MINISTRY OF HEALTH OF UKRAINE
DANYLO HALYTSKY LVIV NATIONAL MEDICAL UNIVERSITY

SYLLABUS

for the discipline

"SOCIAL MEDICINE, PUBLIC HEALTH"

(Content module 1. BIOSTATISTICS)

ОК 33.1

for the 3-year students

of the second (master`s) level of higher education,

qualification "Master of Medicine"

professional qualification "Physician"

branch of knowledge 22 «Health Care»

specialty 222 «Medicine»

2023

1. General information	
Faculty	Foreign Students
Educational program	22 Health care, 222 Medicine, second (master's) level of higher education, full-time
Academic year	2023-2024
Name of discipline, code	Social medicine, public health (content module 1. Biostatistics) OK 33.1 https://new.meduniv.lviv.ua/kafedry/kafedra-sotsialnoyi-medytsyny-ekonomiky-ta-organizatsiyi-ohorony-zdorov-ya/
Department	Department of social medicine, economics and organization of health care Address: Zelena, 12 tel. +38 032 276-81-67 e-mail: kaf_socmed@meduniv.lviv.ua
Head of the department	Associate professor Taras Gutor, taras_gutor@ukr.net
Year of study	3rd year of study
Term	5th or 6th terms
Type of discipline / module	Obligatory
Teachers	Associate Professor Taras Gutor taras_gutor@ukr.net Associate Professor Oksana Kovalska oksanaromkov@ukr.net Assistant of the department Zaremba Natalia natalyazaremba@gmail.com Assistant of the department Iryna Hupalo irahup@gmail.com Assistant of the department Natalia Timchenko timchenkonataliaf@ukr.net Assistant of the department Roman Lysuyk socmed_ES@i.ua
Erasmus	no
The person responsible for the syllabus	Assistant of the department Hupalo Iryna irahup@gmail.com
Number of ECTS credits	3 credits
Number of academic hours	90 hours (14 hours of lectures, 30 hours of practical classes, 46 hours of self-guided study of students)
Language of study	English
Information on consultations	Consultations - according to the schedule for the course once a week from 3.30 p.m. till 5.00 p.m.
Address, telephone and regulations of the clinical base, office	Clinical base is not provided
2. Short description to the course	

Academic discipline "Social medicine, public health" (module 1. Biostatistics) involves mastering biostatistics, which includes the definition and analysis of basic biostatistical indicators and criteria based on the principles of evidence-based medicine.

| 3. The purpose and objectives of the course | |

1. **The purpose** of the course "Social medicine, public health" (content module 1. Biostatistics) is to acquire necessary knowledge, skills and competencies for research, analysis and evaluation of public health indicators. It will enable developing recommendations for prevention and eliminating the harmful effects of factors on public health based on the principles of evidence-based medicine

2. **Learning objectives:**
• acquiring theoretical knowledge in biostatistics;
• knowing modern principles of evidence-based medicine;
• getting familiar with common methods for definition and analysis of the basic biostatistical indicators and

criteria;

   • acquiring methodological and theoretical knowledge in the formation of statistical aggregates for their further adequate analysis;

   • knowing the methodology for determination, analysis and evaluation of the main indicators of public health according to individual criteria and in relation to the factors that affect it.

  3. **Competences** and learning outcomes of the discipline:

  - **General competences (GC):**

GC-1 – Ability to abstract thinking, analysis and synthesis.

GC-2 – Ability to learn and master modern knowledge.

GC-3 – Ability to apply knowledge in practical situations.

GC-4 – Knowledge and understanding of the subject area and understanding of professional activity.

GC-5 – Ability to adapt and act in a new situation.

GC-6 – Ability to make informed decisions.

GC-7 – Ability to work in a team.

GC-8 – Ability to interpersonal interaction.

GC-9 – Ability to communicate in a foreign language.

GC-10 – Ability to use information and communication technologies.

GC-11 – Ability to search, process and analyze information from various sources.

GC-12 – Definiteness and perseverance in terms of tasks and responsibilities.

GC-13 – Awareness of equal opportunities and gender issues.

GC-14 – The ability to exercise their rights and responsibilities as a member of society, to be aware of the values of civil (free democratic) society and the need for its sustainable development, the rule of law, human and civil rights and freedoms in Ukraine.

