

Al-Farabi Kazakh National University Faculty
Medicine and Health Care Education program on
specialty: «7M 1128380 Public Health»

**PROGRAM OF THE FINAL EXAM IN DISCIPLINE
OF COURSE “EPIDEMIOLOGY”**

3 credits

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TMC OF COURSE IS CONFIRMED

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PROGRAM OF THE FINAL EXAM ON COURSE “EPIDEMIOLOGY”

3 credits

The aim of course is to provide students with the terminology, theory, principles and methods of epidemiology. The course will be focused on principles and methods, and types of Epidemiology. Masters students study epidemiologic methods by which risk factors are evaluated as potential causes of health endpoints. The students will know about causality and probability an occurrence of diseases, study measures of disease occurrence and effect; define causation and its conceptualization; learn the basic logic of epidemiologic studies and their design; learn how epidemiologic data are collected; learn the strengths, limitations, and biases associated with study designs; learn the fundamental mathematical principles used in epidemiology; and discuss ethical issues in conducting epidemiologic studies.

Upon completion of the course, the student will be able to

1. Understand and speak the language of epidemiology.
2. Know basic principles and core functions of Epidemiology.
3. Know causality and probability an occurrence of diseases.
4. Apply the basic design strategies in epidemiologic research.
5. Recognize the essential connections between the planning of empirical studies, the collection of data, the analysis of data, the interpretation of findings, and the application of results to public health and clinical medicine.
6. Understand ethical and policy issues relevant to epidemiologic studies.

[List of examination items for a preparation to exam](#)

Module I. Bases and concepts of Epidemiology

Class 1. Introduction to Epidemiology. Definition of Epidemiology. History of Epidemiological methods and concepts. Core Epidemiologic Functions. Causal thinking. Core The Epidemiologic Approach.

Content. Epidemiology is the study of frequency and determinants related with diseases that are distributed in specific group of population. In recent years epidemiology has become an increasingly important approach in both public health and clinical practice. Epidemiology is the basic science of disease prevention and plays major roles in the development and evaluation of public policy as well as in social and legal arenas.

Epidemiology studies using of epidemiologic studies in Medicine. So Epidemiology and Clinical Epidemiology have close relationship for solving problem of People's health. Quantitative and Qualified Epidemiology.

Class. 2. Concepts of Disease Occurrence. Natural History and Spectrum of Disease. Chain of Infection. Epidemic Disease Occurrence.

Content. A critical premise of epidemiology is that disease and other health events do not occur randomly in a population. A number of models of disease causation have been proposed. The traditional model for infectious disease consists of an external agent, a susceptible host, and an environment that brings the host and agent together. In this model, disease results from the interaction between the agent and the susceptible host in an environment that supports transmission of the agent from a source to that host.

Class 3. Quantitative and Qualitative Epidemiology. Measures of risk. Frequency Measures. Morbidity and Mortality Frequency Measures. Natality (Birth) Measures. Measures of Association. Measures of Public Health Impact.

Content. Quantitative and qualitative research use different research methods to collect and analyze data, and they allow you to answer different kinds of research questions. For quantitative data it used statistical analysis methods to test relationships between variables; and for qualitative data it used methods such as thematic analysis to interpret patterns and meanings in the data. Qualitative vs. quantitative research. A descriptive research design use a wide variety of quantitative and qualitative methods to investigate one or more variables. The researcher observes and measures variables related with disease and outcomes of them.

Class 4. Epidemiological Investigation. Investigating an Outbreak.

Content. Outbreaks of disease is the occurrence of more cases than expected or occur frequently. Each day, health departments learn about cases or outbreaks that require investigation. One way is to analyze surveillance data is reports of cases of communicable diseases that are routinely sent by laboratories and healthcare providers to health departments. Investigation indicated that the increase in gastroenteritis was probably attributable to the consumption of meat that had spoiled during the power failure. Steps of outbreak investigations are Prepare for field work, Establish the existence of an outbreak, Verify the diagnosis, Construct a working case definition, Find cases systematically and record information, Perform descriptive epidemiology, Develop hypotheses, Evaluate hypotheses epidemiologically, As necessary, reconsider, refine, and re-evaluate hypotheses, Compare and reconcile with laboratory and/or environmental studies, Implement control and prevention measures, Initiate or maintain surveillance, Communicate findings.

