Al-Farabi Kazakh National University
Faculty of Medicine and HealthCare
Education program on specialty: «6B10105 Public Health»

GUIDELINE ON SEMINARS FOR STUDENTS ON COURSE
"Basic Epidemiology" 5 credits

Author: FA. Iskakova, Assocc.Professor

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Seminar Framework: Basic Epidemiology

Module 1: The Introduction to Epidemiology

L.1. Introduction to Epidemiology.
Seminar 1: Introduction & Core Concepts
Learning Objective: Define epidemiology and its key uses (assessment, etiology, evaluation). Distinguish between descriptive and analytic approaches.
Key Activity: study and analyze "The Epidemiologist's First Questions: What? Who? Where? When?)
Practical Work. Read the publication according to the Topic and analyze the content.
Quiz.

Seminar 2: History and Evolution of Epidemiology
L.2. History and Evolution of Epidemiology.
Learning Objective: Trace the evolution from miasma theory to germ theory to the modern multifactorial model, using seminal studies (Snow, Framingham, Doll & Hill).
Key Activity: "The Logic of Landmark Studies" – In groups, dissect the methodology and inferential leap of one classic study (e.g., Snow's cholera map) to identify how it advanced causal thinking.
Quiz.

Seminar 3: Concepts of Causation and Epidemiological Triad.
L.Concepts of Epidemiology: Causation, Epidemiological Triad.
Learning Objective: Apply Bradford Hill's viewpoints for causal inference and differentiate between association and causation.
Practical Task: Evaluate a contemporary public health claim (e.g., "X chemical causes cancer") using Hill's criteria in a guided debate.
Quiz.

Seminar 4: Summarize Data and Display Public Health Data.
L.4. Summarize and Display Public Health Data.
Learning Objective: Choose appropriate tables and graphs (line lists, epidemic curves, spot maps, bar/line charts) for different public health data types.
Practical Task: Given a messy line list from a foodborne outbreak, create a clear summary table and an epidemic curve to visualize the outbreak's time trend.
Quiz.

Seminar 5: Measures of Disease Frequency.Sources of Health-Related Data.
L .5. Measures of Disease Frequency & Data Sources
Learning Objective: Calculate and interpret incidence (risk, rate), prevalence (point, period), and mortality rates. Identify common sources of public health data (vital statistics, registries, surveys).
Practical Task: Calculate prevalence and incidence rates from a cohort dataset. Compare the utility of data from a national health survey vs. a cancer registry for a specific research question.
Quiz.

Seminar 6: Comparing Frequencies & Standardization
L.6. Compare Disease Frequency & Standardization
Learning Objective: Calculate and interpret crude, specific, and standardized rates (direct and indirect). Explain the purpose of standardization to control for confounding by age or other factors.

Practical Task: Compare the crude mortality rates of two populations with different age structures, then apply direct standardization to derive a valid comparison.
Quiz.

Seminar 7: Public Health Surveillance
L. Public Health Surveillance.
Learning Objective: Describe the components and types of surveillance systems (passive, active, syndromic) and their role in health planning.
Key Activity: Design a surveillance system for an emerging health threat (e.g., severe vaping-related illness), specifying data sources, case definition, and reporting flow.
Quiz.

Seminar 8: Study Design Overview
L8. Design of Epidemiological Studies
Learning Objective: Classify major study designs (observational vs. experimental; descriptive vs. analytic) and construct a basic 2x2 table.
Practical Task: Given a series of brief study descriptions, correctly classify each by design and sketch its corresponding 2x2 table structure.
Quiz.

MODULE 2. EPIDEMIOLOGICAL STUDIES
Seminar 9: Observational Analytic Studies
L.Observational Analytic Studies
Learning Objective: Calculate and interpret measures of association (RR, OR) from cohort and case-control studies. Articulate their respective strengths and biases.
Practical Task: Analyze data from a simulated case-control study (smoking and lung cancer) to calculate an Odds Ratio. Discuss potential confounding and recall bias.
Quiz.

Seminar 10: Experimental Studies (Trials)
L. Experimental Studies.
Learning Objective: Explain the principles of randomization, blinding, and control in RCTs. Contrast efficacy (trial) vs. effectiveness (real-world).
Key Activity: Critically appraise the protocol of a published clinical trial, evaluating its design for minimizing bias and ensuring ethical conduct.
Quiz.

Seminar 11: Diagnostic & Screening Tests
L.Diagnostic and Screening Tests.
Learning Objective: Calculate and interpret validity measures (sensitivity, specificity, PPV, NPV) and understand the concept of reliability.
Practical Task: Use a 2x2 table to calculate the sensitivity of a new rapid diagnostic test. Explore how disease prevalence affects the Predictive Value in different populations.
Quiz.

Seminar 12: Basics of Epidemiology of Infectious Diseases
L.Epidemiology of Infectious Diseases.
Learning Objective: Apply the Epidemiologic Triangle (Agent-Host-Environment) and the chain of infection. Understand key concepts like herd immunity and Ro (basic reproduction number).
Key Activity: Model an outbreak using a simple SIR (Susceptible-Infectious-Recovered) simulation to visualize the impact of vaccination on herd immunity.

Quiz.

Seminar 13: Non-Communicable Diseases (NCD) Epidemiology
L.Epidemiology of Non-Communicable Diseases.
Learning Objective: Describe the multifactorial etiology and global burden of NCDs. Discuss the challenges in studying chronic diseases (latency, multiple causes).
Key Activity: Develop a conceptual diagram (DAG - Directed Acyclic Graph) for a complex NCD outcome (e.g., coronary heart disease), identifying risk factors and potential confounders.
Quiz.

Seminar 14: Outbreak Investigation
L.Outbreak Investigation.
Learning Objective: List the 10 classic steps of an outbreak investigation and apply hypothesis-generating techniques.
Practical Task: Outbreak Simulation: Work through a step-by-step mystery outbreak (e.g., gastroenteritis at a banquet), analyzing data to identify the likely source and mode of transmission.
Quiz.

Seminar 15: Prevention & Prophylaxis
L. Prevention and Prophylaxis.
Learning Objective: Classify prevention strategies (primordial, primary, secondary, tertiary) and select appropriate measures for different disease stages.
Key Activity: For a specific disease (e.g., diabetes), propose a coherent prevention strategy encompassing all four levels and identify responsible actors (clinical vs. public health).
Quiz.

Literature:
1. Gordis, Leon, Epidemiology, 5th Edition, W.B. Saunders Company, 2013.
2. Basic epidemiology .R. Bonita, R. Beaglehole, T. Kjellström. 2nd edition.WHO, 2016. -326 p.
3. Principles of Epidemiology in Public Health. CDC. -2014. 326 p.
    4. Essentials of Epidemiology in Public Health. Third Edition. -2016.-526 p.
    5. Kaplan USMLE: Lecture Notes. 2017.- Epidemiology. 229 p/
6. MMWR (Morbidity and Mortality Weekly Report