GC-15 – Ability to preserve and multiply moral, cultural, scientific values and achievements of soci-ety based on understanding the history and patterns of development of the subject area, its place in the general system of knowledge about nature, society and in the development of society, techniques and technolo-gies. active recreation and leading a healthy lifestyle, use different types and forms of physical activity for active recreation and a healthy lifestyle-

  - **Special (professional, subject) competences (PC):**

PC-1 – Ability to collect medical information about the patient and analyze clinical data.

PC-11 – Ability to solve medical problems in new or unfamiliar environments with incomplete or limited information, taking into account aspects of social and ethical responsibility.

PC-13 – Ability to carry out sanitary and hygienic, preventive measures.

PC-14 – Ability to plan and carry out preventive and anti-epidemic measures against infectious dis-eases.

PC-15 – Ability to conduct an examination of working capacity.

PC-16 – Ability to keep medical records, including electronic forms.

PC-17 – Ability to assess the impact of the environment, socio-economic and biological determi-nants on the health state of the individual, family, population.

PC-18 – Ability to analyze the activities of a doctor, subdivision, health care institution, ensure the quality of medical care and improve the efficiency of the use of medical resources.

PC-19 – Ability to organize and integrate the provision of medical care to the population and the marketing of medical services.

PC-20 – Ability to conduct epidemiological and medical-statistical studies of public health; pro-cessing of social, economic and medical information.

PC-21 – Clearly and unambiguously convey their own knowledge, conclusions and arguments on health care issues and related issues to specialists and non-specialists, in particular to students.

PC-22 – Ability to manage workflows, in the field of health care, which are complex, unpredictable and require new strategic approaches

PC-23 – Ability to develop and implement scientific and applied projects in the field of health care.

PC-24 – Adherence to ethical principles when working with patients, laboratory animals.

PC-25 – Adherence to professional and academic integrity, to be responsible for the accuracy of the ob-tained scientific results

4. Prerequisites of the course

"Social medicine, public health" (content module 1. Biostatistics) as a discipline:

- is based on and interacts with the following disciplines: history of medicine, medical informatics and com-puter technology, ethics, hygiene and ecology, epidemiology, sociology and medical sociology, the basics of economic theories;

- lays the foundations for the study of the organization of medical and diagnostic process, as well as assessment of its scope and quality in the study of clinical disciplines;

- promotes the formation of preventive activities of future doctors, taking into account the possible impact on public health of factors of various origins, risk assessment in the development of comprehensive medical and social measures in cooperation with the public health system; - contributes to the formation of economic worldview and basic competency characteristics for the methodology of economic analysis of medical institutions in modern conditions.		

5. Program learning outcomes/ results

List of learning outcomes /results

Codes of Learning Outcomes	Description of the learning outcome	Reference to the code of the competence matrix of the program learning outcome in the Standard of higher education
Kn-2	Knowledge of statistical and epidemiological methods. Knowledge of the requirements for diagnostic tests that can be used in screening studies	*PR 3*
Kn-1, Kn-2	Knowledge of the sources of evidence-based medicine, the scale of gradations of the strength of evidence	*PR 1, PR 2*
Kn-1, Kn-2	Knowledge of socio-economic and biological determinants that affect public health	*PR 1, PR 2*
Kn-2	Knowledge of the main indicators that characterize the activities of the healthcare institutions	*PR 1, PR 2*
S-2	Process standard methods of descriptive, analytical, epidemiological and medical-statistical research. Ability to calculate risks	*PR 3*
S-1	Be able to determine the source and location of the required information depending on its type. Be able to process information and analyze the received information.	*PR 21, PR 22*
S-2, S-3	Ability to analyze the results, compare them with existing ones	*PR 18, PR 20*
S-2, S-3	Be able to calculate and evaluate the main indicators of the doctor, department, health care institution activity	*PR 3*
C-1, C-2	Conducting epidemiological and medical-statistical studies of public health	*PR 27*
C-2	Decision making based on evidence-based medicine	*PR 15, PR 28, PR 29*
C-2	Assess the impact of risk factors on health	*PR 18, PR 23*
C-2	Carrying out a statistical analysis of the activities of a doctor, department, health care institution	*PR 22*
AR-1, AR-3	Ability to formulate conclusions based on medical and epidemiological data	*PR 19*
AR-1, AR-3	Responsibility for the completeness and quality of the analysis of information and conclusions based on its analysis	*PR 25*
AR-1, AR-2	Responsibility for the validity of assessments of risk factors for public health	*PR 24, PR 29*
AR-1, AR-2	Responsibility for the validity of decisions to improve the activities of the doctor, institution / health care unit	*PR 16, PR 26, PR 28*

