федеральное государственное бюджетное образовательное учреждение высшего образования "Оренбургский государственный медицинский университет" Министерства здравоохранения Российской Федерации

Кафедра общественного здоровья и здравоохранения №1

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УЧЕБНОЕ ПОСОБИЕ ДЛЯ ПРАКТИЧЕСКИХ ЗАНЯТИЙ ПО ОБЩЕСТВЕННОМУ ЗДОРОВЬЮ И ЗДРАВООХРАНЕНИЮ

Учебное пособие предназначено студентам, обучающимся по специальности 31.05.01 "Лечебное дело" (факультет иностранных студентов)

Оренбург, 2018

Orenburg State Medical University

Department of public health and health care № 1

Begun D.N., Borshchuk E.L., Begun T.V.

COURSE BOOK
FOR PRACTICAL TRAINING IN
THE SPHERE OF PUBLIC HEALTH AND HEALTH CARE

The course book is intended for students enrolled in the specialty 31.05.01 "General Medicine" (Foreign Students Faculty)

Orenburg, 2018

УДК614.2 (075.8) = 111

ББК51.1я 73 = 432.1

Б 34

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Б 34 Begun D.N., Borshchuk E.L., Begun T.V.

Course book for practical training in the sphere of public health and health care / Begun D.N., Borshchuk E.L., Begun T.V. – Orenburg: OrSMU 2018. – 121 p.

The course book is for foreign students of the fifth year of study, 31.05.01 “General medicine” specialty. The course book is composed in accordance with the public health and health care work program; it concerns the statistical survey arrangement principles, the key concepts and statistical indicators for the analysis of public health and business activity of healthcare institutions (case study solutions).

The course book is prepared taking into account the requirements of the standard FGOS VO in the field of training 31.05.01 “General medicine” (Approved by Order of the Ministry of Education and Science of the Russian Federation of February 9, 2016 No. 95)

The manual has been reviewed and recommended for internal use by the editorial-publishing council of OrSMU (stamp No. _____, dated _____)

УДК614.2 (075.8) = 111

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CONTENTS

INTRODUCTION

This course book is intended for students of the Faculty of foreign students. The course book is prepared taking into account the requirements of the standard FGOS VO in the field of training 31.05.01 “General medicine”.

The purpose of studying the discipline "Public health and health care, health care economy" is to give the knowledge and skills necessary for the doctor to work in public health on issues: public health and the factors that determine it; systems that ensure the preservation, strengthening and restoration of public health; organizational and medical technologies; administrative processes, including economic, legal, administrative, organizational and other intra-sectoral and intersectoral relations; trends in health development in foreign countries. Application of principles and methods of health management and practical skills in economics in the practice of a doctor in public and private practice, in accordance with standards and taking into account the requirements of a modern healthcare system to ensure the high quality of medical care for the population.

In accordance with the specified purpose of this course the book is intended for students' independent work and directed at achieving the following learning objectives:

- acquisition by students the knowledge of the medical-statistical analysis at studying the indicators of health of various age-sex, social, professional and other groups of the population;
- studying the factor conditionality of health of the population, the role of lifestyle in the formation of health indicators of the population and the system, ensuring the preservation, strengthening and restoration of public health;
- training students in the organization of medical and medico-preventive care for the population;
- training students in medical and statistical analysis of indicators of medical institutions;
- studying the issues of health economics and the activities of medical institutions of various forms of ownership by students;
- assessment of the quality of medical care for the population;
- training students in management processes carried out in medical organizations.

This course book is aimed at developing students' competencies:

Index	Competence
ОК-1	ability to abstract thinking, analysis, synthesis
ОПК-3	ability to use the basics of economic and legal knowledge in professional activities
ОПК-5	ability and willingness to analyze the results of their own activities to prevent professional errors
ОПК-6	willingness to conduct medical documentation
ПК-17	the ability to apply the basic principles of organization and management in the field of protecting public health, in medical organizations and their structural units
ПК-18	willingness to participate in assessing the quality of medical care using the basic medical and statistical indicators
ПК-20	readiness for analysis and public presentation of medical information on the basis of evidence-based medicine
ПК-21	ability to participate in scientific research
ПК-4	ability and readiness to apply social and hygienic methods of collecting and medico-statistical analysis of information on health indicators of the population
ПК-6	the ability to determine the patient's basic pathological conditions, symptoms, disease syndromes, nosological forms in accordance with the International Statistical Classification of Diseases and Health Problems, X revision

1. THE ORGANIZATION AND CARRYING OUT OF STATISTICAL RESEARCH

Main questions

1. Medical statistics as method of a research of public health and health care. Parts of medical statistics.
2. The plan of statistical research, maintenance. The statistical set. Kinds, types, peculiarities.
3. The program of statistical research. Registration blank, types, requirements.
4. Development of statistical data on personal computers. Types of data. Data entry. Error checking and outliers.

Theoretical information

Statistics is a social science concerned with quantitative characteristics of mass social phenomena closely connected to their qualitative peculiarities.

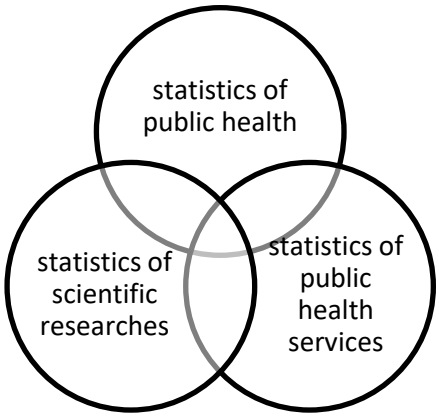


Fig. 1.1. Parts of medical statistics

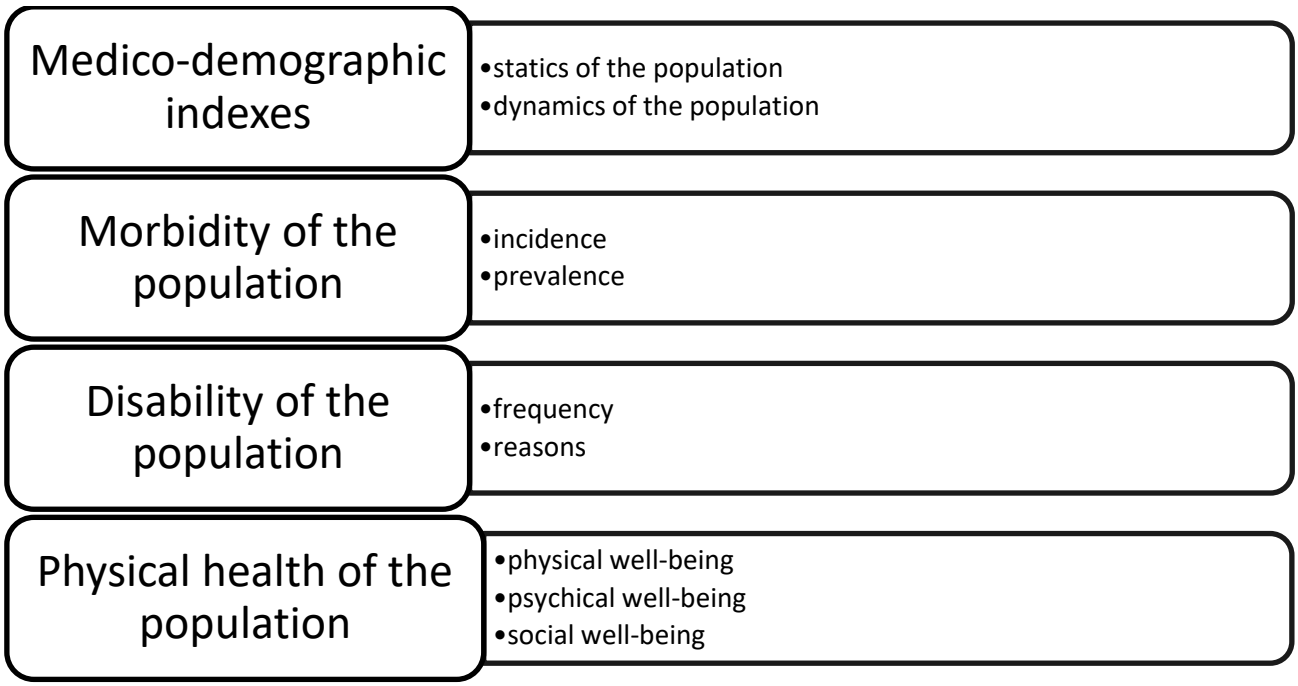


Fig. 1.2. Statistics of public health

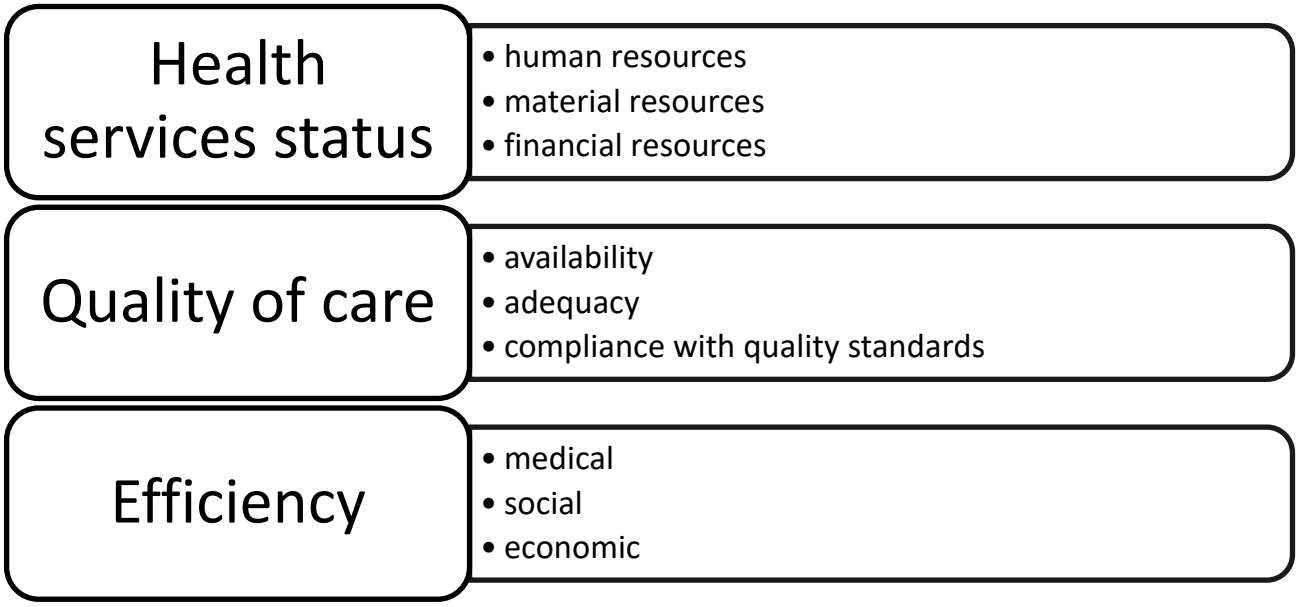


Fig. 1.3. Statistics of public health services

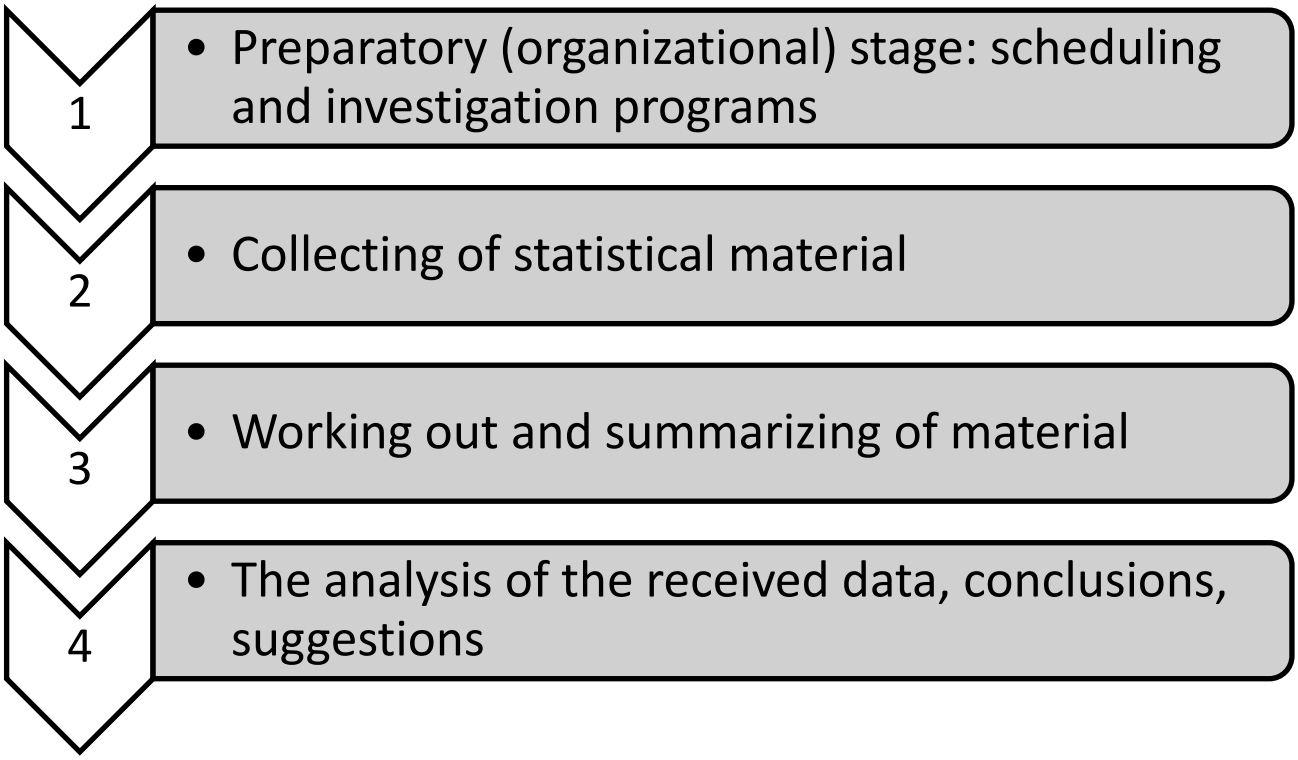


Fig. 1.4.Stages of statistical research

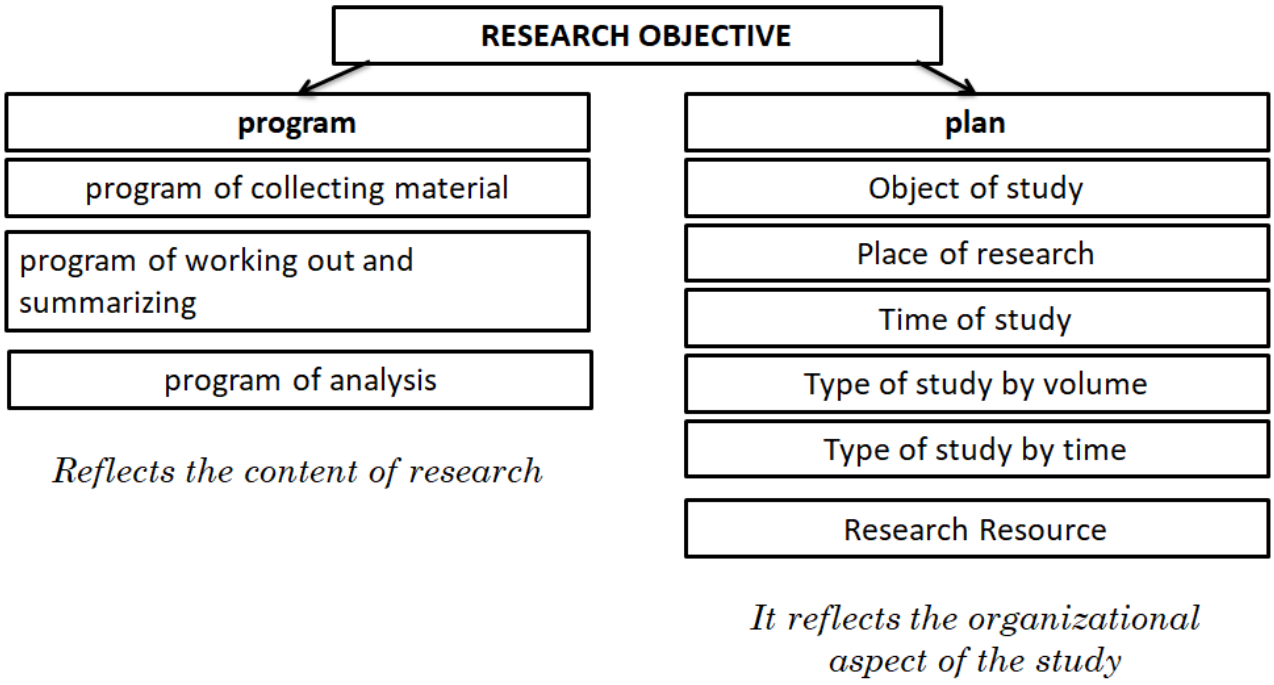


Fig. 1.5. The plan and program of statistical investigation

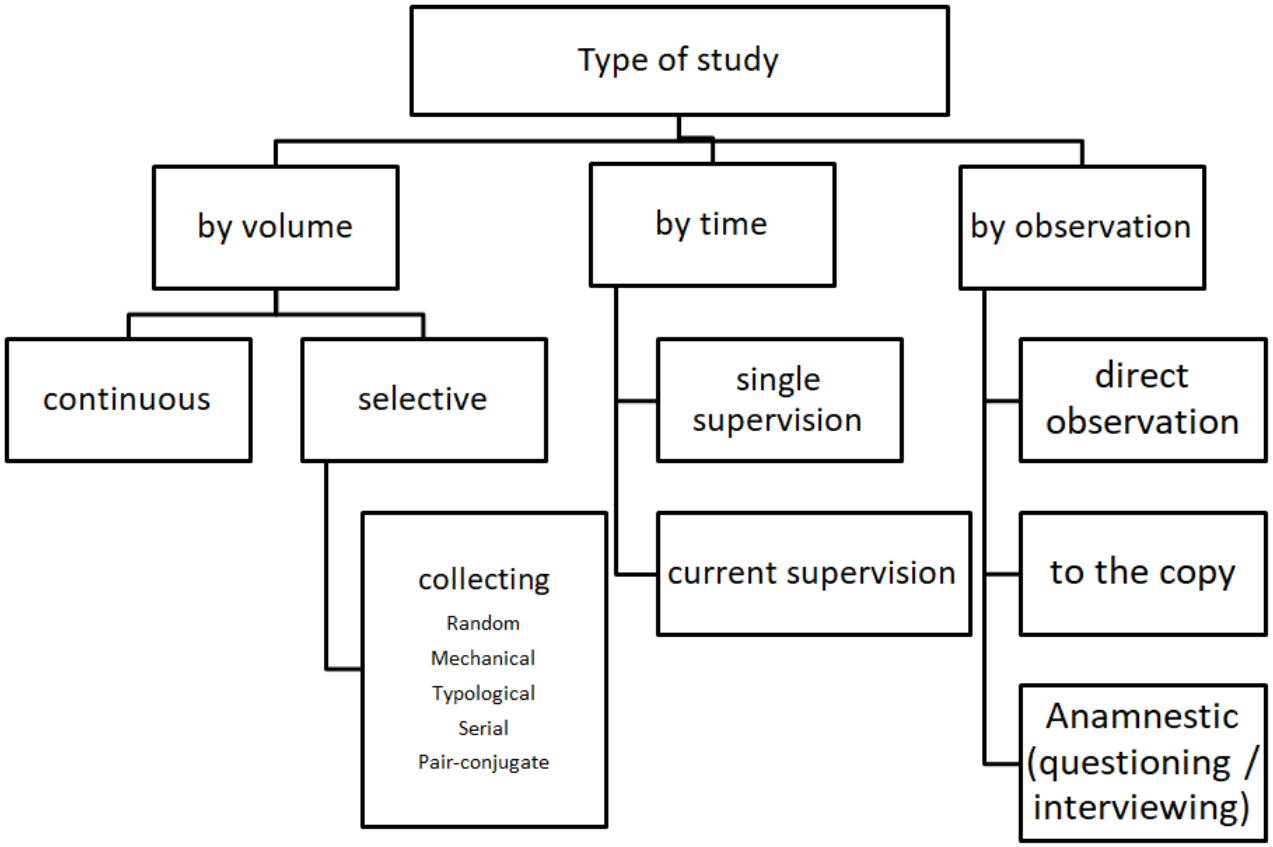


Fig. 1.6.Types of study.

Table 1.1. Types of statistical research in time depending on the research objectives

Research objectives	Type of research
Investigation of the diagnostic method	single supervision
Study of the prevalence	single supervision
A study of the incidence of new cases, outcomes	current supervision (cohort study)
Investigation of risk factors or prognostic factors	current supervision (cohort study), single supervision (case-control study)
Research methods of treatment and prevention	current supervision (randomized clinical trial)

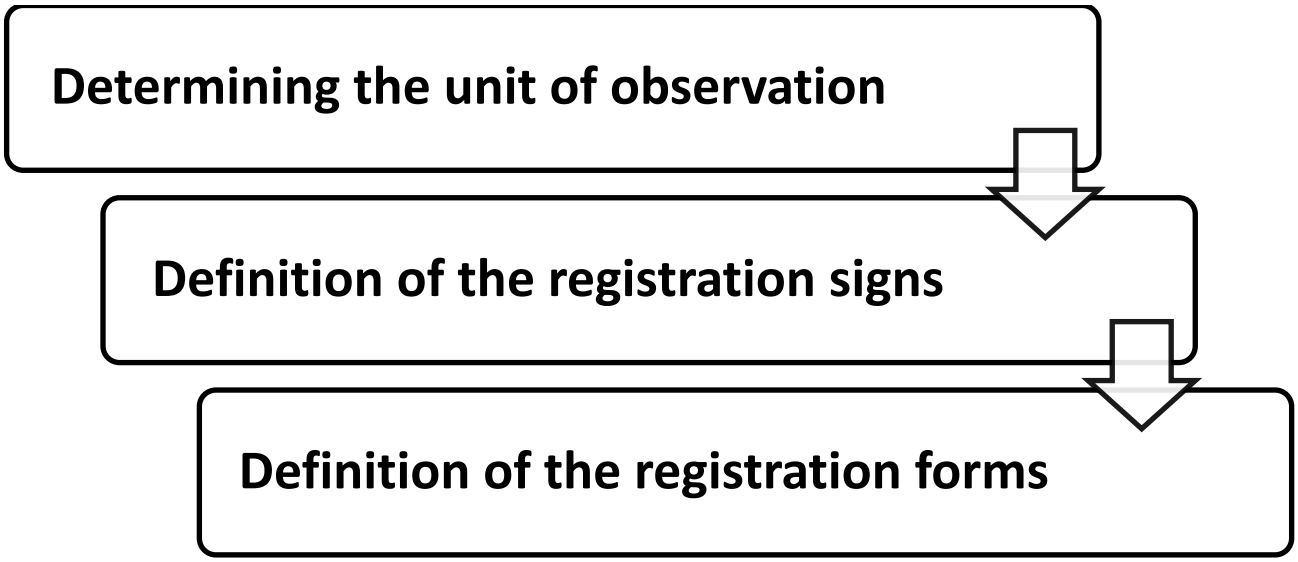


Fig. 1.7. Content of the material collection program

Recommendations for the development of a registration form

- Clear and concise formulation of questions (registration signs).
- Optimality of information (40 - 50 questions).
- The document should not contain unnecessary questions.
- It is desirable to make possible answers to the question (system: "question - answer - code").
- There is no need to provide quantitative traits in the form of discrete intervals.
- It is not necessary to make the calculation of various indexes in the document.

An example of a plan and a statistical research program

The purpose of the study - to study the prevalence of athletes, identified as a result of a periodic medical examination.

Objectives of the study

1. To study the prevalence of diseases among athletes
2. Identify and quantify risk factors for incidence

3. Identify target groups for prevention activities

The plan of statistical investigation

1. Object of study: athletes

2. Place of research: Orenburg city

3. Research time: 2018.

4. Type of research on time: one-time.

5. Type of study by volume: selective.

6. Performers: doctors of the medical and physical training center

7. Financing: the municipal budget.

The program of statistical investigation

The material collection program

Unit of observation: each case of illness in the athlete.

The registration signs: Passport data, housing conditions, bad habits, a history of the disease, family history, from what age began to engage in what kind of sport, anthropometric data, data of stress tests, physical data, the diagnosis is basic, the diagnosis is concomitant.

The registration forms

STATISTICAL CARD OF THE SPORTSMAN WHO PASSED THE MEDICAL EXAMINATION

Full name: _____□□□ code

Gender: male - 1, female – 2

Age _____ full years

Kind of sport: athletics - 1, weightlifting - 2, football - 3, basketball - 4, hockey - 5, boxing - 6, other types _____

Duration of playing sports _____ years

Education: absent - 1, primary - 2, secondary - 3, higher - 4, other _____

Marital status: married - 1, not married – 2

Diagnosis :_____

_____□□□□ code

Drinking alcohol: a lot - 1, a little - 2, habitually - 3, accidentally - 4, total failure - 5

Program of working out and summarizing

Example of a simple table

Table 1. The number of diseases among male and female athletes

Gender	Number of diseases
male	
female	
Total	

Example of a group table

Table 2. The number of diseases in male and female athletes involved in various sports

Kind of sport	Gender		Total
	male	female	
athletics			
weightlifting			
sport games			
other types			
Total			

Example of Combination Table

Table 3. The number of diseases in male and female athletes engaged in various sports in the class of diseases

Classes of diseases	Kind of sport												Total		
	athletics			weightlifting			sport games			other types					
	male	female	Total	male	female	Total	male	female	Total	male	female	Total	male	female	Total
Diseases of the respiratory system															
Diseases of the nervous system															
Diseases of the cardiovascular system															
Diseases of the musculoskeletal system															
Other															
Total															

Tasks for independent work

1. The aim of the work is to study the prevalence of hypotrophy among the children of the Orenburg region for the development of targeted preventive measures.

Make a plan and a program of statistical research on this issue.

2. The purpose of the work is to study the traumatism among adolescents in Orenburg for the development of targeted preventive measures for its reduction.

Make a plan and a program for statistical study of the question.

3. The aim of the work is to study the incidence of chronic diseases of digestive organs in students of the Orenburg State Medical Academy for the development of ways of targeted prevention.

Make a plan and a program of statistical research on this issue.

4. The aim of the study was to study the frequency, structure and risk factors of perinatal mortality in the Orenburg region for the development of targeted preventive measures.

Make a plan and a program of statistical research on this issue.

5. The aim of the study was to study the frequency, structure and risk factors of the incidence of infectious diseases in children of the Belyaevsky District for the development of rational prevention routes.

Make a plan and a program of statistical research on this issue.

6. The aim of the work is to study the incidence of chronic respiratory diseases in the children's population of Eastern Orenburg region for the development of rational preventive measures.

Make a plan and a program of statistical research on this issue.

7. The purpose of the study is to study the incidence of rachitis in the children's population of Orenburg for the development of targeted prevention routes.

Make a plan and a program of statistical research on this issue.

8. The purpose of the study is to study the incidence of osteochondrosis of the lumbosacral spine of drivers in the city of Orenburg for the development of targeted preventive measures.

Make a plan and a program of statistical research on this issue.

9. The purpose of the study was to study the occupational traumatism of workers of the helium plant in Orenburg to develop targeted preventive measures to reduce it.

Make a plan and a program for statistical study of the question.

10. The purpose of the study was to study the frequency and structure of risk factors for postoperative complications in surgical departments of the city hospital for the development of targeted preventive measures.

Make a plan and a program of statistical research on this issue.

11. The aim of the work is to study the morbidity of the adult population of the city of Orenburg with diseases of the cardiovascular system for the development of purposeful prevention routes.

Make a plan and a program of statistical research on this issue.

Tests

1. MEDICAL STATISTICS INCLUDE THE FOLLOWING PARTS:
    1. statistics of public health
    2. veterinary statistics
    3. statistics of scientific researches
    4. statistics of public health services
    5. crime statistics
2. STATISTICS OF PUBLIC HEALTH ARE STUDYING INDICATORS
    1. Medico-demographic
    2. Health services status
    3. Morbidity of the population
    4. Quality of care
    5. Efficiency of care
    6. Disability of the population
    7. Physical health of the population
3. STATISTICS OF PUBLIC HEALTH SERVICES INCLUDE:
    1. Medico-demographic
    2. Health services status
    3. Morbidity of the population
    4. Quality of care
    5. Efficiency of care
    6. Disability of the population
    7. Physical health of the population
4. HOW MANY STAGES ARE THERE IN THE STATISTICAL STUDY?
    1. 4
    2. 3
    3. 8
    4. 2
5. THE FIRST STAGE OF THE STATISTICAL STUDY IS…
    1. The analysis of the received data, conclusions, suggestions
    2. Preparatory (organizational) stage: scheduling and investigation programs
    3. Collecting of statistical material
    4. Working out and summarizing of material
6. THE PLAN OF STATISTICAL INVESTIGATION
    1. It reflects the content of research
    2. It reflects the organizational aspect of the study
7. THE PROGRAM OF STATISTICAL INVESTIGATION
    1. It reflects the content of research
    2. It reflects the organizational aspect of the study
8. THE PLAN OF STATISTICAL INVESTIGATION INCLUDES:
    1. Object of study
    2. Unit of observation
    3. Time of study
    4. Research Resource
    5. Registration forms
9. THE PROGRAM OF STATISTICAL INVESTIGATION INCLUDES:
    1. Object of study
    2. Determining the unit of observation
    3. Time of study
    4. Definition of the registration signs
    5. Research Resource
    6. Definition of the registration forms

10. TYPE OF STUDY BY VOLUME MAY BE
    1. single supervision
    2. continuous
    3. selective
    4. current supervision
11. TYPE OF STUDY BY TIME MAY BE
    1. single supervision
    2. continuous
    3. selective
    4. current supervision
12. A SELECTIVE OBSERVATION IS…
    1. observation, covering a part of the units of the population for the characterization of the whole
    2. observation confined to one or another moment
    3. monitoring in the order of the current registration
    4. examination of all units of the studied population
13. A CONTINUOUS OBSERVATION IS…
    1. observation, covering a part of the units of the population for the characterization of the whole
    2. observation, confined to one or another moment
    3. monitoring in the order of the current registration
    4. examination of all units of the studied population
14. A SINGLE SUPERVISION IS…
    1. observation, covering a part of the units of the population for the characterization of the whole
    2. observation, confined to one or another moment
    3. monitoring in the order of the current registration
    4. examination of all units of the studied population
15. A CURRENT SUPERVISION OBSERVATION IS…
    1. observation, covering a part of the units of the population for the characterization of the whole
    2. observation, confined to one or another moment
    3. monitoring in the order of the current registration
    4. examination of all units of the studied population
16. THE UNIT OF OBSERVATION IS…
    1. the primary element of the statistical population, which is the bearer of the characteristics subject to registration
    2. the array of units that carry the feature being studied
    3. observing timed to any point
    4. determining the volume of observation
17. WHEN STUDYING THE INCIDENCE OF MYOCARDIAL INFARCTION IN THE ADULT POPULATION, THE UNIT OF OBSERVATION IS…
    1. adult
    2. patients with myocardial infarction
    3. each patient with myocardial infarction
18. STATISTICAL TABLES MAY BE…
    1. simple tables
    2. graphic tables
    3. group tables

4. combinational tables
5. mixed tables

19. OF THESE KINDS OF STATISTICAL TABLES, THE BEST REPRESENTATION OF THE TARGET POPULATION IS GIVEN BY

1. simple tables
2. group tables
3. combinational tables

20. WHEN CONDUCTING A SELECTIVE OBSERVATION, THE TYPES OF STATISTICAL MATERIAL COLLECTING ARE…

1. Random
2. Mechanical
3. Main array
4. Typological
5. Serial
6. Continuous

2. BASIC TECHNIQUES FOR ANALYSING CATEGORICAL DATA

Main questions

1. Absolute sizes, using in public health.
2. Relative sizes, types, methodic of calculation, using.
3. Standard Error of assessment and confidence intervals of relative sizes.
4. Estimation of statistical significance of differences in relative values (single proportion, two proportions, more than two categories).
5. Visualization and graphic representation of the relative values.