Class 5. Public Health Surveillance.

Content. The health department is responsible for protecting the public's health using program named Public Health Surveillance which have function of survey and control over population health. Objectives of PHS are Identifying Health Problems for Surveillance, and Collecting Data for Surveillance, Analyzing and Interpreting Data, Disseminating Data and Interpretations, Evaluating and Improving Surveillance, Summary, References.

Module II. Methodological approaches in Epidemiology

Class 6. Concepts and Design of Epidemiological Studies. Descriptive studies: case reports, case series, ecological and cross-sectional.

Content. Epidemiologic studies: observational and experimental. Descriptive studies identify patterns among cases and in populations by time, place and person. Descriptive research answer what, when, where, when and how questions, but not why and how questions. Hypothesis is formed on base of descriptive study. Case-report, case-series, ecological and cross-sectional studies. Estimation of advantages and disadvantages. Using in Medicine. Measurement of associations. An ecological study design is used to monitor population health, make large- scale comparisons, to study the relationship between population-level exposure to risk factors and disease. In a cross-sectional study, the investigator measures the outcome and the exposures in the study participants at the same time on the inclusion and exclusion criteria set for the study.

Class 7. Analytical studies. Case-control study: strength and limitations, using in Medicine. Measures of association or measures of excess risk. OR, RR, AR, AR%, PAR, PAR%.

Content. Analytic studies are then undertaken to test specific hypotheses. Samples of subjects are identified and information about exposure status and outcome is collected. The essence of an analytic study is that groups of subjects are compared in order to estimate the magnitude of association between exposures and outcomes. A case-control study is designed to help determine if an exposure is associated with an outcome (i.e., disease or condition of interest). The case-control study can be described simply. First, identify the cases (a group known to have the outcome) and the controls (a group known to be free of the outcome). In the analysis stage, calculate the frequency of each of the measured variables in each of the two groups. As a measure of the strength of the association between an exposure and the outcome, case-control studies yield the odds ratio. An odds ratio is the ratio of the odds of an exposure in the case group to the odds of an exposure in the control group.

Class 8. Analytical studies. Cohort study: strength and limitations, measure association, using in Medicine. Practical work: analysis of case- control study using scientific articles from websites as an example. Evaluation and measurement of the occurrence of diseases. Measurement of expose in studies: RR, OR, AR, AR%, PAR, PAR%. Practical work using scientific articles from websites as an example.

Content. Cohort study is the main analytical study that focuses of exposition of risk factors. They were open and closed, retrospective and prospective. Evaluation and measurement of the occurrence of diseases. Measurement of expose in studies using RR, OR, AR, AR%, PAR, PAR%. Practical work using scientific articles from websites as an example. Summary measures of population health are measures that combine information on mortality and non-fatal health outcomes to represent the health of a particular population as a single number. A wide array of summary measures have been proposed (for example, active life expectancy, disability-free life expectancy, dementia-free life expectancy, disabilityadjusted life expectancy,

health-adjusted life expectancy, healthy life-years, Years of Healthy Life, disability-adjusted life years, etc.). On the basis of a simple survivorship curve, these measures can be divided broadly into two families: health expectancies and health gaps.

Class 9. Experimental studies. Randomized controlled trial and non-randomized trial. Stratified, crossover, factorial design and group randomization. Design of clinical trials (phases, safety and effectiveness of drugs).