6. Format and scope of the course

Course Format	**full-time**	
Type of academic classes	Number of hours	Number of groups
lectures	**16**	23
practical	**32**	23
seminars	**0**	-
self-study	**42**	23

7. Topics and description of the course

Code of occupation type	Topic	Content of learning	Code of learning outcome	Teacher
L-1	Fundamentals of biostatistics: history, practical significance, basic concepts	Definitions of "biostatistics", "evidence-based medicine", "clinical epidemiology". The main stages of the development of biostatistics. Outstanding scientists and their contribution to the development of biostatistics. Relative values, their graphic images. Types of statistical research.	*PR 1, PR 2, PR 3*	Associate Professor Taras Gutor

L-2	Descriptive statistics of quantitative indicators. Estimation of probability of the received results	Measures of variation, the concept of distribution laws, their types, characteristics. Description of results in Gaussian and non-Gaussian distributions. Principles of assessing the probability of the difference between the results obtained in clinical trials.	*PR 1, PR 2, PR 3*	Associate Professor Taras Gutor
L-3	Evidence - based medicine. Statistical indicators of diagnostic tests on the example of diagnostics of acute respiratory disease COVID-19 caused by coronavirus SARS-CoV	Basic principles of evidence-based medicine. Theory and practice of evidence-based medicine. The concept of end results. Accuracy, sensitivity and specificity of diagnostic tests. ROC analysis. Bayesian distribution.	*PR 1, PR 2, PR 3*	Associate Professor Taras Gutor
L-4	Sociological research in the health care system. Interrelation analysis.	Sociology of health. Principles and rules of conducting surveys and questionnaires. Expert assessments. Rank and linear methods for assessing the interrelation between indicators.	*PR 1, PR 2, PR 3*	Associate Professor Taras Gutor
L-5	Medical and social problems of the health of population and methodology of its study	Population health as a conditional statistical concept. Methods of studying health. Population health indicators: demographic (fertility, mortality, life expectancy); physical development; morbidity; disability.	*PR 1, PR 2, PR 3*	Associate Professor Taras Gutor
L-6	Medical and social problems of demographic processes. /Peculiarities of demographic indicators in different regions of the world and in Ukraine, including during martial law	Demography as a science. Sources. Dynamics of the number and composition of the population in different regions of the world, countries and in Ukraine. Natural population movement. Fertility, indicators and factors influencing fertility. Current trends and regional features of birth rate in Ukraine and the world. Total mortality rate, its leading causes in different regions	*PR 1, PR 2, PR 3*	Associate Professor Taras Gutor
L-7	Morbidity of the population as a medical and social problem. Types and epidemiological methods of studying morbidity	Disease epidemic surveillance system. Monitoring the incidence and prevalence of diseases. Registers of infectious and non-infectious diseases. Monitoring of diseases and indicators of maternal and child health, mental health, social health.	*PR 1, PR 2 , PR 3*	Associate Professor Taras Gutor
P-1	Organization and conduct of statistical research	Methodological bases, forms and methods of statistical observation and data collection. Accuracy of observations. Types, stages, research design, methods of sampling, methods of calculating the sample size	*PR 15-16, PR 18-20, PR 22-29*	according to the schedule of groups
P-2	Relative values	The concept of statistical indicators, their types, form of presentation. Absolute data, relative values, their practical significance. Types of relative values, methods of their calculation	*PR 15-16, PR 18-20, PR 22-29*	according to the schedule of groups
P-3	Grouping values in the table. Graphic representation of statistical data	Types of diagrams, rules of their construction, correctness of use. Modern methods of graphic images, infographics, animation of diagrams, interactive diagrams	*PR 15-16, PR 18-20, PR 22-29*	according to the schedule of groups
P-4	Variation series. Mean values (non-Gaussian /Gaussian distribution)	Elements and characteristics of variation series. Measures of variation, the concept of distribution laws, their types, characteristics. Evaluation of the distribution norms.	*PR 15-16, PR 18-20, PR 22-29*	according to the schedule of groups
P-5	Mean values (Gaussian /Gaussian distribution)	Average values: their types, calculation methods, features of use. The concept of variation, its meaning. The rule of "three sigma", its practical use	*PR 15-16, PR 18-20, PR 22-29*	according to the schedule of groups
P-6	Types of dynamics series and basics of forecasting, including acute respiratory disease	Types of dynamics series. The main indicators of the analysis of dynamic series. The main methods of processing the dynamic series in order to determine the trend. Methods	*PR 15-16, PR 18-20, PR 22-29*	according to the schedule of groups

