

Lesson 4.

## **The effect of basic economic laws on the pharmaceutical market**

### Questions for discussion

1. Demand and the amount of demand.
2. The law of demand.
3. Elasticity of demand and ways to measure it.
4. Price factors of demand.
5. Non-price demand factors.
6. Economic approach to the study of consumer behavior.
7. Analysis of budget constraints and definition of consumer choice.
8. Income and substitution effects.
9. Non-functional demand and its types.

### **1. Demand and quantity of demand**

From an economic point of view, the pharmaceutical market is a set of economic relations that arise between people regarding the purchase and sale and destination-consumption of medicines and other pharmacy products. To predict the economic performance of pharmacies, it is necessary to know the objective patterns that determine the behavior of buyers and sellers in the pharmaceutical market.

The main elements of the action of the pharmaceutical market are demand, supply, price.

And the basic laws are the laws of demand, supply, and value.

Demand is the need of buyers for a particular product, expressed in money, i.e. a solvent need.

Depending on the level at which the economic analysis is carried out, the following types of demand are distinguished:

- individual is the solvent need of an individual buyer for a particular product;
- market is the total demand of individual buyers;
- aggregate, or aggregated, demand is formed at the national level and represents the real volume of goods and services that all economic entities are ready to buy at a certain price level.

The demand in the pharmaceutical market is the quantity of medicines, other pharmacy products, pharmaceutical services that consumers (intermediate and final) are willing and able to purchase for a certain period at a certain price.

Demand can be quantified. And in this case, it will be characterized by such a concept as the quantity of demand — the quantity of a given product that buyers (consumers) are willing, ready and have the monetary opportunity to purchase for a certain period at certain prices. Demand depends primarily on the price of the product (service) being sold. The interaction between the quantity of goods that people want to buy and the price of this product describes the law of demand.

### **2. The law of demand.**

The law of demand states that, all other things being equal, there is an inverse (or negative) relationship between the price of a commodity and the amount of demand, i.e. a decrease in price leads to an increase in demand, and vice versa.

The assumption "all other things being equal" means that when conducting an economic analysis, all variables, with the exception of those that are currently being considered (in this case, demand, price), remain unchanged. Graph (Fig. 4.1) or the following data clearly demonstrate this dependence:

Price (P) ..	1	2	3	4	5
Demand (quantity purchased-(Q) . . .	10	8	6	4	2

When graphically depicting the dependence of demand (D, demand) on the price on the ordinate axis, a factor is postponed — price (P, price); on the abscissa axis, the resultant sign is quantity (Q, quantity). The graph shows how much of the product consumers are willing to buy at each price. So, at the price P<sub>1</sub>, demand is equal to Q<sub>1</sub>, with an increase in price to P<sub>2</sub>, demand decreases to Q<sub>2</sub>. Thus, the change in the amount of demand when the price changes is expressed by moving a point along the demand curve. This curve is a graph of the demand function of the price, which can be analytically represented in the following simplified form:

$$Q = a - bP,$$

where Q is the amount of demand; P is the price;

a, b are the coefficients of the equation.

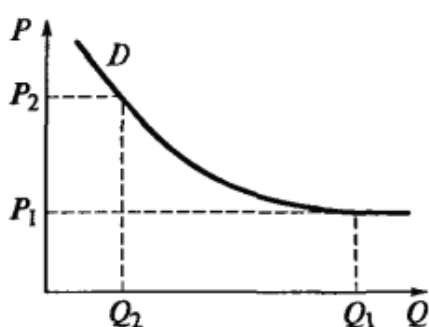


Рис. 4.1. Зависимость величины спроса (Q) от цены (P)

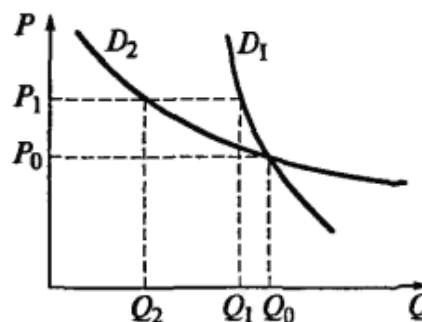


Рис. 4.2. Изменение величины спроса (Q) при изменении цены (P) для двух товаров

Demand for different goods reacts differently to price changes.

