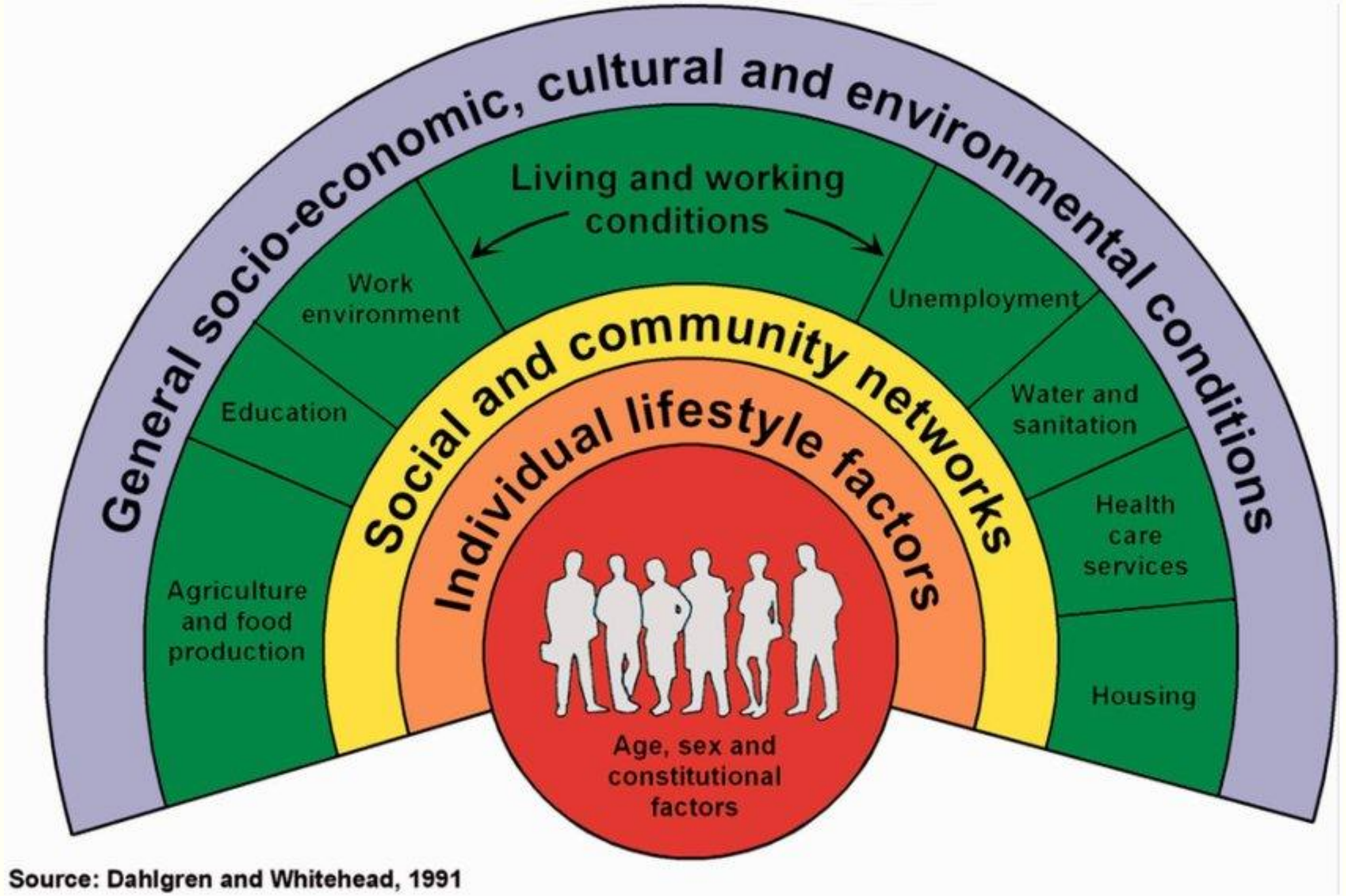
- **Physical health** – how well the body functions
- **Mental health** – emotional and psychological well-being
- **Social health** – quality of relationships and ability to interact
- **Environmental health** – clean water, air, safe housing
- **Spiritual health** – meaning, values, beliefs (varies by person)

Determinants of Health

Health is shaped by many factors—not only medical care.

Major determinants include:

- **Biology & genetics** – age, sex, inherited conditions.
- **Behavior** – diet, exercise, smoking, sleep.
- **Social environment** – education, income, family support.
- **Physical environment** – pollution, water quality, housing.
- **Healthcare services** – access, quality, affordability.



Source: Dahlgren and Whitehead, 1991

SUSTAINABLE DEVELOPMENT GOALS



Health Improvement

- Life expectancy.
- Mortality.
- Morbidity.
- Composite measures such as healthy life years.

Health is not distributed equally

Some groups have better health than others due to:

- wealth differences
- social inequality
- gender differences
- conflict and displacement
- education gaps

What Makes Health Different from Other Goods?

Health is unique compared to normal economic goods:

- People do NOT choose to become sick
- Health needs are unpredictable
- Illness can be emotionally stressful
- Health decisions often require expert knowledge
- Health problems can be financially catastrophic

INTRODUCTION TO HEALTH CARE

Introduction to health care

What is Health Care?

Why Do We Study Health Care?

Why Health Care Needs Good Planning?

When Health Systems Face Limited Resources?

Components of a Health Care System.

Levels of Health Care.

Levels of Health Care in Gaza.

Real challenges in Gaza’s health care system.

The Role of Health Economics & Health Care in Gaza.

Case study.

What is Health Care?

Health care includes all services that help keep people healthy, prevent disease, treat illness, and support recovery. It covers prevention, diagnosis, treatment, and rehabilitation.

Why Do We Study Health Care?

We study health care to understand how systems work, how services are delivered, and how to respond when resources are limited or during emergencies.

During recent crises, several hospitals in Gaza operated far above capacity, with emergency rooms treating double or triple the usual number of patients — showing the need for strong health system planning.

Why Do We Study Health Care?

- We study health care because it is the backbone of any healthy society.
- Health care affects every part of life: work, education, family stability, and even a country's economy. When the health system works well, people live longer, work better, and communities grow.

But when the health system is weak — people suffer, productivity decreases, and costs rise for families and governments.

Why Health Care Needs Good Planning?

- Understanding health care is not only about knowing diseases and treatments — it is also about understanding how to organize services, how to use resources wisely, and how to make sure every patient receives the care they need.
- Health systems often face challenges such as limited staff, limited equipment, and crowded hospitals.
- This means we must think carefully about priorities, planning, and how to deliver care in the most effective way.

When Health Systems Face Limited Resources?

Every health system in the world faces limits — limits in money, staff, medicines, beds, and technology.

Because of these limits, health services must be organized carefully so patients receive safe and timely care.

This challenge becomes even greater in places facing conflict or economic hardship, such as Gaza. Thinking about these limits helps us understand why countries use different methods to plan, prioritise, and improve their health services.

Components of a Health Care System

A health care system includes:

- Health workers (doctors, nurses, technicians)
- Health facilities (hospitals, clinics)
- Medicines and supplies
- Health financing
- Health information systems

Levels of Health Care

- **Primary care:** first contact, basic treatment, vaccination.
- **Secondary care:** specialist services, general hospitals.
- **Tertiary care:** advanced surgery, ICU, specialized care.

Levels of Health Care in Gaza

Primary health care is widely available through clinics run by the Ministry of Health and UNRWA, where people receive vaccinations, maternal care, and treatment for common infections.

However, secondary care services — such as specialist consultations and general hospital care — often face overcrowding, long waiting times, and shortages of equipment.

Tertiary care is the most limited: Gaza has very few advanced services like cardiac surgery, neurosurgery, or certain cancer treatments, and these services are difficult to access due to limited resources and damaged facilities.

Real challenges in Gaza's health care system

- Many families in Gaza rely on UNRWA health centers for primary care services, including vaccinations, maternal care, and treatment of common illnesses, serving more than 1.6 million people (UNRWA, 2025).
- Major hospitals such as Al-Shifa and Nasser often operate at over 150% of capacity, especially during emergencies, forcing medical staff to treat patients in hallways (WHO, 2025).
- Evidence shows that good primary care—including vaccinations, nutrition support, and early disease detection—significantly reduces hospital admissions and eases pressure on the healthcare system (OECD, 2020; WHO, 2025).

Real challenges in Gaza's health care system

- After recent hostilities, only 19 out of 36 hospitals in Gaza remain operational, and many of them provide only basic or emergency services (WHO, 2025).
- Many hospitals face severe shortages of medicines, medical supplies, and fuel, which threatens their ability to treat patients safely (UN Geneva, 2025).
- Hospital bed capacity is insufficient, and several hospitals report occupancy rates far above their normal limits (UN Geneva, 2025).

The Role of Health Economics & Health Care in Gaza

Understanding health care challenges in Gaza is essential, but in a context of scarce resources, economic thinking is crucial. Health economics guides how to prioritise, allocate resources efficiently, and ensure fair access for all. Studying health care gives us knowledge, but applying health economics turns that knowledge into action, protecting lives and building a more resilient and equitable health system.

Case Study:
UNRWA Primary Health Care in Gaza

Background:

- UNRWA health centers provide primary care services to over 1.6 million people
  - Vaccinations
  - Maternal & child care
  - Treatment of common illnesses

Impact:

- Reduces hospital admissions & eases pressure on hospitals
- Supports preventive care and early detection of diseases

Challenges:

- Limited staff, medicines, and equipment
- Hospitals often overcrowded, especially during emergencies
- High demand for care in a conflict-affected area

Discussion Question:

How can health resources be allocated efficiently to serve everyone effectively in Gaza?

INTRODUCTION TO HEALTH ECONOMICS

Introduction to Health Economics

Why Do We Study Health Economics?

What is Health Economics?

What Does Health Economics Study?

What questions do health economics ask?

Important Aspects in Health Economics

Importance of Training Doctors in Health Economics

Health Production Curve

Partial Agenda For Physician-Economist Collaboration

Final Thought: Clinical Decisions in the Real World

Why Do We Study Health Economics?



Medicine does not work alone.

Every health service needs resources, such as:

- Doctors and nurses
- Medicines
- Medical equipment
- Hospitals and clinics
- Funding

However, these resources are limited, while health needs are unlimited.

This creates a constant challenge in health care systems.

Health Economics helps us deal with this challenge

What is Health Economics?

Health Economics is a branch of economics that applies microeconomic tools, such as demand theory and cost analysis, to health-related issues and health care systems. Its main goal is to understand how limited health care resources can be used efficiently and fairly to achieve the best possible health outcomes, and to help in designing effective and corrective health care policies.

Health Economics is about making the best health decisions with limited resources.

What Does Health Economics Study?

1. Allocation of Health Care Resources

Health economics examines how limited health resources are allocated, including:

The production of health care services *(doctors, specialists, nurses, hospitals)*

How health care is distributed across the population:

- Based on ability to pay?
- Based on health needs?
- Or a combination of both?

How much the government should spend on health care

What Does Health Economics Study?

