

SYLLABUS
Spring semester 2025-2026 a.y. for
7M10102 specialty "Public Health"
on discipline Biostatistics and
Epidemiology

ID and name of course	Independent work of the student (SIW)	Number of credits			General number of credits	Independent work of the student under the guidance of a teacher (ISWT)				
		Lectures (L)	Practical classes (PC)	Lab. classes (LC)						
BioE	4	0	90	-	5	6.				
ACADEMIC INFORMATION ABOUT THE COURSE										
Learning Format	Cycle, component	Lecture types		Types of practical classes	Form and platform final control					
Offline		yes			SDL Moodle: Creative task					
Lecturer - (s)	Farida Iskakova									
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Assistant - (s)										
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ACADEMIC COURSE PRESENTATION										
Course Objective:	Expected Learning Outcomes (LO)*				Indicators of achievement of LO (IA)					
to develop students' practical skills in planning and executing applied public health research by employing epidemiological study designs and statistical analysis methods, with the writing of a scientific report.	1. To describe the fundamental concepts, typology of study designs, core methodologies, and principles of statistical analysis in epidemiological research.				1.1 Distinguishes between types of epidemiological study designs. 1.2 Demonstrates how the choice of study design informs the selection of appropriate measures of association and statistical tests.					
	2. To design a protocol for an epidemiological study.				2.1 Develops a comprehensive study protocol that includes a theoretical part (research question, objectives, study design) and a practical part (participant selection, exposure and outcome measurement, and data management). 2.2 Defines variables and statistical methods for analysis. 2.3 Develops a research protocol using a standard template.					
	3. To perform descriptive statistical analysis of research datasets.				3.1 Calculates and generates key descriptive statistics (e.g., measures of central tendency, dispersion, frequency) appropriate for the scale and distribution of all variables in a dataset. 3.2 Summarizes and presents the descriptive analysis through well-formatted tables and graphs that clearly characterize the study sample and highlight key patterns in the data.					
	4. To select and apply appropriate inferential statistical tests based on study aims and data characteristics.				4.1 Justifies the choice of specific inferential statistical tests (e.g., t-test, chi-square, regression) based on the study design, measurement scales of variables, and underlying assumptions of the data. 4.2 Review results of inferential statistical analysis, and visualize in tables and graphs to perform associations between exposure and outcome.					
	5. To describe the fundamental concepts, typology of study designs, core methodologies, and principles of statistical analysis in epidemiological research.				5.1 Critically interprets statistical results that links to the study's aims and existing evidence. 5.2. Write a well-structured report with appropriate visual aids and conclusions.					

Prerequisites	Biostatistics [96313]
Postrequisites	Advanced epidemiology
Learning Resources	<p>The main literature:</p> <ol style="list-style-type: none"> 1. Gordis Epidemiology, Sixth Edition. 2019.-ELSEVIER.-434 p. 2. Rothman, Kenneth J.; Greenland, Sander; Lash, Timothy L. Modern Epidemiology, 3rd Edition - 2008 Lippincott Williams & Wilkins <p>The additional literature:</p> <ol style="list-style-type: none"> 3. Principles of Epidemiology in Public Health Practice Third Edition An Introduction to Applied Epidemiology and Biostatistics.CDC, USA, 512 p. 4. Kaplan Medical USMLE Step 1: Behavioral Science Lecture Notes Paperback – January 1, 2013 5. Biyasheva, Zarema Maratovna. Introduction to Biostatistics (Biometry) [Text] : educational man. / Z. M. Biyasheva, A. V. Lovinskaya, 2017. - 181 p. <p>Research infrastructure:</p> <ol style="list-style-type: none"> 1. computer class <p>Professional scientific databases:</p> <p>https://www.who.org/</p> <p>https://www.cdc.gov/index.html:</p> <p>www.gapminder.com</p> <p>Online resources</p> <p>e-library KazNU</p> <p>K.Glaser, Anthony N. High-yield biostatistics, epidemiology, and public health [Электронный ресурс] : [Electronic resource] : monograph / A. Glaser. - 4th ed. - / Glaser, Anthony N., 2014. - 122 c. Faselis, Charles Behavioral Science. USMLE Step 1 [Электронный ресурс] : [Electronic resource] : Lecture Notes. / C. Faselis. - / Faselis, Charles, 2013. - 230 c.</p> <p>Software</p> <p>Excel program</p> <p>IBM SPSS program 26 version</p>