For example, Figure 4.2 shows the change in the value of demand for two goods (Q<sub>1</sub>; Q<sub>2</sub>) when the price changes by the same value (P<sub>1</sub>).

### 3. Elasticity of demand and ways to measure it.

The ability of one variable to respond to a change in another is called elasticity.

This ability can be measured using the elasticity coefficient.

The dependence of the quantity of demand on the price is characterized by the coefficient of price elasticity of demand (Ed), which is calculated by the formula

$$\text{Unit} = (Q_1 - Q_0) / Q_0 : (P_0 - P_1) / P_0$$

where  $U$  is the coefficient of price elasticity of demand;

$Q_0, Q_1$ ; - respectively the initial and final value of the quantity of purchased goods;

$P_0, P_1$  — respectively the initial and final value of the price of the goods.

If the change in demand and price are expressed as a percentage, we get

$$\text{Unit} = \frac{\Delta Q}{\Delta P}$$

where  $\Delta Q$  is the change in demand, %;

$\Delta P$  — price change, %.

**The coefficient of price elasticity** is related to the effect of the law of demand and shows the degree of change in the amount of demand for a product or group of goods when the price of this product or group of goods changes. Given that the relationship between price and the amount of demand is reversed, the coefficient of elasticity is usually a negative value (the exception is new, prestigious and scarce goods, as well as the situation of expectation of an increase in prices).

If  $E_d > 1$  — the demand is elastic;

if  $E_d < 1$  — the demand is inelastic.

Knowledge of the degree of elasticity of demand depending on the price is one of the foundations of the pricing policy of a pharmacy organization.

By calculating the coefficient of price elasticity or plotting demand graphs, it is possible to determine whether the demand for a particular product is elastic or not.

For example, in Fig. 4.2. the demand for the product  $D_2$  is more elastic than the demand  $D_1$  (the demand curve 2 is more flat) when the price changes by the same value.

#### 4. Price factors of demand.

What makes the demand for some types of goods elastic, and for others — inelastic?

Consider the factors affecting the price elasticity of demand — the price determinants of demand, These factors determine the slope of the demand curve.

**1. Availability of substitute goods** (interchangeable goods) — the more substitutes a given product has, the more elastic the demand for it.

**2. The share of the consumer budget allocated to this product** — the greater the specific weight of the product in the consumer's budget, the higher the elasticity of demand for it.

**3. Time to adjust to price changes** — demand is more elastic in the long term, as consumers get more opportunities to select replacements over time.

**4. The degree of need for a product** — the more necessary this product is for the consumer, the less elastic the demand for it is.

#### 5. Non-price demand factors.

And what will happen to demand if the price of the product remains unchanged, but if other conditions change? If these conditions change, then there is a shift, a shift of the entire demand curve, i.e. not the amount of demand changes depending on the price, but the demand entirely depends on other, non-price factors (or determinants).

In its new position, the demand curve (Fig. 4.3), as before, expresses the dependence of two variables, but this is a qualitatively different dependence.

Consider factors — non-price determinants of demand, they change demand and shift demand curves to the right or left without changing their slope.

1. **Changing consumer preferences** — an increase in consumer preferences may be caused by advertising of a particular drug, changes in fashion; information about side effects of drugs, for example, may have an adverse effect on consumer tastes.