Content. Experimental studies are studies in which the investigator artificially manipulates study factors or subjects, such as therapeutic regimen, or some other parameter. An experimental study is the preferred means of hypothesis testing in most laboratory settings, and relevant methods are subject to continuing improvements. Types of experimental studies are randomized and non-randomized trials. Randomized controlled trial: (RCT) A study in which people are allocated at random (by chance alone) to receive one of several clinical interventions. One of these interventions is the standard of comparison or control. The control may be a standard practice, a placebo ("sugar pill"), or no intervention at all. Someone who takes part in a randomized controlled trial (RCT) is called a participant or subject. RCTs seek to measure and compare the outcomes after the participants receive the interventions. Because the outcomes are measured, RCTs are quantitative studies. In sum, RCTs are quantitative, comparative, controlled experiments in which investigators study two or more interventions in a series of individuals who receive them in random order. The RCT is one of the simplest and most powerful tools in clinical research.

Class 10. Bias and confounding factors in studies. Overview of epidemiological studies. Practical work using scientific articles from websites as an example.

Content. Bias may be defined as any systematic error in an epidemiological study that results in an incorrect estimate of the true effect of an exposure on the outcome of interest. Bias results from systematic errors in the research methodology. More than 50 types of bias have been identified in epidemiological studies, but for simplicity they can be broadly grouped into two categories: information bias and selection bias. Confounding provides an alternative explanation for an association between an exposure (X) and an outcome. It occurs when an observed association is in fact distorted because the exposure is also correlated with another risk factor (Y). This risk factor Y is also associated with the outcome, but independently of the exposure under investigation, X. As a consequence, the estimated association is not that same as the true effect of exposure X on the outcome.

Module III. Module III. Types of Epidemiology

Class 11. Diagnostic and screening tests. Sensitivity and specificity of tests.

Content. A diagnostic test is used to determine the presence or absence of a disease when a subject shows signs or symptoms of the disease. A screening test identifies asymptomatic individuals who may have the disease. The diagnostic test is performed after a positive screening test to establish a definitive diagnosis.

The probability of having the disease, given the results of a test, is called the predictive value of the test. Positive predictive value is the probability that a patient with a positive (abnormal) test result actually has the disease. Negative predictive value is the probability that a person with a negative (normal) test result is truly free of disease.

Sensitivity is the ability of the test to identify correctly those who have the disease. Specificity is the ability of the test to identify correctly those who do not have the disease.

Class 12. Statistical methods in Epidemiology. Meta-Analysis. Practical work using scientific articles from websites as an example.

Content. Statistical methods and techniques used in Epidemiology. Epidemiologic studies are determined by the study design and data type. Principles of Data Analysis, Statistical Thinking, Multivariate Analysis, Handling of Data Problems, Meta-Analysis. Meta-analysis is a quantitative, formal, epidemiological study design used to systematically assess the results of previous research to derive conclusions about that body of research. Meta-analysis combines information from multiple scientific publications and can increase the chances of finding true positives among the identified associations. Meta-analysis is an analytical tool that permits the evaluation of a diagnostic or therapeutic modality through the appropriate use of previously published smaller studies.

Class 13. DEPTH model in Medicine. Implementation of epidemiologic studies in Medicine. Practical work using scientific articles from websites as an example.

Content. DEPTH model in Medicine. There are diagnostic, etiologic, prognostic and therapeutic researches for solving problem of Clinical Medicine.

Class 14. Exposure-Oriented Epidemiology: Occupational, Environmental, Nutritional, Radiation, Physical Activity Epidemiology.

Content. Epidemiology has been defined as the study of the effects of workplace exposures on the frequency and distribution of diseases and injuries in the population. Thus it is an exposure-oriented discipline versus of outcome-oriented Epidemiology as Epidemiology of Infectious diseases, cardio-vascular diseases etc. Types of Exposure-Oriented Epidemiology are Occupational, Environmental, Nutritional, Radiation, Physical Activity Epidemiology.

Class 15. Outcome-Oriented Epidemiology: Infectious Disease Epidemiology, Cardiovascular Disease and Health, Cancer Epidemiology, Epidemiology of Diabetes, Epidemiology of Psychiatric Disorders.