Academic course policy	<p>Academic Values: Integration of science and education. The research work of students, undergraduates, and doctoral candidates represents a deepening of the educational process. It is carried out directly in the university's laboratories, scientific and design departments, and student scientific and technical associations. Independent student work at all levels of education is aimed at developing research skills and competencies through acquiring new knowledge using modern research and information technologies. Instructors at a research university integrate the outcomes of scientific activities into lecture and seminar topics, practical and laboratory classes, as well as into tasks for student scientific and technical work. These elements are reflected in the syllabus and ensure the relevance of training sessions and assignments.</p> <p>Attendance & Deadlines: The deadline for each task is indicated in the course calendar (schedule). Failure to meet deadlines will result in a loss of points.</p> <p>Academic Honesty: Practical and laboratory classes, along with student scientific work, foster independence, critical thinking, and creativity. Plagiarism, forgery, the use of cheat sheets, and cheating at any stage of task completion are unacceptable. Compliance with academic honesty during theoretical training and examinations is regulated, in addition to general policies, by the "Regulations on Checking Students' Text Documents for Borrowings." These documents are available on the main page of the University's Information System.</p> <p>Basic Principles of Inclusive Education: The university's educational environment is designed as a safe space where support is always available and where teachers maintain an equal attitude toward all students, and students toward each other, regardless of gender, race/ethnicity, religious beliefs, socioeconomic status, physical health, etc. Everyone needs the support and friendship of peers and fellow students. For all students, progress is measured more by what they can do than by what they cannot. Diversity enriches all aspects of university life.</p> <p>All students, especially those with disabilities, can receive counseling assistance via phone/email at iskakovaf@gmail.com or through WhatsApp video link via a permanent meeting link in MS Teams.</p> <p>Integration of MOOCs (Massive Open Online Courses): If a MOOC is integrated into the course, all students must register for it. The deadlines for completing MOOC modules must be strictly followed according to the course study schedule.</p>
ATTENTION! The deadline for each task is indicated in the calendar (schedule) for the implementation of the content of the course, as well as in the MOOC. Failure to meet deadlines results in loss of points.	

INFORMATION ABOUT TEACHING, LEARNING AND ASSESSMENT

Score-rating letter system of assessment of accounting for educational achievements	Assessment Methods
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Grade	Digital equivalent points	points, % content	Assessment according to the traditional system	Criteria-based assessment is the process of correlating actual learning outcomes with expected ones, using clearly defined criteria. Based on formative and
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A	4.0	95-100	excellent	summative assessments. Formative assessment is a type of assessment conducted during daily learning activities. It is the current measure of progress. Provides an operational relationship between the student and the teacher. It allows you to determine the capabilities of the student, identify difficulties, help achieve the best results, and timely correct the educational process for the teacher. The performance of tasks, and the activity of work in the classroom during lectures, seminars, and practical exercises (discussions, quizzes, debates, round tables, laboratory work, etc.) are evaluated. Acquired knowledge and competencies are assessed.
A-	3.67	90-94		Summative assessment - a type of assessment, that is carried out upon completion of the study of the section by the program of the course. Conducted 3-4 times per semester when performing SIW. This is the assessment of mastering the expected learning outcomes of the descriptors. Allows you to determine and fix the level of mastery of the course for a certain period. Learning outcomes are evaluated.
B+	3.33	85-89	Good	
B	3.0	80-84		Formative and summative assessment 1. Activity in discussions of topic in classes 2. Work in practical classes 3. Independent work 4. Design and creative activity 5. Final control (exam)
B-	2.67	75-79		Activity in discussions of topics in classes
C+	2.33	70-74		Work in practical classes
C	2.0	65-69	Satisfactorily	Independent work
C-	1.67	60-64		Design and creative activity
D+	1.33	55-59		Final control (exam) 40
D	1.0	50-54		TOTAL 100
FX	0.5	25-49		
F	0	0-24	Unsatisfactory	

Calendar (schedule) for the implementation of the content of the course. Methods of teaching and learning.