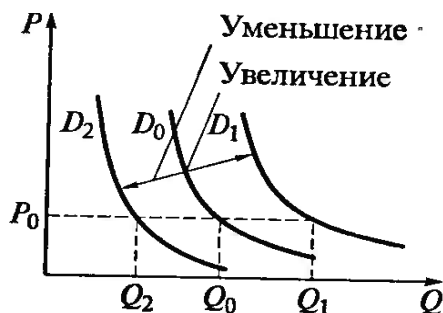


Figure 4.3. Change in demand under the influence of non-price determinants.

2. **Change in consumer incomes** — the impact of income on demand is described by the coefficient of income elasticity ( $E_i$ ):

$$(E_i) = (Q_1 - Q_0) / Q_0 : (I_0 - I_1) / I_0$$

where  $I_0$ ,  $I_1$ , is income;

( $Q_0$ ,  $Q_1$ ) — the number of purchased goods.

The income elasticity coefficient ( $E_i$ ) shows how the demand for a product will change when income changes by 1%.

An increase in the buyer's income affects the market demand for a particular product in different ways. For most goods, the so-called "normal goods" (or goods of the highest category), demand increases with an increase in income, i.e. the elasticity of demand for income is positive ( $E_i > 0$ ).

If an increase in income causes a drop in demand, i.e. the elasticity of demand for income is a negative value ( $E_i < 0$ ), then such goods are called goods of the lowest category. If at the same time the coefficient of elasticity in absolute value is extremely small ( $0 < E_i < 1$ ), then we are talking about essential goods.

If the coefficient is greater than one, then the analyzed product belongs to luxury goods.

3. **The number of buyers in the market** — an increase in the number of consumers of a particular LP leads to an increase in demand, and vice versa.

4. **Change in prices for conjugated goods** — to measure the dependence of demand on the price of conjugated goods, there is a cross-elasticity coefficient ( $E_{xy}$ ), which shows how the amount of demand for a product (X) will change when the price of a product (Y) changes by 1%:

$$E_{xy} = \Delta Q(X) : \Delta P(Y)$$

where  $(\Delta Q(X))\%$  is the percentage change in demand for the product X;  $\Delta P(Y)\%$  is the percentage change in the price of the product Y.

In the analysis of cross-elasticity, interchangeable, complementary and independent products are distinguished.

5. ***Interchangeable goods (substitute goods)*** are synonyms and analogues of LP (for example, seduxen and relanium). If the goods are interchangeable, then an increase in prices for one product entails an increase in demand for another that replaces it ( $E_u > 0$ ).

If the goods are complementary (complementary goods), for example, injectable dosage forms and syringes for single-use injections, then an increase in the price of one product leads to a reduction in demand for another ( $E_{xy} < 0$ ).

The greater the coefficient of cross-elasticity, the stronger the relationship of goods. Conversely, the closer the coefficient is to zero, the weaker the substitution or complement ratio.

If  $E_{xy} = 0$ , then the goods are considered independent of each other and an increase or decrease in the price of one product has virtually no effect on the amount of demand for the second product.

***6. Changing consumer expectations*** — consumer expectations of falling prices or incomes in the future may lead to a reduction in current demand, and vice versa.

Thus, both price and non-price factors influence the change in demand.

Consumer behavior. As noted above, the demand in the market is our needs, which we satisfy by buying certain goods or services. How do our needs turn into a certain amount of demand? How do we choose from a multitude of goods that satisfies us? These questions are answered by the theory of consumer behavior.

The beginning of the analysis of consumer behavior by economists was laid more than a century ago, when there was a fashionable idea in psychological circles that people's behavior was mainly explained by the desire to extract maximum "pleasure" and where possible to avoid "pain". The pleasure-pain doctrine was applied by economists to study consumer costs, which became the first systematic theory of motivated consumer behavior.

### **6. Economic approach to the study of consumer behavior.**

Study of consumer preferences. It is obvious that the buyer purchases a product for the sake of its use value, because this product has utility and is necessary for him to meet his needs.

***Utility as an economic category*** means the ability of a product (products, goods, services) to meet certain needs of people.