Theoretical information

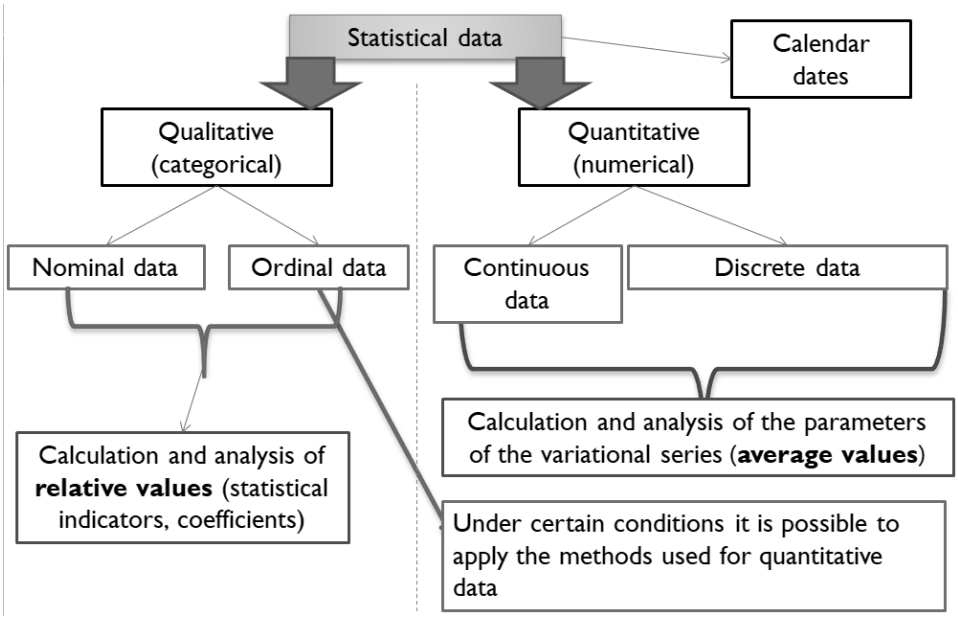


Fig. 2.1.Classification of statistical data and approaches to their analysis.

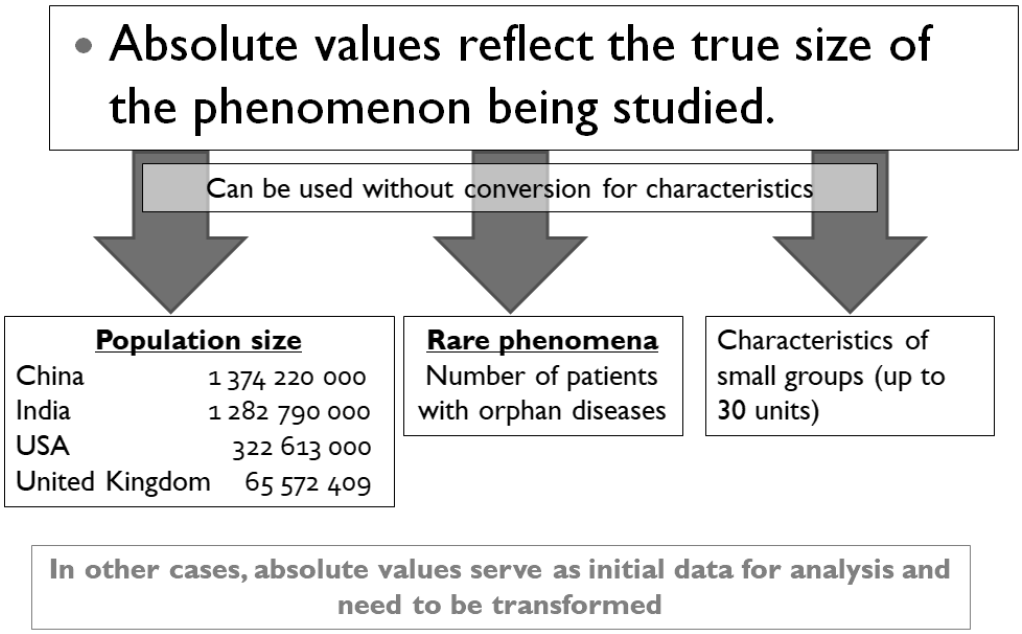


Fig. 2.2.The concept of absolute values.

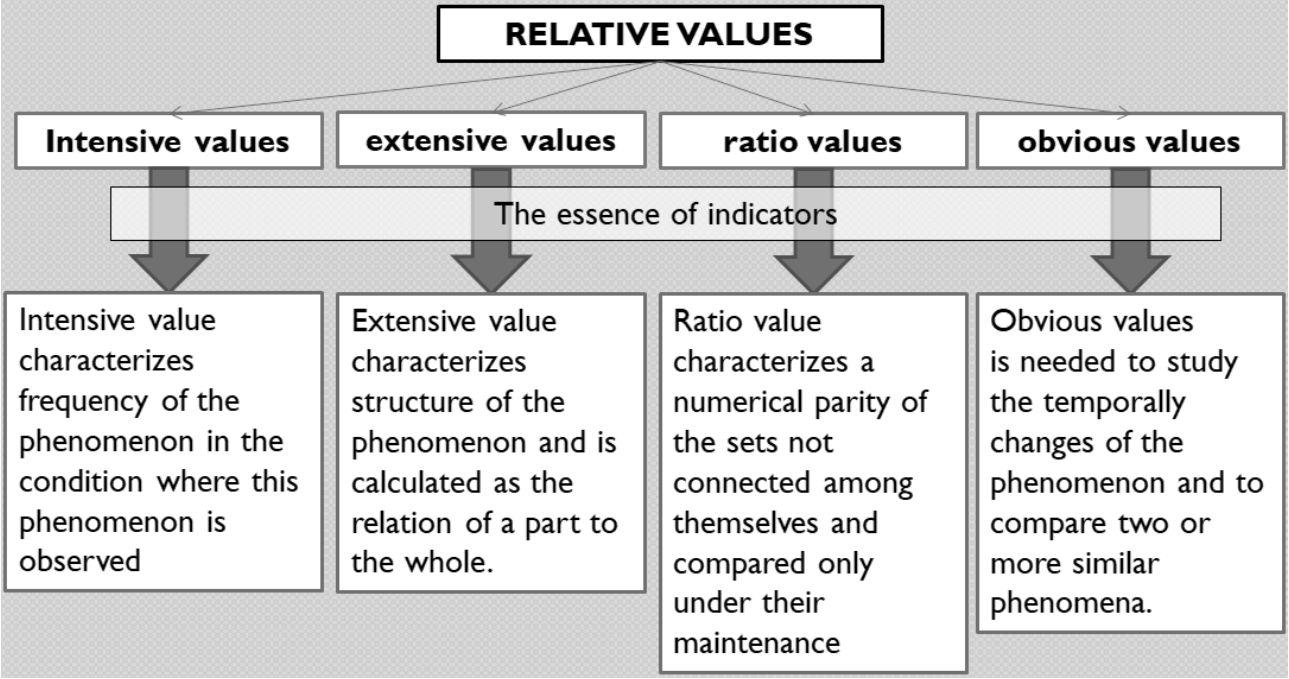


Fig. 2.3.Types of relative values.

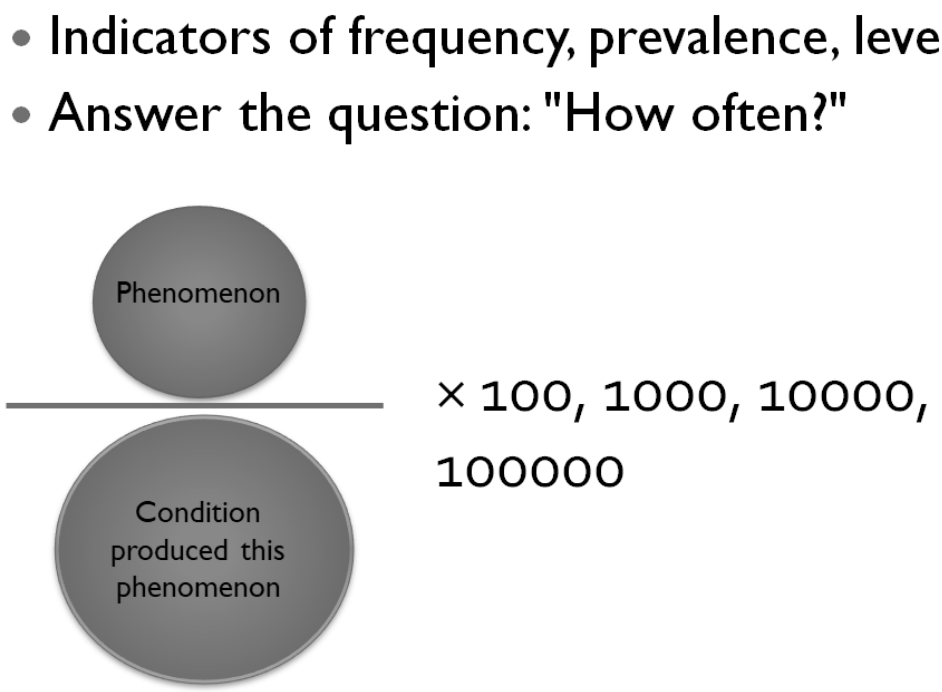


Fig. 2.4.Intensive values.

Example of the intensive value's calculating

Number of births – 54 000 cases for the year

Number of population – 3 800 000 people

Birth rate = 54 000 / 3 800 000 × 1000 = 14.2 births on 1000 population

- Indicators of structure, proportion.
- It answers the question: "Which part?"

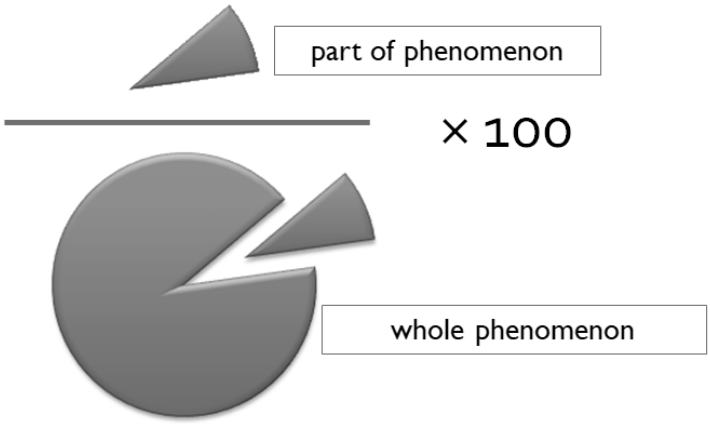


Fig. 2.5.Extensive values.

- Ratio value characterizes a numerical parity of the sets not connected among themselves and compared only under their maintenance

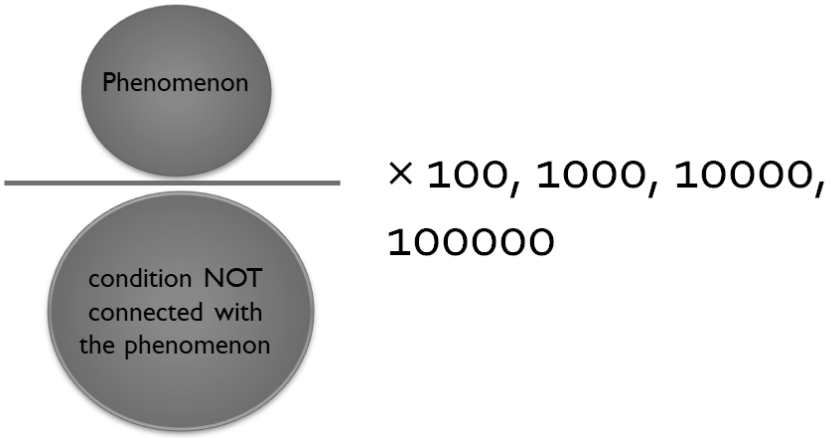


Fig. 2.5.Ratio values.

Example of the extensive value's calculating

The whole number of deaths for the year – 40 000 cases

Number of deaths from trauma – 5 000 cases

Number of deaths from cancer – 4 000 cases

Number of deaths from cardiovascular disease – 20 000 cases

Number of deaths from other reasons – 11 000 cases

Proportion of deaths from CVS's disease = 20 000 / 40 000 × 100% = 50%

Proportion of deaths from trauma = 5 000 / 40 000 × 100% = 12.5%

Proportion of deaths from cancer = 4 000 / 40 000 × 100% = 10%

Proportion of deaths from other reasons = 11 000 / 40 000 × 100% = 27.5%

Example of the ratio value's calculating

Number of hospital beds – 40 000 beds

Number of population – 3 800 000 people

Number of beds on 10 000 population = 40 000 / 3 800 000 × 10 000 = 105.3 beds on 10 000 population

- Obvious values is needed to study the temporally changes of the phenomenon and to compare two or more similar phenomena.

Population in India	Population in the UK
1 282 790 000	65 572 409

Obvious values = 65 572 409 / 1 282 790 000 × 100 = 5%

The population in the UK is 5% of the population of India.

Fig. 2.6.Obvious values.

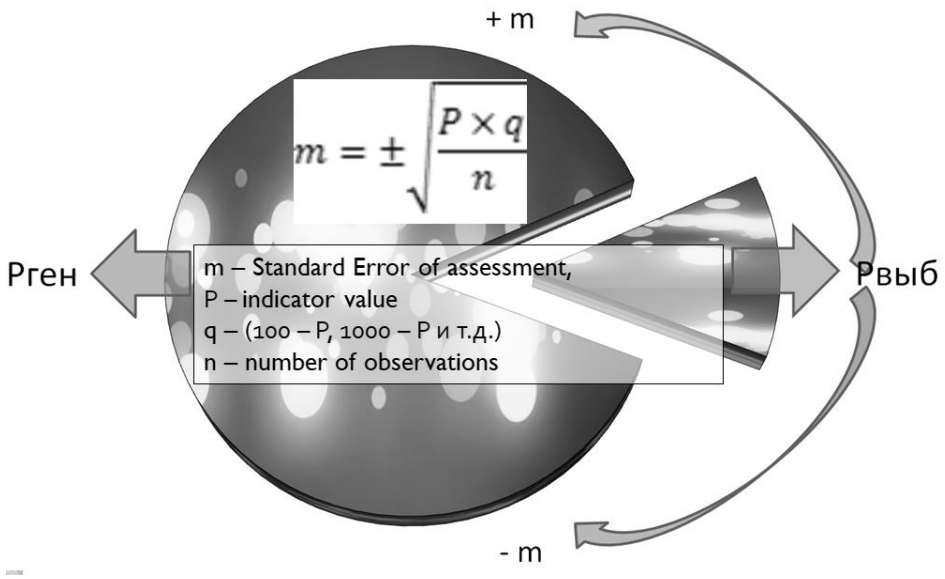


Fig. 2.7.Standard Error of assessment for relative values.

Example of Standard Error calculating

As a result of the survey of 200 workers in kindergartens, Staphylococcus aureus was diagnosed in 15% of workers.

$$m = \pm\sqrt{\frac{Pq}{n}} = \pm\sqrt{\frac{15 \times (100 - 15)}{200}} = \pm 6{,}4\%$$

Why do you need Standard Error?

Using a standard error, you can generalize the results to similar objects with a certain probability.

$$P_{cont} = P_{sel} \pm tm$$

Table 2.1. Level of statistical significance, confidence probability and Significance criteria (t)

Level of statistical significance (p)	Confidence probability (%)	Significance criteria (t)
0,05	95,0%	1,98
0,01	99,0%	2,63
0,001	99,9%	4,0

Example of confidence intervals calculating

$$P_{cont} = P_{sel} \pm tm = 15 \pm 1{,}98 \times 6{,}4\% = [2{,}3 - 27{,}7]\%$$

Conclusion: The level of carriage of Staphylococcus aureus in kindergarten employees can range from 2.3% to 27.7% with a confidence rate of 95%.

Table 2.2.Estimation of statistical significance of differences in relative values.

Objective	Method
single proportion	Calculation of confidence intervals
two proportions	Calculation significance criteria t; calculation of the chi-square test
more than two categories	calculation of the chi-square test

Example of a solution to a typical problem

The table shows the data on the appeal of the population of different age groups to the general practitioners.

Age	Population	Number of visits
15 – 19	8000	4000
20 – 59	40000	48000
60 – 69	11000	12000
70 and over	21000	16000
Total:	80000	80000

1. Calculate the overall and group intensive rates of visits of the population. Make a conclusion.

$$\text{Address to the doctor of the age group 15 - 19 years} = \frac{\text{Number of visits}}{\text{Population}} \times 1000 =$$

$$\frac{4000}{8000} \times 1000 = 500{,}0‰$$

Similarly, we calculate the remaining indicators, the results are recorded in the table.

Age	Population	Number of visits	Frequency of visits to the doctor (‰)
15 – 19	8000	4000	500,0
20 – 59	40000	48000	1200,0
60 – 69	11000	12000	1090,9
70 and over	21000	16000	761,9
Total:	80000	80000	1000

Conclusion. The rates of visits to the general practitioners was 1000 ‰. Most often visitors to the general practitioners are people aged 20 to 59 years.

2. Calculate the structure of the appeal to the general practitioners depending on the age. Make a conclusion.

$$\text{The proportion of those who applied to a doctor in the age group 15-19 years} = \frac{\text{Number of visits in the age group 15-19 years}}{\text{Number of visits Total}} \times 100 =$$

$$\frac{4000}{80000} \times 100 = 5\%$$

Similarly, we calculate the remaining indicators, the results are recorded in the table.

Age	Population	Number of visits	Frequency of visits to the doctor (‰)	Structure of the appeal (%)
15 – 19	8000	4000	500,0	5,0%
20 – 59	40000	48000	1200,0	60,0%
60 – 69	11000	12000	1090,9	15,0%
70 and over	21000	16000	761,9	20,0%
Total:	80000	80000	1000	100,0%

Conclusion. In the structure of the appeal, the age group of 20 to 59 years stands first. Then follow: 70 years and older, 60 - 69 years, 15 - 19 years.

3. Calculate the minimum and the highest possible level of appeal for the age group of 20-59 years.

We calculate the error of representativeness of the level of appeal to the doctor of the age group of 20 to 59 years:

$$m = \pm\sqrt{\frac{Pq}{n}} = \pm\sqrt{\frac{1200 \times 200}{40000}} = 2{,}5‰.$$

Then we find confidence intervals within ± 3m.

$$Pcont. = Psel. \pm tm = 1200 \pm 3 \times 2,5 = [1192,5;1207,5]‰$$

Conclusion. If all the conditions of the current year are preserved in the next year, the turnover to the physician of the age group of 20 to 59 years will be from 1192.5 to 1207.5 ‰, with a probability of an error-free forecast of 99.7%.

4. Calculate the reliability of differences in appeal to the general practitioners in the age groups of 20 to 59 years and 60 to 69 years.

We calculate the SE for the age group 60 - 69 years:

$$m = \pm\sqrt{\frac{Pq}{n}} = \pm\sqrt{\frac{1090,9 \times 90,9}{12000}} = 2,9‰.$$

We calculate the Student's test

$$t = \frac{P_1 - P_2}{\sqrt{m_1^2 + m_2^2}} = \frac{1200 - 1090,9}{\sqrt{2,5^2 + 2,9^2}} = 28,7$$

Conclusion. Differences between the levels of access to the doctor in the age groups of 20 to 59 years and 60 to 69 years are statistically significant, ($p < 0.001$).

The task for independent work

Task 1

When studying the incidence of osteochondrosis of the lumbosacral spine of drivers of urban transport in Orenburg, the data presented in the table were obtained.

The number of patients with osteochondrosis of the lumbosacral spine department among drivers of urban vehicles, depending on the length of service

Work experience as a driver	***Examined***	***Number of patients with osteochondrosis***
1- 9 years	2964	520
10 – 19 years	1629	440
20 and more years	250	165
Total	***4843***	***1125***

1. Calculate the total and group (depending on the work experience as a driver) indicators of the disease rate of osteochondrosis of the lumbosacral spine of the drivers of urban transport.

2. Calculate the structure of the incidence of drivers' osteochondrosis of the lumbosacral spine, depending on the length of service.

3. Calculate the minimum and maximum possible incidence of drivers of urban vehicles lumbosacral osteochondrosis.

4. Determine the reliability of differences in the incidence of drivers who have worked for 1-9 years and 20 years or more.

5. On the basis of the data obtained, make a conclusion.

Task 2

In the study of occupational injuries at the helium plant, the data presented in the table were obtained.

The number of cases of industrial injuries among management personnel and workers in the helium plant

Employee category	***Number of employees***	***Number of cases of industrial injuries***
Administrative staff	206	2
Workers	1602	17
Total	***1808***	***19***

1. Calculate the total and group (depending on the category of workers) indicators of occupational injuries at the helium plant.

2. Calculate the structure of industrial injuries, depending on the category of workers.

3. Calculate the minimum and the maximum possible level of industrial injuries in the workers of the helium plant.

4. Determine the reliability of differences in levels of occupational traumatism among workers and management personnel.

5. On the basis of the data obtained, make a conclusion.

Task 3

In studying the hospitalized morbidity of women of reproductive age in Orenburg, the data presented in the table were obtained by gynecological diseases.

The number of cases of hospitalization of women with gynecological diseases in different age groups

Age	***Number of patients***	***Number of hospitalized***
Up to 30 years	1210	47
30 - 49 years	1740	110
50 years and over	380	30
Total	**3330**	**187**

1. Calculate the total and group (depending on age) indicators of the level of hospitalization of women with gynecological diseases.

2. Calculate the structure of hospitalized gynecological incidence, depending on age.

3. Calculate the minimum and the maximum possible level of hospitalization of women with gynecological diseases in Orenburg.

4. Determine the reliability of the differences in the levels of hospitalization of women in the age groups "up to 30 years" and "30-49 years."

5. On the basis of the data obtained, make a conclusion.

Task 4

In the analysis of postpartum complications, the women presented in the perinatal center of Orenburg the data presented in the table were received.

The number of cases of postpartum complications in women of different age groups

Age	***Number of women discharged from maternity ward***	***Number of cases of postpartum complications***
Up to 20 years	458	29
20 – 29 years	845	92
30 – 39 years	240	35
Total	**1543**	**156**

1. Calculate the total and group (depending on age) indicators of the frequency of postpartum complications.

2. Calculate the structure of postpartum complications depending on age.

3. Calculate the minimum and maximum possible level of postpartum complications.

4. Determine the reliability of differences in postpartum complications in the age groups "20-29 years" and "30-39" years.

5. On the basis of the data obtained, make a conclusion.

Task 5

In the study of the frequency of complications in type II diabetes mellitus, depending on the duration of the disease, the data presented in the table were obtained.

The number of cases of complications of type II diabetes mellitus depending on the duration of the disease

Duration of the disease	***Number of patients***	***Number of complications***
Up to 5 years	863	384
5 - 10 years	405	237
More than 10 years	219	211
Total	**1487**	**832**

1. Calculate the total and subgroup indicators of the frequency of complications.

2. Calculate the structure of complications depending on the duration of diabetes mellitus.

3. Calculate the minimum and maximum possible levels of complications of diabetes in all patients.

4. Determine the reliability of differences in the incidence of complications in people with diabetes 5-10 years and more than 10 years.

5. Based on the findings, draw a conclusion.

Task 6

When studying the level and structure of postoperative complications in the surgical hospital, the data presented in the table were obtained.

Number of cases of postoperative complications

Bed profile	***Number of operated patients***	***Number of cases of postoperative complications***
general surgery	1280	18
purulent surgery	845	17
Total	**2125**	**35**

1. Calculate the total and group (depending on the profile of beds) indicators of the frequency of postoperative complications.

2. Calculate the structure of postoperative complications depending on the profile of the beds.

3. Calculate the minimum and maximum possible level of postoperative complications in the surgical hospital.

4. Determine the reliability of differences in postoperative complications in the department of general and purulent surgery.

5. On the basis of the data obtained, make a conclusion.

Task 7

When examining the satisfaction of the adult population of Orenburg with the provision of outpatient care, the following data were obtained, presented in the table.

Distribution of patients who are satisfied with the provision of outpatient care according to age

Age	Covered by research	The number of patients satisfied with health care
Working age	188	148
Retirement age	48	28
Total	**236**	**176**

1. Calculate the general and group (depending on the age) indicators of satisfaction of the population of Orenburg with providing outpatient care.

2. Calculate the structure of patient satisfaction, depending on age.

3. Calculate the minimum and maximum possible level of satisfaction of patients in Orenburg with providing outpatient care.

4. Determine the reliability of differences in levels of satisfaction of patients of working age and retirement age.

6. On the basis of the data obtained, make a conclusion.

Task 8

In a selective study of the incidence of the rural population of the Sol-Iletsky district with diseases of the digestive organs, the data presented in the table were obtained.

The number of cases of diseases of the digestive system in the adult population of the Sol-Iletsky district in terms of sex

Sex	***Covered by research***	***Number of cases of diseases of the digestive system***
Male	480	20
Female	679	70
Total	**1159**	**90**

1. Calculate the total and group (depending on sex) rates of the incidence of diseases of the digestive system.

2. Calculate the structure of the incidence of diseases of the digestive system, depending on sex.

3. Calculate the minimum and the maximum possible incidence of diseases of the digestive system among residents of the Sol-Iletsky district.

4. Determine the reliability of differences in levels of morbidity in men and women.

5. On the basis of the data obtained, make a conclusion.

Tests

1. STATISTICAL VALUES ARE
   1. absolute values
   2. relative values
   3. all listed

2. WHAT VALUES REFLECT THE TRUE SIZE OF THE PHENOMENON BEING STUDIED?
   1. relative values
   2. average values
   3. absolute values
   4. statistical values

3. RELATIVE VALUES ARE ALL LISTED, EXCEPT
   1. Intensive values
   2. extensive values
   3. average values
   4. ratio values
   5. obvious values

4. WHICH VALUES CHARACTERIZES FREQUENCY OF THE PHENOMENON IN THE CONDITION WHERE THIS PHENOMENON IS OBSERVED?
   1. Intensive values
   2. extensive values
   3. ratio values
   4. obvious values

5. WHICH VALUES CHARACTERIZE A NUMERICAL PARITY OF THE SETS NOT CONNECTED AMONG THEMSELVES AND COMPARED ONLY UNDER THEIR MAINTENANCE?
   1. Intensive values
   2. extensive values
   3. obvious values
   4. ratio values

6. WHICH VALUES ARE CALCULATED AS THE RELATION OF A PART TO THE WHOLE?
   1. Intensive values
   2. extensive values
   3. ratio values
   4. obvious values

7. WHICH VALUES ARE NEEDED TO STUDY THE TEMPORALLY CHANGES OF THE PHENOMENON AND TO COMPARE TWO OR MORE SIMILAR PHENOMENA?
   1. Intensive values

2. extensive values
3. ratio values
4. obvious values

8. WHICH VALUES ARE USED TO CHARACTERIZE THE STRUCTURE OF THE PHENOMENON?
1. Intensive values
2. extensive values
3. ratio values
4. obvious values

9. WHY DO YOU NEED STANDARD ERROR OF ASSESSMENT RELATIVE VALUES?
1. Using a standard error, you can generalize the results to similar objects with a certain probability.
2. To determine the error in collecting statistical data.
3. To determine the statistical significance of the differences between the two phenomena.

10. $m = \pm\sqrt{\frac{P \times q}{n}}$ WHAT IS THIS FORMULA USED FOR?
1. For calculation of intensive values
2. For calculation standard error
3. For calculation of extensive values
4. For determine the statistical significance of the differences between the two phenomena.

3. BASIC TECHNIQUES FOR ANALYSING NUMERICAL DATA

Main questions

1. Theoretical distributions: the Normal and other distributions.
2. Variational line, types, construction.
3. Average sizes, types, using in health services. Arithmetic mean and median characteristics and peculiarities, methods of calculation.
4. Assessment of a variety of numerical data. Standard deviation, methods of calculation and practical implementation. Variety assessment by means of percentiles.
5. Standard Error of assessment and confidence intervals of average sizes.
6. Estimation of statistical significance of differences in average sizes. Parametrical and non-parametrical statistical methods.

Theoretical information

The main tasks in the analysis of quantitative data

- Calculate the most typical number characterizing the **variational line** (data set)– **average value**.
- Determine the **variability** (individual variability) of the quantitative trait.
- Calculate the **Standard Error** of assessment and **confidence intervals** of the average value.
- Determine the **level of statistical significance** of the differences between the mean values in two or more groups.