2. Size and Importance of the Health Sector

Health economics demonstrates:

The magnitude and importance of the health sector in the economy

How fast the health sector is growing

The main reasons behind this growth (technology, population growth, aging, chronic diseases)

What Does Health Economics Study?

3. Why Is Health Care Different from Other Markets?

Health economics explains:

Why health care markets differ from other markets?

Why traditional economic analysis needs to be adjusted?

Examples:

Patients do not have full information (information asymmetry)

Demand for health care is often urgent and unavoidable

Strong government intervention is necessary

What Does Health Economics Study?

4. Determinants of Health Status and Public Policy

Health economics studies:

The determinants of health status, such as: Income, Education, Environment, Lifestyle

How government policies can improve health status:

In the short run, In the long run

Examples: vaccination programs, health insurance, investment in primary health care

Why Is Health Economics Important?

Health economics helps us understand why health care needs planning, regulation, and public policies not just markets.

The Key Problem: Scarcity



In health care, we must always make choices:

Who receives treatment first?

Which services should be provided?

How should limited budgets be spent?

Because we cannot provide everything to everyone, choices are unavoidable.

Discussion Questions

- Doctor's Decision-Making

1. If you have one ICU bed and two critically ill patients, how would you decide who receives care? What medical and economic factors should be considered?

2. Should a doctor request all possible diagnostic tests for a patient if resources are limited? Why or why not?

3. How can doctors balance patient needs with limited hospital resources?

Discussion Questions

- Gaza Context

4. In Gaza, medicines and medical supplies are often limited.
How should doctors prioritize treatment in such situations?

5. Should health care be provided based on ability to pay or medical need?
How realistic is this in Gaza?

6. How do shortages of staff and equipment affect clinical decisions?

Discussion Questions

- Ethics, Economics & Society

7. Can economic considerations be ethical in health care?
Why or why not?

8. How do individual medical decisions affect public health?
Give examples such as vaccination or antibiotic use.

How can understanding health economics make you a better doctor in Gaza?

What questions do health economics ask?

- What role should the government play in health?
- What health care investments should a developing country make?
- What advertising should be banned?
- What is the optimal design for health insurance?
- Why has health care become so expensive?
- Does health care early in childhood lead to improved cognition and higher incomes in the future?
- Have Medicare and Medicaid increased utilization and improved health outcomes?
- Do different methods of doctor payment change quality of care, outcomes or costs?

Important Aspects in Health Economics

Efficiency

Choosing the least expensive option that achieves the same health outcome.
Example: If two treatments for the same disease give the same improvement, the cheaper one should be used to save resources.

Important Aspects in Health Economics

Effectiveness

Ensuring that health services actually achieve their intended goals, like improving health or reducing suffering.
Example: Childhood vaccinations prevent diseases and reduce the overall health burden.

Important Aspects in Health Economics

Equity

Providing fair access to health services for all patients, regardless of income or location.
Example: Ensuring primary health care reaches all neighborhoods, including underprivileged or isolated areas.

Important Aspects in Health Economics

Efficiency

Effectiveness

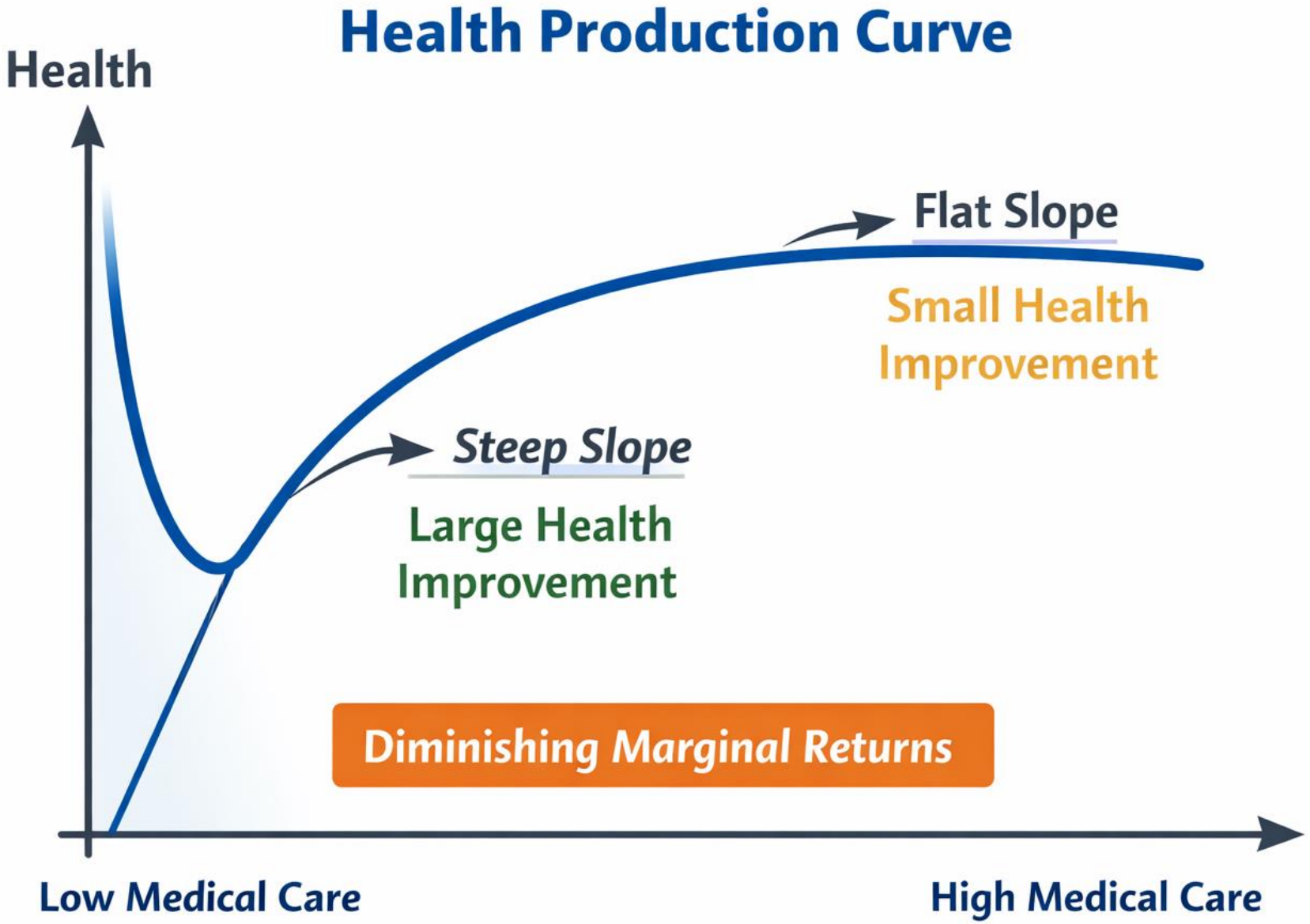
Equity

Importance of Training Doctors in Health Economics

- **Physicians shape health care supply:**
  Doctors play a major role in deciding what services patients receive, which affects the quantity, quality, and cost of health care.
- **Doctors as gate-keepers:**
  Physicians control access to the health system, guiding patients to the right tests, treatments, or specialists.
- **The double role of physicians:**
  - **Counselor:** Advising patients on the best treatment options.
  - **Provider:** Delivering health care services directly.
- *Example:* With limited operating rooms and specialized medical teams, doctors prioritize patients based on urgency and the potential impact on patient survival.

Partial Agenda For Physician-Economist Collaboration

- **Improving health data:**
  Developing better data to support disease prevention and effective treatment.
- **Studying health patterns:**
  Analyzing time trends and differences across populations in mortality and use of medical care.
- **Including patient preferences:**
  Incorporating patients' values and choices into physicians' clinical decisions.
- **Assessing new technologies:**
  Evaluating the benefits and costs of new medical technologies before widespread use.
- **Understanding incentives:**
  Increasing knowledge of how financial and non-financial incentives influence the behavior of patients and physicians.


Health Production Curve
Health
Flat Slope
Small Health Improvement
Steep Slope
Large Health Improvement
Diminishing Marginal Returns
Low Medical Care
High Medical Care

Final Thought: Clinical Decisions in the Real World

- Every medical decision involves a trade-off between health benefits and limited resources.
- In settings like Gaza, doctors must often choose who receives care first and how.
- Understanding health economics helps physicians ask:
  - *Will this intervention significantly improve the patient's health?*
  - *Is this the best use of scarce resources?*

Good doctors save lives.

Economically informed doctors save lives and resources.

DEMAND AND SUPPLY

Defining need

- A need refers to a basic requirement that is essential for the survival and well-being of an individual.
  For example, food is a need because it satisfies hunger and is necessary for survival.
- A need is something that is essential for living — a good or service that a person must have to survive.
  Examples of basic needs include food, shelter, clothing, and clean water.
- According to Maslow's hierarchy of needs, these basic physiological needs must be satisfied first before individuals can focus on higher-level needs such as safety, social belonging, and self-esteem.

Wants

A want refers to the different options or preferences people choose to satisfy their needs.

For example, you need food to survive, but you may want to eat Maqloba.

Wants are not essential for survival.

A person can live without wants, but having them increases comfort, satisfaction, and happiness.

In simple words, wants are choices, while needs are necessities.

Health Needs Assessments – Why Important?

Health needs assessments are important because they help health systems use resources efficiently and avoid unnecessary waste.

They also help decision-makers set priorities, especially in settings where resources are limited, such as hospitals with shortages of staff, medicines, or equipment.

In addition, health needs assessments increase the ability of health systems to reduce health inequities by identifying which populations or areas need more support.

In general, health needs assessments provide a strong evidence-based foundation for effective health planning and policy-making.

Defining the need for medical care

Defining the need for medical care means identifying what health services are required, for whom, and to what extent.

An important question in health economics is whether we can measure and plan medical needs.

For example, can we estimate how many hospital beds per 1,000 population a country needs?
Can we determine how many doctors, nurses, or clinics are required?