The needs for medicines are strictly individual, so the same product has different usefulness for different buyers. There are many sources and reasons for usefulness. For example, the most obvious ones are: the ability to maintain the normal state of the human body, ensuring safety (for example, cardiac drugs regulate the work of the heart, hypotensive drugs normalize blood pressure levels), etc.

Utility has objective and subjective qualities, it is not absolute, therefore it cannot be measured in absolute quantities. However, it is possible to quantify some principles of consumer behavior. One of these principles describes the position of marginal utility. This principle states that as the amount of good consumed increases, each new, additional unit of it brings less and less utility.

Marginal utility is the utility extracted by the consumer from one additional unit of production. From the first unit of the consumed good, a person receives the greatest benefit. The second unit is beneficial, but

to a lesser extent than the first. The third unit gives even less benefit. This phenomenon is known as the law of diminishing marginal utility.

**The law of decreasing marginal utility states that, starting from a certain point, additional units of each product will bring the consumer an ever-decreasing additional satisfaction (marginal utility).**

In the pharmaceutical market, the law of decreasing marginal utility can be illustrated as follows. At the stage of using LP by end users in the process of treatment or prevention, each additional unit of LP brings greater marginal utility compared to the previous one, i.e. the marginal utility increases to a certain level that characterizes either symptom relief or recovery. And only after reaching this point, the marginal utility decreases sharply, and further use of the drug is no longer desirable, since it can harm the patient.

### 7. Analysis of budget constraints and determination of consumer choice.

Study of budget constraints. If the indifference curves show combinations of goods that are preferred and the degree of substitution of some goods by others, then the consumer's ability to satisfy these preferences depends on the monetary income available to him and the corresponding prices for the goods that the consumer wants to purchase. The combination of these factors determines the budget constraint of the consumer.

The budget constraint shows that the total expenditure should be equal to income

$$I = RA \times QA + Rv \times Qb$$

Where

I -- is income;

QA — quantity of the product A;

RA — unit price of the product A;

QB — quantity of goods in;

Rv — the price of a unit of goods In .

To analyze how budget constraints determine the limits of people's consumption, budget lines are being built. The budget line shows various combinations of sets of goods, such as LP and food, within the budget allocated for them. It is a straight line with a negative slope, displaying a set of sets of two products that require the same costs for their purchase.

*Example.* Let 30 rubles a day be allocated for the purchase of fruits and vegetables. Suppose that fruits can be bought at a price of 2 rubles. for 1 pc., and the necessary LP — at a price of 3 rubles. per unit. Then you can buy 10 units for 30 rubles. LP and About fruit units, 8 units. LP and 3 units of fruit , etc .

Indifference curves characterize consumer preferences, and the budget line determines its capabilities, limited by the size of the consumer budget — all this together makes it possible to justify consumer choice.

Striving for maximum satisfaction of their needs, the consumer gets into the position of consumer equilibrium — the point of contact of the budget line with the indifference curve .

At the point of consumer equilibrium, the consumer reaches maximum utility with a given budget. In the example above, this is a purchase of 6 units. LP and 6 pieces of fruit.

### 8. Income and substitution effects.

As already noted, the volume of purchases made by consumers depends not only on the level of income, but also on the prices of goods and services. When the price of a product changes (all other things being equal), two forces are activated, prompting a change in the quantity of the purchased product. These forces in the economy are called income and substitution effects. Both forces manifest themselves in the event of a price drop.

**Income effect.** When the price of a product decreases, the buyer has the opportunity to purchase additional units of this product, without denying himself the purchase of alternative goods.

In this case, the consumer's real income (purchasing power) increases to some extent, and he can purchase more goods and services.

**Substitution effect.** When the price of a particular product decreases, buyers will tend to purchase more of this product instead of a similar, but more expensive one.

In conditions of rising prices and a decrease in people's living standards, the latter is one of the main points in determining consumer choice.