Content. Outcome-Oriented Epidemiology as Infectious Disease Epidemiology, Cardiovascular Disease and Health, Cancer Epidemiology, Epidemiology of Diabetes, Epidemiology of Psychiatric Disorders based of results of outcomes related with exposure determinants (reasons and risk factors). They are the major cause of burden: morbidity, mortality and disorders.

Typology and approximate content of examination tasks:

Each exam ticket includes 3 questions on the above course topics.

1) key competency; 2) general competency relate to a certain circle of subjects and educational areas; 3) subject competency relates is private in relation to the two previous ones, having a specific description and the possibility of forming educational subjects.

Block	Example question	Determining the level of competencies
Block 1. Questions aimed at identifying of cognitive competencies.	Explain core function and classification of Epidemiology, and epidemiologic studies according to criteria.	Master's student shows ability to justify definition.
Block 2. Questions defining system competencies.	Analyze scientific researches, and its results.	Master's student shows ability to analyze results of epidemiologic studies.
Block 3. Questions regarding to a definition of functional competencies.	Prove using epidemiologic studies to make decision in Medicine and Public Health.	Able to identify the content of problems in a professional areas of

Grades:

Traditional Grades	Scores	Requirements
Excellent	90-100	<p>The work was done independently and at a high scientific and methodological level.</p> <p>The text of the answer shows that the student is able to evaluate and process learned scientific methods and methods of activity, and is also able to offer concepts, models and use new methods and tools of professional activity.</p> <p>The paper presents an independent vision of the problem and the corresponding argumentation.</p> <p>The work was done neatly, the student has professional terminology and writing skills for scientific papers.</p>

Good	75-89	The work as a whole was well written, but the author did not disclose or did not fully cover certain issues of the topic. The author's vision of the problem and argumentation are not presented in the work. The paper made some inaccuracies, but they do not relate to the main content of the work. The answer reveals knowledge and understanding of the material by no less than 75%.
Satisfied	50-74	The task as a whole has been completed, but the author has not demonstrated the skills of analyzing the problem, individual issues of the topic have not been disclosed or missing. The author's vision of the problem is not presented in the work. The author does not have sufficient knowledge of the methodology of scientific research. In the answer there were inaccuracies related to the main content of the question.
Unsatisfied	0-49	The task is not completed, or completed less than 50%, The task is not completed correctly.

Required and Recommended Reading

Required reading:

1. Aschengrau A., Essentials of Epidemiology in Public Health, 3rd Edition, 2008

Recommended reading:

1. Gordis: Epidemiology, 5th Edition, Saunders 2013
2. Rothman K., Modern Epidemiology, 3rd Edition, 2008
3. Pickles A. Epidemiological Methods in Life Course Research, 1st Edition, 2007
4. Webb P and Bain C. Essential Epidemiology: An introduction for Students and Health Professionals. Second Edition. Cambridge University Press. 2011.

5. Wolfgang, A. Handbook of Epidemiology. Vol.1//Ahrens Wolfgang, Peugeot Iris. - 2 ed.- Springer Reference, 2014.- 469 p.
6. Principles and methods of Epidemiology. 3-d Edition. R. Dicker Ooffice of epidemiologic program CDC, USAID. -2012.-457 P.
7. Principles of Epidemiology in Public Health Practice. Third Edition. An introduction to Epidemiology and Biostatics.US, CDC, Atlanta. -2012.-6-75 p.
8. Hennekens, C., & Buring, J. (1987). Epidemiology in Medicine, Boston/Toronto: Little, Brown and Company.
9. Kelsey, J., Whittemore, A., Evans, A. & Thompson, D. (1996). Methods in Observational Epidemiology, Second Edition, New York: Oxford University Press.

Electronic source:

10. www.who.org
11. www.cdc.gov
12. www.medline
13. www.cochrane.library
14. www.PubMed