Examples of medical care needs include:

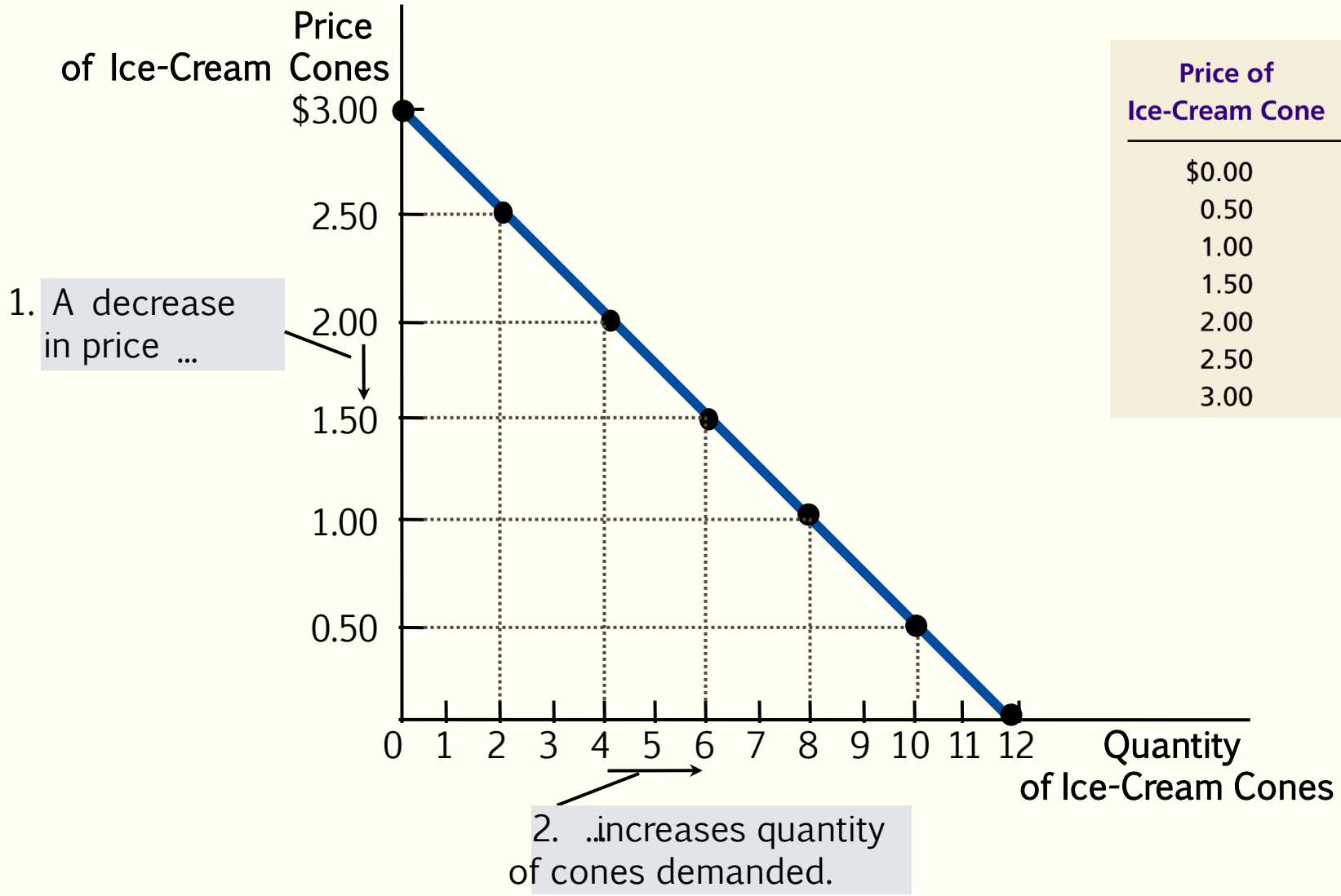
- The need for physician services, such as consultations and follow-up care
- The need for continuous care during pregnancy, from antenatal visits to delivery
- The need for immunization services, especially for children, to prevent infectious diseases

Understanding these needs helps health systems plan services, allocate resources efficiently, and ensure access to essential care.

Demand

- **Quantity demanded** is the amount of a commodity that buyers are willing and able to purchase
- **Demand** is a full description of how the quantity demanded changes as the price of the commodity changes.

Catherine's Demand Schedule and Demand Curve



Price of Ice-Cream Cone	Quantity of Cones Demanded
$0.00	12
0.50	10
1.00	8
1.50	6
2.00	4
2.50	2
3.00	0

Law of Demand

- The law of demand states that

the quantity demanded of a good falls when the price of the good rise, and other things being constant, provided all other factors that affect buyers' decisions are unchanged

Law of Demand

What are we holding constant?

- Income
- Tastes and preferences
- Price of other goods
- Many other factors

Other economic factors

Price of other goods and services:

- Complements in consumption: goods normally consumed together. Demand for glasses and services of optometrists are likely to be complementary.

- Substitutes in consumption: physician services and hospital out-patient services could be substitutes. Generic and brand name drugs.

Other economic factors

- Real income: change in income of the population will affect demand. With the increase in income, consumers are able to buy more of all goods including health care.
- Monetary cost of travel: bus fare, gasoline.
- Opportunity cost time: dollar value of work or activities foregone due to the time spent to acquire medical care.

Non economic determinants

- **Taste and preference:** preference pattern of individuals: Marital status, education, lifestyle.

- **Marital status and demand:** married individuals demand more medical care than non- married, especially hospital in patient care days

Non economic determinants

- **Education and demand:**

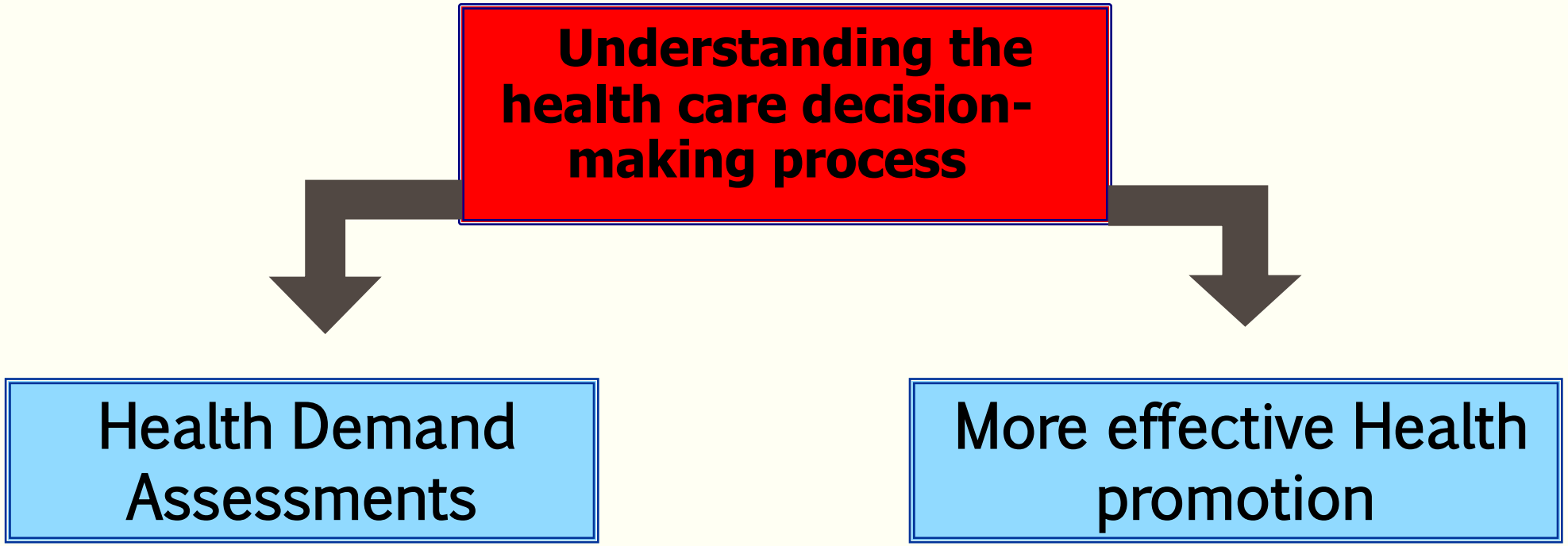
Better education may imply higher demand; know more about the importance of health; higher value of productive time.

Better education may also imply better use of other resources, better ability to protect health, more likely to recognize early warning signs and lower the use of high-cost services.

Non economic determinants

- **Life style variables:** cigarette smoking, alcohol consumption.
- **Individual profile:** gender, race/ethnicity, age.
- **State of health.**
- **Quality of care.**

Managing Health Demand



Influential Factors for

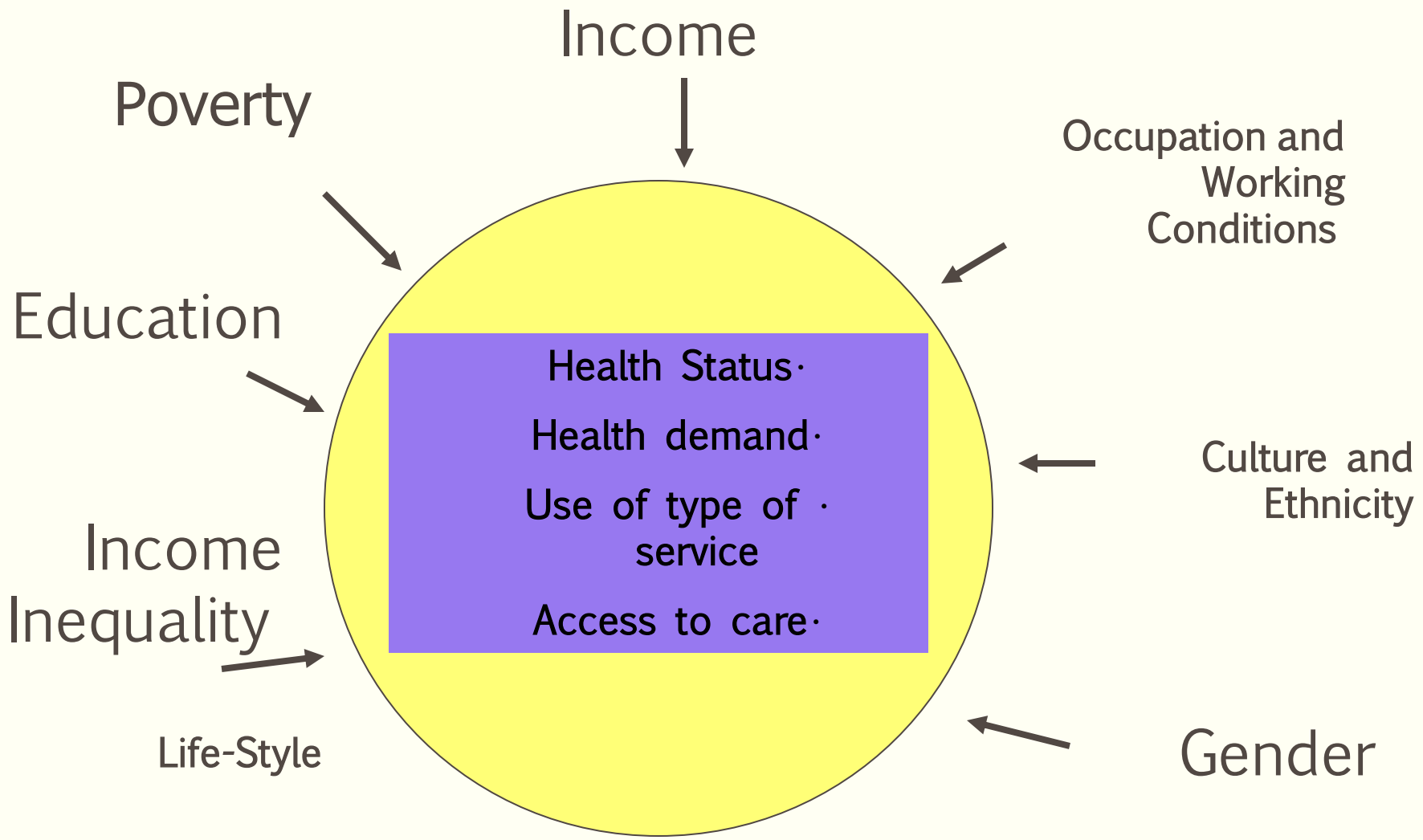
HEALTH DEMAND

- *Demographics*
- *Socio-economic status*
- *Health services supply*
- Environmental situation – e.g. water, sanitation
- Nutrition
- Illness prev. behaviors
- Life style
- Perceptions of illness & health expectations
- Stigma
- Trade-Offs

HEALTH NEED

- *Demographics*
- *Socio-economic status*
- *Health Services supply*
- Environmental situation- E.g. water , sanitation
- Nutrition
- Illness prev. behaviors
- Life-Style
- Genes

Socio-Economic Factors



Demand, Need, Utilization (PHC)

- In an environment free of access barriers, the population's **need** for care is fully expressed as **demand** for services which, when met by adequate supply, translates into **utilization** at the proper level.
- Drivers of Primary Care Utilization
  - Promote: Prevention, Illness (undifferentiated acute or chronic)
  - Suppress: Barriers to care
  - Vary: Age/Gender, cultural/personal preferences, disease etc.