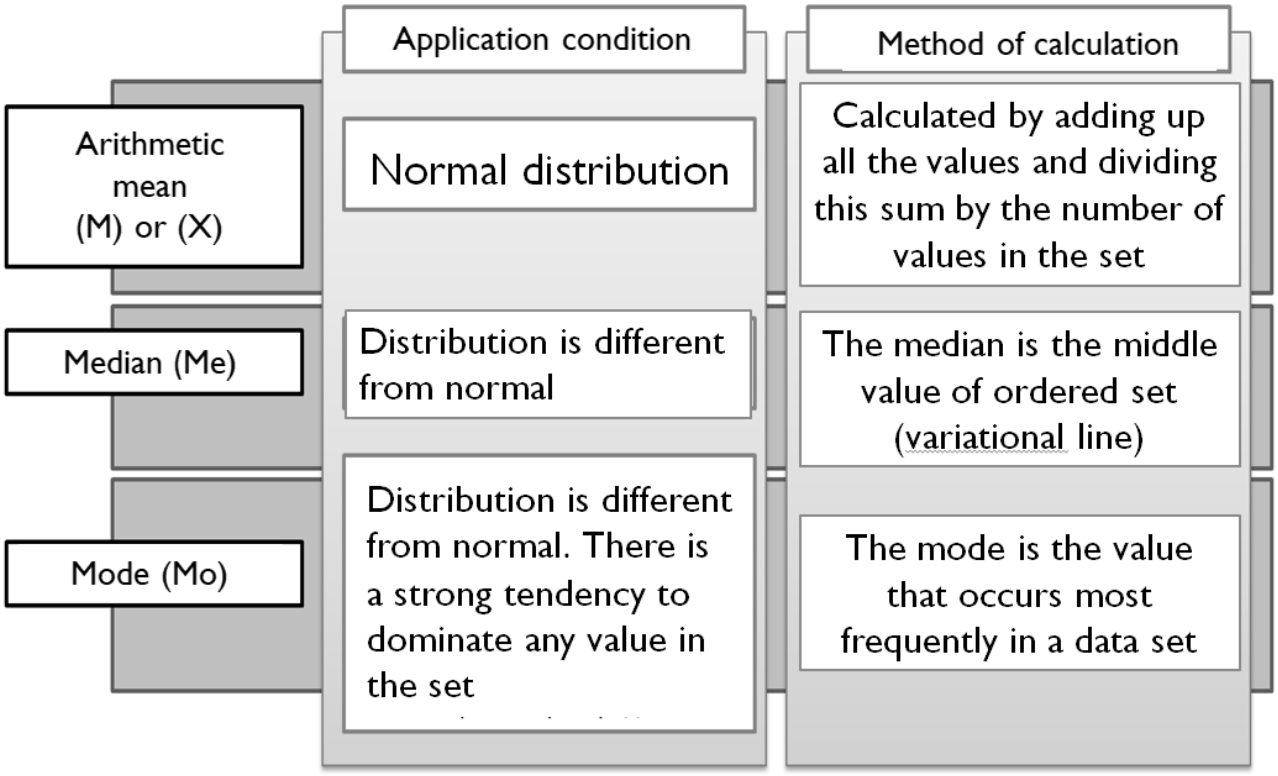


Fig. 3.1. Types of average values

The consequences of the distribution type

If the distribution is normal (Fig. 3.2), then the researcher may use the arithmetic mean value.

If the distribution is asymmetric (Fig. 3.3), then DO NOT use the arithmetic mean. You must use the median or mode

In 80% of CLINICAL RESEARCHES DISTRIBUTION IS UNSIMETHERICAL!

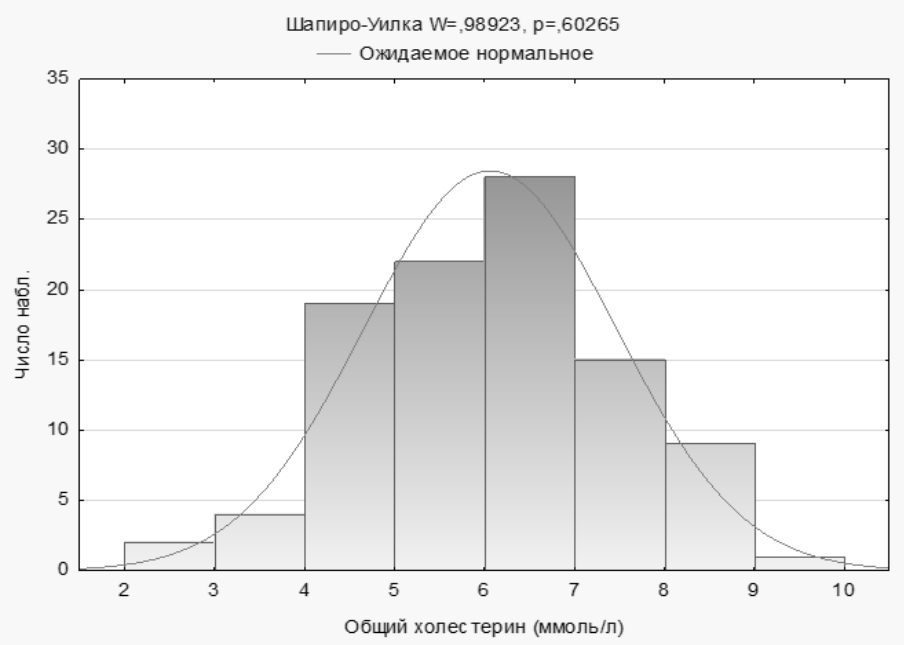


Fig. 3.2. Normal distribution.

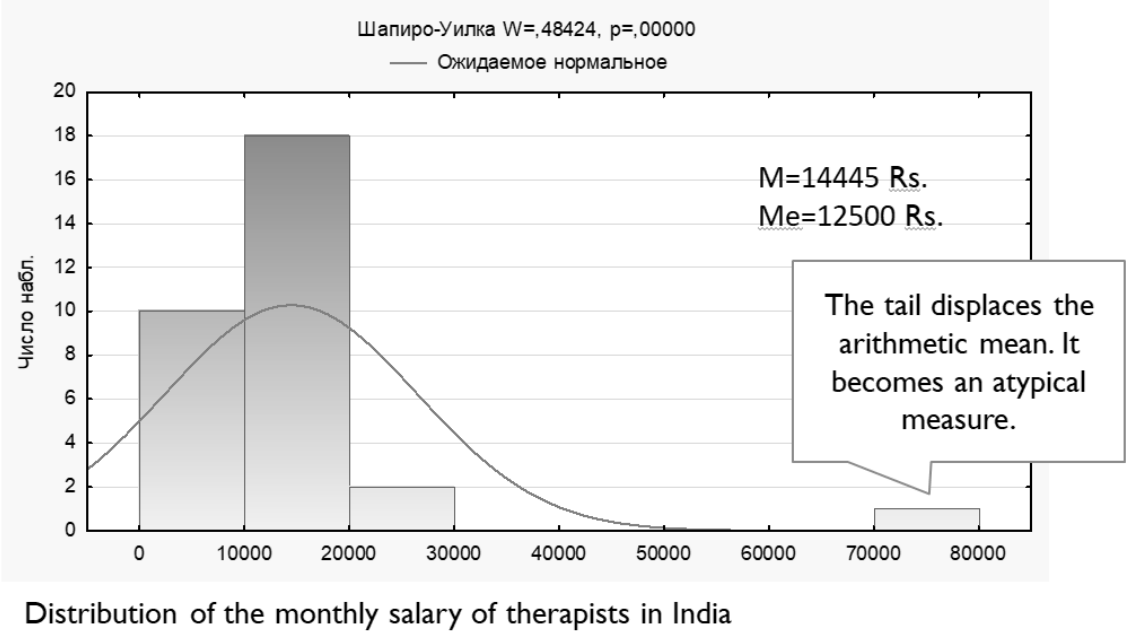


Fig. 3.3. Distribution is different from normal.

Depending on the kind of the variation number this or that way of average value calculation

is used. Average arithmetic for a prime series where one variant occurs once, is calculated using the formula: $M = \frac{\sum V}{n}$, where $\sum$ – a sum sign, **V** – separate values of variants, **n** - number of supervisions. The average arithmetic value weighed is defined using the formula: $M = \frac{\sum Vp}{n}$, where $\sum$ – a sum sign, **V** – separate values of variants, **n** – number of supervisions, **p** – frequency of variant occurrence. One of the most simple and exact enough ways of average arithmetic calculation is a way of the moments, based on the fact that the algebraic sum of deviations of every variant in a variational series from average arithmetic is equal to zero. $M = A + i \frac{\sum ap}{n}$, where **A** - conditionally accepted average or a mode, ***a***- a deviation of every variant from conditionally accepted by the average, **p** – frequency of variant occurrence, **n** – number of supervisions, **i** – an interval or distance between the adjacent variants.

Characteristics of variety

- Standard deviation (SDor ϭ) (under normal distribution!).
- Minimum and maximum variants (min, max).
- Range (amplitude) (A = x max – x min).
- The coefficient of variation (SD / X × 100) (under normal distribution!).
- Centels: percentiles, deciles, quartiles (in case of distribution different from normal!).

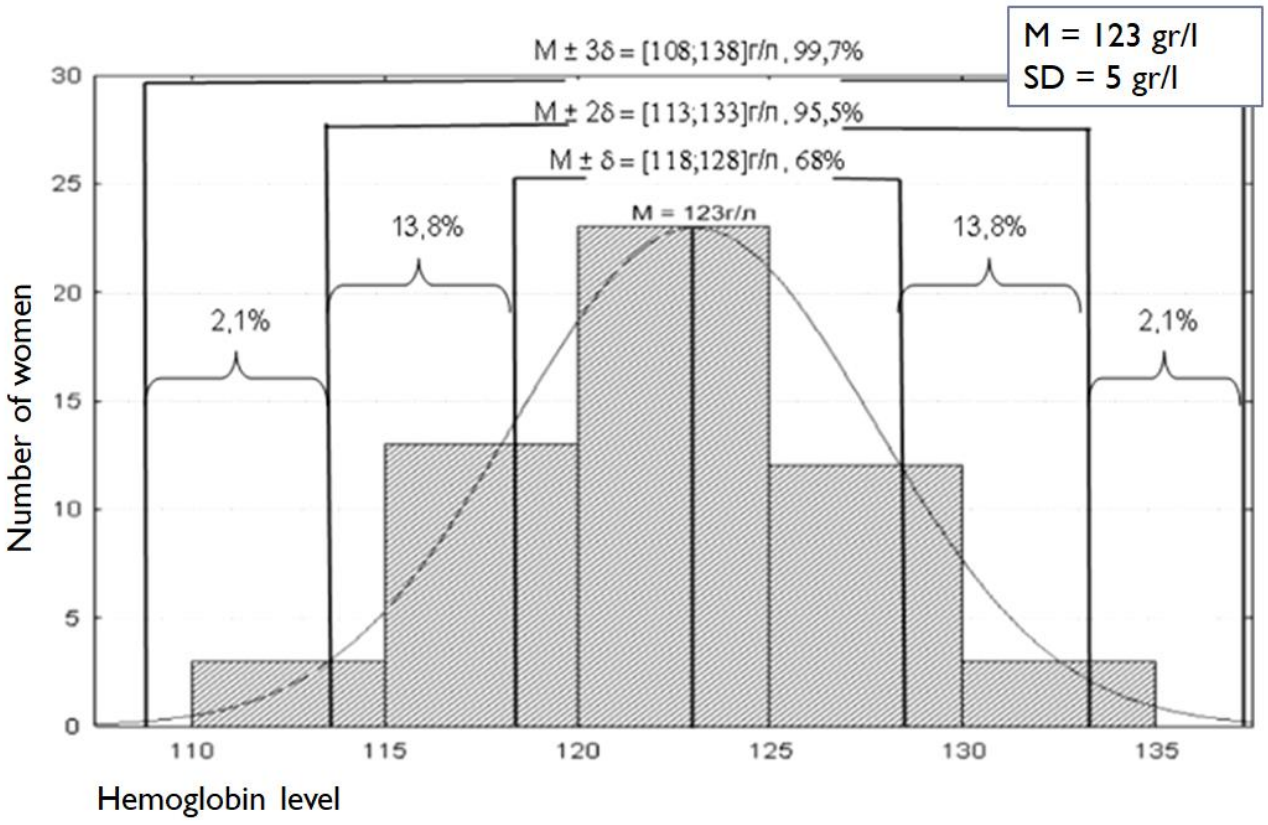


Fig. 3.4. Determination of variance according to standard deviation.

The Standard deviation most precisely characterizes the variety degree of a varying sign; it is impossible to characterize the phenomenon full enough without it. For a simple variational series (p = 1) mean-square deviation is calculated

using the formula $\sigma = \sqrt{\frac{\sum d^2}{n}}$

For the weighed variational series – using the formula:

$\sigma = \sqrt{\frac{\sum d^2 p}{n}}$, where **d = V - M** – a deviation of every variant from average arithmetic. At the number of supervisions less than 30, we take not ***n*** but ***n - 1*** in a denominator of these formulas (in statistics the so-called number of freedom degree). At the number of supervisions more than 30, reduction of a denominator by one has no practical value since it does not affect essentially the final result. Mean-square deviation calculation by a way of the moments simplifies considerably the calculations.

$\sigma = \sqrt{\frac{\sum a^2 p}{n} - \left(\frac{\sum ap}{n}\right)^2}$, where the value $\frac{\sum ap}{n}$ is called as the moment of the first degree, and $-\frac{\sum a^2 p}{n}$ – the moment of the second degree.

If we add one sigma to the average then 68,3% correspond to this calculated average, at two sigmas – 95,4 %, at three sigmas – 99,7 % of all signs. In medicine the concept of norm is connected with M value ± 1 σ; deviation from average (to any direction) more than by 1 σ, but less than by 2 σ, is considered subnormal (above or below norm), and at deviation from average more than by 2 σ, variants are considered considerably differing from norm (pathology).

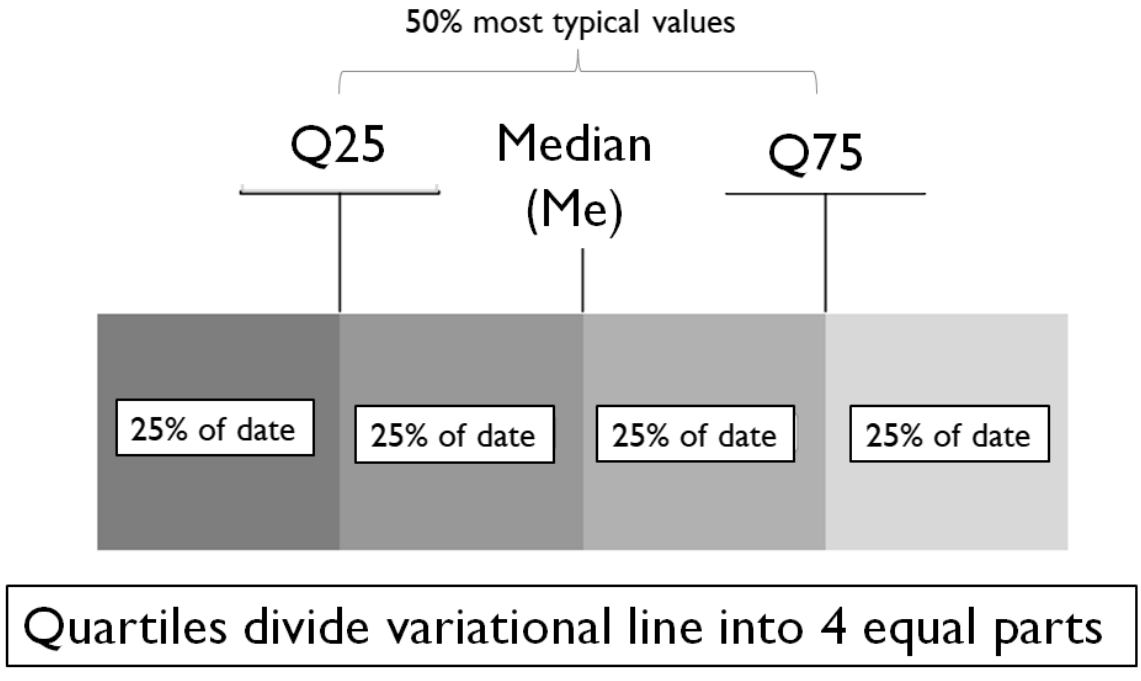
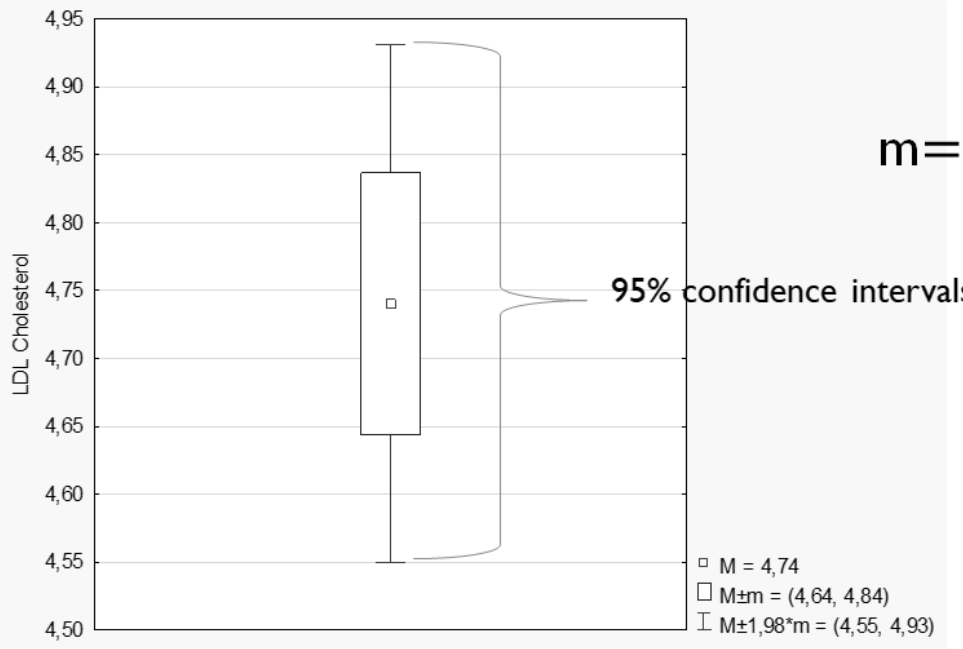


Fig. 3.4. Determination of variance according to quartiles.



$$m = \frac{\delta}{\sqrt{n}}$$

$$Mcont = Msel \pm tm$$

Fig. 3.5.Standard Error of assessment and confidence intervals of arithmetic mean.

Estimation of statistical significance of differences in average sizes. Parametrical and non-parametrical statistical methods

- T - test, ANOVA (*ANalysis Of Variance)*
  - 1) The characteristic values in each of the compared groups should have a normal distribution;
  - 2) Variances of attribute distributions in two compared groups are equal.
- The Mana-Whitney Criteria, Dispersive analysis of Kruskel-Woliss

Example of a solution to a typical problem

- According to the study of serum free thyroxin content, a number of distribution was constructed in 65 healthy women.

V	P
6-8	2
9-11	7
12-14	13
15-17	19
18-20	14
21-23	9
24-26	1
n=65	

It is necessary to calculate:

1. The average of the arithmetic value (M1) by the method of moments.
2. Standard deviation (δ) by the method of moments
3. Standard Error of the arithmetic mean (m_1)
4. Determine whether there are significant differences in mean thyroxine levels in healthy women and women with hypothyroidism if it is known that the average thyroxine level in women with hypothyroidism (M2) is 9.7 nmol / L and the mean error of the arithmetic mean (m2) is ± 0.4 nmol / l.

V	p	Vсредняя	a	ap	a^2p
6-8	2	7	-3	-6	18
9-11	7	10	-2	-14	28
12-14	13	13	-1	-13	13
15-17	19	16	0	0	0
18-20	14	19	1	14	14
21-23	9	22	2	18	36
24-26	1	25	3	3	9
n=65				Σap=2	Σa^2p=118

$$M = A + i\frac{\sum ap}{n} = 16 + 3\frac{2}{65} = 16,1 нмоль \ / л$$

$$\delta = \pm i\sqrt{\frac{\Sigma a^2 p}{n} - \left(\frac{\Sigma ap}{n}\right)^2} = \pm 3\sqrt{\frac{118}{65} - \left(\frac{2}{65}\right)^2} = \pm 4,0 нмоль \ / л$$

$$m = \pm\frac{\delta}{\sqrt{n}} = \pm\frac{4,0}{\sqrt{65}} = \pm 0,5 нмоль \ / л$$

$$t = \frac{M_1 - M_2}{\sqrt{m_1^2 + m_2^2}} = \frac{16,1 - 9,7}{\sqrt{0,5^2 + 0,4^2}} = 10$$

Conclusion:

The average level of free thyroxin in the serum of healthy women was 16.1 nmol / l. The standard deviation is ± 4.0 nmol / L, the representativeness error is ± 0.5 nmol / l. Differences in the mean levels of free thyroxin in healthy women and women with hypothyroidism are reliable.

The task for independent work

Task 1

According to the study of the physical development of 200 boys - teenagers aged 15 in Orenburg, a number of growth distributions were built. It is necessary to calculate:

V	P
144-148	4
149-153	10
154-158	16
159-163	30
164-168	85
169-173	35
174-178	15
179-183	5
n = 200	

1. Average arithmetic value (M1) by the method of moments.
2. Standard deviation (δ) by the method of moments.
3. The average error of the arithmetic mean (m1).
4. Determine if there are any significant differences in the mean growth in boys adolescents in Orenburg and Orsk, if it is known that the average height of boys in the city of Orsk (M2) is 159.7 cm and the average error of the arithmetic mean (m2) is equal to ± 0.5 cm.
5. Analyze the data and draw a conclusion.

Task 2

According to the study of physical development of 200 draftees in Orenburg, a number of conscripts were distributed according to body weight.

V	P
64-66	2
67-69	6
70-72	20
73-75	30
76-78	85
79-81	35
82-84	15
85-87	5
88-91	2
n = 200	

It is necessary to calculate:

1. Average arithmetic value (M1) by the method of moments.
2. Standard deviation (δ) by the method of moments.
3. The average error of the arithmetic mean (m1).
4. Determine if there are significant differences in the mean weight of conscripts in Orenburg and Orsk, if it is known that the average weight of the recruits of Orsk (M2) is 79.5 kg. and the average error of the arithmetic mean (m2) is ± 0.5 kg.
5. Analyze the data and draw a conclusion.

Task 3

Based on the data on the duration of treatment of 45 patients with angina (in days), a number of distributions were constructed in the polyclinic. It is necessary to calculate:

V	P
3-5	5
6-8	8
9-11	15
12-14	9
15-17	5
18-20	3
n = 45	

1. Average arithmetic value (M1) by the method of moments.
2. Standard deviation (δ) by the method of moments.
3. The average error of the arithmetic mean (m1).
4. Determine if there are significant differences in the mean duration of treatment for angina in a given out-patient clinic and a polyclinic from another area, if it is known that the average duration of treatment for angina in a polyclinic in another district (M2) was 12.5 days and the mean error of the arithmetic mean (m2) is equal to ± 0.5 days.
5. Analyze the data and draw a conclusion.

Task 4

Based on the data on the growth of 56 female first year students, a number of distributions were constructed.

V	P
158-160	4
161-163	6
164-166	21
167-169	11
170-172	9
173-175	4
176-178	1
n = 56	

It is necessary to calculate:

1. Average arithmetic value (M1) by the method of moments.
2. Standard deviation (δ) by the method of moments.
3. The average error of the arithmetic mean (m1).
4. Determine whether there are significant differences in the mean growth in female students and male students, if it is known that the average growth of male students (M2) is 176.6 cm and the average error of the arithmetic mean (m2) is ± 0.5 cm .
5. Analyze the data and draw a conclusion.

Task 5

Based on the data on the body weight of 120 eight-year-old girls, a series of distributions was constructed.

V	P
21-23	4
24-26	15
27-29	64
30-32	28
33-35	5
36-38	4
n = 120	

It is necessary to calculate:

1. Average arithmetic value (M1) by the method of moments.
2. Standard deviation (δ) by the method of moments.
3. The average error of the arithmetic mean (m1).
4. Determine whether there are significant differences in the mean body weight for 8-year-old girls and boys, if it is known that the average body weight of boys is 31.5 kg and the mean error of the arithmetic mean (m2) is ± 0.5 kg.
5. Analyze the data and draw a conclusion.

Task 6

Based on the data on the duration of treatment (in days) in the clinic, 55 patients with chronic gastritis have a number of distributions.

V	P
5-7	3
8-10	8
11-13	10
14-16	23
17-19	7
20-22	3
23-25	1
n = 55	

It is necessary to calculate:

1. Average arithmetic value (M1) by the method of moments.
2. The mean deviation (δ) by the method of moments.
3. The average error of the arithmetic mean (m1).
4. Determine if there are significant differences in the mean duration of treatment for gastritis and gastric ulcer if it is known that the average duration of gastric ulcer (M2) is 18 days and the mean error of the arithmetic mean (m2) is ± 0.7 days.
5. Analyze the data and draw a conclusion.

Task 7

Based on the data on the heart rate of 100 students, a distribution series was constructed.

V	P
60-62	5
63-65	8
66-68	16
69-71	28
72-74	18
75-77	12
78-80	8
81-83	5
n = 100	

It is necessary to calculate:

1. Average arithmetic value (M1) by the method of moments.
2. Standard deviation (δ) by the method of moments.
3. The average error of the arithmetic mean (m1).
4. Determine whether there are significant differences in the mean heart rate for students (M1) and military personnel (M2), if it is known that the average heart rate for military personnel is 71 beats per minute and the average error of the arithmetic mean (m2) is ± 1 beat per minute.
5. Analyze the data and draw a conclusion.

Task 8

Based on the data on the frequency of breathing of 200 skiers during the competition a number of distributions was constructed.

V	P
15-16	1
17-18	7
19-20	19
21-22	31
23-24	87
25-26	33
27-28	13
29-30	7
n = 200	

It is necessary to calculate:

1. Average arithmetic value (M1) by the method of moments.
2. Standard deviation (δ) by the method of moments.
3. The average error of the arithmetic mean (m1).
4. Determine whether there are significant differences in the mean respiratory rate in skiers before and during the competition, if it is known that the average respiration rate of skiers before the competition (M2) is 18 and the mean error of the arithmetic mean (m2) is ± 1.

5. Analyze the data and draw a conclusion.

Task 9

Based on the data on the growth of 110 weightlifter athletes a number of distribution was built.

V	P
158-160	7
161-163	11
164-166	20
167-169	37
170-172	16
173-175	11
176-178	6
179-181	2
n = 110	

It is necessary to calculate:
1. Average arithmetic value (M1) by the method of moments.
2. Standard deviation (δ) by the method of moments.
3. The average error of the arithmetic mean (m1).
4. Determine whether there are significant differences in the growth rates of weightlifters and non-sportsmen if it is known that their average height (M2) is 176.7 cm and the average error of the arithmetic mean (m2) is ± 0.7 cm.
5. Analyze the data and draw a conclusion.

Task 10

Based on the data on the duration of treatment (in days), 100 patients with pneumonia in the hospital a number of distributions was built.

V	P
9-11	4
12-14	6
15-17	19
18-20	48
21-23	14
24-26	7
27-29	2
n = 100	

It is necessary to calculate:

1. Average arithmetic value (M1) by the method of moments.
2. Standard deviation (δ) by the method of moments.
3. The average error of the arithmetic mean (m1).
4. Determine if there are significant differences in the mean duration of treatment for pneumonia and chronic bronchitis if it is known that it (M2) is 16 days and the average error of the arithmetic mean (m2) is ± 1 day.
5. Analyze the data and draw a conclusion.

Task 11

Based on data on systolic blood pressure (SBP) of 188 women with neurocirculatory dystonia syndrome, a series of distributions was built.

V	P
71 – 80	5
81 – 90	44
91 – 100	79
101 – 110	20
111 – 120	18
121 – 130	15
131 – 140	5
141 – 150	2
n = 188	

It is necessary to calculate:
1. Average arithmetic value (M1) by the method of moments.
2. Standard deviation (δ) by the method of moments.
3. The average error of the arithmetic mean (m1).
4. Determine whether there are significant differences in mean SBP values in patients and healthy women if it is known that the average SBP in healthy individuals is 120 mm Hg. and the average error of the mean value (m2) is ± 1 mm Hg.
5. Analyze the data and draw a conclusion.

Task 12

Based on the data on the level of hemoglobin (g / l), 78 male swimmers have built a number of distributions.

V	P
120-129	6
130-139	8
140-149	18
150-159	20
160-169	14
170-179	9
180-189	3
n = 78	

It is necessary to calculate:

1. Average arithmetic value (M1) by the method of moments.
2. Standard deviation (δ) by the method of moments.
3. The average error of the arithmetic mean (m1).
4. Determine if there are significant differences in the mean hemoglobin levels in swimmers and non-sportsmen if it is known that the average hemoglobin level is 140 g / l and the mean error of the arithmetic mean (m2) is ± 0, 5 g / l.
5. Analyze the data and draw a conclusion.

Task 13

Based on the data on the average level of systolic blood pressure (mmHg), a distribution series was constructed in men aged 50.

V	P
100-109	3
110-119	11
120-129	22
130-139	34
140-149	63
150-159	34
160-169	18
170-179	15
n = 200	

It is necessary to calculate:

1. Average arithmetic value (M1) by the method of moments.
2. Standard deviation (δ) by the method of moments.
3. The average error of the arithmetic mean (m1).
4. Determine whether there are significant differences in the mean systolic blood pressure in men aged 50 years and in men aged 25 years, if it is known that the mean systolic pressure in them (M2) was 121.8 mm Hg. Art. and the mean error of the arithmetic mean (m2) is ± 0.4 mm Hg. Art.
5. Analyze the data and draw a conclusion.

Tests

1. NORMAL DISTRIBUTION OR ASSIMENTIAL DISTRIBUTION IS DEFINITE FOR …
   1) qualitative data
   2) quantitative data
   3) any data

2. WHICH OF THE AVERAGE VALUES WILL BETTER CHARACTERIZE THE STATISTICAL SET WITH NORMAL DISTRIBUTION?
   1) arithmetic mean
   2) median
   3) mode

3. WHAT IS THE AVERAGE VALUE THAT BEST CHARACTERIZES THE STATISTICAL SET IN A DISTRIBUTION DIFFERENT FROM NORMAL?

1) arithmetic mean
2) median
3) mode

4. WHAT IS THE BEST VALUE TO USE IF THERE IS A STRONG TENDENCY TO DOMINATE ANY VALUE IN THE STATISTICAL SET?
1) arithmetic mean
2) median
3) mode

5. WHAT IS THE BEST MEASURE OF THE VARIABILITY OF QUANTITATIVE DATA IN A STATISTICAL SET WITH A NORMAL DISTRIBUTION?
1) mode
2) standard deviation
3) quartiles
4) coefficient of variation

6. WHAT IS THE BEST MEASURE OF THE VARIABILITY OF QUANTITATIVE DATA IN A STATISTICAL SET IN A DISTRIBUTION DIFFERENT FROM NORMAL?
1) coefficient of variation
2) standard deviation
3) centels (percentiles, deciles, quartiles)
4) obvious values

7. IN THE LIMIT M ± 2SD ARE LOCATED…
1) 68,3% all observations
2) 95,5% all observations
3) 99,7% all observations

8. WHAT VALUE OF T - TEST CONFIRMS THE PRESENCE OF A STATISTICALLY SIGNIFICANT DIFFERENCE BETWEEN THE GROUPS BEING COMPARED?
1) $t \geq 1,98$
2) $t \leq 1,98$
3) $t = 1$
4) $t = 0,05$

9. WHAT CHARACTERIZES THE STANDARD ERROR OF THE AVERAGE VALUE?
1) variability of analyzed quantitative data
2) the reliability of the differences between two mean values
3) the number by which the value of the average value of the sample population will differ from the average value calculated in the general population.
4) material collection error

10. WHAT CHARACTERIZES THE STANDARD DEVIATION?
1) variability of analyzed quantitative data
2) the reliability of the differences between two mean values
3) the number by which the value of the average value of the sample population will differ from the average value calculated in the general population.
4) material collection error

4. TIME SERIES AND THEIR ANALYSIS

Main questions

1. Time series, types, mean for health service.
2. Indicators of dynamic series, calculation, analysis.
3. Transformation of time series.