	COVID-19 caused by coronavirus SARS-CoV-2	for aligning dynamic series. Forecasting based on extrapolation of dynamic series.		
Р-7	Standardization method	Types of standardization methods: direct, indirect, reverse. Characteristics of the stages of the standardization method. Selection and calculation of the standard. Calculation of expected numbers. Calculation of standardized indicators.	*PR 15-16, PR 18-20, PR 22-29*	according to the schedule of groups
П-8	Parametric methods for assessing the reliability of the results (Student's criterion)	Hypotheses zero, alternative, relative and mean errors, Wald confidence intervals. Calculation and interpretation at $n > 30$ and $n < 30$, Student's table	*PR 15-16, PR 18-20, PR 22-29*	according to the schedule of groups
Р-9	Nonparametric methods for assessing the reliability of the results (Mann-Whitney test). Comparison of particles by the Pearson chi-square method	Features of the use of nonparametric criteria: Mann-Whitney, Kruskal-Wallis. Using the Pearson chi-square method	*PR 15-16, PR 18-20, PR 22-29*	according to the schedule of groups
Р-10	Survival analysis. Mortality	The concept of one-factor analysis of variance and multifactor analysis. Patient survival analysis (Kaplan-Meier method). The concept of cluster analysis	*PR 15-16, PR 18-20, PR 22-29*	according to the schedule of groups
Р-11	Methods of sociological research in medical practice, including during martial law	Methods of collecting statistical material. Types of questionnaires, their characteristics. Marketing and sociological surveys, types of questions in the survey, problems of organizing surveys in health care	*PR 15-16, PR 18-20, PR 22-29*	according to the schedule of groups
Р-12	Risk factors	Absolute, relative, attributive risks, chance, ratio of chances, added risk (addition, multiplication of risks)	*PR 15-16, PR 18-20, PR 22-29*	according to the schedule of groups
Р-13	Correlation analysis (linear, rank correlations, regression)	Study of the interrelation between quantitative variables. The concept of functional and correlation interaction. Strength and direction of interaction. Types of correlation coefficients. Pearson's linear correlation coefficient, its estimation, characteristic. Spearman's rank correlation coefficient.	*PR 15-16, PR 18-20, PR 22-29*	according to the schedule of groups
Р-14	Effectiveness of diagnostic tests	Screening. Evaluation of screening results. Requirements for screening tests. Sensitivity and specificity of the screening test. The relationship between sensitivity and specificity. Accuracy, PPV, NPV	*PR 15-16, PR 18-20, PR 22-29*	according to the schedule of groups
Р-15	Power analysis. Types of errors in conducting clinical trials	The practical significance of the method of power analysis. Statistical research planning. The size of the effect, its clinical significance. Typical errors at the stages of research. Random and systematic error.	*PR 15-16, PR 18-20, PR 22-29*	according to the schedule of groups
IWS-1	Clinical epidemiology, its importance for practice of health care, including during martial law	Grouping of statistical data, methods, meaning. The concept of multidimensional classifications. Data encryption and encoding. Program for the development and compilation of statistical material.	*PR 21, PR 22*	according to the schedule of groups
IWS-2	Analysis of general theoretical and methodological foundations of the formation and development of biostatistics as an independent science	Medical information: its components, problems related to information search. Literature databases, medical libraries. Generalization of results of clinical research. Analytical reviews.	*PR 21, PR 22*	according to the schedule of groups
IWS-3	Types of values used in biostatistics and methods of visual representation of statistical data	Methodical bases of application for data analysis. The concept and types of structure of medical and biological data, structural changes, features of their analysis.	*PR 21, PR 22*	according to the schedule of groups