Need and utilization

- Demand schedule: the relationship between the quantity demanded of a good and the price, whether for an individual or for the market as a whole

- Derived demand: the demand for one commodity that depends on the demand for another good, such as when the first commodity is used as an input in producing the (i.e., derives from) second.

Need and utilization

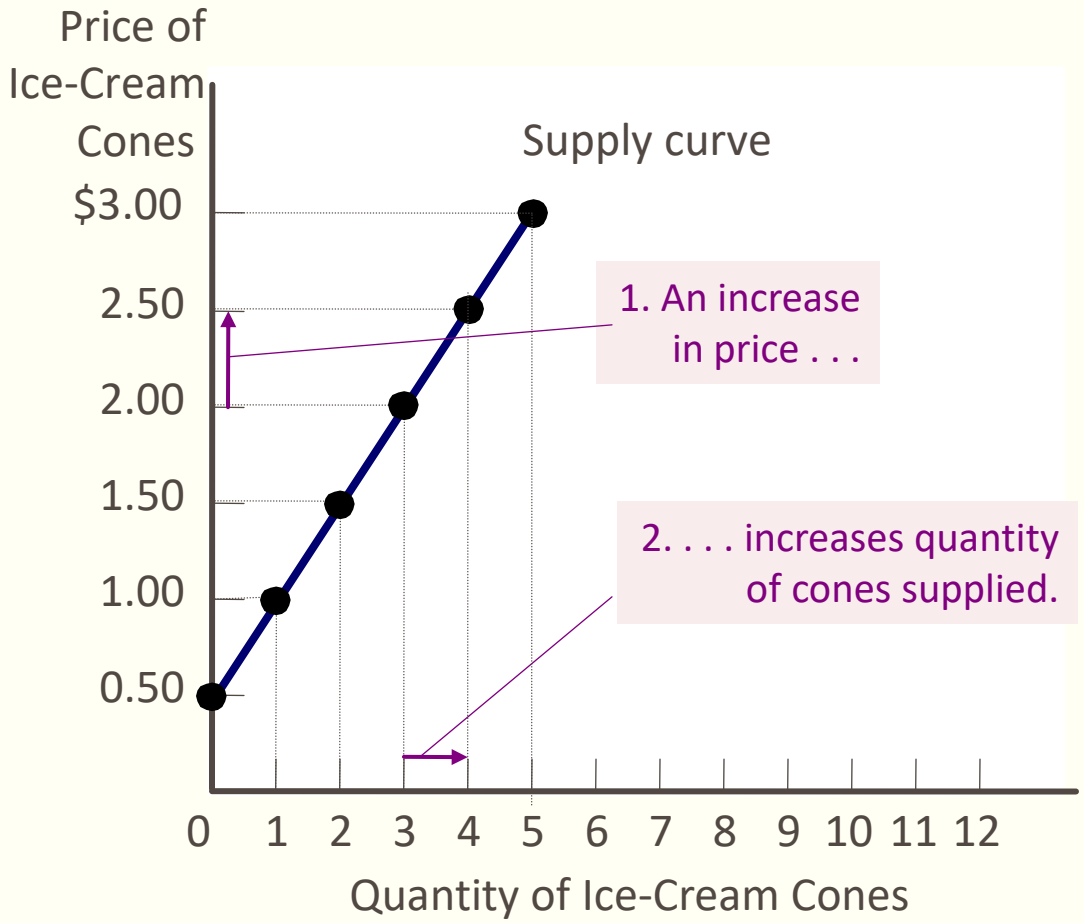
- Supplier-induced demand: a phenomenon whereby a health care provider, influences the level of demand for health care services over and above that which would have been chosen had the patient made the choice with the same knowledge of the provider.
- Supplier-induced demand arises from the existence of informational asymmetry between a patient and a provider. Professional ethics encourages supplier-induced demand in the interest of the patient, because the patient often has insufficient information to judge what services will improve their health. Providers may however exploit their superior informational advantage to induce demand to further their own interest.

SUPPLY

- *Quantity supplied* is the amount of a good that sellers are willing and able to sell at a certain price.
- *Supply* is a full description of how the quantity supplied of a commodity responds to changes in its price

Ben's supply schedule and supply curve

Price of Ice-cream cone	Quantity of Cones supplied
$0.00	0 cones
0.50	0
1.00	1
1.50	2
2.00	3
2.50	4
3.00	5



Law of Supply

- The *law of supply* states that, **the quantity supplied of a good *rises* when the price of the good *rise***, and other things being constant, as long as all other factors that affect suppliers' decisions are unchanged.

Equilibrium

- The theory of supply and demand assumes that the price automatically reaches a level at which the quantity demanded equals the quantity supplied

SUPPLY AND DEMAND TOGETHER

Demand Schedule

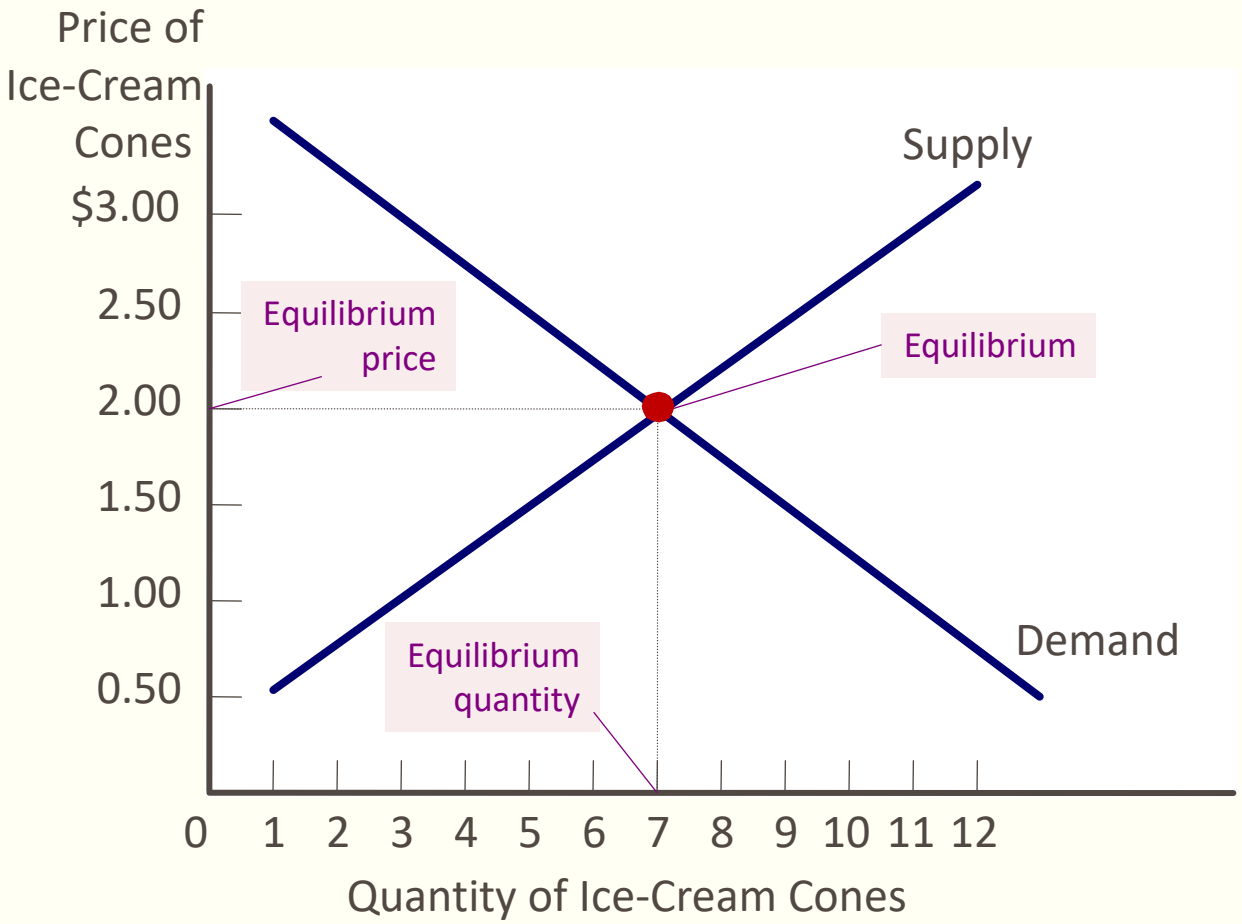
Price of Ice-Cream Cone	Market
$0.00	19
0.50	16
1.00	13
1.50	10
2.00	7
2.50	4
3.00	1

Supply Schedule

Price of Ice-Cream Cone	Market
$0.00	0
0.50	0
1.00	1
1.50	4
2.00	7
2.50	10
3.00	13

At $2.00, the quantity demanded is equal to the quantity supplied!

Equilibrium of supply and demand



ELASTICITY

Why is elasticity important in healthcare?

The elasticity of demand is necessary for measuring the effects of human behavior based on changes in prices.

When the price of medicines rises, does the amount demanded fall? And when the price falls, does the demand rise?

- The law of supply and demand is arguably one of the most solid tenets of microeconomics. It states that, all other things being equal, when the price of goods increases, the market demand decreases, and when the price drops, demand rises.

- **Price elasticity of demand** (PED) quantifies how price changes affect the number of goods sold.

Elasticity

Elasticity measures how much one variable responds to changes in another variable.

Elasticity is a numerical measure of the responsiveness of Q^d or Q^s to one of its determinants.

Price Elasticity of Demand

$$\text{Price elasticity of demand} = \frac{\text{Percentage change in } Q^d}{\text{Percentage change in } P}$$

- **Price elasticity of demand** measures how much Q^d responds to a change in P.

It measures the price-sensitivity of buyers' demand.

Calculating Percentage Changes

- So, we instead use the **midpoint method**:

$$\frac{\text{end value} - \text{start value}}{\text{midpoint}} \times 100\%$$

- The midpoint is the number halfway between the start & end values, also the average of those values.
- It doesn't matter which value you use as the "start" and which as the "end" – you get the same answer either way!