Theoretical information

The **TIME SERIES** is a series of homogeneous quantities that characterize the changes of the phenomenon in time.

The field of application

1. Applied to characterize changes in the health status of the population as a whole or its individual groups.

Example

Dynamics on the incidence of diseases of the endocrine system per 1000 people of the city's population

Years	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
incidence rate	5,8	5,3	6,0	5,9	5,1	4,9	5,7	5,2	4,8	4,1

2. It is used to characterize the activities of a medical organization and for planning public health services.

Example

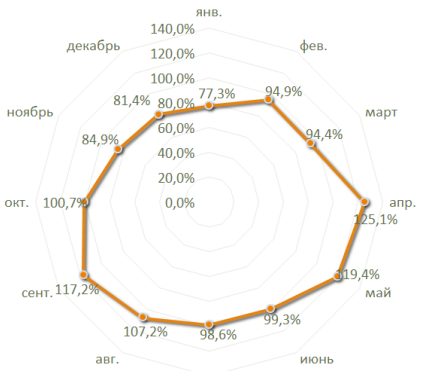
Dynamics of the number of doctors of all specialties per 10 thousand people

Years	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of doctors per 10,000 population	45,8	45,2	46,1	49,1	49,5	48,9	48,8	45,9	52,2	52,2

3. Used to identify the seasonal component of phenomena.

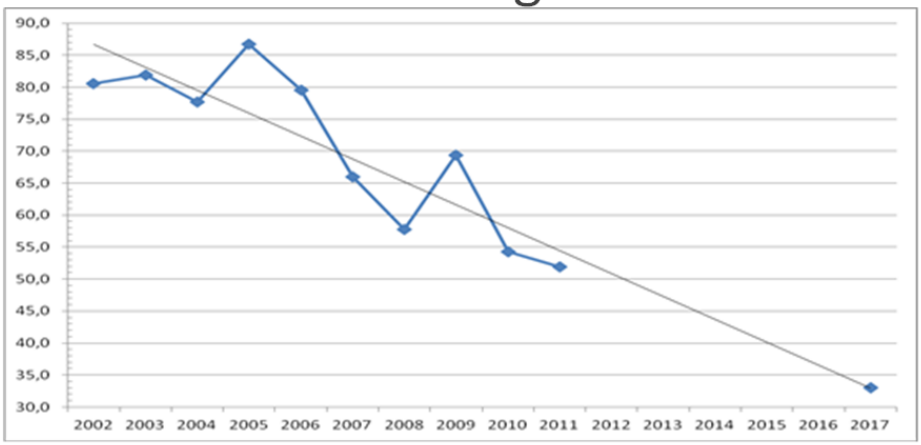
Example

Seasonality indicators of children's injuries in Orenburg



3. Can be used as a forecasting tool.

Example



Dynamics of primary disability of the working age population is forecast until 2017.

Types of time series

Simple time series consists of absolute values.

Complex time series consists of relative or average values

Moment series - characterizes the change in the values of the phenomenon at a certain date (moment). For example, each level can characterize the number of doctors at the end of a year or the population of some region on January 1 of a certain year.

Interval series - characterizes the changes in the values of the phenomenon over a certain period (time interval). Moment series can be divided into smaller intervals.

The main tasks of the analysis of time series

1. Characteristics of time series by calculating the indicators of the change in the levels of a series.
2. Determination of the presence of a trend.
3. In the absence of a clear trend, the use of time series conversion methods.
4. Forecasting trends for a further period
5. If necessary, evaluate the seasonal component.

Indicators of time series

Absolute growth (or decrease) characterizes the absolute value of growth or decrease per unit of time. Absolute growth is calculated as the difference between this level and the previous one; is indicated by the sign "+", characterizing the growth, or by the sign "-", characterizing the decrease.

Year	The level of disability (‰)		Absolute growth (‰)	
	city	village	city	village
2000	8,5	7,2		
2001	9,5	9,7	1,0	2,5
2002	8,9	9,7	-0,6	0

$$AG = L_{this\ year} - L_{last\ year}$$

The **growth rate** is calculated as the percentage of the next (level) to the previous one.

Year	The level of disability (‰)		Growth rate (%)	
	city	village	city	village
2000	8,5	7,2		
2001	9,5	9,7	111,8	134,7
2002	8,9	9,7	93,8	100

$$GR = \frac{L_{this\ year}}{L_{last\ year}} \times 100\%$$

The **Gain rate** characterizes the amount of growth (decrease) in relative indicators in % and is defined as the percentage ratio of the absolute increase (decrease) to the previous level of the series; is indicated by the sign "+" (increment) or by the sign "-" (decrease).

Year	The level of disability (‰)		Gain rate (%)	
	city	village	city	village
2000	8,5	7,2		
2001	9,5	9,7	1,0	2,5
2002	8,9	9,7	-0,6	0

$$G = \frac{AG}{L_{last\ year}} \times 100\%$$

Indicators of time series can be calculated in the form of basic and chain indicators.

Basic indicators are usually determined in relation to the initial level of the series. Chain - starting from the beginning to the end of the series in turn.

Also, how the final figures can be calculated:

The average level of the series over the entire observation period is the arithmetic mean.

Average absolute growth - as the average of the arithmetic mean

Average growth rate - as an average geometric value

Mechanical transformation of series

1. the intervals' enlargement – Integration of the interval is carried out in simple dynamic series by summing the data for a number of adjacent levels. For example, quarterly summation of monthly size of incidence.

2. the moving average calculation – the arithmetical mean for 3 years;

3. the group mean counting.

The essence of the method of smoothing over the moving average is that each level is replaced by an average of it and its neighboring levels.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
The proportion of disabled people of the first group	11,3	12,0	11,8	12,2	13,1	12,6	11,9	12,9	12,9	11,3
moving average	-	11,7	12,0	12,4	12,6	12,5	12,5	12,6	12,4	-

Fig. 4.1. The moving average calculation.

The calculation of the group mean consists in determining the average value of each aggregated period (summation of adjacent levels of neighboring periods and dividing the sum by the number of terms)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
The proportion of disabled people of the first group	11,3	12,0	11,8	12,2	13,1	12,6	11,9	12,9	12,9	11,3
group mean	11,7		12,0		12,9		12,4		12,1	

Fig. 4.2.The group mean counting.

Calculation of the seasonal component of the time series

Table 4.1. Seasonality indicators of children's injuries in Orenburg

Month	Days in a month	Average number of injuries per month	Average per day	Seasonal component	
				abs.	%
January	31	905	29,20072	0,773359	77,3%
February	28	1003	35,83333	0,949019	94,9%
March	31	1105	35,64875	0,94413	94,4%
April	30	1417	47,24074	1,251135	125,1%
May	31	1398	45,10036	1,194449	119,4%
June	30	1125	37,4963	0,993061	99,3%
July	31	1154	37,21147	0,985518	98,6%
August	31	1255	40,46953	1,071805	107,2%
September	30	1327	44,24444	1,171781	117,2%
October	31	1179	38,02509	1,007066	100,7%
November	30	961	32,04444	0,848673	84,9%
December	31	952	30,72043	0,813607	81,4%
Total	365	13781,78	37,7583	1	100,0%

The task for independent work

1. Align a time-series by a way of moving average, represent graphically the obtained data.

2. Calculate indicators of a time-series − an absolute growth, growth indicators, gain rate, obviousness indicators.

Problem 1.

Tuberculosis prevalence per 100 thousand population in the Russian Federation

Years	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Disease	57,8	67,5	73,9	84,2	81,5	78,3	65,6	66,7	66,8	68,0

Problem 2.

Quantity dynamics of the children with complicated forms of pneumonia (atelectases, destruction), treated in pulmonological department

Years	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of children with complicated course of pneumonia	50	9	15	26	31	25	18	16	39	26

Problem 3.

Dynamics of general mortality of the Stavropol Territory population

Years	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
The total death rate,	13,2	13,1	12,8	13,4	13,9	14,0	14,6	14,9	14,3	14,4

Problem 4.

Dynamics of a network of independent children's hospitals in the Russian Federation

Years	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Children's hospitals, in total	503	487	476	471	463	459	452	442	435	433	429

Problem 5.

Development dynamics of day hospitals in system of the pediatric aid to children

Years	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Number of children's day hospitals of all types	160	65	206	224	264	300	401	423	457	489

Problem 6.

Dynamics of an infantile death rate indicator in the Russian Federation

Years	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Infantile death rate per 1000 children, born alive	18,1	17,4	17,2	16,5	16,9	15,3	14,6	13,2	12,4	11,6

Problem 7.

Share of expenses for public health services in structure of expenses of the city budget

Years	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Share of expenses, %	17	16	13	12	10	8	9	8	7	6

Problem 8.

Dynamics of the newborns general morbidity in Stavropol Territory

Years	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Morbidity, ‰	419	445	462	421	399	409	381	368	360	383

Problem 9.

Dynamics of maternal mortality index in the Russian Federation per 100 thousand born alive

Years	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Level of maternal death rate	54,9	68,1	32,2	44,0	44,2	39,7	36,5	33,6	31,9	23,4

Problem 10.

Dynamics of primary disablement (per 100 thousand population of able-bodied age) in Stavropol Territory

Years	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
disablement level	681	632	612	589	546	680	685	672	678	725

Problem 11.

Dynamics of anaemia prevalence per 10 thousand children's population of the Stavropol city

Years	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Morbidity level	35,6	69,7	63,9	67,5	68,4	54,8	52,5	56,8	47,8	50,2

Problem 12.

Dynamics of a breast cancer death rate (per 100 thousand women)

Years	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Death rate	13,9	14,5	14,8	14,6	14,1	15,9	16,5	17,3	18,1	16,7

Tests

1. WHAT TIME SERIES CAN BE?
1) complex
2) interval
3) moment
4) variational

2. DIFFERENCE OF LEVELS OF THIS YEAR AND PREVIOUS INDICATES…
1) rate of increase
2) growth rate
3) absolute increase
4) the value of 1% increase
5) level of distribution

3. RATIO OF ABSOLUTE INCREASES TO THE PREVIOUS LEVEL EXPRESSED AS A PERCENTAGE SHOWS…
1) absolute increase
2) the value of 1% increase
3) rate of increase
4) growth rate
5) level of distribution

4. WHAT IS THE RATE OF INCREASE?
1) The ratio of the next level to the previous one
2) The ratio of absolute growth to growth rate
3) The difference between the levels of a given year and the previous one
4) The ratio of absolute growth to the previous level, expressed as a percentage

5. HOW TO CALCULATE THE ABSOLUTE INCREASE?
1) The ratio of the next level to the previous one
2) The difference between the levels of a given year and the previous one
3) The ratio of absolute growth to the previous level, expressed as a percentage
4) The ratio of absolute growth to growth rate

6. WHEN IS IT NECESSARY TO APPLY THE METHODS OF CONVERTING THE TIME SERIES?
1) in cases where there is no pronounced trend
2) to confirm a pronounced trend
3) it is always desirable
4) it is optional

7. BY WHAT METHODS CAN YOU CONVERT THE TIME SERIES?
1) mixed

2) mathematical
3) mechanical
4) magical

8. WHICH OF THE METHODS REFERS TO THE METHODS OF MECHANICAL TRANSFORMATION OF TIME SERIES?
1) the method of linear smoothing
2) the method of exponential smoothing
3) method of integration of the interval
4) the subtraction method

9. WHAT IS THE METHOD TO APPLY TO METHODS OF MATHEMATICAL TRANSFORMATION OF TIME SERIES?
1) method of integration of the interval
2) the subtraction method
3) logarithmic analysis method
4) the method of exponential smoothing

10. WHAT IS THE ESSENCE OF THE METHOD OF INTEGRATION OF INTERVALS?
1) Each level is replaced by an average of the same and neighboring levels
2) In calculating the average value of each aggregate period
3) In the summation of data for a number of adjacent levels
4) In obtaining the data difference for a number of adjacent levels

5. CORRELATION AND REGRESSION ANALYSIS

Main questions

1. Relationship between factors. Types of statistical relationship: functional, correlation.
2. Coefficients of correlation (Pearson, Spearmen), calculation and assessment.
3. Linear and non-linear regression analysis.

Theoretical information

- ***The functional relationship*** describes the strong dependence of phenomena on the strictly defined amount.
- ***Functional relationship*** is determined by physical, mathematical and chemical phenomena. It can be represented in formulas.
- ***Functional relationship*** is not a subject of study in medical statistics

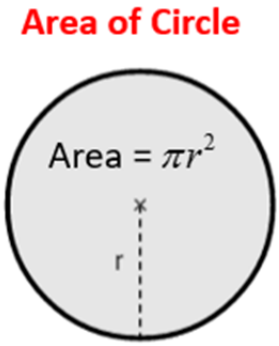


Fig. 5.1.Types of relationship between factors(functional relationship).

- With a **correlation relationship**, changing one value can lead to a change in the other by **different values**.

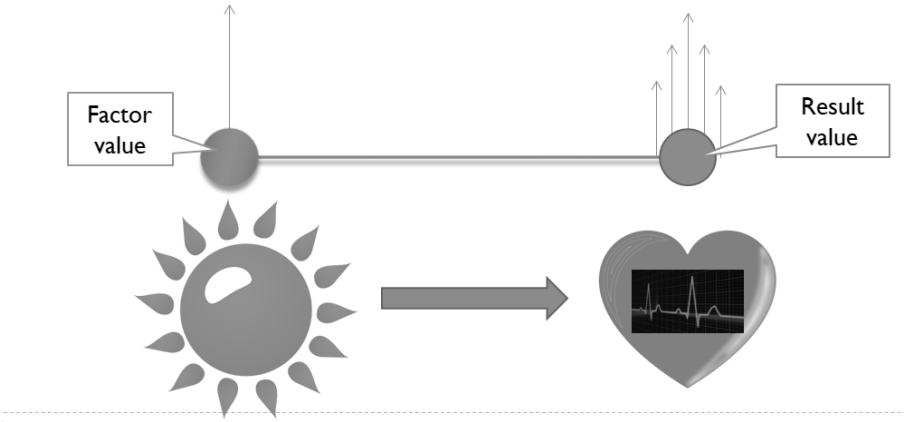


Fig. 5.2.Types of relationship between factors (correlation relationship).

- Correlation relationship may be **positive – direct relationship** (at one sign increase another one increases) and **negative – back relationship or reverse** (at increase in one indicator another one decreases).

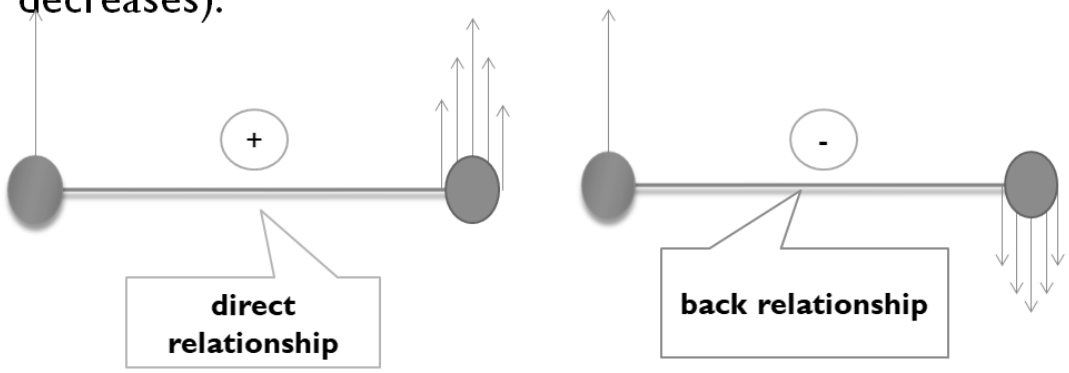


Fig. 5.3.Types of correlation relationship.

Relationship strength	Relationship direction	
	direct (+)	reverse (-)
Strong	from + 1 to +0,7	from - 1 to - 0,7
Medium	from + 0,699 to + 0,3	from - 0,699 to - 0,3
Weak	from + 0,299 to 0	from - 0,299 to 0

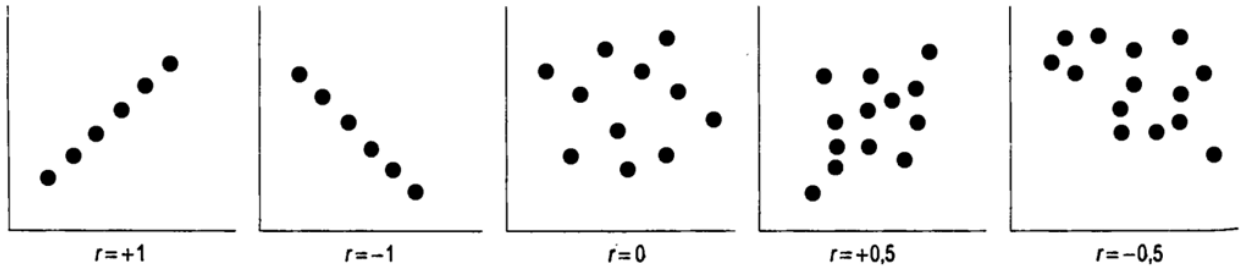


Fig. 5.4.Types of correlation relationship by power.

Correlation coefficients

- **Pearson correlation coefficient**– quantitative variables that have a normal distribution are compared.
- **Spearman's rank correlation coefficient**– quantitative variables are compared with a distribution different from normal.
- **Kendall rank correlation coefficient** – at least one of the compared variables is qualitative (ordinal).

- **Coefficient of gamma**– there are many repeating values.

The Pearson correlation coefficient is calculated by the following formula:

$$r = \frac{\sum d_x d_y}{\sqrt{\sum d_x^2 \times \sum d_y^2}}$$

where: r - correlation coefficient;

x and y are correlated series;

dx and dy are the deviations of each of the numbers of the series from their averages.

Since most medical studies rarely manage to obtain a distribution that is close to normal, the Spearman rank correlation method is often used to assess the relationship between feature pairs.

The coefficient of rank correlation is calculated by the formula:

$$\rho = 1 - \frac{6\sum d^2}{n(n^2 - 1)}$$

where:p - coefficient of rank correlation;

d - difference of ranks (sequence numbers of series)

n is the number of correlated pairs of rows.

Let us illustrate the calculation of the rank correlation coefficient in the following example. There is an opinion that the birth rate in the region depends on the share of the rural population. It is necessary to find the presence, direction and strength of the connection and draw a conclusion. In Table 5.1 the first two columns contain data on the share of the rural population in different regions of Russia and the corresponding levels of fertility. In the following graphs, the sum of the squares of the difference in rank is calculated successively.

Table 14. Calculation of Spearman's rank correlation coefficient by the example of the correlation between the birth rate and the share of the rural population in different regions

X **Share of rural population (%)**	**y** **The birth rate (‰)**	**Ranking places**		d	d^2
		RankX	**Rank**y		
21,5	9,9	1	2	-1	1
28,9	9,6	2	1	1	1
29,4	10,1	3	3,5	-0,5	0,25
34,1	10,1	4	3,5	0,5	0,25
37,4	11,7	5	7	-2	4
38,4	10,7	6	6	0	0
38,6	10,2	7	5	2	4
					$\sum d^2 = 10,5$

It is necessary to arrange the data of one of the rows (x) in ascending order (they are already arranged in the table). Since the values of the second series (y) are related to the values of the first row, then naturally there can be no uniform increase or decrease of them. For each of the series we determine the ranks, i.e. we arrange the ordinal numbers of the values in ascending order. Because in the second row there are two identical values of the birth rate, then for each of them we enter the value of the arithmetic mean of their ordinal numbers. In the next column, we line by line the difference in rank. In the last column, row by row the difference of the ranks is squared, and we get the sum of the squares of the difference in rank. The obtained data is substituted into the formula.

$$\rho = 1 - \frac{6\sum d^2}{n(n^2-1)} = 1 - \frac{6 \times 10{,}5}{7 \times (7^2-1)} = 0{,}8$$

Before making a conclusion, it is necessary to estimate the reliability of the value of the obtained coefficient by calculating the average error of the rank correlation coefficient and the reliability criterion:

$$m_\rho = \pm\sqrt{\frac{1-\rho^2}{n-2}} = \pm\sqrt{\frac{1-0{,}8^2}{7-2}} = \pm 0{,}3$$

$$t = \frac{\rho}{m_\rho} = \frac{0{,}8}{0{,}3} = 2{,}7$$

It can be concluded that there is a strong direct correlation between the birth rate in different regions and the share of the rural population. The higher the proportion of the rural population in the region, the higher the birth rate. Since the reliability criterion is more than 2, this conclusion can be considered reliable with a probability of more than 95.5%.

Regression analysis

- It is necessary to identify the presence, strength and degree of influence of one or several factor quantitative characteristics on the resultant one.
- The results of the regression analysis can be used to predict the values of the effective trait from the known values of the factor.

Linear Regression Equations

One-factor model: $y_i=b_0+b_1x_i+c_i$

- y_i - the dependent, outcome or response variable. if we know the value of x, and is called the fitted value of y;
- b_0 and b_1 – unknown parameters (coefficients of the equation);
- X_i– factor variable;
- C_i– observation errors or Residual

Multiple linear regression

$$y_i=b_1x_1+_ib_2x_{2i}+ + b_px_{pi} + b_0+c_i$$

The task for independent work

Problem 1.

Is there a relation between the work experience at the machine-building enterprise and morbidity indicators of workers?

The work experience	Up to 1 year	1-3 years	4-5 years	6-10 years	11-15 years	16-20 years	21-25 years	26 and more
Number of cases of diseases per 100 workers	59,6	41,9	40,8	64,7	64,7	77,5	83,6	112,8

Problem 2.

Is there a relation between the age of flu patients and a death rate from this disease?

Age of the diseased in years	Under 1 year	1-4	5-9	10-14	15-17	18-20	21-30	31-40	41-50	51-60	61 and older
Death rate per 100000 persons	68,3	57,7	55,9	24,7	55,9	42,1	67,9	86,6	89,4	106,7	158,2

Problem 3.

Is there a relation between the age of men and a death rate?

Age in years	0-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65 and older
Death rate per 100000 persons	801,0	272,0	194,7	296,8	624,1	922,8	2624,4	4324,5	9275,1

Problem 4.

Is there a relation between a part of a contingent being often ill (OI) and the age of children?

Age in years	Under 1 year	1-2	3-4	5-6	7-8	9-10	11-12	13-14
Part of OI	28,5	48,2	44,9	38,7	38,7	27,9	24,2	20,1

Problem 5.

Is there a relation between the age and frequency of sight infringement at children?

Age in years	0-3	4-5	6-7	8-9	10-11	12-13	14-15	16-17
Infringements of sight, ‰	18,9	20,7	31,4	42,7	42,1	54,6	54,6	92,0

Problem 6.

Is there a correlation between a serial number of a month of the year and frequency of the appeal for the first and urgent medical aid concerning cardiovascular diseases by the population

Month	January	February	March	April	May	June	July	August	September	October	November	December
Frequency of appeal for FUMA ‰	114,3	108,3	109,7	103,2	104,5	95,2	98,4	97,8	87,6	92,7	92,7	96,4

Problem 7.

Is there a relation between the distance from a residence to the enterprise and the workers' morbidity?

Distance in metres	To 500 m	600-1000	1100-3000	3100-4000	4100-5000	5100-7000	7100-9000	9100 and more
Workers' morbidity %	920,1	887,9	920,1	954,0	1286,3	1107,8	1510,8	1832,7

Problem 8.

Is there a relation between the time passed from the onset of cholecystitis acute attack prior to the beginning of operation and frequency of postoperative complications?

Time in hours	up to 3 hours	3-5	6-8	9-11	12-14	15-17	18-20	21-23	24 and more
Frequency of complications in %	8	8	12	19	20	24	21	35	46

Problem 9.

Is there a relation between the age group and frequency of suicides at men?

Age group of died, years	Under 20	20-29	30-39	40-49	50-59	60-69	70 and older
Frequency of suicides per 100 thousand people	4,1	28,5	43,8	54,8	54,8	48,2	75,5

Problem 10.

Is there a relation between the age group of men and prevalence of mental diseases?

Age group, years	0-4	5-9	10-14	15-19	20-24	25-29	30-39	40-49	50-59	60-69	70 and older
Morbidity of %	16,2	35,4	31,2	8,1	10,2	35,0	31,4	53,1	58,8	30,5	19,2

Problem 11.

Is there a relation between the age of a child and quantity of patients with clubfoot caused by spastic paresis in the lower extremities?

Age	Under 1 month	1 3 months	4 - 6 months	7-9 months	10-12 months	1-2 years	2-3 years	3 years and older
patients	8	12	8	2	4	6	6	2

Problem 12.

Is there a relation between age group and level of traumatism at men?

Age group of men, years	Children from 0 to 14 years	15-17	18-19	20-29	30-39	40-49	50-59	60-69	70 and older
traumatism rate per 100 thousand people	72,3	165,6	233,6	196,9	157,2	176,3	153,3	141,9	97,2

Tests

1. WHAT IS A CORRELATION RELATIONSHIP?

1) describes the strong dependence of phenomena on the strictly defined amount.

2) The relationship in which changing one value can lead to a change in the other by different values.

2. BY THE DIRECTION CORRELATION RELATIONSHIP MAY BE

1) direct and reverse
2) strong and weak
3) parallel
4) only the inverse
5) positive and negative

3. STRENGTH CORRELATION RELATIONSHIP MAY BE

1) direct and reverse
2) strong, medium and weak
3) parallel
4) only the inverse
5) positive and negative

4. DIRECT CORRELATION RELATIONSHIP MEANS SUCH CONTACT WHEN

1) increase (decrease) of one value corresponds to an increase (decrease) associated with it another
2) an increase (decrease) in one value corresponds to a decrease (increase) associated with it another
3) there is an increase in the value of the characteristic by some amount
4) the value of the characteristic decreases by some amount

5. AT THE VALUES OF THE CORRELATION COEFFICIENT 0 - 0.29 SAY OF

1) strong relationship
2) connections of medium strength
3) weak relationship
4) about its absence
5) its presence

6. AT THE CORRELATION FACTOR VALUES 0.3 - 0.69 SAY ABOUT

1) strong relationship
2) relationship of medium strength
3) weak relationship
4) about its absence
5) its presence

7. AT THE CORRELATION FACTOR VALUES 0.7 - 1.0 SAY ABOUT

1) strong relationship
2) connections of medium strength
3) weak relationship
4) about its absence
5) its presence

8. WHAT COEFFICIENT IS CALCULATED BY THIS FORMULA?

$$r = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sqrt{\sum (x - \bar{x})^2 \sum (y - \bar{y})^2}}$$

1) Kendall rank correlation coefficient
2) Spearman's rank correlation coefficient
3) Pearson correlation coefficient
4) Coefficient of gamma

9. WHAT COEFFICIENT IS CALCULATED BY THIS FORMULA?

$$\rho = 1 - \frac{6\sum d^2}{n(n^2 - 1)}$$

1) Kendall rank correlation coefficient
2) Spearman's rank correlation coefficient
3) Pearson correlation coefficient
4) Coefficient of gamma

10. WHY IS REGRESSION ANALYSIS NECESSARY?

1) it is determined by physical, mathematical and chemical phenomena. It can be represented in formulas.
2) It is necessary to identify the presence, strength and degree of influence of one or several factor quantitative characteristics on the resultant one.

6. A TECHNIQUE OF DEMOGRAPHIC PROCESSES STUDYING

Main questions

1. Medical demography, subject and its maintenance.
2. Statics of population, definition, significance for health service.
3. Population dynamics, definition, significance for health service.
4. Reproduction of population, types, indexes.
5. Mortality of population, indexes, methodology of calculation.
6. Infant mortality rate, age peculiarities, reasons.
7. Perinatal mortality rate. Fetal mortality rate, early neonatal rate, methodology of calculation.
8. Average life expectancy.

Theoretical information

Definition of Demography

Demography is a science about the population and its social development

Demography studies 3 aspects of a population

- Changes in population size
- Composition of population
- Distribution of population on the territory

Demography studies:

- numerical structure of the population;
- shares of the population according to gender, age, social and professional groups;
- accommodation and movement of the population around the territory;
- causes and effects of changes in population structure;
- interrelation of socio-economic factors and the changes.

IMPORTANCE OF DEMOGRAPHIC STATISTICS

- natural movement indicators calculation
- planning the work of the whole health system
- determining the need for different types of medical care
- determine the required amount of budgeted funds for health care
- the organization of anti-epidemic work, etc.

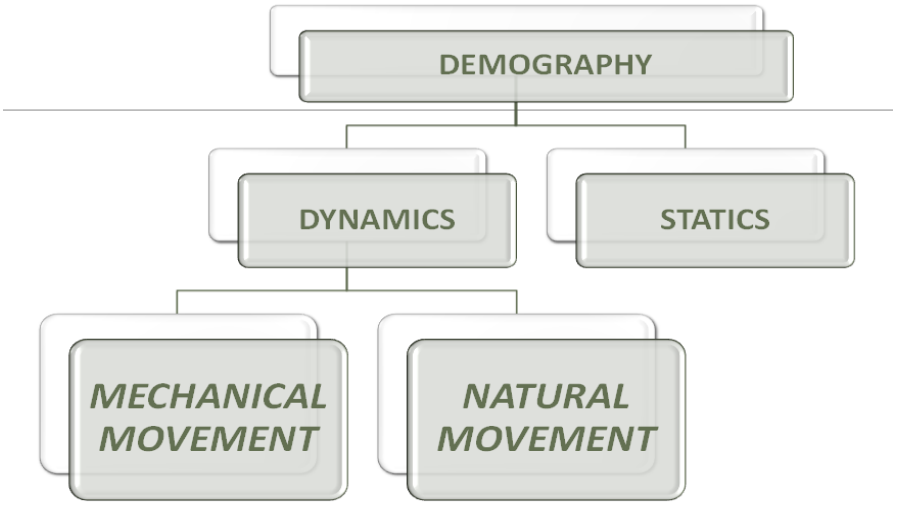


Fig. 6.1.Demographic sections

Statics of the population (the population at a given time, composition of the population by sex, age, occupation, marital status, language, education, etc.).

Population Dynamics (changes in the number of people): the mechanical movement of the population and the natural movement of the population or reproduction.

Population census is the main method for estimation of population static. Population census is the special scientifically organized state statistical operation for account and analysis of the size of the population, its structure and distribution around the territory.

Features of population census

– Periodicity (in the majority of the countries PCs are carried out in every 10 years, in economically advanced - in 5 years).

– Generality (scope of all population).

– Unity of a technique (presence of the uniform program of census as census sheet).

– Single character (the population is taken into account for the certain moment when the population conducts the most settled way of life).

– Collecting data by method of interrogation by means of copyists without obligatory documental confirmation.

– Centralized method of data processing.