IWS-4	Characteristics and analysis of statistical data. Types of average values and criterion of variability of features	Average values in clinical and epidemiological studies, their practical significance. Variability of population parameters, estimation methods. Absolute indicators of variation	*PR 21, PR 22*	according to the schedule of groups
IWS-5	Methods of alignment and indicators of dynamic series	Basic rules of construction and analysis of dynamic series in the study of the dynamics of medical and biological phenomena. Levels of series.	*PR 21, PR 22*	according to the schedule of groups
IWS-6	Methods of standardization in the assessment of health of population and analysis of performance indicators of health care institutions	Problems of comparing statistical indicators in inhomogeneous aggregates. The practical significance of the standardization method	*PR 21, PR 22*	according to the schedule of groups
IWS-7	Methods of assessing the reliability of the results of statistical research	Estimation of probability of the received results. The concept of internal and external validity. The level of significance of statistical criteria. Zero and alternative hypotheses. Hypothesis testing. Error of the 1st and 2nd type.	*PR 21, PR 22*	according to the schedule of groups
IWS-8	Analysis of the interrelation between the studied parameters of statistical aggregates	Paired and multiple correlation coefficients. Regression analysis, regression coefficient, regression equation. Using regression analysis for prediction.	*PR 21, PR 22*	according to the schedule of groups
IWS-9	Methods of conducting of scientific research	Statistical research planning. The purpose and objectives of the study. Sources of statistical information. Object of research, unit of observation. Types of research by the amount of content	*PR 21, PR 22*	according to the schedule of groups
IWS-10	Medical and social problems of demographic processes and morbidity of the population, including acute respiratory disease COVID-19 caused by coronavirus SARS-CoV-2	The value of the demographic indicator to assess the health of the population, the level of socio-economic well-being and the development of society. Leading causes of infant mortality. Average life expectancy, definition.	*PR 21, PR 22*	according to the schedule of groups

8. Verification of learning outcomes

Current control

is carried out during academic classes and aims to check the knowledge of learning material by students. Forms of assessment of current educational activities include control of theoretical and practical skills. The final grade for the current academic activity is based on a 4-point (national) scale

Code of learning outcome	Code of occupation type	Method of verifying learning outcomes / results	Evaluation criteria
AR-1, AR-2, AR-3	*L-1-7*	Checking the lecture notes	passed / not passed
AR-1, AR-2, AR-3	*P-1-15*	Checking of a written task for extracurricular self-preparation for practical lesson	passed / not passed
AR-1, AR-2, AR-3	*IWS-1-10*	Checking of a written task for self-study	passed / not passed
Kn-1, Kn-2, S-1, S-2, S-3, C-1, C-2	*L-1-7, P-1-15, IWS-1-10*	Oral control during a practical class on lecture material, the topic of practical lesson and independent work	"2" - <60% of correct answers; "3" - 60-69%, "4" - 70-89%, "5" - 90-100%.
Kn-1, Kn-2, S-1, S-2, S-3, C-1, C-2	*L-1-7, P-1-15, IWS-1-10*	Test control during a practical lesson	"2" - <70% of correct answers; "3" - 70-79%, "4" - 80-89%, "5" - 90-100%.
Kn-1, Kn-2, S-1, S-2, S-3, C-1, C-2	*P-1-15, IWS-1-10*	Demonstrating practical skills of calculation of indicators	"2" - <60% of correct answers; "3" - 60-69%, "4" - 70-89%, "5" - 90-100%.

Kn-1, Kn-2, S-1, S-2, S-3, C-1, C-2	P-1-15, IWS-1-10	Demonstrating practical skills of evaluation and analysis of the study results	"2" - <60% of correct answers; "3" - 60-69%, "4" - 70-89%, "5" - 90-100%.

Final control

General evaluation system	Academic performance during the semester - 100% on a 200-point scale	
Rating scales	Traditional 4-point scale, multi-point (200-point) scale, ECTS rating scale	
Conditions of admission to the final control	The student attended all practical (laboratory, seminar) classes and received at least 120 points for classroom academic performance	
Type of final control	Methods of final control	Criteria of Evaluation
Credit	Students have to pass all topics by the thematic schedule. Grades by the 4-point scale are converted into points on a multi-point (200-point) scale in accordance with the Regulation "Criteria, rules and procedures for evaluating the results of student academic performance"	*The maximum number of points is 200. The minimum number of points is 120*

The maximum number of points that a student can score for the current academic performance to pass a credit is 200 points.