Calculating Percentage Changes

- Using the midpoint method, the % change in ***P*** equals

$$\frac{\$250 - \$200}{\$225} \times 100\% = 22.2\%$$

- The % change in ***Q*** equals

$$\frac{12 - 8}{10} \times 100\% = 40.0\%$$

- The price elasticity of demand equals

$$40/22.2 = 1.8$$

Why is elasticity important in healthcare?

The elasticity of demand is necessary for measuring the effects of human behavior based on changes in prices.

"Perfectly inelastic demand" (one extreme case)

$$\text{Price elasticity of demand} = \frac{\%\text{ change in } Q}{\%\text{ change in } P} = \frac{0\%}{10\%} = 0$$

D curve:

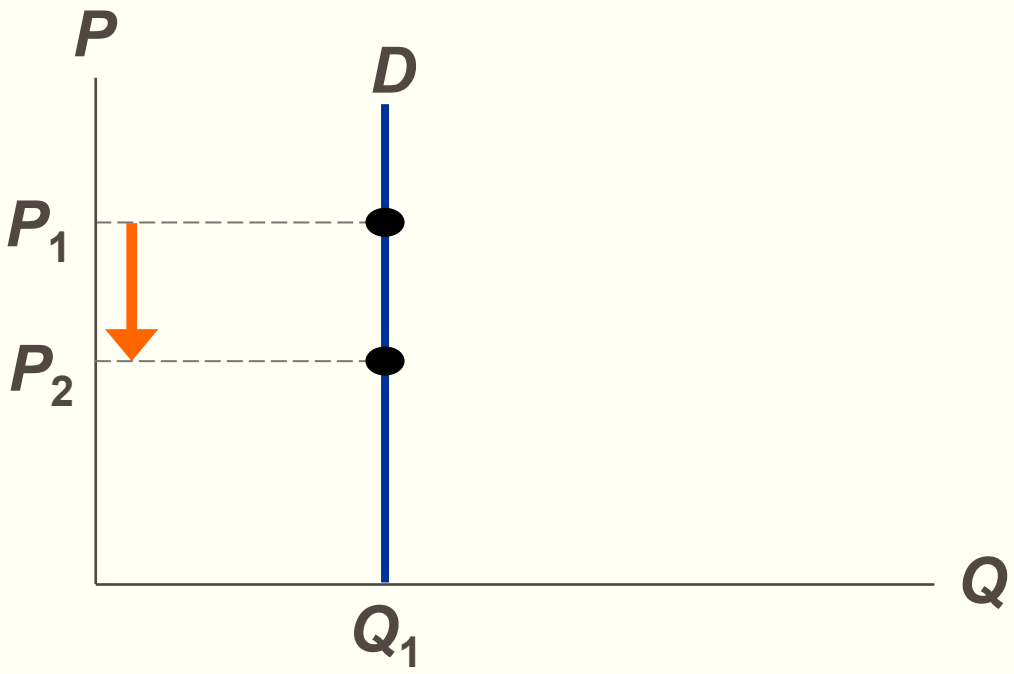
vertical

Consumers' price sensitivity:

0

Elasticity:

0



P falls by 10%

Q changes by 0%

"Inelastic demand"

$$\text{Price elasticity of demand} = \frac{\%\text{ change in } \boldsymbol{Q}}{\%\text{ change in } \boldsymbol{P}} = \frac{< 10\%}{10\%} < 1$$

D curve:

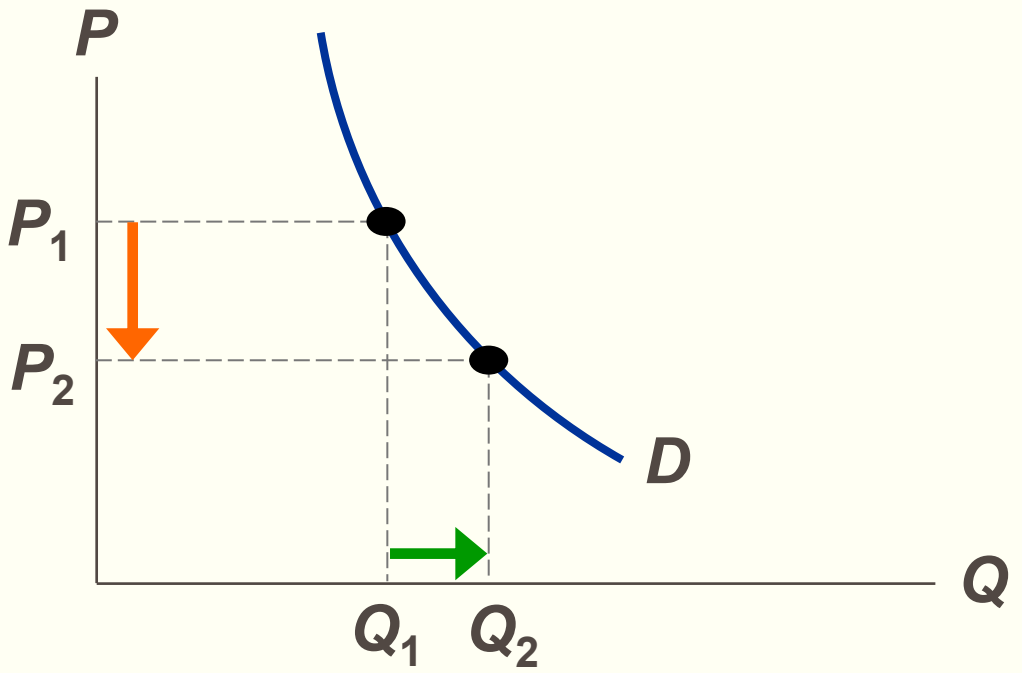
relatively steep

Consumers' price sensitivity:

relatively low

Elasticity:

(0 < E< 1)



P falls by 10%

Q rises less than 10%

"Unit elastic demand"

$$\text{Price elasticity of demand} = \frac{\%\ \text{change in } Q}{\%\ \text{change in } P} = \frac{10\%}{10\%} = 1$$

D curve:

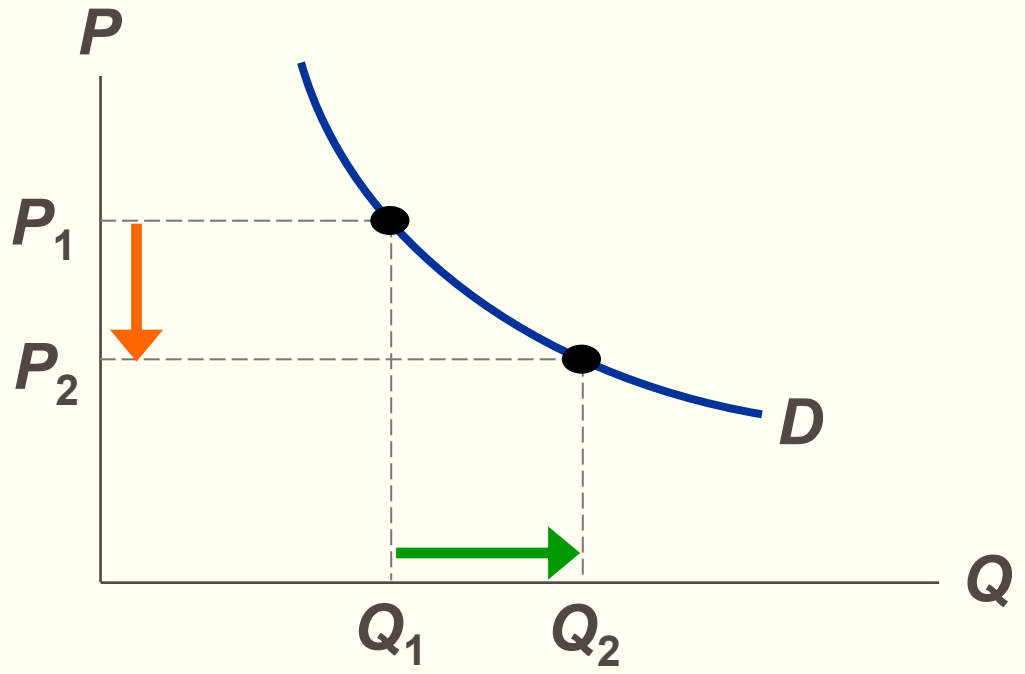
intermediate slope

Consumers' price sensitivity:

intermediate

Elasticity:

1



P falls by 10%

Q rises by 10%

"Elastic demand"

$$\text{Price elasticity of demand} = \frac{\%\ \text{change in } Q}{\%\ \text{change in } P} = \frac{> 10\%}{10\%} > 1$$

D curve:

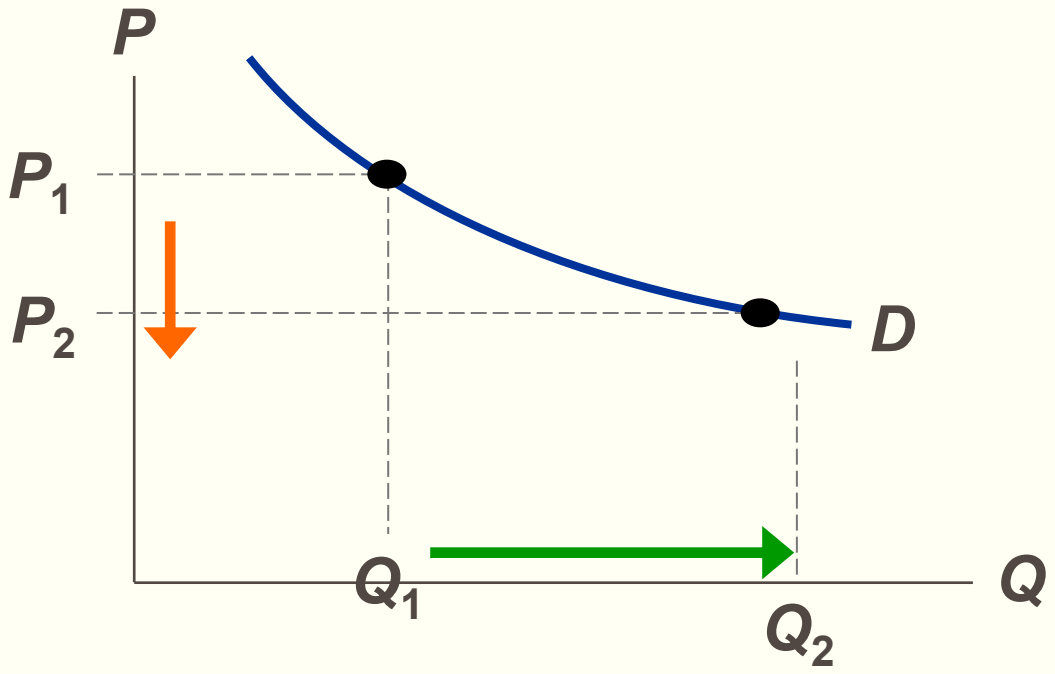
relatively flat

Consumers' price sensitivity:

relatively high

Elasticity:

$(\infty > E > 1)$



P falls by 10%

Q rises more than 10%

"Perfectly elastic demand" (the other extreme)

$$\text{Price elasticity of demand} = \frac{\%\ \text{change in } Q}{\%\ \text{change in } P} = \frac{\text{any } \%}{0\%} = \text{infinity}$$