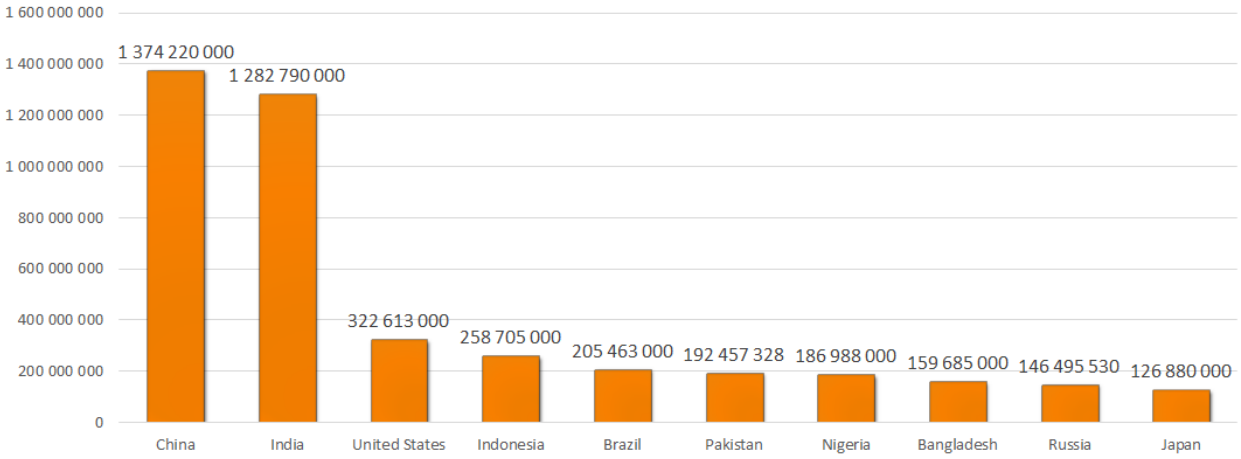


Fig. 6.2.Population of the countries of the world for 2016

Age structure of the population

The ages groups	The type of age structure of population		
	Regressive	Stationary	Progressive
Till 14 years (A)	A < C	A = C	A > C
From 15 to 49 years (B)	~ 50%	~ 50%	~ 50%
50 years old and older (C)	C > A	A = C	C < A

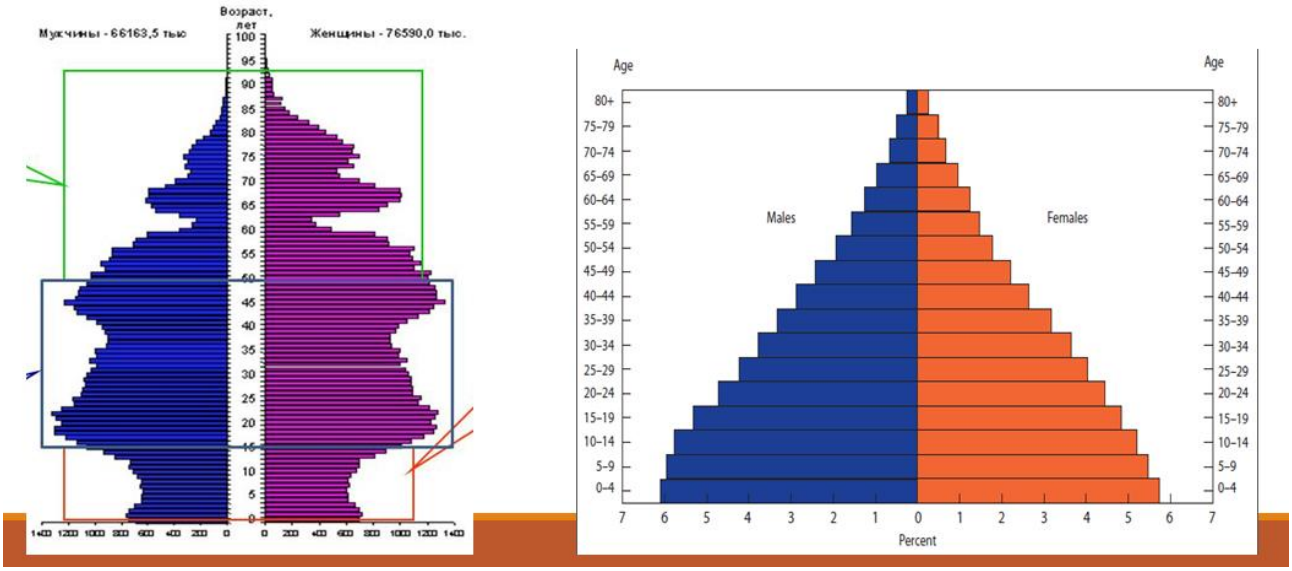


Fig. 6.3.Age-sexual population pyramid. Russia and India

Mechanical movement of the population

Human migration is the movement of people from one place to another with the intentions of settling, permanently or temporary in the new location.

The main reasons for migration: socio-economic, political, military, natural and climatic. The last ones include natural disasters (earthquakes, floods, etc.).

Types of migration

- Irrevocable migration (with a constant change of residence)
- Revocable (temporary)
- Seasonal migration
- Pendulum migration (commuting rides to and from work or study outside their locality)
- External (emigration, immigration) and internal (interregional migration and resettlement of residents from rural to urban)
- Over the last 2 centuries, the world population is characterized by the process of urbanization (from the Latin «urbs» - city) - increasing the role of cities in the development of society

Migration has a great medical and social importance

- Urbanization alters the way the environment affects the structure of morbidity and mortality
- Pendulum migration - leads to an increase in injuries and contributes to the spread of infectious diseases
- Seasonal migration leads to uneven loading of medical organizations
- Health indicators of migrants differ from health indicators of the indigenous population

The natural movement of the population - a set of processes of birth, mortality and natural growth that provide generational renewal and change.

The main components of the population natural movement

- **birth rate** (natural process of the population renewal)
- **mortality** (the process of natural population decline)
- **population growth**
  - If birth rate exceeds death rate of a population => natural increase of a population
  - If death rate exceeds birth rate of a population => natural decrease of a population (depopulation)
- **average life expectancy**

Birth rate is characterized by statistically registered number of live births in a given population over a certain period of time.

For the analysis of major trends of natality the following statistics indicators are used:

- The total fertility rate
- Special fertility rate
- Age-specific birth rates
- Aggregated fertility rate

Method of calculating the total fertility rate

$$\frac{\text{the total number of live births per year} \times 1000}{\text{average annual population}}$$

Evaluative levels of total fertility rate (WHO):

High higher than 25 ‰

Medium 15-25 ‰

Low up to 15 ‰

Factors affecting natality

- Age, sex and marital structure of the population
- The social position of women
- The level of material well-being
- The cultural level
- Living conditions
- Urbanization, migration
- National traditions, religious factors
- Demographic aging of population
- State demographic policy

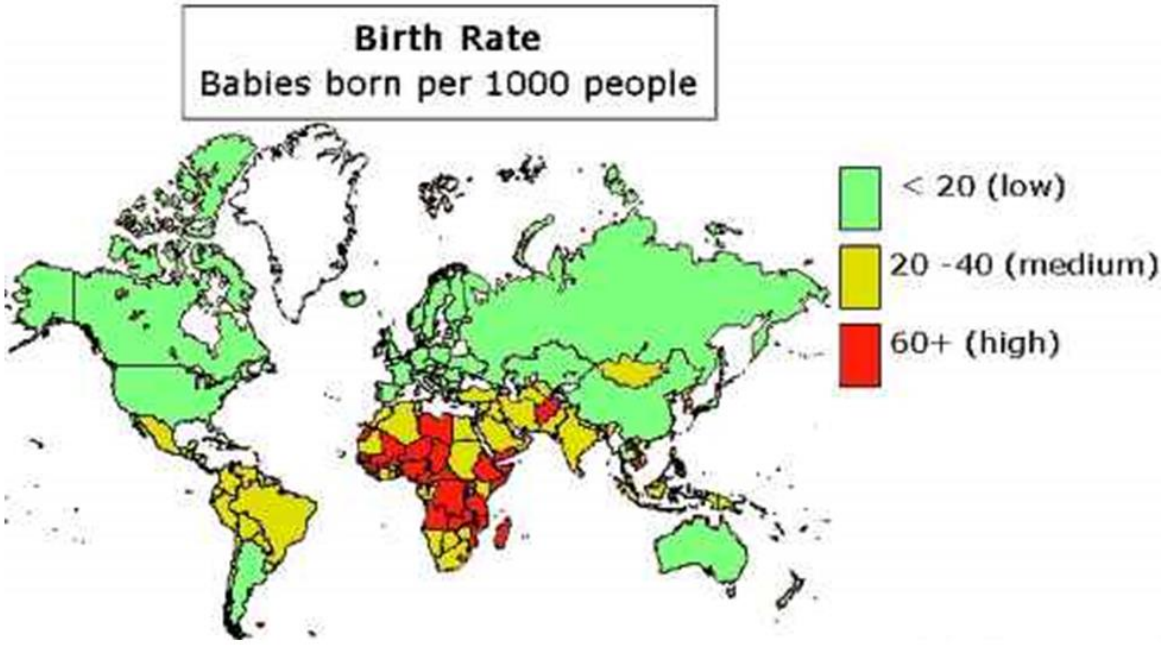


Fig. 6.4. World fertility rate

Mortality

Mortality is characterized by statistically recorded number of deaths in a given population over a certain period of time

For the analysis of mortality statistics are used:

• Crude death rate (total mortality rate)

• Age-specific death rates

• Indicators of mortality patterns per reasons

• The maternal mortality rate

• The infant and child mortality coefficients

• Perinatal mortality rate and Coefficient of stillbirth

Method of calculating the crude death rate

$$\frac{\text{the total number of deaths per year} \times 1000}{\text{average annual population}}$$

Evaluation levels of total mortality (WHO):

Low 7-10 ‰

Medium 11-15 ‰

High 16-20 ‰

Factors affecting the mortality rate

- Demographic aging of the population (in the age structure when more than 12% of persons are aged 60 years and older)
- Lifestyle of the population

- The current state of medical science
- The availability and quality of care, and others.

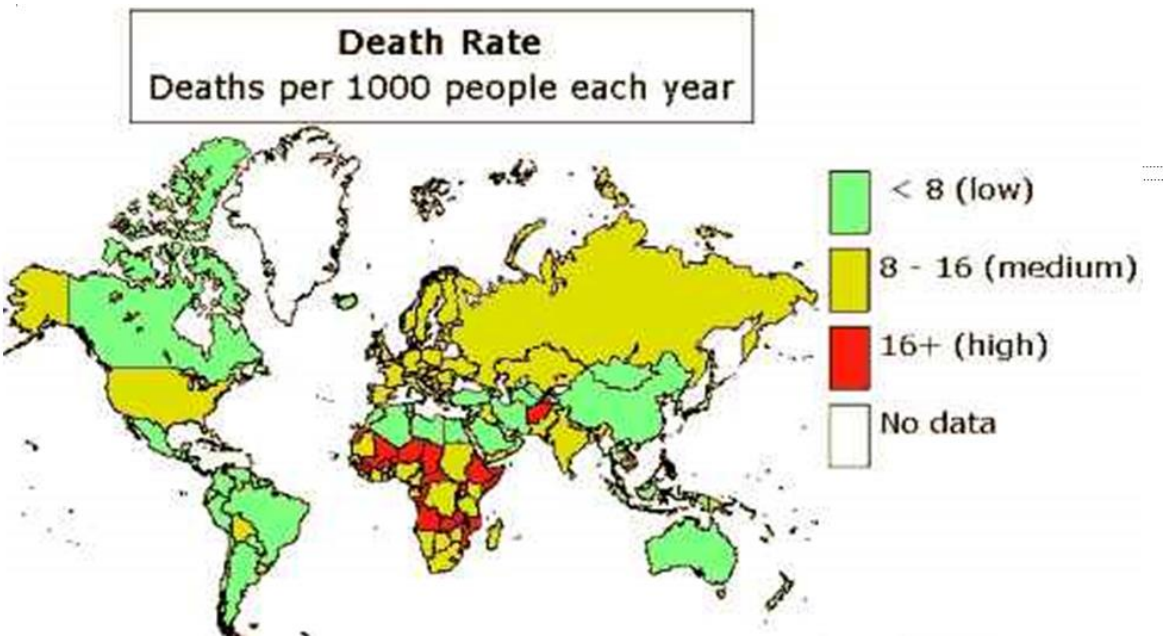


Fig. 6.5. Mortality rate in the world

Infant mortality - deaths of children in the first year of life

A simple way to calculate the infant mortality rate (crude rate):

$$\frac{\text{the number of children who died during the year at the 1st year of life}}{\text{the number of live births in given calendar year}} \times 1000$$

The calculation methodology of the infant mortality rate recommended by the WHO (Raatz formula)

$$\frac{\text{the number of children who died during the year at the 1st year of life} \times 1000}{\text{2/3 live births in a given calendar year} + \text{1/3 live births in the previous year}}$$

Evaluation levels of the indicator according to the WHO:

Very low 6-10 ‰,

Low 11-15.‰,

Medium 16-23.‰,

High above 24‰.

Causes of infant mortality (by primary causes of death)

- Certain conditions originating in the perinatal period
- Congenital anomalies (malformations) and chromosomal abnormalities
- Respiratory diseases
- External causes
- Factors affecting infant mortality: mother's health and way of life, the pregnant woman should in time be registered in the antenatal clinic, peculiarities of pregnancy, labor (parturition) management tactics, newborn care , etc.

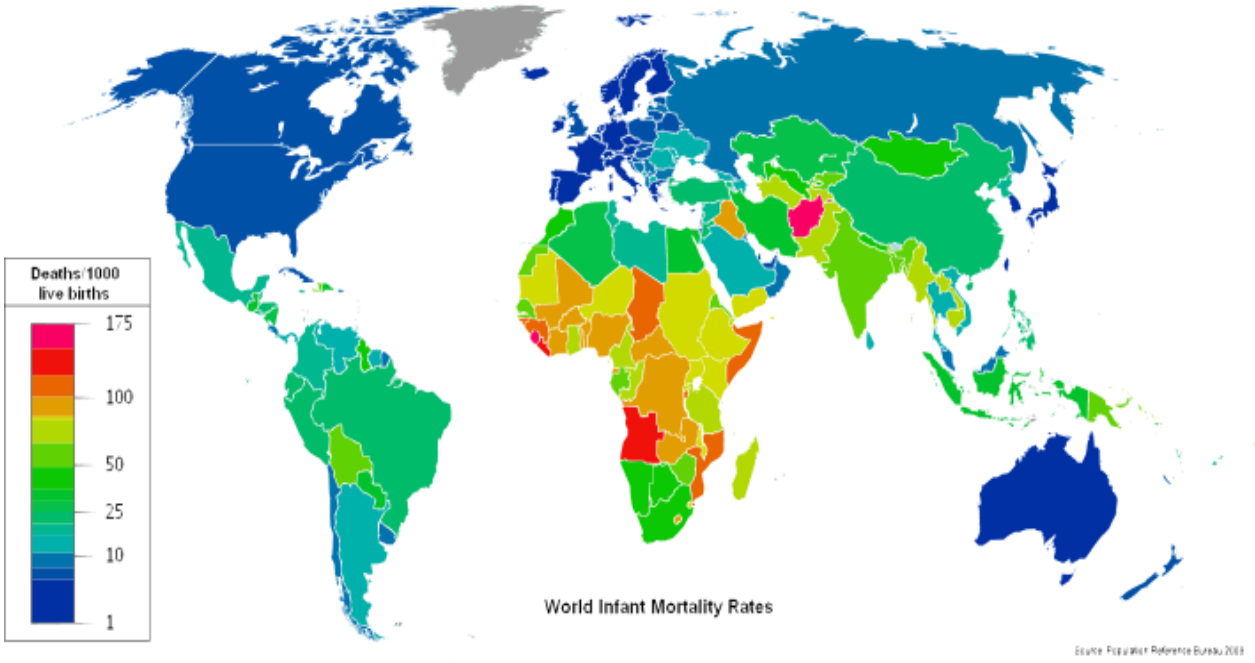


Fig. 6.6. World Infant Mortality Rates

Perinatal mortality (mortality in the perinatal period: 22 weeks of gestation before birth, during childbirth, in the first 168 hours of life)

$$\frac{\text{number of born dead + the number of deaths during the first 168 hours of life} \times 1000}{\text{the number of live and dead births}}$$

The main causes of perinatal mortality: states of the perinatal period, congenital anomalies, hemolytic diseases of the newborn, fetal infection

The task for independent work

Calculate indicators of population natural dynamics:

1.An indicator of birth rate, the general death rate, population natural increase.

2.An indicator of infant mortality, death rate of newborns, perinatal death rates, early neonatal death rates and mortinatality.

3.Define structure of the reasons of infant mortality.

4.Estimate demographic indicators on the basis of the accepted average levels.

5.Define the type of reproduction of the population, developed in settlement.

6.Compare the calculated demographic indicators for a year of account to corresponding indicators of a previous year.

7.Represent graphically the level of birth rate, the general death rate, population natural increase, structure of the reasons of infant mortality.

Problem 1.

In the city of V in a year of account the population consisted of 75100 persons, including 18500 children from 0 till 14 years old inclusive, and 38320 persons of able-bodied age. 900 children were born, 1200 persons have died, including 18 infants under 1 year of age (of them: aged under 1 month – 14, and at the first week of life – 11 persons). 8 children were born dead.

The number of those who died aged under 1 year was distributed by causes of death as follows: due to separate conditions of the perinatal period 11 children have died, with congenital anomalies – 4, with respiratory diseases – 2, by other reasons –1.

Demographic indicators of the previous year in the city of V.

Indicator	Level	Indicator	Level
Number of the born	850 people	Perinatal death rate	16 ‰
Birth rate	11 ‰	Early neonatal mortality	10 ‰
Death rate	13 ‰	Neonatal mortality	12,3 ‰
Natural increase	-2 ‰	Mortinatality	6,6 ‰
Infant mortality	17 ‰		

Problem 2.

In the city of S the population numbered 35900 persons in accounting year, including 17900 persons of able-bodied age, and people older than able-bodied age – 9500 persons. 420 children were born, 510 persons have died, including 7 under 1 year old (of them: aged under 1 month – 6 infants, and at the first week of life – 5). Three children were born dead.

The number of those who died aged under 1 year was distributed by causes of death as follows: due to separate conditions of the perinatal period 5 children have died, with congenital anomalies − 1, with respiratory diseases - 1 have died.

Demographic indicators of the previous year in the city of S.

Indicator	Level	Indicator	Level
Number of the born	450 people	Perinatal death rate	16 ‰
Birth rate	11 ‰	Early neonatal mortality	10 ‰
Death rate	13,5 ‰	Neonatal death rate	13,3 ‰
Natural increase	-2,5 ‰	Mortinatality	6,6 ‰
Infant death rate	17 ‰		

Problem 3.

In the city of Nevinnomyssk in accounting year the population numbered 112000 persons, including 28900children from 0 till 14 years inclusive, and 55450 persons of able-bodied age 1030 children were born, 1500 persons have died, including 14 under 1 year (of them: aged under 1 month – 10, and at the first week of life - 9). 7 children were born dead.

The number of those who died aged under 1 year was distributed by causes of death as follows: due to separate conditions of the perinatal period 10 children have died, with congenital anomalies – 2, with respiratory diseases − 1 have died, by the other reasons − 1 have died.

Demographic indicators of the previous year in the city of N.

Indicator	Level	Indicator	Level
Number of the born	950 people	Perinatal death rate	16 ‰
Birth rate	9,6 ‰	Early neonatal mortality	9 ‰
Death rate	13 ‰	Neonatal death rate	9,9 ‰
Natural increase	-4,4 ‰	Mortinatality	6,9 ‰
Infant death rate	14 ‰		

Problem 4.

In the city of Stavropol in accounting year the population numbered 420000 persons, including 96450 children from 0 till 14 years old inclusive, and 218400 persons of able-bodied age. 3700 children were born, 5900 persons have died, including 49 under 1 year old (of them: 38 aged under 1 month, and 33 ones of those who at the first week of life. 17 children were born dead.

The number of those who died aged under 1 year was distributed by causes of death as follows: due to separate conditions of the perinatal period 27 children have died, with congenital anomalies − 9, with respiratory diseases − 7, by the other reasons − 6 have died.

Demographic indicators of the previous year in the city of S.

Indicator	Level	Indicator	Level
Number of the born	3450 people	Perinatal death rate	12,5 ‰
Birth rate	9,2 ‰	Early neonatal mortality	6,3 ‰
Death rate	15 ‰	Neonatal death rate	8,5 ‰
Natural increase	-6,8 ‰	Mortinatality	6,2 ‰
Infant death rate	11,7 ‰		

Problem 5.

In the city of I. in accounting year the population numbered 97100 persons, including 25500children from 0 till 14 years old inclusive, and 49120 persons of able-bodied age. 870 children were born, 1490 persons have died, including 15 under 1 year old (of them: 12 aged under 1 month, and at the first week of life − 11). 3 children were born dead.

The number of those who died aged under 1 year was distributed by causes of death as follows: due to separate conditions of the perinatal period 10 children have died, with congenital anomalies − 3, with respiratory diseases − 2 have died.

Demographic indicators of the previous year in the city of I.

Indicator	Level	Indicator	Level
Number of the born	810 people	Perinatal death rate	11,9 ‰
Birth rate	8,1 ‰	Early neonatal mortality	5,9 ‰
Death rate	16 ‰	Neonatal death rate	7,8 ‰
Natural increase	-7,9 ‰	Mortinatality	3,3 ‰
Infant death rate	12,6 ‰		

Problem 6.

In the city of Lermontov in accounting year the population numbered 25200 persons, including 6200 children from 0 till 14 years inclusive, and 12750 persons of able-bodied age. 262 children were born, 418 persons have died, including 6 under 1 year old (of them: 2 aged under 1 month, and 1 at the first week of a life). 2 children were born dead.

The number of those who died aged under 1 year was distributed by causes of death as follows: due to separate conditions of the perinatal period 3 children have died, with congenital anomalies − 2, with respiratory diseases - 1 have died.

Demographic indicators of the previous year in the city of L.

Indicator	Level	Indicator	Level
Number of the born	258 people	Perinatal death rate	18,4 ‰
Birth rate	10,1 ‰	Early neonatal mortality	10,6 ‰
Death rate	15,4 ‰	Neonatal death rate	12,1 ‰
Natural increase	-5,3 ‰	Mortinatality	8,3 ‰
Infant mortality	18,6 ‰		

Problem 7.

In the city of E. in accounting year the population has made 59100 persons, including 28900 persons of able-bodied age, and 15500 persons older than able-bodied age. 712 children were born, 850 persons have died, including 12 under 1 year old (of them: 7 aged under 1 month, and 6 at the first week of life). 6 children were born dead.

The number of those who died aged under 1 year was distributed by causes of death as follows: due to separate conditions of the perinatal period 6 children have died, with congenital anomalies − 3, with respiratory diseases − 2, by the other reasons − 1 have died.

Demographic indicators of the previous year in the city of E.

Indicator	Level	Indicator	Level
Number of the born	697 people	Perinatal death rate	16,6 ‰
Birth rate	11 ‰	Early neonatal mortality	12,4 ‰
Death rate	15,5 ‰	Neonatal death rate	13,3 ‰
Natural increase	-4,5 ‰	Mortinatality	7,6 ‰
Infant death rate	17 ‰		

Problem 8.

In the city of Kislovodsk in accounting year the population numbered 134720 persons, including 67800 persons of able-bodied age, and 34900 persons of older than able-bodied age. 1077 children were born, 1750 persons have died, including 10 infants under 1 year old (of them: 8 aged under 1 month, and 5 infants at the first week of life). 7 children were born dead.

The number of those who died aged under 1 year was distributed by causes of death as follows: due to separate conditions of the perinatal period 6 children have died, with congenital anomalies − 2, with respiratory diseases − 1 have died, by the other reasons − 1 have died.

Demographic indicators of the previous year in the city of K.

Indicator	Level	Indicator	Level
Number of the born	1056 people	Perinatal death rate	10,6 ‰
Birth rate	7,4 ‰	Early neonatal mortality	6,4 ‰
Death rate	13,5 ‰	Neonatal death rate	7,3 ‰
Natural increase	-6,1 ‰	Mortinatality	4,6 ‰
Infant death rate	13 ‰		

Tests

1. WHAT ARE THE MAIN SECTIONS OF THE DEMOGRAPHY?

1) Natural and mechanical dynamics of the population
2) Statics and dynamics of the population.
3) Statics and migration of the population
4) Population structure by age and sex
5) Structure and migration of the population

2. THE STUDY OF THE REGION N. SHOWED THE INCREASE IN THE PROPORTION OF PEOPLE OF THE RETIREMENT AGE FOR THE LAST 15 YEARS. WHAT ABOUT PROGNOSIS OF HEALTH CARE ECONOMISTS ABOUT CHANGES OF SHARE OF FUNDING FOR HEALTH CARE IN THIS REGION?

1) Reduction
2)Without changes
3) Considerable rise
4) Increase
5) Insignificant downcome

3. DYNAMICS IS THE SECTION OF DEMOGRAPHY TO STUDY:

1) Number and type of population
2) Mechanical and natural movement of the population
3) Reproduction of the population
4) Migration and birth rate
5) Natural movement of population and birth rate

4.STATICS IS THE SECTION OF DEMOGRAPHY TO STUDY:

1) General and age-specific fertility
2) Geographical features of birth rate and structure of the population
3) Migration in different regions of the country
4) Number, composition and density of the population
5) Birth rate, mortality rate and reproduction of the population

5. STATISTICS OF NATURAL DYNAMICS OF POPULATION INCLUDES:

1) Natural increase, life expectancy at birth, morbidity rate, death rate
2) Birth rate, marriages, divorces, infant mortality rate, incidence rate
3) Birth rate, mortality rate, incidence rate, prevalence rate
4) Fertility, crude death rate, birth rate, pathological affection
5) Birth rate, mortality rate, population growth, life expectancy at birth

6. DETERMINE THE TYPE OF AGE STRUCTURE OF THE POPULATION IF THE PROPORTION OF POPULATION FROM 0 TO 14 IS 30%, FROM 15 TO 49 - 50% AND 50 AND OLDER - 20%?

1) Intermediate
2) Progressive
3) Stationary
4) Regressive
5) Depopulation

7. TO CALCULATE CRUDE BIRTH RATE ONE NEEDS THE FOLLOWING DATA:

1) Number of birth alive this year / Mid-year population.
2) Number of birth alive this year / Number of birth alive last year

3) Number of stillborn and birth alive this year / Number of birth alive this year
4) Number of stillborn and birth alive this year / Mid-year population
5) Mid-year population this year / Mid-year population last year

8. **TO CALCULATE CRUDE MORTALITY RATE ONE NEEDS THE FOLLOWING DATA:**

1) Mid-year population this year / Mid-year population last year
2) Number of died people this year / Mid-year population.
3) Number of dead this year / Number of births this year
4) 2/3 dead this year + 1/3 dead previous year / Number of population
5) Number of dead this year + number of stillborn this year / Number of population

9. TO CALCULATE INFANT MORTALITY RATE ONE NEEDS TO USE THE FOLLOWING DATA:

1) No. of died before 1 week this year / No. of born alive this year
2) No. of died before 1 year this year / No. of born alive this year
3) No. of died before 1 month this year / No. of born alive this year
4) No. of born alive this year + number of born alive and died before 1 week / Mid-year population.
5) No. of died before 1 year this year / Mid-year population.

10. TO CALCULATE MATERNAL MORTALITY RATE WE NEED TO USE THE FOLLOWING DATA:

1) No. of maternal deaths / Total number of pregnant women.
2) No. of maternal deaths / Total number of births.
3) No. of maternal deaths /Total number of live births
4) No. of maternal deaths / Total number of stillborn
5) No. of maternal deaths / Total number of fertile age women

7. METHOD OF STUDY AND ESTIMATION OF INDEXES OF GENERAL MORBIDITY

Main questions

1. Basic terminology of morbidity. A role and place of morbidity in the system of indexes of health of population.
2. Methods of study and types of morbidity.
3. Registration and current documents, that are used at the study of morbidity from data of official statistics, rule of their filling and account.
4. Basic data, necessary for the calculation of indexes of morbidity.
5. International classification of illnesses of traumas and reasons of death of tenth revision (ICI-10): principles of construction and value for the study of morbidity.

Theoretical information

Definitions of the concepts «disease» and «morbidity»

Disease is any subjective or objective deviation from the normal physical state of the body (WHO)

The morbidity describes the level, the structure and dynamics of disease registered in the population as a whole or in its individual groups (age, gender, regional, professional, etc.).

Importance of studying morbidity for medical science and practice

- Morbidity is one of the leading groups of **indicators of public health**.
- According to the morbidity, the **population's need for medical care** is determined.
- Personnel, material and financial resources in health care are **planned**.
- The study of **risk factors for morbidity** is the basis for **planning and conducting preventive activities** at all levels.
- Morbidity is a criterion for the **effectiveness of health care**.

The main terms characterizing the morbidity

– **Incidence** (primary disease incidence) – frequency of the new, nowhere recorded before and revealed for the first time in the given calendar year, diseases among the population;

– **Prevalence** (morbidity, accumulated disease prevalence) – frequency of all diseases existing among the population, both revealed for the first time in the given calendar year, and registered in previous years because of which the patient has appealed for medical aid in the given year again;

– **Point prevalence** – frequency of pathology among the population, determined at carrying out of single medical inspections (examinations); as a result, all the diseases are considered, as well as premorbide forms and conditions.