The minimum number of points that a student has to score for the current academic performance to receive credit is 120 points.

The calculation of the number of points is based on the grades received by the student by a 4-point (national) scale during the course of the discipline, by calculating the arithmetic mean (A), rounded to two decimal places. The resulting value is converted into points on a multi-point scale as follows:

$$x = \frac{A \times 200}{5}$$

9. Course policy

During the course, teachers promote a policy of academic integrity.

10. Literature

Basic

1.Gruzeva T.S., Lekhan V.M., Ognev V.A., Galienko L.I., Kryachkova L.V., Palamar B.I., Grechishkina N.V., Litvynova L.O., Gutor T.G. [etc.]. Biostatistics: a textbook for the training of specialists of the second (master's) level of higher education / edited by Prof. T.S. Gruzeva. Vin-nytsia: New Book, 2020. 384 p.

2.The public health: textbook for students of higher educational establishments. Vinnytsia: «New book/Nova Knyha », pub. 3. 2013. 560 p.

3. Workshop for preparation for practical classes in the academic discipline "Public Health". Lviv, 2020.

4.Jekel's Epidemiology, Biostatistics, Preventive Medicine, and Public Health: With Stu-dent Consult. Joann G. Elmore, Dorothea Wild, Heidi D. Nelson, David L. Katz. Elsevier; 5th edi-tion. 2020. 464 p.

5.Oxford Textbook of Global Public Health, 6 edition. / Edited by Roges Detels, Martin Gulliford, Quarraisha Abdool Karim and Chorh Chuan Tan. Oxford University Press, 2018. 1728 p.

Additional

1.Brigitte Baldi, David S. Moore Practice of Statistics in the Life Sciences Fourth Edition. W. H. Freeman; Fourth edition. 2018. 768 p.

2.Board Review in Preventive Medicine and Public Health. Gregory Schwaid. Elsevier, 2017. 450 p.

3.Liam J. Donaldson, Paul Rutter. Donaldson`s Essential Public Health, Fourth Edition. CRC Press, Taylor&Francis Group, 2017. 374 p.

4.The Legislation of Ukraine. The electronic resource: zakon.rada.gov.ua/

5.The medical legislation of Ukraine. The electronic resource: http://mozdocs.kiev.ua/

6.The statistical data of Ukraine. The electronic resource: http://www.ukrstat.gov.ua/

7.The statistical data of the Lviv region. The electronic resource: https://www.lv.ukrstat.gov.ua/

8.The center of public health WHC of Ukraine (Ministry of Health of Ukraine): https://phc.org.ua/

9.The Ukrainian database of medico-statistical information «Health for all»: http://med-stat.gov.ua/ukr/news.html?id=203

10.The World Health Organization www.who.int

11.The European Regional Bureau of WHO www.euro.who.int/ru/home

12.The Kokhranivsky centre of evidence-based medicine www.cebm.net

13.The Kokhranivsky library www.cochrane.org

14.The National medical library of the USA – MEDLINE PubMed www.ncbi.nlm.nih.gov/PubMed

15.The Canadian evidence-based centre of public care www.cche.net

16.The Centre of control and disease prevention www.cdc.gov

17.The Journal British Medical Journal www.bmj.com
18.The Journal Evidence-Based Medicine www.evidence-basedmedicine.com

11. Equipment, logistics and software of the discipline / course

• Curriculum, thematic schedules of lectures, seminars and independent extracurricular activities
• Presentations and full scripts of lectures
• Educational and methodical recommendations on the topic of the lesson (theoretical presentation of the topic of the lesson, control questions, situational tasks for independent work and a list of recommended references)
• Textbooks and manuals from the library
• Computer and multimedia projector

12. Additional information

All the necessary information for the educational process –thematic schedules of classes and extra classes, lecture materials, guidelines for practical classes, independent work of students, test control of knowledge is available in Misa: http://misa.meduniv.lviv.ua/course/view.php?id=1940

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Assoc. Prof., PhD Gutor T.H.