A week	Topic name	N.of hs	Max. ball
MODULE 1 INTRODUCTION TO MEDICAL ECOLOGY			
1	PC 1. Science of Epidemiology. Definition, Core functions and role of Epidemiology in Public Health.	3	0
2	PC 2. Summarizing data, measuring frequency, and risk for disease. Application of standardization.		8
3	PC 3. Study planning. Ecological study. Case-control study. ISWT 1. Consultations on the implementation of SIW 1.	3	7
4	PC 4. Study Planning. Cohort Studies. Experimental Studies.	3	7
5	PC 5 Diagnostic and Screening tests. Sensitivity, specificity, PPV and NPV of tests. ISWT 2. Consultations on the implementation of SIW 1. IWS 1 on 1-5 Seminar topics.	3	7
			25
MODULE 2 ENVIRONMENTAL FACTORS			
6	PC 6. Working in MS Excel. Organization and logic of database creation. Calculation of descriptive statistics measures. ISWT 3. Consultations on the implementation of SIW 2	3	7
7	PC 7. Analysis of qualitative (categorical) variables. Fisher's exact test. Chi-square test. Z-test for comparing proportions. ISTW 4. Parsing and analyzing an article about an environmental problem.	3	7
8	PC 8. Conducting one-way analysis of variance (ANOVA).. ISW2 on 5-8 seminars topic.	3	7
			25
Midterm 1			
9	PC 9. Application of Student's t-test for paired (dependent) and independent samples. ISWT 5. Write an abstract on an environmental problem and medical interventions to reduce harm to public health (review of several articles).	3	7
10	PC 10. Measuring the association between quantitative variables. Correlation analysis. Simple (univariate) linear regression analysis.	3	7
MODULE 3. OTHER ENVIRONMENTAL FACTORS			
11	PC 11. Application of Nonparametric Tests. Mann-Whitney U Test. Wilcoxon Signed-Rank Test. SIW 3 on 9-11 seminars topic.	3	7
12	PC 12. Comparison of Multiple Groups. Kruskal-Wallis H Test. Friedman Test.	3	7
13	PC 13. Assessment of nutrition and the impact of harmful substances associated with their quality and preparation on the population's health. ISWT 6. Overview of research results	3	7
14	PC 14. Linear and Logistic Regression.	3	7
15	PC 15. Fundamental Principles of Data Analysis. Analysis of Stratified Data and Statistical Results. Hypothesis Testing.	3	8

ISW 4 on 14-16 seminars topic.		25
Midterm 2		100
Final control (exam)		100
TOTAL for course		100

Dean _____ **S.B.**

Kalmahanov Chairman of the Academic Committee
on the quality of teaching and learning _____ **G.M.Kurmanova**

Head of Department _____ **A.E.Ualiyeva**

Lecturer _____ **F.A. Iskakova**

List of ISW with a scenario

ISW 1. A written proposal on the Outbreak Investigation of Infectious Disease

1. Choose one publication in PubMed site.
2. Develop a Brief Outbreak Investigation Protocol (2–3 pages): define the outbreak (case definition: clinical, laboratory, time, place, person). Propose immediate public health actions (control measures, communication). Outline the steps for an analytical epidemiological study to identify the source (e.g., cohort study or case-control study design). Justify your choice of study design. Draft a simple data collection tool (questionnaire) targeting key exposures (food, water, venue attendance).
3. Write a Descriptive Analysis Report by using the provided simulated dataset, and produce a descriptive analysis (An epidemic curve using a histogram or diagram. A table summarizing case characteristics (age, sex distribution, symptoms, hospitalization rate) and write a brief interpretation (200 words) summarizing the pattern (time, place, person) and generating 2-3 hypotheses about the possible source and mode of transmission.

ISW 2. A critical appraisal report on Evaluating a Public Health Program on screening.

Choose one publication in PubMed site and critically appraise a provided scientific article on the effectiveness of a similar public health intervention (e.g., a screening or vaccination program). In a 3–4-page critique. Summarize the study's aim, design, and main finding in one paragraph. Using a structured framework (e.g., key questions on internal validity), evaluate the strengths and major limitations of the study design and methods. Assess the applicable (external validity) of the study's findings to the Public Health system in Kazakhstan. Based on your critique, make one recommendation for improving the design of the Kazakhstani program.

ISW 3. Analysis of Risk Factors for Non-Communicable Disease (NCD)

Scenario:

You are given a cleaned dataset from the "Kazakhstan National Health Survey. The dataset includes variables such as age, sex, BMI, smoking status, physical activity, and the presence of hypertension (yes/no).