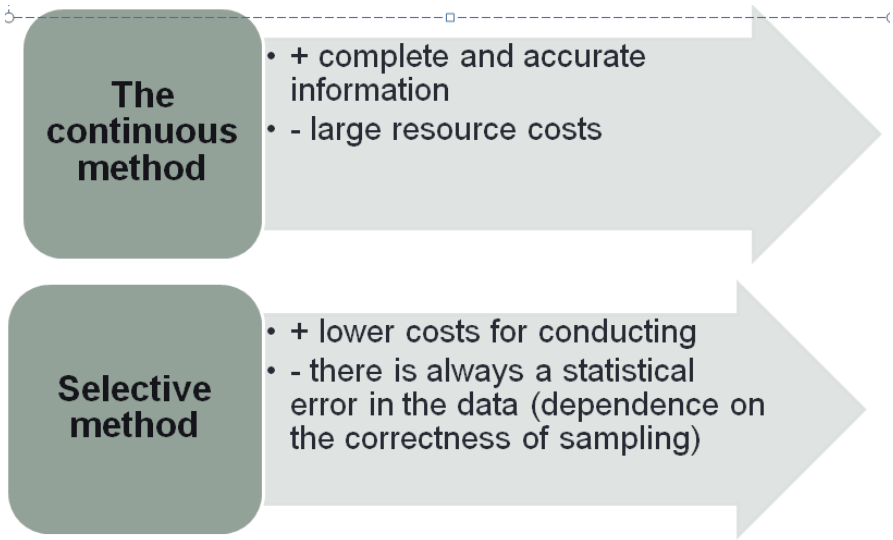


Fig. 7.1. Methodology for studying the morbidity

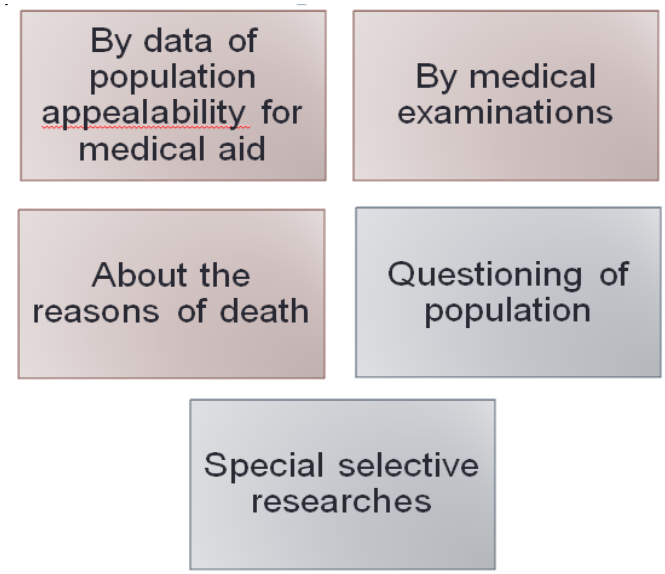


Fig. 7.2. Methods of studying the morbidity by sources of information

Fig. 7.3. Stages of studying the incidence by appeals for medical help in medical establishments

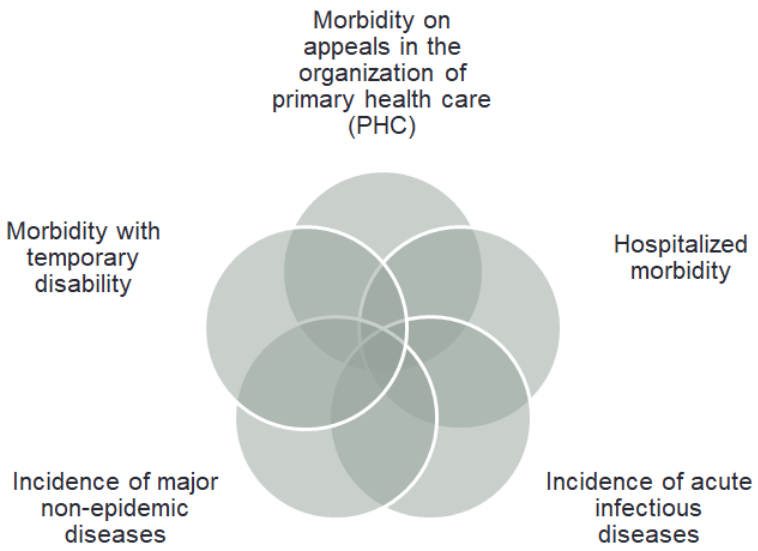
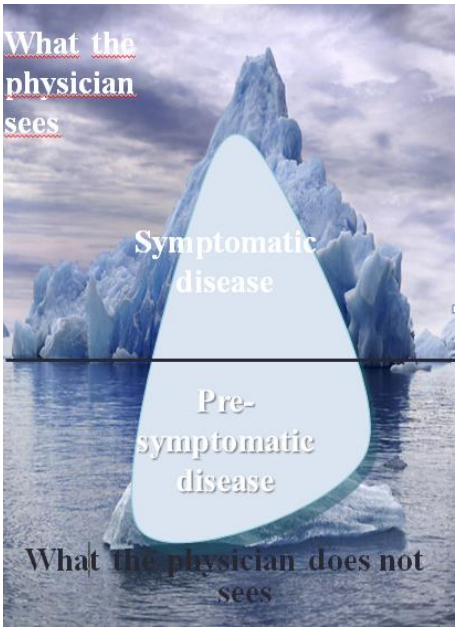


Fig. 7.4. Kinds of morbidity on appealability

Table 7.1. Advantages and disadvantages of studying morbidity by data of population appealability for medical aid (method of registration)

Advantages of method	Disadvantages of method
• availability for all layers of population; • continuous and dynamics of supervision the state the health of population; • effectiveness of diseases account; • most complete account of acute diseases; • possibility of selection of the diseases first registered during the year	• incomplete account of chronically diseases: • incomplete account of initial symptomless stages and forms of diseases; • incomplete account of diseases in cases: insufficient availability of medicare, insufficient plenitude of diseases registration and degree of specialization of medicare, bad sanitary culture of population; during service of population in private medical establishments



Iceberg of disease

The quantity of the diseases revealed in a course of appealability of the population for medical aid is great, but it is considerably below the true number of diseases, which the population suffered within a year. Disease can be compared to an iceberg which surface part are illnesses that make the population appeal to medical institutions, and underwater part is formed by those who remain unknown for medical workers. Therefore, for more complete estimation of public health by appealability data it is necessary to supplement indices with the data received as a result of medical examinations.

Fig. 7. 5. Iceberg of disease

Table 7.2. Advantages and disadvantages of studying morbidity by medical examinations

Advantages of method	Disadvantages of method
•almost a complete account of chronical diseases; • «exposure of diseases on initial stages»; • the independence of examinations' results from availability of medicare, sanitary culture of population etc.	• impossibility of account of acute diseases; • scope of only separate groups of population: children, young people, workers of some professions; • high price

Table 7.3. Advantages and disadvantages of studying morbidity by the reasons of death

Advantages of method	Disadvantages of method
• the most accurate diagnosis of diseases, including those not detected in human life; • definition of the most serious diseases that cause death	• diagnosis of diseases occurs after life.

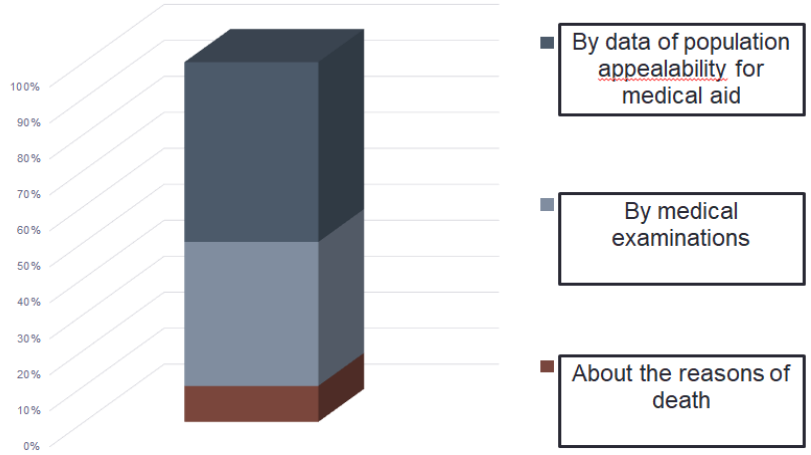


Fig. 7.6. The true (complete) morbidity

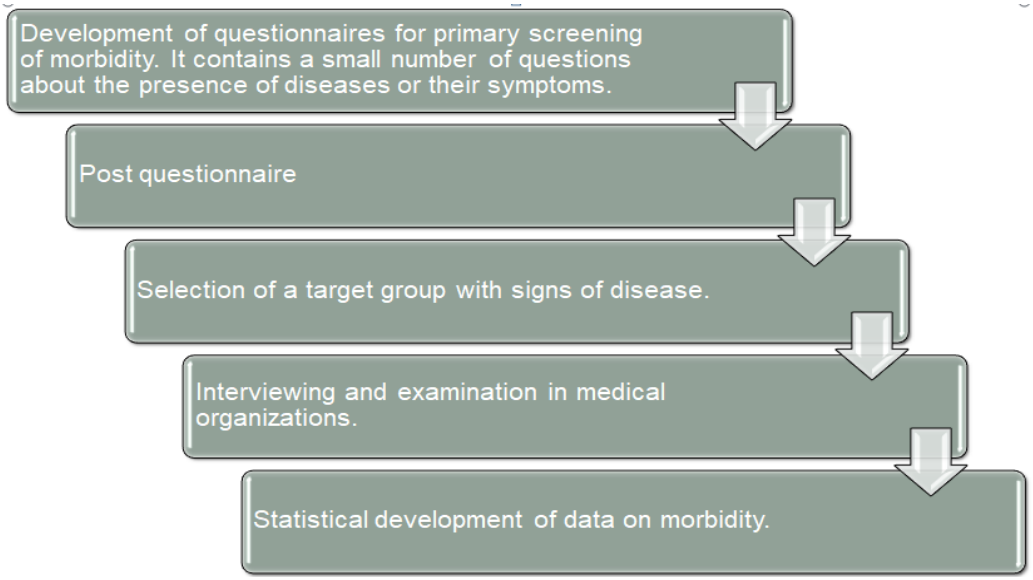


Fig. 7.7.Questioning of population

Table 7.4. Questioning of population

Advantages of method	Disadvantages of method
• It allows to identify various chronic diseases including those with which people do not seek medical help. • A relatively cheap way of forming target groups for prevention and treatment.	• Since the method is selective, there is always a statistical error. • There is a certain proportion of false positive and lop-negative answers. • There are no acute diseases.

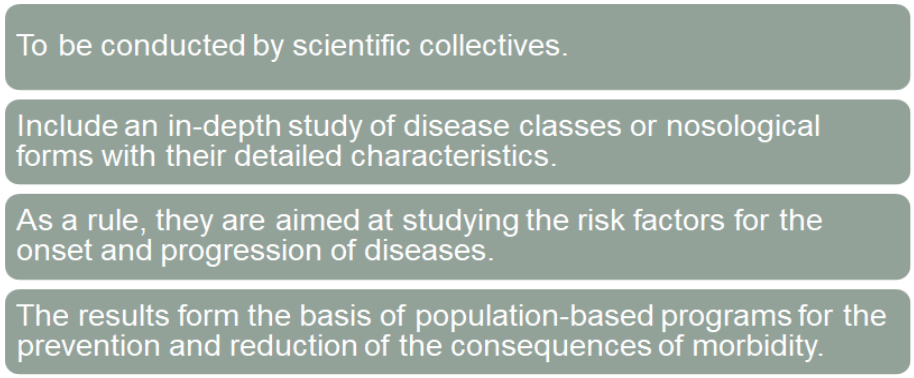


Fig. 7.8. Special selective researches

International statistical classification of diseases of the last Tenth revision (ICD-10) was ratified by the forty-third Assembly of WHCO January, 1, 1993. In obedience to the decision of the Assembly the document has a new name "International statistical classification of diseases and close problems of health protection", though the comfortable abbreviation ICD is preserved.

PRINCIPLES OF CONSTRUCTION OF INTERNATIONAL CLASSIFICATION OF DISEASES

- Etiological
- Local
- Common pathogenesis
- Diseases associated with certain physiological or age-related conditions

Table 7.5. The method of calculation of the values

Name of values	Method of calculation
Primary morbidity	Amount of diseases which are registered first at current year (all acute + first exposed chronic diseases) x 1000
	Average annual quantity of population
General morbidity (prevalence of all registered diseases)	Amount of all registered diseases during this year (acute + chronic, exposed both in current and in previous years) x 1000
	Average annual quantity of population
Structure of primary, general morbidity (prevalence)	Amount of all diseases of this class, group, nosology form registered for a year (first registered) x 100
	Amount of all (first) diseases registered for a year

Hospitalization frequency	Number of hospitalized during the year x 1000
	Average annual quantity of population
Average duration of hospitalization	The average number of days spent by patients in a hospital
	Average number of hospitalized patients
Structure of hospitalization for certain diseases	Number of hospitalized patients with acute myocardial infarction x 100
	Number of hospitalized during the year
Value of cases of temporal disability on 100 working persons	Absolute number of cases at temporal disability x 100
	Medium quantity of working persons
Value of calendar days temporal disability on 100 working persons	Absolute number of calendar days of temporal disability x 100
	Medium quantity of working persons
Medium duration of case of temporal disability	Number of calendar days of temporal disability
	Number of cases of temporal disability

The task for independent work

Calculate the following indicators of morbidity with temporary disability at the industrial enterprise:

1. Number of cases of diseases per 100 employees.
2. Number of sick persons per 100 employees (whole-year).
3. Number of days of TD for 100 employees in a year.
4. Average duration of one case of temporary invalidity.
5. Frequency rate of diseases.
6. Structure of disease with TD.

Compare the obtained data with average data on the Russian Federation (tab. 1). Draw the conclusion.

Problem 1.

At the confectionery the mid-annual number of employees was 950 persons. A whole-year number of employees is 835 persons. The number of sick persons is 650. The number of cases of disability in accounting year has reached 690, and number of days of temporary disability 8965, including concerning acute respiratory diseases – 1832 days, digestion organs diseases – 1095 days, diseases of blood circulation system − 855 days, musculoskeletal system diseases − 557 days, traumas − 143 days.

Problem 2.

At the machine building plant the mid-annual number of workers was 1770 persons. The whole-year number of workers is 1650 persons. The number of sick persons is 1240. The number of cases of disability in accounting year has reached 1360, and the number of days of temporary disability – 17825, including those concerning acute respiratory diseases – 2842 days, digestive system diseases – 830 days, diseases of blood circulation system – 1190 days, musculoskeletal system diseases – 1175 days, traumas − 1543 days.

Problem 3.

At the electronic industry enterprise the mid-annual number of workers was 1300 persons. The whole-year number of workers is 1150 persons. The number of sick persons is 965. The number of cases of disability in accounting year has reached 1070, and the number of days of temporary disability is

12200, including those concerning acute respiratory diseases – 2950 days, digestive system diseases – 930 days, diseases of blood circulation system – 980 days, musculoskeletal system diseases – 707 days, traumas – 233 days.

Problem 4.

At the shoe factory the mid-annual number of workers was 620 persons. The whole-year number of workers is 575 persons. The number of sick persons is 550. The number of cases of disability in accounting year has reached 590, and the number of days of temporary disability – 2985, including those concerning acute respiratory diseases 684 days, digestive system diseases − 320 days, diseases of blood circulation system − 440 days, musculoskeletal system diseases − 317 days, traumas − 413 days.

Problem 5.

At the chemical enterprise the mid-annual number of workers has made 1200 persons. The whole-year number of workers is 1100 persons. The number of sick persons is 960. The number of cases of disability in accounting year has reached 1170, and the number of days of temporary disability is 11500, including those concerning acute respiratory diseases – 2954 days, digestive system diseases - 2705 days, diseases of blood circulation system − 1189 days, musculoskeletal system diseases − 730 days, skin and subcutaneous tissues diseases − 580 days.

Problem 6.

At the weaving factory the mid-annual number of workers has made 1470 persons. The whole-year number of workers is 1250 persons. The number of sick persons is 950. The number of cases of disability in accounting year has reached 1280, and the number of days of temporary disability is 9910, including those concerning acute respiratory diseases – 2062 days, digestive system diseases – 808 days, diseases of blood circulation system – 915 days, musculoskeletal system diseases − 770 days, traumas-334 days.

Problem 7.

At the cannery the mid-annual number of workers has made 517 persons. The whole-year number of workers is 450 persons. The number of sick persons is 340. The number of cases of disability in accounting year has reached 390, and the number of days of temporary disability is 3910, including those concerning acute respiratory diseases – 1062 days, digestive system diseases – 158 days, diseases of blood circulation system – 365 days, musculoskeletal system diseases – 210 days, traumas − 402 days.

Problem 8.

At the meat-packing plant the mid-annual number of workers has made 915 persons. The whole-year number of workers is 880 persons. The number of sick persons is 772. The number of cases of disability in accounting year has reached 850, and the number of days of temporary disability is 6956, including those concerning acute respiratory diseases – 1993 days, digestive system diseases – 236 days, diseases of blood circulation system – 435 days, musculoskeletal system diseases – 487 days, traumas − 422 days.

Table 1

Indicators of temporary invalidity in the Russian Federation

Indicators	In total	Including:			
		ARVI	Diseases of blood circulation system	Digestive system diseases	Traumas
Number of cases of TD per 100 employees	69,8	14,8	4,0	3,6	6,1
Number of days of TD per 100 employees	908,4	118,5	72,9	60,6	128,6
Average duration of one case	13,0	8,0	18,2	16,8	21,1

Tests

1. WHAT DOES PREVALENCE RATE MEAN?

1) The total number of cases of a disease in a given population at a specific time

2) The share of diseases among the population

3) The changes of incidence rate over time

4) The number of new cases of a disease within a time period

5) The presence of socially important diseases

2. TO CALCULATE INCIDENCE RATE THE FOLLOWING DATA ARE USED:

1) The number of diseases for the previous year / the number of diseases this year.

2) Diseases detected during medical examinations / Mid-year population.

3) The number of new cases of a disease within a time period / The total number of cases of a disease in a given population at a specific time

4) The total number of cases of a disease in a given population at a specific time/ Mid-year population

5) The number of new cases of a disease within a time period / Mid-year population

3. TO CALCULATE POINT PREVALENCE RATE THE FOLLOWING DATA ARE USED:

1) The total number of cases of a disease in a given population at a specific time/ Mid-year population

2) Diseases and premorbid conditions detected during medical examinations / number of examined people

3) The number of new cases of a disease within a time period / Mid-year population

4) The number of diseases for the previous year / the number of diseases this year.

5) The number of new cases of a disease within a time period / the total number of cases of a disease in a given population at a specific time

4. TO CALCULATE MORBIDITY STRUCTURE THE FOLLOWING DATA ARE USED:

1) Total number of diseases / mid-year population

2) Total number of diseases this year / mid-year population

3) The cases of the particular disease / total number of diseases

4) Total number of all diseases this year / total number of diseases for previous year
5) Diseases detected during medical examinations this year / the number of complaints about the disease this year

5. WHAT INDEX CAN WE CALCULATE IF THE TOTAL NUMBER OF DISEASES IN POPULATION IS DIVIDED INTO MID-YEAR POPULATION AND MULTIPLIED BY 1000?

1) Point prevalence rate
2) Incidence rate
3) Prevalence rate
4) Structure of morbidity
5) Standardized index

6. WHICH SOURCE OF INFORMATION TO STUDY MORBIDITY WILL ALLOW PRIMARY CARE PHYSICIAN TO TAKE GREATER ACCOUNT OF THE INCIDENCE OF ACUTE DISEASES?

1) Data of patient visits to a doctor in medical institutions
2) Data of special selective studies
3) Data about causes of death
4) Survey of the population
5) Data of medical examinations

7. WHAT ARE THE MAIN SOURCES TO STUDY MORBIDITY?

1) Appealability in medical facilities, data of medical examinations, and data of death causes
2) Data of death causes, data of medical records, data of survey
3) Data of medical examinations, data of survey, data of outpatient cards
4) Data of the census, data of polyclinic visits, data of medical records
5) Admission data, data of census, data of press reports

8. WHICH OF THE FOLLOWING INDICES DOES NOT APPLY TO MORBIDITY?

1) Incidence rate
2) Prevalence rate
3) Point prevalence rate
4) Crude mortality rate
5) The structure of morbidity

9. WHAT IS THE BEST SOURCE TO STUDY MORBIDITY WITH AIM OF MAXIMAL REGISTRATION OF "ACUTE" DISEASES?

1) Data of visits to medical establishments
2) Epidemiological study
3) Medical examinations
4) Population surveys
5) Data of death causes

10. WHAT IS THE BEST SOURCE TO STUDY MORBIDITY WITH AIM OF MAXIMAL REGISTRATION OF "CHRONIC" DISEASES?

1) Data of visits to medical establishments
2) Epidemiological study
3) Medical examinations
4) Population surveys
5) Data of death causes

8. PRIMARY HEALTH CARE. ORGANIZATION OF OUTPATIENT CARE

Main questions

1. Definition of a concept primary health care. Basic elements and principles of primary health care.
2. System of organization of ambulatory-polyclinic help. Structure and functions of city hospital – polyclinic.
3. Maintenance of work of district doctor.
4. General practitioner; main tasks, organization of activity.
5. Main kinds of report documentation of city hospital. Basic indexes of activity of polyclinic.

Theoretical information

Primary healthcare (PHC) refers to «essential health care" that is based on «scientifically sound and socially acceptable methods and technology, which make universal health care accessible to all individuals and families in a community. It is through their full participation and at a cost that the community and the country can afford to maintain at every stage of their development in the spirit of self-reliance and self-determination».

Principles of Primary Health Care

- Availability
- Prophylactic orientation
- The district principle
- Continuity and consistency

MAIN ELEMENTS OF PHC

1. Education concerning prevailing health problems and the methods of identifying, preventing and controlling them
2. Promotion of food supply and proper nutrition, an adequate supply of safe water and basic sanitation
3. Maternal and child health care including family planning
4. Immunization against major infectious diseases
5. Prevention and control of locally endemic diseases
6. Treatment of common diseases and injuries
7. Promotion of mental health
8. Provision of essential drugs

Levels of Health Care

1. Primary care level
2. Secondary care level
3. Tertiary care level

Polyclinic objectives

- Provision of qualified specialized medical care
- Prevention of diseases
- Examination of the population
- Hygienic training and education of the population

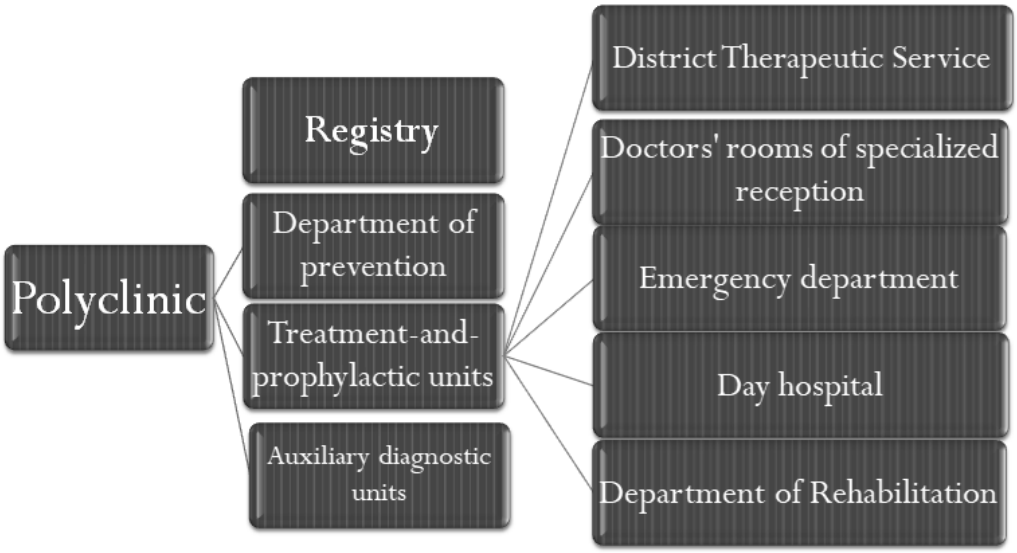


Fig. 8.1.Structure of the polyclinic

Registry Functions:

- Make an appointment to see a doctor
- Record of calls to the house
- Distribution of streams
- Storing medical records
- Informing the public
- Filling documents

The structure of the prevention department:

- First aid office.
- office of preventive examinations;
- The office of the clinical examination;
- Anamnesis office;
- office of sanitary and education work;
- Examination rooms

First-aid office functions:

- Emergency action
- Clarifications route
- Pre-medical examination (blood pressure, pulse, height, weight, temperature, etc.)
- Directions repeated tests
- Issue of repeat prescription

Sections of the district doctor's work:

- Prophylactic
- Treatment-diagnostic
- Rehabilitation
- Palliative care
- Organizational and methodical work

Calculation technique and the analysis of the general indicators of a polyclinic's activity

- Provision of adult population with the therapeutic out-patient-polyclinic aid (for 10 thousand population)

$$\frac{\text{Number of the occupied medical posts of therapists in polyclinic} \times 10000}{\text{Number of the adult population living in area of activity of a polyclinic}}$$

Staff specifications of the medical personnel of polyclinics – 9,6: of them: the district therapist – 5,9; the surgeon – 0,4

- Provision of the children's population with the pediatric out-patient-polyclinic aid

$$\frac{\text{Number of the occupied medical posts of pediatricians in polyclinic} \times 10000}{\text{Number of children and teenagers living in area of activity of a polyclinic}}$$

For 10000 children's population there should be 12,5 posts of pediatricians in norm

- Population at one medical district
- Population at one pediatric district

$$\frac{\text{Number of the adult population living in area of service of a polyclinic}}{\text{Number of medical districts or number of the occupied posts of district therapists}}$$

At a medical district 1700 persons live in norm, the doctor of the general practice has – 1500 persons

$$\frac{\text{Number of children + teenagers, living in area of service of a polyclinic}}{\text{Number of pediatric districts or number of the occupied posts of district pediatricians}}$$

At a pediatric district there live in norm 800 children and teenagers

- Staffing of medical posts in a polyclinic (%)

$$\frac{\text{Number of occupied medical posts} \times 100}{\text{Number of staff medical posts}}$$

- An average of visits per one inhabitant in year (it is calculated separately for the adult and children's population)

$$\frac{\text{Number of medical visits to a polyclinic + number of visits in-home}}{\text{Population}}$$

- Share of preventive visits in a polyclinic

$$\frac{\text{Number of visits to a polyclinic with preventive purpose} \times 100}{\text{Number of all medical visits to a polyclinic}}$$

Makes 20 – 25 % with the tendency of the further increase

- Share of visits in-home

$$\frac{\text{Number of medical visits in-home} \times 100\ \%}{\text{Number of medical visits to a polyclinic and in-home}}$$

20-30 %. At therapists, 30-35 % of doctors of the general practice and pediatricians

- Actual loading of the doctor of out-patient-polyclinic for a year of a post (is calculated for separate specialties)

$$\frac{\text{Number of medical visits to a polyclinic + number of visits in-home}}{\text{Number of the occupied medical posts}}$$

In norm the planned loading makes: the local therapist (pediatrician) – 5500-6000, the surgeon – 12000, the accoucheur-gynecologist – 7000-8000

- Indicators of morbidity of the population living in area of service of out-patient-polyclinic establishment

The task for independent work

Calculate the main indicators of the polyclinic. Give them an assessment.

Problem 1

DATA OF THE ANNUAL REPORT OF THE MEDICAL ORGANIZATION

Abdulinsky district

Number of the served population

Total (people)	**25599**
Children (aged 0-17)	5351
Adults	20248

Data on the medical staff

Job title	Number of posts in the organization as a whole		of them in the polyclinic		Number of individuals in the occupied positions	
	established	occupied posts	established	occupied posts	Number of posts in the organization as a whole	of them in the polyclinic
Doctors - total	**100.25**	**91.75**	**57**	**52**	**56**	**39**
therapists - total	**17**	**15.5**	**10.5**	**9**	**10**	**7**
pediatricians - total	**13**	**11**	**8.5**	**7**	**6**	**6**

Data on the activity of the polyclinic

Job title	№	Number of visits			Of the total number of visits made about the diseases		Number of visits by doctors at home				
		Total	of them by rural residents	children	Adults	Children	Total	of them by rural residents	about diseases	Children	about diseases
1	2	3	4	5	6	7	8	9	10	11	12
Doctors - total	1	148515	44762	60815	72928	31442	8161	578	7995	3174	3086
pediatricians - total	2	28258	10795	28258		16644	3171		3083	3171	3083
therapists - total	3	27282	6038		22231		4327	174	4327		

Problem 2

DATA OF THE ANNUAL REPORT OF THE MEDICAL ORGANIZATION

Adamovsky district

Number of served population

Total (people)	**23237**
Children (aged 0-17)	5582
Adults	17655

Data on the medical staff

Job title	Number of posts in the organization as a whole		of them in the polyclinic		Number of individuals in the occupied positions	
	established	occupied posts	established	occupied posts	Number of posts in the organization as a whole	of them in the polyclinic
Doctors - total	**77.75**	**50.25**	**59**	**38.25**	**35**	**29**
therapists - total	**6.75**	**5.5**	**5.75**	**4.5**	**6**	**5**
pediatricians - total	**8.75**	**4.75**	**7.5**	**3.5**	**4**	**3**

Data on the activity of the polyclinic

Job title	№	Number of visits			Of the total number of visits made about the diseases		Number of visits by doctors at home				
		Total	of them by rural residents	children	Adults	Children	Total	of them by rural residents	about diseases	Children	about diseases
1	2	3	4	5	6	7	8	9	10	11	12
Doctors - total	1	143721	143721	46043	61671	25420	4308	4308	1991	2215	768
pediatricians - total	2	17249	17249	17249		9411	1223	1223	356	1223	356
therapists - total	3	23314	23314		17122		870	870	481		

Problem 3

DATA OF THE ANNUAL REPORT OF THE MEDICAL ORGANIZATION

Akbulaksky district

Number of served population

Total (people)	**25473**
Children (aged 0-17)	6316
Adults	19157

Data on the medical staff

Job title	Number of posts in the organization as a whole		of them in the polyclinic		Number of individuals in the occupied positions	
	established	occupied posts	established	occupied posts	Number of posts in the organization as a whole	of them in the polyclinic
Doctors - total	**77**	**68.5**	**52.75**	**47**	**54**	**42**
therapists - total	**16**	**15**	**12**	**11**	**11**	**10**
pediatricians - total	**11.75**	**11.75**	**10.5**	**10.5**	**11**	**10**

Data on the activity of the polyclinic

Job title	№	Number of visits			Of the total number of visits made about the diseases		Number of visits by doctors at home				
		Total	of them by rural residents	children	Adults	Children	Total	of them by rural residents	about diseases	Children	about diseases
1	2	3	4	5	6	7	8	9	10	11	12
Doctors - total	1	249495	249495	106604	55943	32621	8899	8899	5939	4808	2904
pediatricians - total	2	59449	59449	59449		19283	4265	4265	2361	4265	2361
therapists - total	3	57789	57789		24339		3315	3315	2259		

Problem 4

DATA OF THE ANNUAL REPORT OF THE MEDICAL ORGANIZATION

Belyaevsky district

Number of served population

Total (people)	**16152**
Children (aged 0-17)	3405
Adults	12747

Data on the medical staff

Job title	Number of posts in the organization as a whole		of them in the polyclinic		Number of individuals in the occupied positions	
	established	occupied posts	established	occupied posts	Number of posts in the organization as a whole	of them in the polyclinic
Doctors - total	**44.5**	**43.5**	**31.5**	**30.5**	**37**	**25**
therapists - total	**6.75**	**6.25**	**5.75**	**5.25**	**6**	**5**
pediatricians - total	**6**	**6**	**5**	**5**	**6**	**5**

Data on the activity of the polyclinic

Job title	№	Number of visits			Of the total number of visits made about the diseases		Number of visits by doctors at home				
		Total	of them by rural residents	children	Adults	Children	Total	of them by rural residents	about diseases	Children	about diseases
1	2	3	4	5	6	7	8	9	10	11	12
Doctors - total	1	145538	145538	49434	74202	30038	3344	3344	2181	663	374
pediatricians - total	2	39474	39474	39474		26225	1600	1600	1092	663	374
therapists - total	3	28711	28711		22577		1057	1057	635		

Problem 5

DATA OF THE ANNUAL REPORT OF THE MEDICAL ORGANIZATION

Gay district

Number of served population

Total (people)	**47391**
Children (aged 0-17)	**10103**
Adults	**37288**

Data on the medical staff

Job title	Number of posts in the organization as a whole		of them in the polyclinic		Number of individuals in the occupied positions	
	established	occupied posts	established	occupied posts	Number of posts in the organization as a whole	of them in the polyclinic
Doctors - total	**210.25**	**209.25**	**122.75**	**122.25**	**108**	**71**
therapists - total	**38**	**38**	**23.5**	**23.5**	**16**	**11**
pediatricians - total	**29**	**29**	**22.25**	**22.25**	**14**	**10**

Data on the activity of the polyclinic

Job title	№	Number of visits			Of the total number of visits made about the diseases		Number of visits by doctors at home				
		Total	of them by rural residents	children	Adults	Children	Total	of them by rural residents	about diseases	Children	about diseases
1	2	3	4	5	6	7	8	9	10	11	12
Doctors - total	1	416543	49945	135341	144624	46020	18221	486	16812	10935	10120
pediatricians - total	2	71839	6219	71839		30054	10786	186	9980	10786	9980
therapists - total	3	62566	7591		49092		6102	108	6102		

Tests

1. PRIMARY HEALTH CARE (PHC) MAY BE GRANTED IN THE FOLLOWING CONDITIONS:

1) Outpatiently and in day hospital
2) Outpatiently, in day hospital and at home
3) In medical establishments, outpatiently and in a hospital
4) Outpatiently and in a hospital

2. WHICH SPECIALISTS PROVIDE PRIMARY HEALTH CARE?

1) Only doctors who conduct ambulatory appointments
2) Doctors and nurses working in a hospital.
3) General practitioners, nurses and other doctors providing medical care to the population on an outpatient basis and at home
4) Doctors and nurses working out-patient and in the emergency medical service

3. WHAT TYPES OF MEDICAL CARE ARE PROVIDED TO THE POPULATION IN A CITY POLYCLINIC?

1) Primary health care and specialized care
2) Primary care, specialized care including high technological medical care
3) Emergency care and palliative medical care
4) Primary health care and emergency care
5) Primary health care including primary pre-medical, primary care and primary specialized care

4.DESCRIBE THE MAIN PRINCIPLES OF OUTPATIENT CARE IN THE RUSSIAN FEDERATION:

1) District principle of service, continuity and stages, prevention priority, availability
2) Preventive focus, professionalism, compassion, accessibility
3) Continuity and stages, preventive orientation, professionalism
4) Preventive orientation, compassion, accessibility
5) Professionalism, preventive orientation, availability, compassion

5. WHAT DEPARTMENTS ARE INCLUDED IN THE POLYCLINIC?

1) Registration, doctors' offices, an ambulance station, auxiliary medical diagnostic units.
2) Registration, outpatient clinics, inpatient.
3) Registration, doctors' offices, auxiliary diagnostic units, auxiliary medical units

6. GIVE A DEFINITION OF THE CONCEPT OF "PRIMARY HEALTH CARE"

1) PHC is the first level of contact of individuals, families and communities with the national health system
2) PHC is the first medical aid provided at the pre-medical level
3) PHC is a complex of measures to provide emergency (emergency and urgent) care

7. OBJECTIVES OF AMBULATORY-POLYCLINIC ASSISTANCE ARE ALL, EXCEPT

1) assisting the attached population
2) servicing of industrial workers
3) preventive and dispensary work
4) the examination of persistent disability

8. THE SECTIONS OF THE WORK OF THE DISTRICT DOCTOR ARE ALL LISTED EXCEPT

1) prevention
2) treatment
3) coordination of work between the structural units of the polyclinic
4) rehabilitation
5) palliative care

9. THE MAIN SECTIONS OF THE DOCTOR'S WORK, WHICH PROVIDE SPECIALIZED ASSISTANCE IN THE POLYCLINIC, ARE ALL LISTED EXCEPT

1) medical-diagnostic work
2) advisory work
3) carrying out preventive measures according to their profile
4) control over the activities of a district doctor

10. WHICH OF THE INDICATORS IS NOT USED IN THE ANALYSIS OF THE POLYCLINIC?

1) Staffing of medical posts in a polyclinic

2) Indicators of morbidity of the population living in area of service of out-patient-polyclinic establishment

3) Share of preventive visits in a polyclinic

4) Share of visits in-home

5) Hospitalization level

9. ORGANIZATION OF THE IN-PATIENT AID TO THE POPULATION. INDICATORS OF HOSPITAL ACTIVITY

Main questions

1. The organization of in-patient (hospital) aid to urban population. Classification, the main organization-methodical principles of work and tasks of a hospital.
2. The structure and tasks of a city hospital inpatient department.
3. Organization of activity of reception of hospital
4. Functional duties of the doctor of a hospital.
5. Name the basic indicators of inpatient activity.