D curve:

horizontal

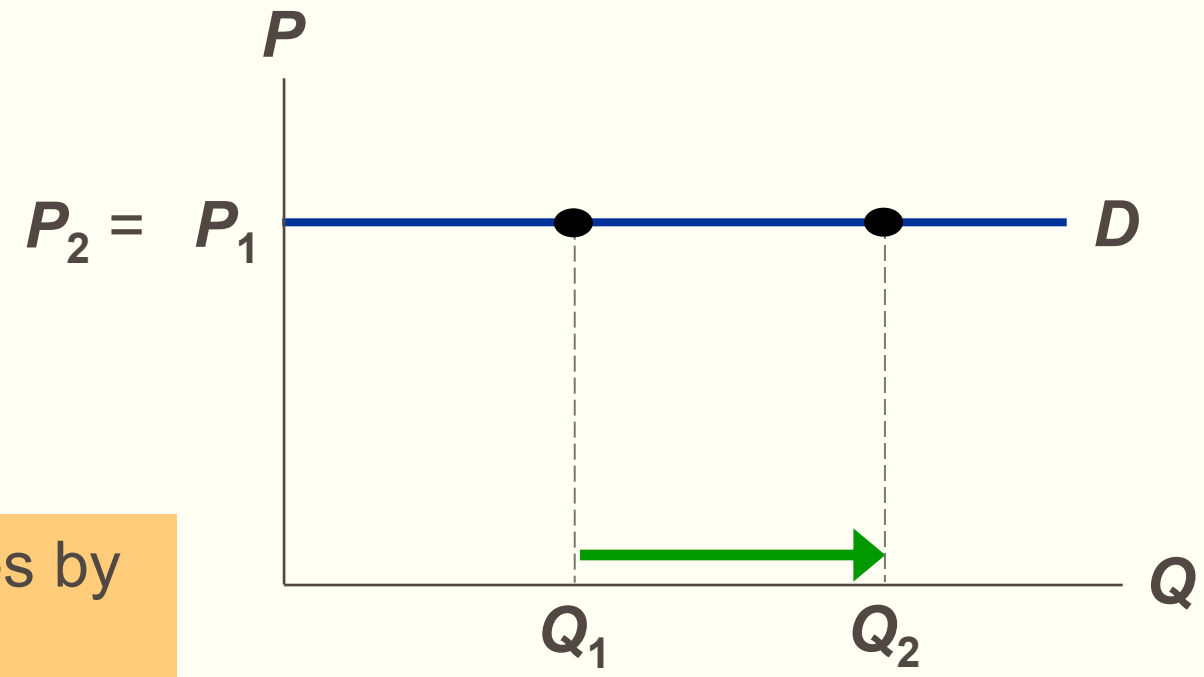
Consumers' price sensitivity:

extreme

Elasticity:

infinity

P changes by 0%



Q changes by any %

Other Elasticities

- The **cross-price elasticity of demand** measures the response of demand for one good to changes in the price of another good.

$$\text{Cross-price elast. of demand} = \frac{\%\ \text{change in } Q^d \text{ for good 1}}{\%\ \text{change in price of good 2}}$$

- For substitutes, cross-price elasticity > 0
  E.g., an increase in price of beef causes an increase in demand for chicken.
- For complements, cross-price elasticity < 0
  E.g., an increase in price of computers causes decrease in demand for software.

Mid-point formula

- It is often safer, especially if the difference between quantities and prices is high, to use the mid-point formula for price elasticity.

$$\text{Price Elasticity of Demand} = \frac{\text{Percentage change in demand}}{\text{Percentage change in price}} = \frac{\dfrac{(Q_1 - Q_0)}{(Q_0 + Q_1)/2}}{\dfrac{(P_1 - P_0)}{(P_0 + P_1)/2}}$$

Mid-point formula: Example of the life-saving patented drug

»Fictional example of a life-saving patented medicine«

- In this example, the pharmaceutical company raised the unit price of an essential medication from $100 to $150 (a 50% increase); as a result, demand decreased from 1,000 units to 950 units (a decrease of less than 5%).
- Its P.E.D ratio would be: -0.12. As we said before, not very elastic.

$$P.E.D = \frac{\frac{(Q_1 - Q_0)}{(Q_0 + Q_1)/2}}{\frac{(P_1 - P_0)}{(P_0 + P_1)/2}} = \frac{\frac{(950 - 100)}{(1000 + 950)/2}}{\frac{(150 - 100)}{(100 + 150)/2}} = -0.12$$

Two real examples from the US market

- **Company A**. PED for ADENOSINE- 3MG/ML. VIAL US MARKET.
- Adenosine-3mg/ml-vial has as many as 7 products by competing manufacturers that are registered as therapeutic equivalents.
- The product shows a **high degree of price elasticity** (-1.32)
- **Company B.** PED for ADENOSINE- 3MG/ML. VIAL US MARKET
- This is another example taken from the US market. The molecule and presentation of this product is identical to that drug of company A, and thus competes in the same group.
- Company B's product shows a much **higher degree of price elasticity** (- 8.30).





Adenosine-3mg/ml Company A

P0 (Price April20) = $42.48

P1 (Price May20) = $27.18

Q0 (Quantity April20 = 366 units

Q1 (Quantity May20) = 666 units

PED = – 1.32

Adenosine-3mg/ml Company B

P0 (Price May20) = $42.60

P1 (Price June20) = $39.59

Q0 (Quantity May20 = 2,579 units

Q1 (Quantity June20) = 4,833 units

PED = – 8.30

Cross elasticity of demand

- **Cross elasticity of demand** (XED) calculates the change in the quantity demanded of a good when the price for another good changes.
- we saw instances of high levels of elasticity in the pharmaceutical industry.
- In the real world, however, the demand for a product is not only dependent on its own price, but also on the price of other “related” products.
- To set prices, pharmaceutical companies need to measure the sensitivity of competing medicines to their products through detailed cross-elasticity analysis.

The determinants of price elasticity

- **substitutes**
- The availability of substitute goods is probably the main factor determining the elasticity of demand for a pharmaceutical product.
- The more products available, the higher the elasticity, as consumers can easily switch from one good to another. If no substitutes are available, the demand will be inelastic.
- For example, as we saw in the previous post, Adenosine-3mg/ml-vial has 7 products competing as therapeutic equivalents in the US market. At least two of them show high ratios of price-elasticity.
- If, instead of Adenosine, we had a newly patented medicine with no therapeutic equivalent, a 20 percent rise in price might not affect demand at all.

Other determinants of price elasticity

- **Percentage of income** :if a product costs only a small proportion of a person's income, it is likely to be price inelastic. The higher the percentage of the patient's income that the drug's price represents, the higher its elasticity.

Over-the-counter analgesics, such as Ibuprofen, are usually not very expensive. If its price increases by 15 percent, the level of demand is only likely to fall moderately because the price represents a small fraction of the patient's average income.

- **Necessity**: essential medicines are necessities. Their demand is likely to be price inelastic because consumers cannot live without them.
- **Brand loyalty**: an attachment to a specific brand can override sensitivity to price changes, resulting in a more inelastic demand.
- **Who pays:** if the patient does not pay for the drug directly, demand is likely to be more inelastic

Other determinants of price elasticity

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Cross-elasticity. Real example US market: Adenosine 10 mg/ml

- PED is not always enough to explain changes in the demand across a group of therapeutic equivalents. This is evident for Adenosine-10 mg/ml. In this case study, the group of therapeutic equivalents is made up of 5 products. We call the manufacturers here COMPANY-C, COMPANY-D and COMPANY-E.
- COMPANY-D dropped their price from $6.36 to $4.90. Company-D experienced a surge in demand, that took it from 7,580 units to 12,834 units.
- The other two competitors maintained their prices.
- The dramatic discount imposed by COMPANY-D affected the demand of COMPANY-C: lowering it from 6,500 units to 2,229. There is a great degree of cross-elasticity between the presentations of COMPANY-D and COMPANY-C
- Contrarily, the discount imposed by COMPANY-D left COMPANY-E's demand untouched. This makes COMPANY-E almost completely inelastic.



Adenosine 3mg/ml

COMPANY-C

Price June20 = $8.93

Price July20 = $8.92

Quantity June20 = 6,500 units

Quantity July = 2,219 units



Adenosine 3mg/ml

COMPANY-D

Price June20 = $6.36

Price July20= $4.90

Quantity May20 = 7,580 units

Quantity June20 = 12,834 units



Adenosine 3mg/ml

COMPANY-E

Price June20 = $11.80

Price July20 = $11.80

Quantity June20 = 10,923 units

Quantity July = 10,893 units

The formula for cross-elasticity of demand

$$Cross-Elasticity\ of\ Demand = \frac{Percentage\ change\ in\ demand\ (in\ good\ A)}{Percentage\ change\ in\ price\ (in\ good\ B)} = \frac{\frac{(Q_1 - Q_0)}{(Q_0 + Q_1)\ /\ 2}\ in\ good\ A}{\frac{(P_1 - P_0)}{(P_0 + P_1)\ /\ 2}\ in\ good\ B}$$

Where:

Q_0 = *Initial quantity demanded when* P_0

Q_1 = *New quantity demanded when* P_0 *changes to* P_1

P_0 = *Initial price*

P_1 = *The new price*

Cross-elasticity of Adenosine-3mg/ml

- When we apply the formula above to the Adenosine-10 mg produced by companies C and D, we measure the sensitivity of quantity demanded from Company C to the change in price offered by Company-D.
- The **higher** the positive XED, the **easier it is to substitute the products for one another and the bigger the competition between the products.**

Cross-elasticity of Adenosine-3mg/ml

ADENOSINE – 3 mg/ml. CROSS ELASTICITY OF DEMAND OF PRODUCT – C TO PRODUCT – D

$$XED\ (product\ C\ to\ product\ D) = \frac{(2{,}219 - 6{,}500)}{(6{,}500 + 2{,}219)\ /\ 2} = \frac{\frac{-4{,}281}{4{,}359.5} = -0.98}{\frac{-1.46}{5.37} = -0.26} = 3.79$$

- **XED of product C to product D = 3.79**
- This means that product C and product D are **substitutes.** Since the XED is high, there is **strong competition** between them

Cross-elasticity of Adenosine-3mg/ml

ADENOSINE – 3mg / ml. CROSS ELASTICITY OF DEMAND OF PRODUCT – E TO PRODUCT – D

$$XED\ (product\ E\ to\ product\ D) = \frac{(10{,}823 - 10{,}893)}{(10{,}923 + 10{,}893)\ /\ 2} = \frac{\frac{-30}{10{,}908} = -0.00275}{\frac{(4.9 - 6.36)}{(6.36 + 4.9)\ /\ 2}} = \frac{}{\frac{-1.46}{5.37} = -0.26} = 0.0106$$

- **XED of product E to product D = 0.0106**
- This means that product D and product E are **not related.** They don't seem to be competing. Even though they are therapeutic equivalents, changes in price of product D don't affect the demand for product E.