The student should provide a Descriptive Analysis:

1. Generate a comprehensive descriptive summary of the study sample.
-Include: a table of frequencies/percentages for categorical variables (sex, smoking, hypertension) and measures of central tendency & dispersion (mean, SD, min, max) for continuous variables (age, BMI).
- Create 2 appropriate graphs (e.g., bar chart for hypertension prevalence by smoking status, histogram for age distribution).
2. Inferential Analysis:
-Formulate a specific research question (e.g., "Is smoking status associated with hypertension?").
-Perform the correct statistical test (e.g., Chi-square test) to answer your question.
-Report the test statistic, degrees of freedom, p-value, and an appropriate measure of association (e.g., Odds Ratio from a crosstabulation).
3. Write a short, structured results section (200-400 words) describing your findings in plain language. Your text should integrate key numbers from your tables and state the public health implications of your findings.

ISW 4. A well-structured "Statistical Analysis Plan" document.

Scenario:

You have NCD dataset to understand the independent effect of smoking on hypertension, while controlling for other factors like age and BMI.

Write the "Statistical Analysis Plan" section for a research protocol (2–3 pages). The plan must include:

1. Research Question & Hypotheses: State the refined question and null/alternative hypotheses.
2. Variable Specification:
-List the dependent (outcome) variable and its measurement scale.
-List the independent (exposure) variable of primary interest.
-List at least 3 other variables to be included as covariates (justify why each is a potential confounder).
3. Analytical Strategy:
-Justify the choice of multivariable analysis method (e.g., "I will use binary logistic regression because the outcome is dichotomous...").
-Describe the steps you will take:
-Checking model assumptions (e.g., checking for multicollinearity).
-Model building strategy (e.g., entering all covariates simultaneously).
-State how you will present the results (e.g., "The final model results will be presented as Adjusted Odds Ratios (aOR) with 95% Confidence Intervals and p-values.").
4. Interpretate your results. Summary Table of Tasks & Skills

RUBRICATOR OF THE SUMMATIVE ASSESSMENT CRITERIA. EVALUATION OF LEARNING OUTCOMES

Criterion	«Excellent» (A) 90-100%	«Good» (B) 75-89%	«Satisfactory» (C,D) 69-74%	«Unsatisfactory» (F)<50%
1. Understanding & Application of Theory (25%) <i>Demonstrates knowledge of epidemiological concepts (study designs, measures of association) and biostatistical principles appropriate to the</i>	Shows mastery of relevant theories. Accurately selects and expertly justifies the choice of study design and statistical approach for the given problem.	Shows proficient understanding. Selects appropriate study design and statistical methods with a reasonable justification.	Shows a basic or partial understanding. Selection of methods is generally appropriate but justification may be weak or contain inaccuracies.	Shows major misunderstandings . Inappropriate methods are selected, or justification is missing/incorrect.
2. Data Analysis & Methodology (30%) <i>Executes a correct and complete statistical analysis (descriptive & inferential) using appropriate software/tools.</i>	Analysis is flawless and insightful . Correctly calculates all relevant statistics, creates optimal visualizations (tables/graphs), and thoroughly checks assumptions.	Analysis is correct and complete . Performs all necessary calculations and creates clear visualizations. Minor errors in presentation or assumption checking may be present.	Analysis is partially complete or contains errors . Key steps may be missing, visualizations are unclear, or significant methodological errors are present.	Analysis is seriously flawed or incomplete . Major errors in calculations, or fails to perform core analytical tasks.
3. Interpretation & Critical Thinking (25%) <i>Interprets results in context, links findings to public health, and demonstrates critical reasoning.</i>	Interpretation is critical, nuanced, and evidence-based . Clearly links results to study aims, discusses limitations, public health implications, and alternative explanations.	Interpretation is clear and logical . Correctly explains what results mean and connects them to the research question. May lack depth in discussing limitations or implications.	Interpretation is superficial or partially incorrect . Struggles to move beyond describing numbers to explaining meaning. May contain misinterpretations.	Interpretation is missing, irrelevant, or severely incorrect . Fails to explain results or makes fundamentally wrong conclusions.
4. Report Structure & Academic Integrity (20%) <i>Presents work in a well-structured, clear scientific report (IMRaD format) and adheres to academic standards.</i>	Report is professional, clear, and perfectly structured . Follows scientific format rigorously, integrates visual aids effectively, and cites all sources correctly in APA style. No plagiarism .	Report is well-structured and clear . Format is mostly correct, visual aids are included, and citations are largely consistent. No plagiarism .	Report is disorganized or unclear . Deviates from standard format, visual aids are poorly formatted, or contains citation errors.	Report is unstructured and incoherent . Lacks standard sections, visual aids are missing or irrelevant, or contains plagiarism or major citation failures .