Theoretical information

Inpatient (hospital) medical care

The most resource-intensive health sector (It requires expensive buildings, equipment, vehicles). For the maintenance of hospitals an average of 60-70% of the resources allocated to health is spent .

Hospital care includes:

- Comprehensive approach to diagnosis and treatment
- Intensive treatment and care
- Permanent (day and night) medical supervision
- The use of sophisticated techniques, expensive medical technologies

Hospitals are distinguished:

- According to the administrative territorial location
- According to departmental affiliation
- According to the profile and capacity
- By order of hospitalization
- The intensity of observation and care
- According to the organization of work and type of ownership

Types of hospitals

I. According to the administrative-territorial location hospitals are: provincial (regional, national, district); city, district, rural district

II. According to departmental affiliation hospitals can be attributed to: the Ministry of Health, the Ministry of Railways, Ministry of Defense and others.

III. By profile: general and specialized (rehabilitation treatment, psychiatric, tuberculosis, ophthalmology, physiotherapy, etc.).

IV. Hospitals are divided into capacity categories. International Standard defines the optimal size hospitals of 600-800 beds

V. By the order of hospitalization: Emergency Hospital, the hospital for planned hospitalization, the hospital for the general (mixed) hospitalization

VI. According to the degree of intensity of observation and care: hospital intensive care, rehabilitation treatment, nursing hospitals, health and social care, hospices

VII. According to the rules of the organization hospital can be for children and adults; combined with the ambulance station (CRH); combined with the health center; unmerged

VIII. By type of property are distinguished public (budgetary) institutions, municipal institutions, private medical organization

Hospitals, which have the status of clinical institutions:

- If at least 50 percent is used for training by higher education institutions (faculties)
- If used for scientific medical research organizations

Functions of the hospital

WHO systematizes functions for all types of hospitals in 4 groups :

- Restoration (diagnosis and treatment, care, rehabilitation and emergency care)
- Prophylactic (preventive maintenance of complications, chronic and infectious diseases, disability, etc.).
- Training (training of medical staff and postgraduate specialization)
- Research

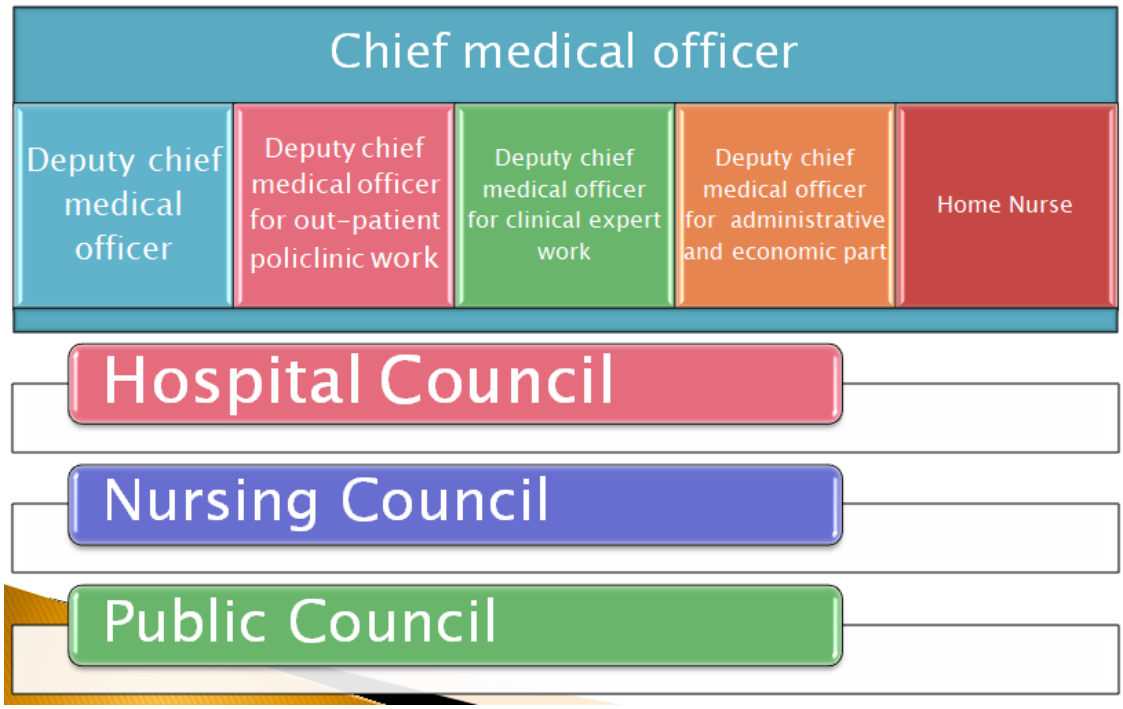


Fig. 9.1. Management of the United City Hospital

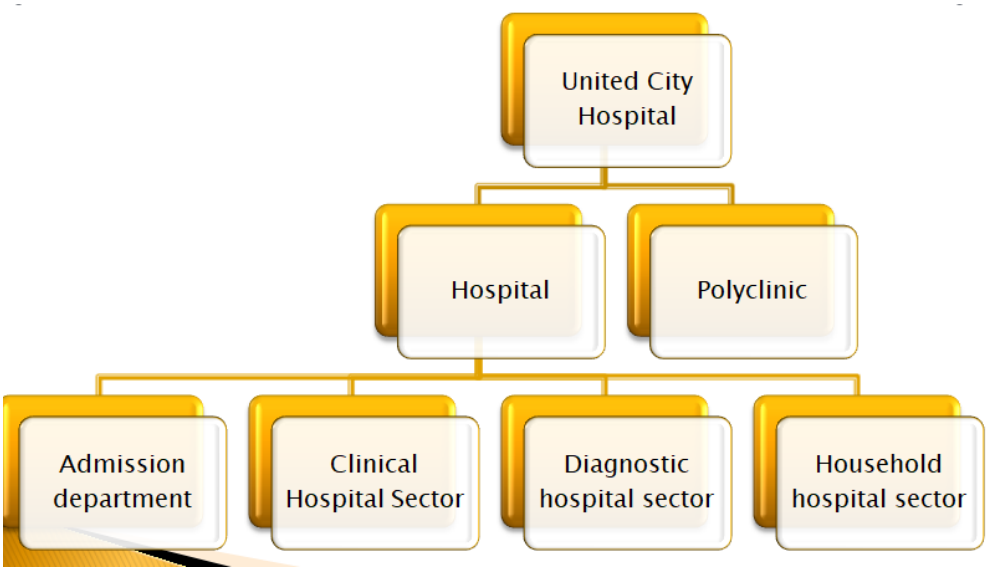


Fig. 9.2. The structure of the hospital

Clinical Hospital Sector :

- Admission department
- Intensive care unit
- Clinical department of therapeutic and surgical profile (Chamber)
- Physiotherapy and physical therapy branch
- Department of Radiotherapy
- Branch of hyperbaric oxygenation
- Department of Hemodialysis and hemosorption
- Department of Blood Transfusion and others.

Diagnostic hospital sector:

- The X-ray department and the department of functional, endoscopic and ultrasound diagnostics
- Laboratory (clinical, biochemical, bacteriological, immunological, serological, radioimmunoassay diagnosis, etc.).
- Pathologic department

Household hospital sector:

- energy system,
- heat and water supply,
- communication,
- catering department,
- pharmacy,
- laundry,
- transport,

- disinfection chamber and central sterilization

Ways of admissions to hospital

- In the direction of doctors clinics (planned hospitalization)
- Shipping patients ambulance (emergency hospitalization)
- Transfer from another hospital
- Self-treatment of patients in the admission department («drift»)
- Patients come to the admission department, which can be centralized and decentralized

The structure of the front desk (Admissions Office):

- vestibule, rooms for relatives
- Cabinet of registration applied patients
- Offices of medical examination
- Procedural, bandaging room
- Diagnostic Chamber
- Sanitary unit

Near the front desk there are: an X-ray room, the office of functional diagnostics, ultrasound diagnostics cabin, Express Lab

Functions of the Admissions Office:

- Reception and registration of incoming patients, registration of necessary documents
- Medical examination and primary diagnosis
- Sort patients by disease severity, emergency care in the order determined by the doctor on duty
- Hour conducting the necessary consultations, laboratory, clinical and instrumental studies of emergency patients
- Monitoring of patients with unclear diagnoses
- Carrying out sanitizing of people admitted to the hospital, the transmission of information about their sickness to relatives

Front desk documentation:

- Log of receiving patients and failure hospitalization (f.001 / y)
- «Medical card of the inpatient» (f.003 / y)
- «The temperature leaf» (f.004 / y)
- «Statistical card left a hospital» (f.066 / u)

From the front desk the patient enters a clinical department or in the intensive care unit

The structure of the intensive care unit:

- Resuscitation room
- ICU (intensive care unit)

- Laboratory of urgent analyzes
- Rooms for the staff, the equipment room

Number of posts is distributed on the basis of 1 post for 3 beds in intensive care units

Resuscitation department carries out a complex of therapeutic measures aimed at restoring the vital functions of the body: (Resuscitation, intensive therapy and intensive care, functional and laboratory studies, hygiene assurance)

The basic structural unit of the clinical sector - Clinical Department:

- Clinical department consist of 30 - 70 or more beds
- One doctor has up to 20-25 patients
- The treatment success in the hospital depends largely on the quality of patients care
- Care system in which direct relations to the patient only have doctors and nurses is called a two-stage
- Junior staff carries responsibilities for cleaning the premises and creating the proper sanitary-hygienic regime in office
- The head of the department shall be appointed and dismissed by order of the head physician

Head of the department functions:

- The administration of the personnel
- Quality control of the diagnostic and treatment process
- Control of uniform admission and discharge of patients, the observance of the terms of stay of patients in hospital
- Selection of patients for planned hospitalization
- Total rounds (administrative and clinical)
- Phasing and final examinations of patients
- Daily inspections of the patients in critical condition
- Consultations
- Analysis of performance indicators

The main functions of the attending physician hospital:

- Diagnosis and treatment of patients
- Informing patients about the nature and objectives of the proposed treatment, about an associated potential risks, about alternatives to this kind of treatment and consent to medical intervention
- Keeping medical records
- Monitoring the implementation of appointments
- Organization of counseling and consultation

- Participation in rounds, clinical conferences
- Implementation of expertise disability
- Making writing out (medical check)

Calculation techniques and the analysis of the general indicators of inpatient activity

1. Provision of the population with inpatient care (for 10 thousand population)

$$\frac{\text{Mid-annual number of beds} \times 10000}{\text{Population aggregate number}}$$

The specification of number of beds for 10 000 persons – only 121.8 beds, including therapeutic – 20.35, pediatric 1.68, stomatologic – 0.44, surgical – 10.45, obstetric – 3.75, gynecologic – 6.07, cardiological – 2.96.

2. Hospitalization level (per 1000 population)

$$\frac{\text{Number of patients discharged (signed out + died) from a hospital} \times 1000}{\text{Population aggregate number}}$$

Expected number of hospitalizations. In total per 1000 population – 243.0, including: therapy – 39.42, pediatrics – 4.39, stomatology – 1.16, surgery – 28.71, obstetrics – 12.58, gynecology – 23.64.

3. Mid-annual hospital bed occupancy (function of a hospital bed)

$$\frac{\text{Patients' bed-days}}{\text{Mid-annual number of beds}}$$

As a whole for a hospital and for the majority of departments the specification is equal to 320 days in a year. Exceptions are made for infectious departments, maternity homes, specialized children's departments in which mid-annual occupancy is lower in connection with features of a sanitary-and-epidemiologic regimen and fluctuates from 250 till 300 days in a year.

4. Average duration of patient's stay on a bed

$$\frac{\text{Number of the bed-days spent by patients}}{\text{Number of discharged (signed out + died) patients}}$$

Actual average duration of stay of the patient in a multifield hospital across the Russian Federation makes now 12-14 days, in Stavropol Territory – 10-12 days, including in therapeutic departments – 13,5, in surgical – 11, maternity – 7, traumatologic – 15, tubercular – 60 days.

5. Bed turnover

$$\frac{\text{Number of discharged (signed out+died) patients}}{\text{Mid-annual number of beds}}$$

The indicator gives insight of the number of patients who have received inpatient treatment in a current year on one bed. It depends on average duration of patient's stay on a bed in a year. The bed turnover in city medical institutions under planned specifications makes approximately 22-24

times. The indicator of a bed turnover is calculated both as a whole at a hospital, and at departments.

6. Hospital lethality (%)

$$\frac{\text{Number of the died patients in hospital} \times 100}{\text{Number of discharged (signed out + died) patients}}$$

The indicator estimation represents difficulties as there is not and there cannot be any specifications of lethality. Lethality depends on composition of patients in department, age, sex of patients, severity of disease, timeliness of hospitalization, on the previous out-patient treatment, etc. Hospital lethality in the Russian Federation makes 1,5 % in hospitals for adults and teenagers and 0,4 % in hospitals for children, including because of tuberculosis of respiratory organs – 7,1 %, sepsis – 22,6 %, new growths – 5,8 %, respiratory diseases – 1,0 %, blood circulation diseases – 4,6 %, myocardial infarction – 43,1 %.

7. Structure of the hospitalized patients by separate nosologic forms of diseases

$$\frac{\text{Number of discharged from a hospital with one nosologic form of disease} \times 100}{\text{Number of all patients who was discharged from a hospital}}$$

8. Structure of hospital lethality reasons

$$\frac{\text{Number of patients died with one nosologic form in hospital} \times 100\ \%}{\text{Number of the died patients in a hospital}}$$

9. Postoperative lethality

$$\frac{\text{Number of died operated patients} \times 100}{\text{Number of the operated patients}}$$

The level of postoperative lethality in the Russian Federation makes – 0,5 - 0,7 %

Also for the assessment of the work of the hospital the following indicators can be calculated:

- Rehospitalization during the year
- 1 day lethality
- Frequency differences of clinical and pathological diagnoses
- The frequency of hospital and postoperative complications
- Patient distribution by treatment outcome

The task for independent work

Calculate the use of hospital bed capacity. Give them an assessment.

Problem 1

DATA OF THE ANNUAL REPORT OF THE MEDICAL ORGANIZATION

Abdulinsky district

Number of served population

Total (people)	**25599**
Children (aged 0-17)	5351
Adults	20248

Data on the use of hospital beds

Bed profile	Number of beds	hospitalized patients - total	patients discharged	died	spent by patients days
Total	**134**	**4211**	**4137**	**100**	**41009**

Problem 2

DATA OF THE ANNUAL REPORT OF THE MEDICAL ORGANIZATION

Adamovsky district

Number of served population

Total (people)	**23237**
Children (aged 0-17)	5582
Adults	17655

Data on the use of hospital beds

Bed profile	Number of beds	hospitalized patients - total	patients discharged	died	spent by patients days
Total	**117**	**3669**	**3613**	**43**	**31876**

Problem 3

DATA OF THE ANNUAL REPORT OF THE MEDICAL ORGANIZATION

Akbulaksky district

Number of served population

Total (people)	**25473**
Children (aged 0-17)	6316
Adults	19157

Data on the use of hospital beds

Bed profile	Number of beds	hospitalized patients - total	patients discharged	died	spent by patients days
Total	**115**	**3891**	**3867**	**49**	**30145**

Problem 4

DATA OF THE ANNUAL REPORT OF THE MEDICAL ORGANIZATION
Belyaevsky district

Number of served population

Total (people)	**16152**
Children (aged 0-17)	3405
Adults	12747

Data on the use of hospital beds

Bed profile	Number of beds	hospitalized patients - total	patients discharged	died	spent by patients days
Total	**72**	**2406**	**2423**	**20**	**22270**

Problem 5

DATA OF THE ANNUAL REPORT OF THE MEDICAL ORGANIZATION
Gay district

Number of served population

Total (people)	**47391**
Children (aged 0-17)	**10103**
Adults	**37288**

Data on the use of hospital beds

Bed profile	Number of beds	hospitalized patients - total	patients discharged	died	spent by patients days
Total	**240**	**8684**	**8554**	**170**	**85018**

Tests

1. THE TASKS OF THE CITY HOSPITAL ARE ALL LISTED EXCEPT:

1) diagnosis and treatment of diseases, care, rehabilitation and emergency care
2) medical and recreational activities, prevention of complications, chronic and infectious diseases, disability, etc.
3) examination of a permanent loss of work incapable of work and recognition of a patient with a disability
4) training of medical personnel and his postgraduate specialization
5) research activities

2. THE STRUCTURE OF THE CITY HOSPITAL DOES NOT INCLUDE:

1) admission office
2) research department

3) profiled medical departments
4) operational unit.
5) department of morbid anatomy

3. THE PATIENT MAY BE HOSPITALIZED IN A HOSPITAL

1) at self-referral to the admissions office
2) if there is a referral for hospitalization
3) when delivered by a brigade of ambulance services
4) all of the above is true

4. HOSPITAL REPORT INCLUDES DATA ABOUT NUMBER OF OPERATED PATIENTS AND NUMBER OF DEATHS AFTER SURGERY. WHICH EFFICIENCY INDEX OF INPATIENT CARE CAN BE CALCULATED ON THE BASIS OF THESE DATA?

1) Admission rate
2) Standardized lethality rate
3) General lethality rate
4) Postoperative mortality rate
5) Postoperative lethality rate

5. LETHALITY RATE IS USED TO ANALYZE:

1) Efficiency of inpatient care
2) Morbidity
3) Bed fund
4) Efficiency of outpatient care
5) Natural dynamics of population

6. WHAT INDICATORS CAN BE DEFINED WHEN WE HAVE: POPULATION NUMBER, TOTAL AMOUNT OF HOSPITALIZED PATIENTS AND ON SEPARATE NOSOLOGIES?

1) General morbidity and its structure on specific nosologies
2) Incidence rate in hospitals
3) Admission rate in the whole and on specific nosologies
4) Incidence rate structure on disease classes

7. LETHALITY RATE IS INDICATOR WHICH CHARACTERIZES:

1) Morbidity rate
2) Work of the polyclinic
3) Natural dynamics of population
4) Hospital activities

8. WHICH INDICATORS ARE USED TO ANALYZE SATISFACTION OF POPULATION IN INPATIENT CARE?

1) Bed population ratio; structure of bed fund
2) Admission rate; inpatient care sufficiency
3) Inpatient lethality rate
4) frequency of refusals in hospitalization
5) Timeliness of hospitalization; bed use

9. INDICATE BASIC FUNCTIONS OF INPATIENT FACILITIES ACCORDING TO WHO:

1) Medical and rehabilitative, preventive and anti-epidemic, educative and research
2) Preventive, emergency care, research, educative

3) Therapeutic, anti-epidemic, informational, educative
4) Dispensarization, medical, preventive, emergency care
5) Medical, statistical, educative, research

10. SPECIFY BASIC FORMS OF INPATIENT PRIMARY MEDICAL RECORDS

1) "Inpatient medical card"; "Outpatient medical card"
2) "Medical death certificate"; "Vaccination card"
3) "Statistical coupon"; "Extract from inpatient medical card"
4) "Inpatient medical card"; "Statistical card of the patient discharged hospital"
5) "Control card of dispensary observation"; "Inpatient medical card

10. PUBLIC HEALTH ECONOMY. METHODOLOGY FOR CALCULATING ECONOMIC EFFICIENCY

Main questions

1. Economics of Public Health: its subject, tasks.
2. Place and role of health care in the country's economy.
3. Types of health care effectiveness. Medical, social and economic efficiency; basic indicators.
4. Methodology for calculating economic efficiency.

Theoretical information

Public health economy is a branch of science that studies the place of health and the relationship with the overall system development and economic planning. Also in the spotlight are methods for finding and using resources and health care provisions. Science evaluates the effectiveness of measures to protect public health and their impact on changes in the production of social product by improving the health status of the people.

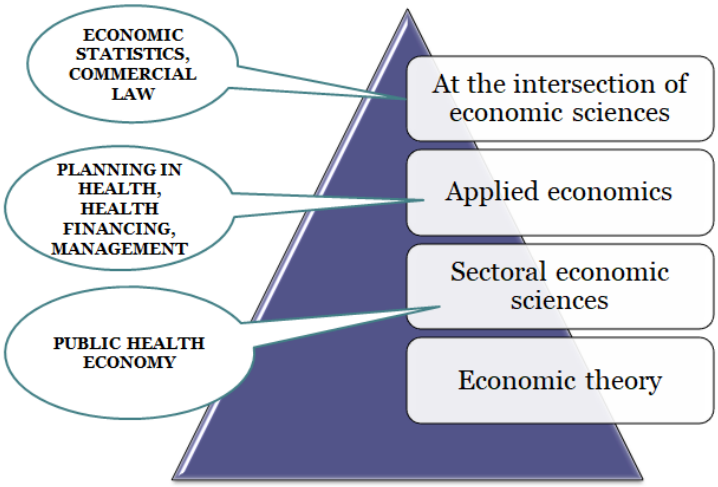


Fig. 10.1. The structure of economic knowledge

Purpose of health economics is to achieve the maximum satisfaction of population requirements in health care at reasonable cost of material and financial spendings.

Subject of health economics is how to develop the most efficient recruitment and use of health care resources to achieve specific objectives in the health of the entire population.

Tasks of health economics:

- Determination of place and role of health care in the country's economy
- Determining the need for health resources (personnel, material, financial).
- Determination of effective models for financing the industry.

– Economic analysis and evaluation of health care effectiveness.

– Analysis of the economic activities of health care in general and the development of measures to improve efficiency.

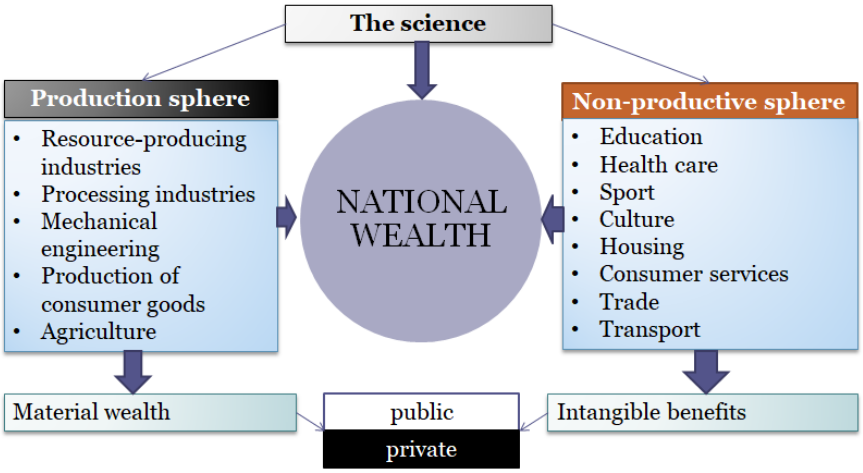


Fig. 10.2.Place of health care in the country's economy

Services - a set of industries that provide services to the public. In the sphere of services, it is customary to include culture, education, healthcare, consumer services, passenger transport and communications, recreational services, public catering.

Social sphere - a set of industries, enterprises, organizations, directly related and determining the image and standard of living of people, their welfare and consumption.

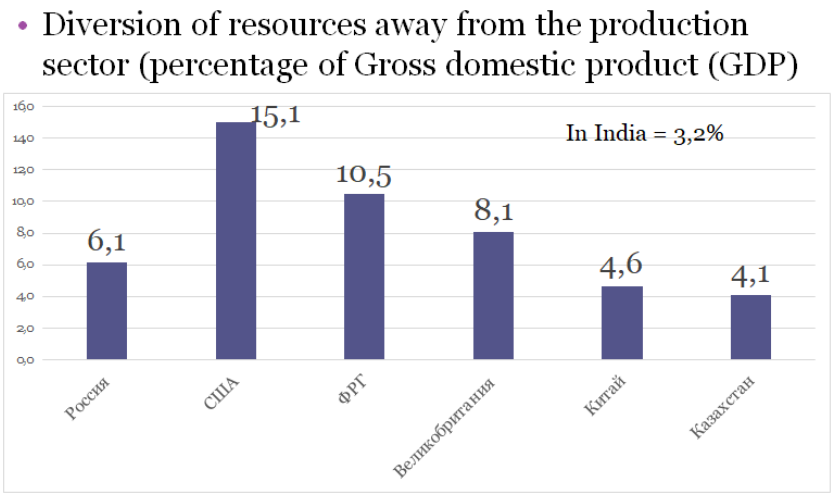


Fig. 10.3.Negative health effects on the economy

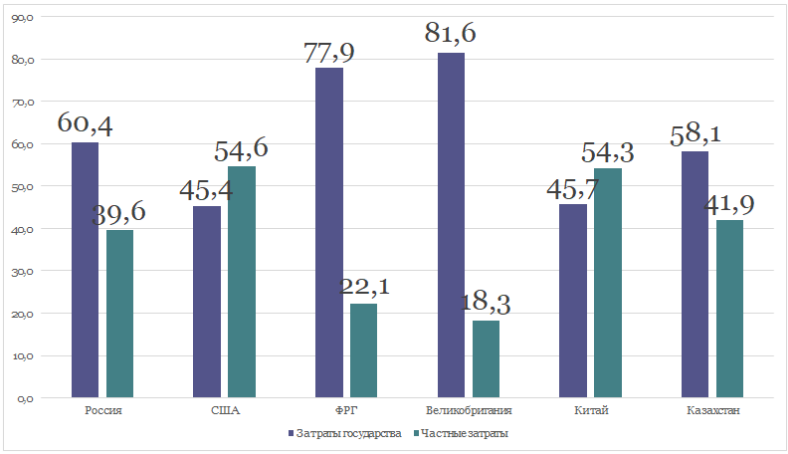
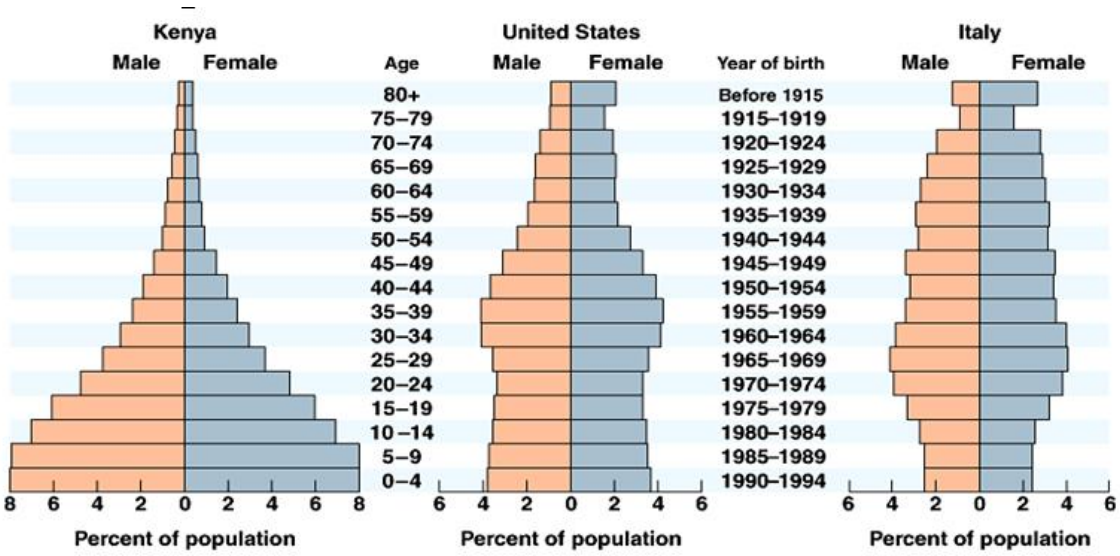


Fig. 10.4.Structure of GDP expenditure on health



The aging of the population and the need for its social protection

Fig. 10.5.Negative health effects on the economy

Saving lives in previously deaths - increasing disability

Fig. 10.6.Negative health effects on the economy

Positive effects:

- Reduction of incidence with temporary incapacity for work :
  - Reduction of losses for non-manufactured products
  - Reducing the cost of medical care
  - Reducing the cost of social benefits.