Insulin vs. Caribbean Cruises

- The prices of both of these goods rise by 20%. For which good does Q^d drop the most? Why?
  - To millions of diabetics, insulin is a necessity. A rise in its price would cause little or no decrease in demand.
  - A cruise is a luxury. If the price rises, some people will forego it.

Price elasticity is higher for luxuries than for necessities

Value of elasticity

- Habit-forming products: low elasticity. Cigarette smoking. Prices may not affect demand that much.

- Availability of substitutes increases the elasticity.

Medical care: elastic or inelastic?

ECONOMIC EVALUATION

What is Economic Evaluation?

- Economic evaluation is the comparative analysis of alternative courses of action in terms of both their costs and consequences.
- It is a key tool used in health economics to support decision-making.
- Economic evaluation is applied when resources are limited and choices must be made.

Why Economic Evaluation is Important in Health Care

- Health care resources are scarce, but health needs are unlimited.
- Not all effective interventions can be provided to everyone.

Economic evaluation helps:

- Allocate resources efficiently.
- Improve population health.
- Support transparent and rational decisions

The Basic Question of Economic Evaluation

- Which intervention provides greater health benefit?
- At what cost?
- Compared to what alternative?
- Is the additional benefit worth the additional cost?

Role of Physicians in Economic Evaluation

Physicians influence:

- ❑ Demand for services
- ❑ Utilization of resources
- ❑ Health care costs
  - Clinical decisions have economic consequences.
  - Understanding economic evaluation supports better medical decisions.

What Do We Mean by Cost?

- Cost represents the value of resources used to produce a health care intervention.
- Costs reflect real resource consumption, not just prices or charges.
- Identifying costs is a key step in economic evaluation.

Total Costs

- The economic goal of a firm is to maximize its *profit*.

  Profit = Total revenue – Total cost

- *Total Revenue*
  - The money a firm receives from the sale of its output. It is price times quantity sold.
  - $TR = P \times Q$
- *Total Cost*
  - The market value of all the inputs (resources) that a firm uses in production.

Total Cost = *fixed cost* + *variable cost*.

- **(Total) Fixed costs** are those costs that do *not* vary with the quantity produced.
- **(Total) Variable costs** are those costs that vary with the quantity produced.

$$TC = FC + VC$$

(Total) Fixed and Variable Costs

- Fixed costs are those costs that do *not* vary with the quantity produced
  - Factory rent
  - Security costs
  - Marketing costs
  - Research and development costs

- Variable costs are those costs that vary with the quantity produced
  - Cost of raw materials
  - Labor costs

Costs can be also classified as:

▪ direct

Direct costs can be traced specifically to a cost unit.

- Direct materials – which form part of the end product
- Direct labour – involved directly in making the product
- Direct expenses – it is rare for expenses to be directly traceable to the product

The sum of the direct costs is known as the prime cost.

▪ Indirect

The factory will also have indirect costs or factory overheads which are not directly traceable to the product but are still part of the cost of making it.

- Indirect materials – such as lubricants for machinery
- Indirect labor – such as supervisors and maintenance workers
- Indirect expenses – such as heating and lighting for the factory

Measuring Costs

- Costs are measured over a relevant time period such as a month or year.
- The length of time used depends on the typical span of the illness.
- Acute diseases such as the flu would have a short span; while chronic or long-term illness such as depression or heart disease would span years.

TYPES OF COSTS

- Direct Medical costs
- Direct non-medical costs
- Indirect costs
- Intangible costs
- Opportunity costs

DIRECT MEDICAL COSTS

Medically related inputs used directly to provide treatment.

Type of Cost	Examples
Direct Medical Cost	Doctor office visits
	Hospitalizations
	Chemotherapy medications
	Other medications used to reduce side effect
	Intravenous supplies
	Laboratory tests
	Clinic costs
	Healthcare professionals' time
	Diagnostic tests
	Emergency
	Ambulance services
	Nursing services
	Patient counseling

DIRECT NON-MEDICAL COSTS

costs to patients and their families that are directly associated with the treatment but non medical in nature

Direct Non-Medical Cost	Transportation to get treatment
	Food (Healthy food, Nutrition program..etc)
	Family care like: Hiring a babysitter for the time they are undergoing treatment
	Home aides: like modifications, buy special stuff, home making services (e.g.: for wheels)
	Increased travel costs the doctor
	Hotel stays for family or patient out of town

INDIRECT COSTS

The costs that result from the loss of productivity (Salary) because of illness or Treatment or Death

InDirect Cost	Missed work due to illness
	Lost wages (morbidity)
	Income forgone because of premature death (mortality)
	Time the patient takes off from work to receive the treatment
	Loss productivity for unpaid care-giver (Family, Neighbor, Friend ...etc)

INTANGIBLE COSTS

- Intangible cost represents costs as a consequence of the treatment not measurable in monetary terms.
- The costs of pain, suffering, anxiety or fatigue that occur because of an illness or the treatment of an illness

Intangible Cost	Nausea
	fatigue
	Pain
	Suffering معاناة
	Inconvenience عدم الراحة
	Grief: (Sadness, Lonely, Depression)
	Reduce the productivity because of the disease or its treatment (like: sedation as side effect of treatment, loss of sound for lecturer, or anxiety of depression due to some drugs)

OPPORTUNITY COSTS

- The value of the forgone option or best next option.
- What you give up because you choose to do something else
- Resources used for one good or service are not longer available to be used for another.

Opportunity Cost	People volunteering in a clinic instead of providing other services.
	A new clinic hiring a currently employed pharmacist instead of bringing a part time pharmacist.
	Lost opportunity
	Revenue forgone

EXAMPLE

A patient with cancer is going under treatment , what costs he might spent?

Direct medical costs
chemotherapy medications
Other medications used to reduce side effect
Intravenous supplies
Laboratory tests
Clinic costs
Physicians visits

Direct nonmedical
Increased travel costs the doctor
Hiring a babysitter for the time they are undergoing treatment

Indirect costs
Time the patient takes off from work to receive the treatment
Reduce the productivity because of the disease **or its treatment**

Intangible costs
Nausea
fatigue

Types of Economic Evaluation

1. Cost Minimization Analysis (CMA) .
2. Cost Effectiveness analysis (CEA) .
3. Cost Utility Analysis (CUA) .
4. Cost Benefit Analysis (CBA).

Types of Economic Evaluation

- **CMA** A type of analysis that compares only the costs of interventions or programs which have similar or identical health outcomes. This type of analysis can be used to assess cost-effectiveness.
- **CEA** A type of analysis that compares interventions or programs having a common health outcome (e.g., reduction of blood pressure; life-years saved) in a situation where, for a given level of resources, the decision maker wishes to maximize the health benefits conferred to the population of concern.
- **CBA** compares treatment alternatives where both costs and benefits are expressed in monetary terms.
- **CUA** A type of analysis that measures benefits in utility-weighted life-years (QALYs) and which computes a cost per utility-measure ratio for comparison between programs.

Quality-adjusted life year (QALY)

A common measure of health improvement used in cost-utility analysis, it measures life expectancy adjusted for quality of life.

The quality-adjusted life year (QALY) is a measure of disease burden, including both the quality and the quantity of life lived. It is used in assessing the value for money of a medical intervention. The QALY model requires utility independent, risk neutral, and constant proportional trade-off behaviour.

Quality-adjusted life year (QALY)

The QALY is based on the number of years of life that would be added by the intervention. Each year in perfect health is assigned the value of 1.0 down to a value of 0.0 for being dead. If the extra years would not be lived in full health, for example if the patient would lose a limb, or be blind or have to use a wheelchair, then the extra life-years are given a value between 0 and 1 to account for this.

QALY-uses

- The QALY is often used in cost-utility analysis to calculate the ratio of cost to QALYs saved for a particular health care intervention.

- This is then used to allocate healthcare resources, with an intervention with a lower cost to QALY saved (incremental cost effectiveness) ratio being preferred over an intervention with a higher ratio.

Quality-adjusted life year (QALY)

Quality adjusted life year (QALY): A year of life adjusted for its quality or its value. A year in perfect health is considered equal to 1.0 QALY. The value of a year in ill health would be discounted. For example, a year bedridden might have a value equal to 0.5 QALY.

Quality-adjusted life year (QALY)

QALYs are used primarily to correct someone's life expectancy based on the levels of health-related quality of life they are predicted to experience throughout the course of their life, or part of it. The number of QALYs lived by an individual in one year is simply

$$\text{QALYs lived in one year} = 1 * Q \quad \text{with } Q \leq 1;$$

Where Q is the health-related quality of life weight attached to the relevant year of life.

Quality-Adjusted Life Year (QALY)

QALYs lived in one year = $1 \times Q$ with $Q \leq 1$



$1 \times 1 = 1$ QALY



$1 \times 0.7 = 0.7$ QALY



Weighting of QALY

- Time-trade-off: Respondents are asked to choose between remaining in a state of ill health for a period of time, or being restored to perfect health but having a shorter life expectancy.
- Standard gamble: Respondents are asked to choose between remaining in a state of ill health for a period of time, or choosing a medical intervention which has a chance of either restoring them to perfect health, or killing them.
- Visual analogue scale: Respondents are asked to rate a state of ill health on a scale from 0 to 100, with 0 representing being dead and 100 representing perfect health. This method has the advantage of being the easiest to ask, but is the most subjective.

Disability-adjusted life year (DALY)

The DALY is primarily a measure of disease burden (disability weights measure loss of functioning) but its use in cost-effectiveness analysis is also relatively common.

One DALY can be thought of as one lost year of "healthy" life. The sum of these DALYs across the population, or the burden of disease, can be thought of as a measurement of the gap between current health status and an ideal health situation where the entire population lives to an advanced age, free of disease and disability.

Disability-adjusted life year (DALY)

- DALYs for a disease or health condition are calculated as the sum of the Years of Life Lost (YLL) due to premature mortality in the population and the Years Lost due to Disability (YLD) for incident cases of the health condition:

Calculation

DALY= YLL+YLD

- The YLL basically correspond to the number of deaths multiplied by the standard life expectancy at the age at which death occurs.

Disability-adjusted life year (DALY)

Years of Life Lost-YLL= NXL

Where

N= number of deaths

L=standard life expectancy at age of death in years

Years Lost due to Disability-YLD= I XDWX L

Where

I = Number of incident cases

DW= Disability Weight

L= Average duration of the case until remission or death (years)

QALY: Quality-Adjusted Life Year

Health State × Utility Weight (0-1) = QALY

QALY = (0-1) Utility Weight × Health State



Time Trade-Off	Standard Gamble	Visual Analogue Scale
TTO	SG	VAS

DALY: Disability-Adjusted Life Year

DALY = YLL + YLD



YLL = Years of Life Lost

YLD = Years Lost to Disability



YLL Years of Life Lost



YLD Years Lost to Disability **DALY**

YLL = Number of Deaths × Life Expectancy

YLD = Cases × Disability Weight × Duration

What is marginal analysis?

- Marginal analysis is a technique used by economists to aid resources allocation decisions.
- It involves the consideration of costs and benefits associated with small increase or decrease of the activities.
- Marginal cost or benefits is simply the additional cost or benefit due to increase in the activity by one additional unit.