These two effects complement each other, causing the consumer's desire to buy more goods at a low price. For normal goods, the effects of income and substitution act in the same direction, reinforcing each other. However, for the goods of the lower category, these effects work in different directions, and for most of these goods, the substitution effect outweighs the effect of the income effect, which leads to a change in the quantity of the consumed goods in the opposite direction to the change in the price of the goods, thus confirming the operation of the law of demand.

The factors and effects considered explain the relationship between the volume of demand and the price of goods in the conditions of independence and rationality of the behavior of each individual in the market (functional demand).

### 9. Non-functional demand and its types.

But individual consumer demand can be significantly influenced by the behavior of others. This means that the usefulness of the product to the consumer increases or decreases depending on whether other people buy this product, or due to the fact that this product has a higher price compared to other goods. Such specific effects of consumer behavior, which are associated with the influence of a subjective factor and are not related to the properties of the product, form the so-called non-functional demand

Non-functional types of demand also include speculative demand (exists in the case of high inflation, when the danger of price increases in the future stimulates an increase in consumption in the present) and irrational demand (arises under the influence of momentary desire, impulse, sudden change in mood).

The listed effects make their own adjustments to the mechanism of the law of demand.

#### Tasks on the topic of lesson 4.

Task 1. In the workbook, write down the questions and your answers to them.

1. Write the definition of the pharmaceutical market. List the main tools and laws of the market.
2. What is the demand in the pharmaceutical market? Write a definition.
3. Write down the definition of the law of demand.
4. Draw a graph of the demand curve (the change in the amount of demand depending on the price change).
5. What is the demand called elastic?
6. What does the coefficient of price elasticity show?
7. List the price factors affecting demand. How does demand change with price changes?
8. List the non-price factors affecting demand. How do these factors affect demand?
9. Write down the definition of the law of decreasing marginal utility. How does this law manifest itself when using medicines?
10. What characterizes the consumer equilibrium point?
11. What are the effects of an increase in demand in the case of a decrease in price?
12. What subjective factors form non-functional demand?

Task 2.

The price of the drug "Digoxin" decreased by 5% per package ( $\Delta P$ ). At the same time, demand increased by 1.5% ( $\Delta Q$ ). Calculate the coefficient of price elasticity (Units). Give your conclusion about the price elasticity of demand for the drug.

Task 3.

The price of Vitamins "Supradin" increased from 250 to 290 rubles. for the packaging. Demand decreased from 32 to 24 packages. Draw a demand line and calculate the coefficient of price elasticity. Give a conclusion about the price elasticity of demand for vitamins.



Answers to tasks on topic 4.

**Solution of task 2.**

According to the conditions of the problem  $\Delta Q$  — the change in demand, was 1.5%;

$\Delta P$  — price change of 5%.

According to the formula: Unit — coefficient of price elasticity of demand

$$\text{Unit} = 1.5\% : 5\% = 0.3$$

Answer. The coefficient of price elasticity of 0.3 is less than 1, Demand is not elastic.

**Solution of task 3 .**

According to the conditions of the task, at a price of 250 rubles ( $P_0$ ), the demand was 32 packages ( $Q_0$ )

When the price became 290 rubles ( $P_1$ ), the demand became 24 packages ( $Q_1$ ).

$$\text{Units} = [ ( Q_1 - Q_0 ) / Q_0 ] : [ ( P_0 - P_1 ) / P_0 ]$$

where U is the coefficient of price elasticity of demand;

$Q_0$  ,  $Q_1$ ; - respectively the initial and final value of the quantity of purchased goods;

$P_0$ ,  $P_1$  — respectively the initial and final value of the price of the goods.

To calculate the coefficient of price elasticity, we substitute our values into the formula:

$$\text{Units} = [(32 - 24) / 32] : [(250 - 290) / 250] = [8 / 32] : [40 / 250] = 0,25 : 0,16 = 1,56$$

Answer. The coefficient of price elasticity of 1.56 is greater than 1, Demand is elastic.