- Reduction of disability, effective rehabilitation - preservation of economically active population.

- Prevent premature death.

- Growth of active longevity.

Health care should be effective!!! This is possible with available medical assistance!

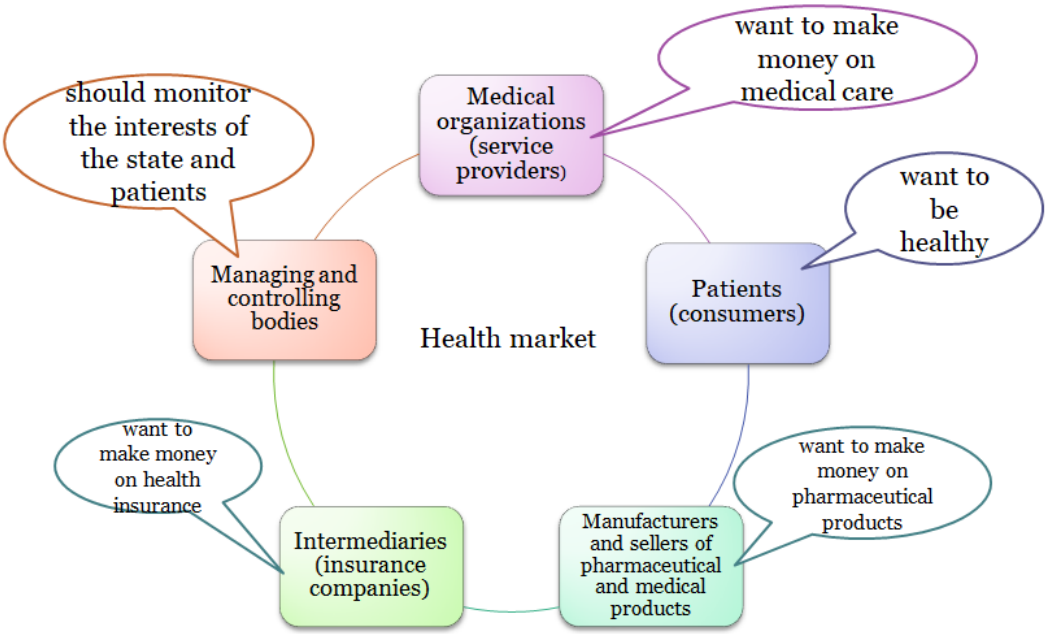


Fig. 10.7.Subjects of economic relations in health care

Table 10.1. Interests of the state

Economic	Institutional	Political
Spreading a healthy lifestyle. Formation of the nation's health capital. Prevention of diseases. Financial provision of social standards, strengthening of the connection of social standardization with the budget-normative activities.	Ensuring a guaranteed minimum of medical care for all citizens. Creating a legal framework. Development of a health strategy Establishment of a national health protection system.	Strengthening the greatness of the state. Increase the quantity and quality of human capital. Realization of national-state interests. Guarantees of providing free medical care.

Table 10.2. Interests of the Medical organizations

Economic	Institutional	Political
Realization of state order. Getting the maximum profit. Getting legal and economic independence. Diversification in order to change the structure of production and product range.	Formation of the motivation of the population to promote health and a corresponding lifestyle, create a healthy person's image, a healthy lifestyle system. Directed influence on the formation of a way of life and style of consumption.	Lobbying

Table 10.3.Interests of the Patients

Economic	Institutional	Political
Maximizing utility. Ensuring a "health effect"	Any reached level generates changes in volumes and assortment of consumption	Stability in providing medical services

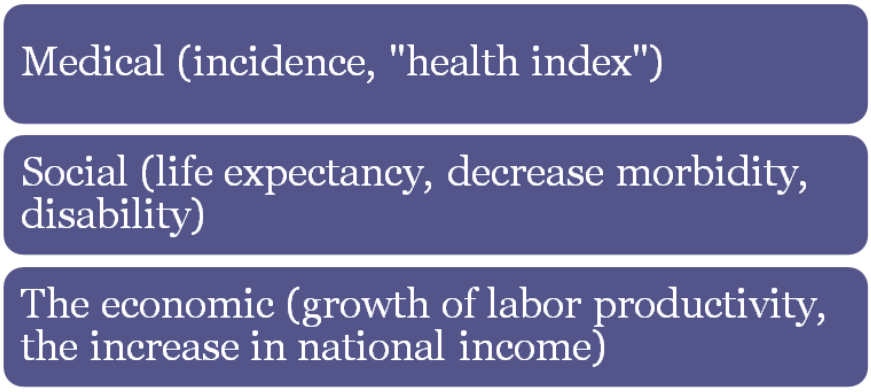


Fig. 10.8.Health Efficiency

Medical efficiency

The degree of achievement of a positive medical result.

$$\text{ME} = \frac{number\ of\ positive\ results}{number\ of\ cases\ assessed} \times 100$$

Social efficiency

Improving the quality of life. The degree of satisfaction with the interaction with the health system

$$= \frac{number\ of\ people\ satisfied\ with\ the\ quality\ of\ care}{number\ of\ cases\ assessed} \times 100$$

Economic efficiency

The ratio of economic effect to costs

$$\text{EE} = \frac{economic\ effect}{\text{costs}}$$

Costs = economic loss (damage)

Economic damage associated with the morbidity

$$Costs = T + Dtemp + Dcont$$

$$T = T_{OUTPATIENT} + T_{IN-PATIENT}$$

$$T_{OUTPATIENT} = price\ 1\ visit \times number\ of\ visits + cost\ of\ a\ unit\ of\ medical\ and\ diagnostic\ services \times number\ of medical\ and\ diagnostic\ services$$

$$T_{IN-PATIENT} = cost\ of\ 1\ day\ stay\ in\ a\ hospital \times number\ of\ days\ in\ hospital$$

The costs associated with temporary disability = (The cost of social benefits per 1 day + The cost of unsold products per 1 day) × Number of working days.

Costs related to disability = (The amount of social benefits per year + The cost of unsold products per year) × Number of disabled people

Economic effect = prevented economic damage

Economic effect = $Costs\ 1 - Costs2$

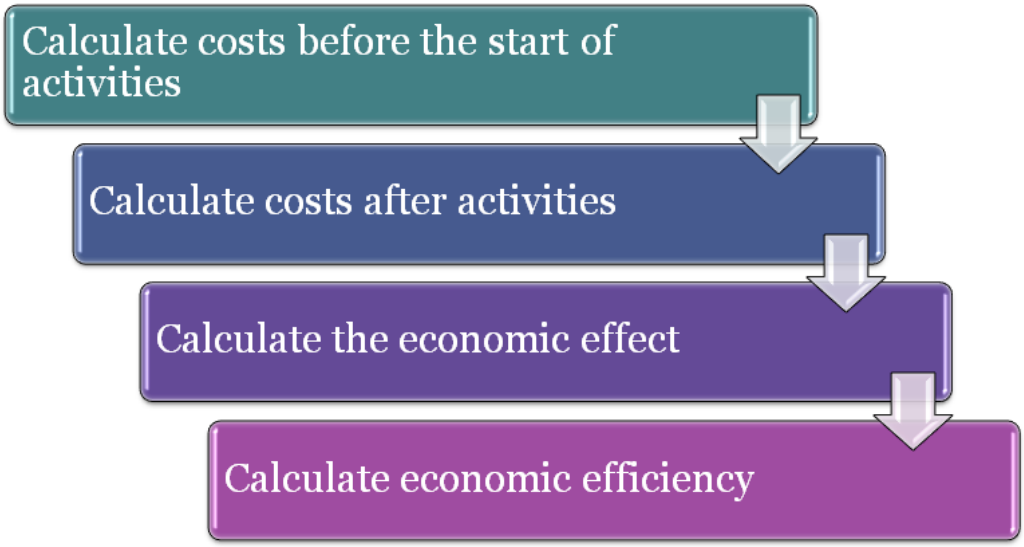


Fig. 10.9.Methodology for calculating economic efficiency. Steps

Tests

1. THE ECONOMICS OF PUBLIC HEALTH IS -

1) the study of the use of objective economic laws and relations in public health services, as one of the branches of state economy
2) a branch of medicine that deals with public health and risk-factor evaluation
3) a branch of medicine that deals with disease prevention and health promotion
4) a complex economic knowledge of forms, methods, results of the activity in the field of medicine

2. WHAT IS THE MAIN PURPOSE OF THE ECONOMICS OF PUBLIC HEALTH?

1) rational use of the available resources
2) maximal satisfaction of the population health care requirements
3) introduction of the new organizational forms and methods of medical care
4) introduction of economic efficiency of public health services

3. WHICH TYPE OF AVAILABLE MEDICAL INSTITUTION′S RESOURCES DO YOU KNOW?

1) financial and worker resources
2) material, financial and manpower resources
3) manpower, material and technical resources

4. WITH REFERENCE TO PUBLIC HEALTH SERVICES WE DISTINGUISH:

1) social and economic efficiency
2) medical and economic efficiency
3) social, medical and economic efficiency
4) social and medical efficiency

5. WHICH TYPE OF EFFICIENCY IS MOST IMPORTANT FOR PUBLIC HEALTH?

1) social efficiency
2) medical efficiency
3) economic efficiency
4) social and medical efficiency

6. WHAT IS HEALTH ECONOMIC EFFICIENCY?

1) a change of the level and character of disease and its tendencies
2) a positive contribution that public health system brings by improving the population's health in relation to with the national income growth
3) optimization of levels of birth rate, reduction of death rate and increase of life expectancy

7. WHAT IS PUBLIC HEALTH SOCIAL EFFICIENCY?

1) a change of the level and character of disease and its tendencies
2) a positive contribution that public health system brings by improving the population's health in relation to with the national income growth
3) optimization of levels of birth rate, reduction of death rate and increase of life expectancy

8. WHAT IS HEALTH MEDICAL EFFICIENCY?

1) a change of the level and character of disease and its tendencies

2) a positive contribution that public health system brings by improving the population's health in relation to with the national income growth

3) optimization of levels of birth rate, reduction of death rate and increase of life expectancy

9. PUBLIC HEALTH AND HEALTH IS –

1) a branch of non-productive sphere of the state economy

2) a branch of productive sphere of the state economy

10. The economic efficiency of health care can be calculated as

1) Number of patients satisfied with medical care × 100 / Number of estimated cases

2) Number of positive medical outcomes × 100 / Number of estimated cases

3) Economic effect / cost

11. HEALTH MANAGEMENT. HEALTH PLANNING

Main questions

1. Management. Definition, core principles of management.
2. Management functions and their characteristics.
3. Levels, styles and methods of management.
4. Planning in health care: definition, principles and tasks.
5. Types of plans in health care. The basic methods of planning, their brief characteristics.

Theoretical information

Definition of the concept «Management»

Management is a kind of work activity, mental labor, as a result of which the **management process** is carried out.

Management is the management process, with all its **functions, methods and means**.

Management is a **management institution** (government)

Management is a **scientific discipline** dedicated to problems arising in the **management of people**.

Management is an **academic discipline** dedicated to management

Management is not only a science, but also an **art** of management.

Management is a **science** and a **kind of practical activity**, consisting in the formation of an integrated **planning, organization, motivation and control** over organizational resources to **achieve the organization's goals**.

The purpose of management is the development and use of principles, methods, management technologies, as well as systems, structures and forms for the effective achievement of the organization's objectives

The subject of management studies is management relations in the sphere of production activity in its various parts and at different levels of management.

Principles of Health Management:

- The principle of allocating management objectives
- Principle of legal protection of management decisions
- Principle of optimization of management
- Principle of sufficiency in centralization and decentralization of management

– The principle of unity of command
– Principle of delegation of authority

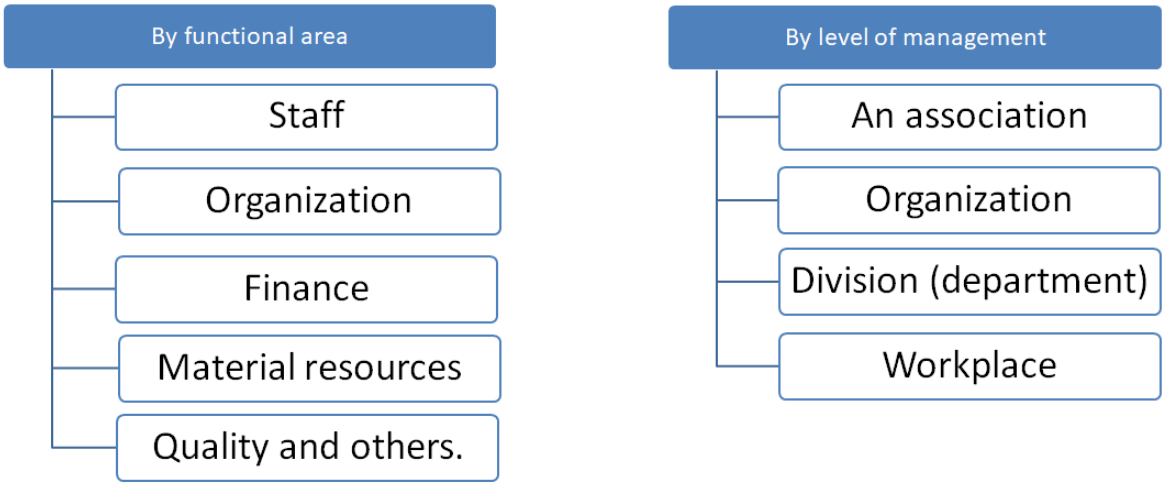


Fig. 11.1. Objects of management

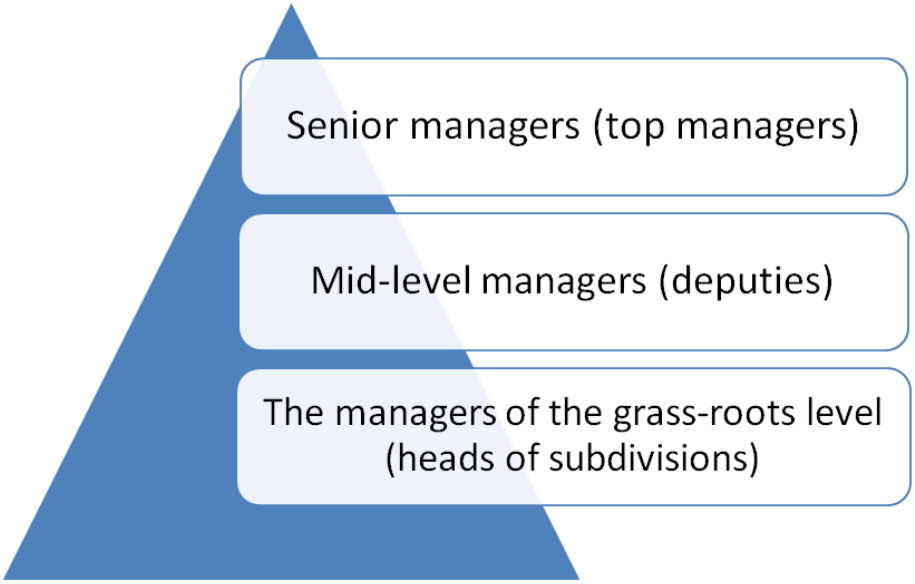
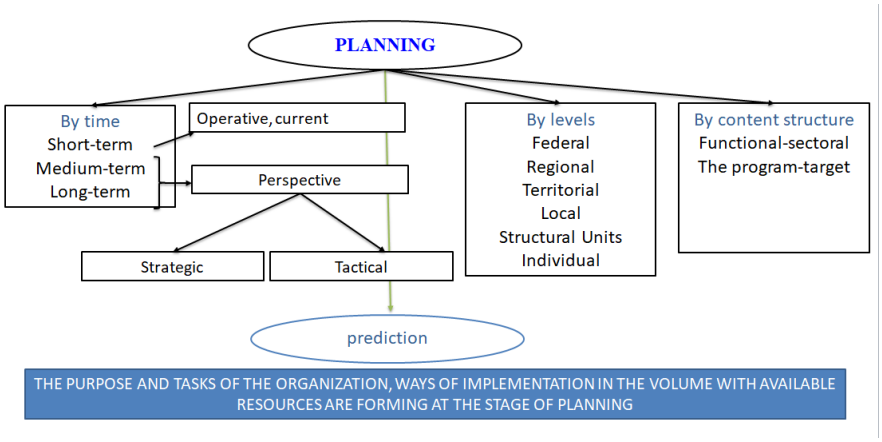


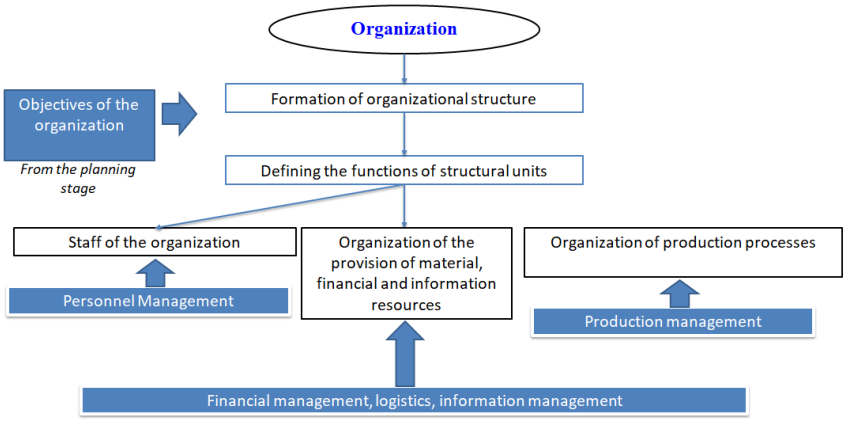
Fig. 11.2. Subjects of management by levels

Fig. 11.3. Management functions

Table 11.1. Questions typical for management functions

PLANNING
1. What is the most important task or nature (mission) of the organization? 2. What shall be the purposes? 3. What changes are taking place in the external environment and how are they reflected and may affect the organization in the future? 4. What strategy and tactics should be chosen to achieve the goals?
ORGANIZATION OF ACTIVITIES
1. How to build the structure of the organization? How to expand the blocks of work? 2. How to coordinate the functioning of these blocks so that it proceeds harmoniously and is not contradictory? 3. Definition of decision-making powers to the various levels of organization. 4. Should the structure of the organization be changed due to changes in the external factors?
MOTIVATION
1. What do subordinates need? 2. How are these needs met in the course of activities aimed at achieving the organization's goals? 3. If job satisfaction and the productivity of subordinates is increased, then why did this happen? 4. What can be done to increase the level of job satisfaction and performance of subordinates?
CONTROL
1. How should the results of the work be measured? 2. How often should the results be evaluated? 3. How successful have we been in achieving our goals? 4. If we have not made enough progress towards the goals, then why did this happen and what adjustments should be made?





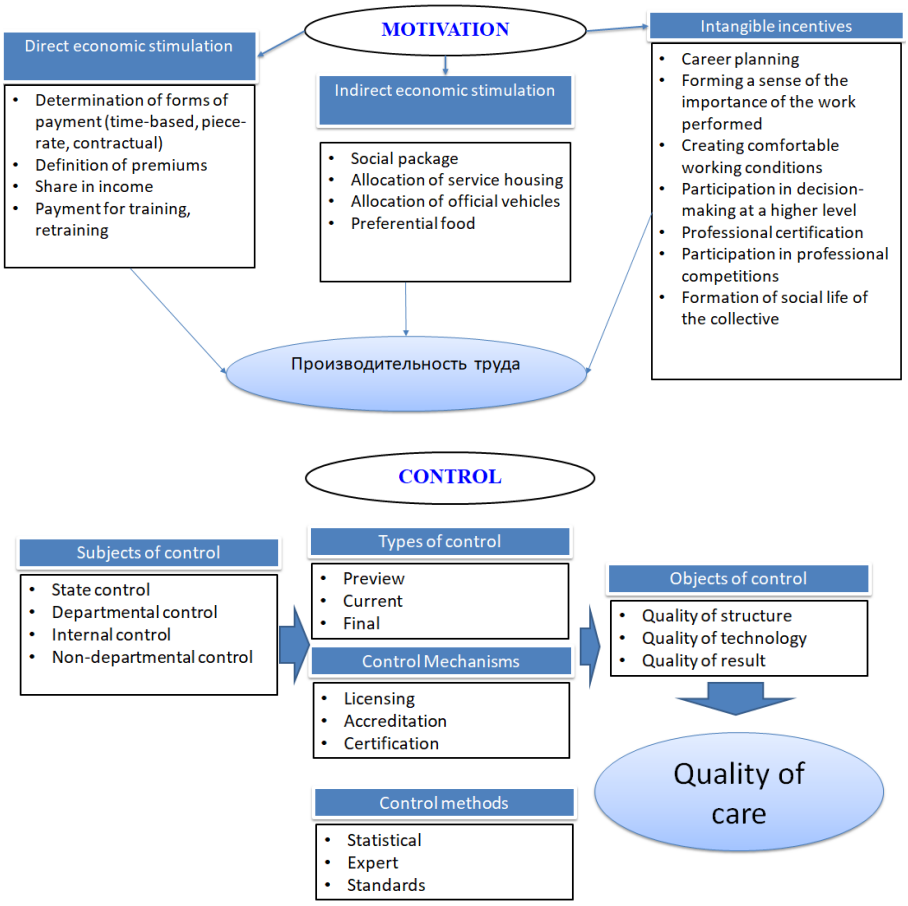


Fig. 11.4.Health management functions

Table 11.2. Management Styles

Management Styles	Authoritarian	Democratic	Liberal
The essence of style	Concentrating all power and responsibility in the hands of the leader Personal goal setting and choice of means to achieve them Communication flows are mainly from the top	Delegation of authority with the retention of key positions from the leader Decision-making is divided into levels based on participation Communications are carried out actively in two directions	Leadership of responsibility and renunciation in favor of a group or organization Granting the group the opportunity of self-management in the mode desired by the group Communications are built mainly horizontally
Strengths	Attention to the urgency and order, predictable results	Enhancement of personal commitment to work through participation in governance	Allows you to start a business the way it is seen without the intervention of a leader
Weak sides	Individual initiative is restrained	It takes a long time to make decisions	The group may lose direction and reduce speed without the intervention of the leader

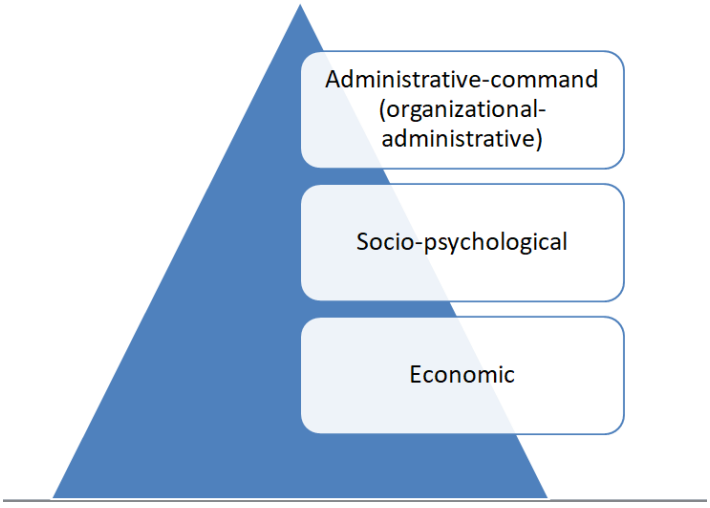


Fig. 11.5.Management Methods

Method of planning inpatient care

1. Calculation of the number of beds required

$$К = \frac{Н \times Р \times П}{Д \times 1000},$$

К - the required number of beds;
Н - number of population;
Р - level of hospitalization;
П - duration of hospitalization;
Д - average number of days of work in the year

2. Calculation of the required number of physicians of residents

$$В = \frac{K}{average\ number\ of\ beds\ per\ doctor}$$

3. Calculation of the required number of physicians of the strengthening group (department heads, doctors consultants, doctors on duty).

$$Ву = \frac{В \times Кву}{Кв},$$

Ву – the number of the doctors of the strengthening group
В – the number of physicians the second stage
Кву – the calculation factor for the physicians of the strengthening group
Кв – calculated factor for physicians

Out-patient and polyclinic care

1. Determination of the necessary number of doctors of the main group

$$В = \frac{Л \times Н}{Ф},$$

В – the required number of doctors;
Л – norm of visits per person per year;
Ф – function of medical staff (number of visits per year for one doctor's staff

2. Calculation of the required number of physicians of the amplification group

$$Ву = \frac{В \times Кву}{Кв}$$

Tests

1. SPECIFY THE CORRECT DEFINITION OF MANAGEMENT

1) Management is the science of meeting the needs of the population through exchange (Marketing)
2) Management is a science and a kind of practical activity, consisting in the formation of an integrated planning, organization, motivation and control over organizational resources to achieve the organization's goals
3) Management the study of the use of objective economic laws and relations in public health services, as one of the branches of state economy

2. WHAT ARE MANAGEMENT OBJECTS?

1) Personnel, organization, financial and material resources, quality of activities
2) Material, financial and manpower resources
3) Senior managers (top managers), mid-level managers (deputies), the managers of the grassroots level

3. WHAT ARE MANAGEMENT SUBJECTS?

1) Personnel, organization, financial and material resources, quality of activities
2) Material, financial and manpower resources
3) Senior managers (top managers), mid-level managers (deputies), the managers of the grassroots level

4. MANAGEMENT FUNCTIONS ARE:

1) Licensing, accreditation, certification
2) Control, searching for defects, punishing those responsible
3) Forecasting, marketing, standardization, licensing, calculation of economic efficiency
4) Planning, organization, motivation, control

5. UNDER WHAT MANAGEMENT STYLE CAN WE EXPECT A TIMELY AND DISCIPLINED APPROACH TO THE SOLUTION OF THE TASKS?

1) Authoritarian
2) Democratic
3) Liberal
4) Dynamic

6. WHAT STYLE OF MANAGEMENT IS BEST FOR REVEALING THE CREATIVE POTENTIAL OF THE TEAM?

1) Authoritarian
2) Democratic
3) Liberal
4) Dynamic

7. UNDER WHAT MANAGEMENT STYLE CAN YOU EXPECT TO SEE INCREASED PERSONAL COMMITMENT TO WORK?

1) Authoritarian
2) Democratic
3) Liberal
4) Dynamic

8. WHAT IS THE MOST OPTIMAL MANAGEMENT STYLE?

1) Authoritarian
2) Democratic
3) Liberal
4) Dynamic

9. CHOOSE CHARACTERISTIC FEATURES OF ECONOMIC MANAGEMENT METHODS

1) make it possible to compensate for miscalculations in planning, to react quickly to a changing situation, to bring the object of management to new paths by means of directives, orders, instructions, orders, resolutions, regulations.

2) include economic analysis of health organizations, methods of planning and forecasting, statistical analysis

3) a set of means of influencing the collective, the ability to motivate the employee to work efficiently, partner relations, creating a favorable psychological climate in the team

4) implies the democratization of management, increasing the participation of employees in the performance of management functions

10. APPROVAL OF STANDARDS OF MAINTENANCE OF POPULATION OF MEDICAL ASSISTANCE THIS IS THE OBJECTIVE OF …

1) program-targeted health planning
2) functional-sectoral health care planning

TEST KEYS

THE ORGANIZATION AND CARRYING OUT OF STATISTICAL RESEARCH

Question	Answers	Question	Answers
1	1, 3, 4	11	1, 4
2	1, 3, 6, 7	12	1
3	2, 4, 5	13	4
4	1	14	2
5	2	15	3
6	2	16	1
7	1	17	3
8	1, 3, 4	18	1, 3, 4
9	2, 4, 6	19	3
10	2, 3	20	1, 2, 4, 5

BASIC TECHNIQUES FOR ANALYSING CATEGORICAL DATA

Question	Answers
1	3
2	3
3	3
4	1
5	4
6	2
7	4
8	2
9	1
10	2

BASIC TECHNIQUES FOR ANALYSING NUMERICAL DATA

Question	Answers
1	2
2	1
3	2
4	3
5	2
6	3
7	2
8	1
9	3
10	1

TIME SERIES AND THEIR ANALYSIS

Question	Answers
1	2,3
2	3
3	4
4	4
5	2
6	1
7	2,3
8	3
9	4
10	3

CORRELATION AND REGRESSION ANALYSIS

Question	Answers
1	2
2	1
3	2
4	1
5	3
6	2
7	1
8	3
9	2
10	2

A TECHNIQUE OF DEMOGRAPHIC PROCESSES STUDYING

Question	Answers
1	2
2	4
3	2
4	4
5	5
6	2
7	1
8	2
9	2
10	3

METHOD OF STUDY AND ESTIMATION OF INDEXES OF GENERAL MORBIDITY

Question	Answers
1	1
2	5
3	2
4	3
5	3
6	1
7	1
8	4
9	1
10	3

PRIMARY HEALTH CARE. ORGANIZATION OF OUTPATIENT CARE

Question	Answers
1	2
2	3
3	5
4	1
5	3
6	1
7	4
8	3
9	4
10	5

ORGANIZATION OF THE IN-PATIENT AID TO THE POPULATION. INDICATORS OF HOSPITAL ACTIVITY

Question	Answers
1	3
2	2
3	4
4	5
5	1
6	3
7	4
8	1
9	1
10	4

PUBLIC HEALTH ECONOMY. METHODOLOGY FOR CALCULATING ECONOMIC EFFICIENCY

Question	Answers
1	1
2	2
3	2
4	3
5	4
6	2
7	3
8	1
9	1
10	3

HEALTH MANAGEMENT. HEALTH PLANNING

Question	Answers
1	2
2	1
3	3
4	4
5	1
6	3
7	2
8	4
9	2
10	2

LIST OF RECOMMENDED LITERATURE

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2. Maksimenko L.L. Organisation of the treatment-and-prophylactic aid in Russia. The manual. Stavropol, 2010. 107 p.
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