What is marginal analysis?

- Marginal analysis: a technique which attempts to improve upon the technical efficiency of current resource spending, by seeking to re-allocate resources between programs such that greater benefits are obtained within the same budget.

- Marginal benefit: the additional benefit obtained by consuming the last (or next) unit of a commodity.

What is marginal analysis?

- Marginal cost: the additional cost incurred in producing the last (or next) unit of a commodity.

- Marginal product/productivity: the change in the level of output when one input is changed with all others held constant.

Defining marginal

- A hospital supplies 20 thousand days of hospital stay in a month at a cost of $8.5 million. If the cost become $9.25 million for 21.5 thousand days.
  - Additional days of services: 1.5 thousand.
  - Additional cost: ($9.25-$8.5) = $ 0.75 million.
- Marginal cost = 0.75/1.5=0.50 million per thousand hospital days

Defining marginal

Mobile immunization team visits 20 schools a month and give 2000 immunizations.

It is intended to visit 5 more and this will result in immunizing 500 more immunizations.

The cost implications are in additional petrol and vaccine

What are the cost implication?

Defining marginal

Cost per month	Present	Proposed
Salaries	$ 400	$ 400
Vaccines at $0,05 per vaccine	$ 100 (2000)	$ 125 (2500)
Petrol at $0.80 per km	$ 240 (300k)	$ 480 (600k)
Total	$740	$1005
Average cost per vaccine	$ 0.37	$ 0.40
M cost per additional vaccination is $ 0.53. formula=dividing extra costs ($265) by the extra vaccinations given (500)		

Defining the optimal allocation

- Optimum allocation implies that the resources are not being misused. Highest level of benefits is obtained using the resources we have.

- Marginal rule says that if there is no fund shortages, resources should be allocated in such a way so that the marginal cost of a project becomes equal to its marginal benefits.

Resources allocation decision

Economics prefer to use the marginal rule of resource allocation to maximize "social" benefit social benefits obtained by the whole society, not just the provider.

For example:

How intensively a resource should be used?

- When marginal benefit of additional resources used exactly equals the marginal cost.

The marginal rule

- Equate the marginal benefits of different projects.
- Choose the allocation in such a way so that:
- Marginal benefit from project 1= marginal benefit from project 2 = marginal benefit from project 3 = ...

Measuring benefits and costs
The important point of view

- Measuring benefits and costs depends on the perspective we are using in the analysis.
- A manager of a public hospital maybe more interested in the social benefit.
- A private hospital's benefit may simply be the profit earned by the hospital.

Other types of decision making using marginal rules (1)

- Given the income. People decide to buy many goods and services, not only medical care. Medical care appears to be just another good like food, shelter, clothing, etc.

Other types of decision making using marginal rules (2)

- Once the allocation to health is made, individuals or society decides how to use the money for health sector activities.
- The question of choice is:

- Preventive or curative?

Today or tomorrow?(1)

- Do we use the resources to meet current needs or should we use some resources for future needs?

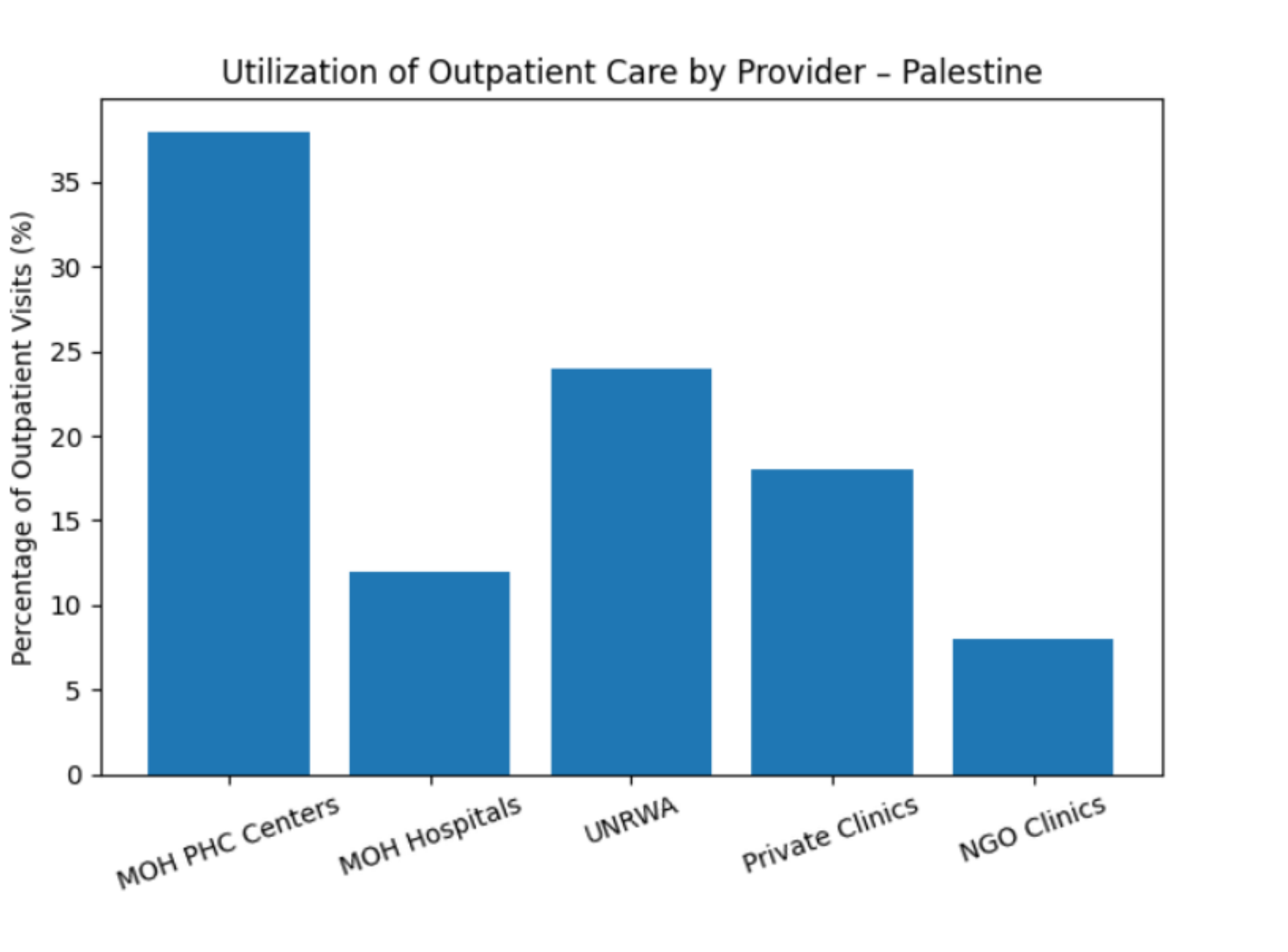
- Current needs → consumption

- Future needs → investment.

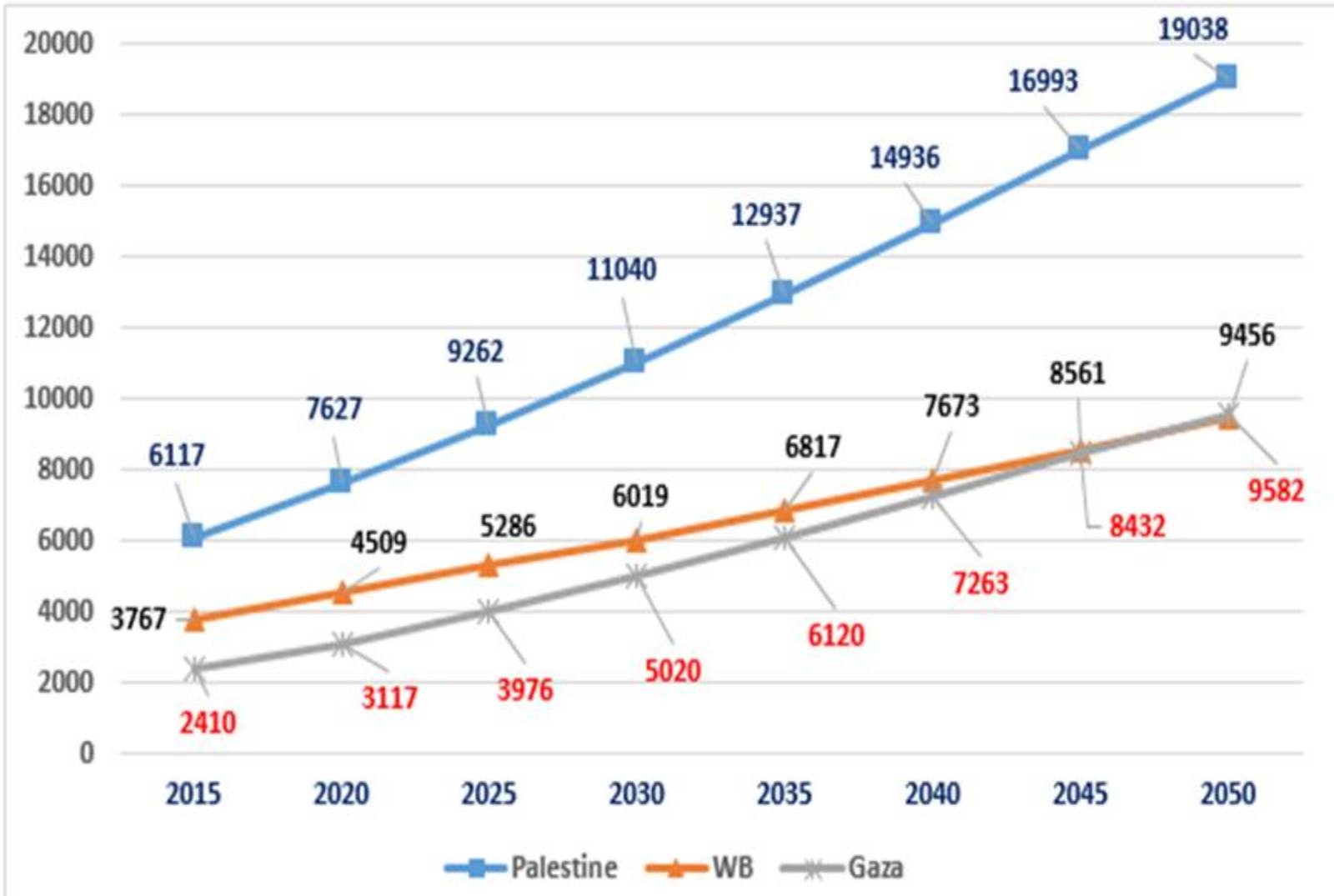
Today or tomorrow?(2)

- Education, construction of a hospital. Spending time for exercise are all examples of investment.

- How far should we go in providing for tomorrow at the expense of today?


Utilization of Outpatient Care by Provider – Palestine
Percentage of Outpatient Visits (%)
0
5
10
15
20
25
30
35
MOH PHC Centers
MOH Hospitals
UNRWA
Private Clinics
NGO Clinics

Projection of the number of hospitals bed in Palestine, 2015-205



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