Study program: Integrated Academic Studies in medicine

Type and level of the study program: Integrated 1st and 2nd level study

Course title: Epidemiology

Teacher (name, middle initial, surname)**:**

Vladimir Petrović, Full Professor, **Head of the Course**
Gorana Dragovac, Full Professor
Tihomir Dugandžija, Full Professor
Mioljub Ristić, Associate Professor
Jelena Đekić Malbaša, Associate Professor
Smiljana Rajčević, Associate Professor
Snežana Medić, Assistant Professor
Vladimir Vuković, Teaching Assistant with PhD
Tatjana Pustahija, Teaching Assistant with PhD
Nataša Čapo, Teaching Assistant

Course status: compulsory

ECTS Credits:

Condition:

Course aim

The aim of this course is to provide students with knowledge to estimate the population health status and to recognize and implement measures of prevention and control of diseases by enduring understandings of:

1. The causes of disease are discoverable by systematically identifying their patterns in populations, formulating hypotheses, and testing those hypotheses using group and individual comparisons. These methods lie at the core of the science of epidemiology, the basic science of public health.
2. Health and disease are not distributed randomly. There are patterns to their occurrence. These patterns can be identified through public health surveillance, looking for patterns based on person, place, and time. Analysis of these patterns can help formulate hypotheses about the possible causes of health and disease.
3. Hypotheses can be tested by comparing the frequency of disease in selected groups of people with and without an exposure to determine if the exposure and the disease are associated.
4. One possible explanation for finding an association is that the exposure causes the outcome. Because studies are complicated by factors not controlled by the observer, other explanations also must be considered, including chance and bias.
5. When an exposure is hypothesized to have a beneficial effect, studies known as randomized clinical trials may at times be designed in which participants are randomly assigned to study and control groups. Those in the study group are then exposed to the hypothesized cause and their outcomes are compared to those in the control group.
6. When an exposure is hypothesized to have a detrimental effect, it is not ethical to intentionally expose a group of people. Randomized clinical trials and community trials may be used to provide evidence for efficacy of potential interventions to reduce the risk.
7. Judgments about whether an exposure causes a disease are developed by examining a body of epidemiologic evidence as well as evidence from other scientific disciplines. While a given exposure may be necessary to cause an outcome, the presence of a single factor is seldom sufficient. Most outcomes are caused by multiple factors including genetic make-up, behaviors, social, economic, and cultural factors, availability of healthcare and the physical environment.
8. Individual and societal health-related decisions about interventions to improve health and prevent disease are based on more than scientific evidence. Social, economic, ethical, environmental,

cultural, and political factors may also be considered in implementation decisions. The effectiveness of a health-related strategy can be evaluated by comparing the frequency of the outcome in carefully selected groups of people who were and were not exposed to the strategy. Costs, trade-offs of harms and benefits, and alternative solutions must also be considered in evaluating the strategy.

9. Principles of testing and screening based on Bayes theorem lie at the core of disease diagnosis and screening for disease and have applications to a range of social decision-making in security, forensics, quality control efforts, etc.
10. An understanding of non-health related phenomena can be also be developed through epidemiologic thinking, by identifying their patterns in populations, formulating causal hypotheses, and testing those hypotheses by making group and individual comparisons.

Expected outcome of the course:

Basic Learning Outcomes

1. Describe the historical roots of epidemiologic thinking and their contribution to the evolution of the scientific method.
2. Explain how ethical principles affect epidemiologic research.
3. Use rates and proportions to express numerically the amount and distribution of health- and non healthrelated outcomes.
4. Use the distribution of a health-related outcome in groups to generate hypotheses that might provide a causal explanation.
5. Explain basic statistical and epidemiologic concepts of estimation, inference, and adjustment to establish association.
6. Explain how to use evidence of an association to make a judgment about whether an association is causal using the principles of contributory cause.
7. Describe the basic epidemiologic study designs that are used to test hypotheses, identify associations, and establish causation.
8. Describe the concepts of measurement of test performance and be able to apply the concepts of testing and screening in different settings.
9. Apply the concepts of benefits, harms, and cost to a public health decision.
10. Describe the broad applicability of epidemiologic methods to clinical and basic science as well as public policy.

Advanced Learning Outcomes

1. Analyze the evidence for and against a recommendation for intervention.
2. Analyze a public health problem (e.g., investigation of a disease outbreak).
3. Synthesize epidemiological methods to assess the strengths and weaknesses of assertions in the scientific literature and popular press.
4. Evaluate the design of an epidemiologic investigation, demonstrating the ability to reconcile scientific validity and ethical sensitivity.

Course description

Theoretical education

History, Philosophy, and Uses of Epidemiology

1. Historical contributions and modern uses of epidemiology—Development of epidemiologic thinking and placement of epidemiology in historical and modern perspective.
2. Ethics and philosophy of epidemiology—Appreciation of the links between epidemiology and broader ethical and philosophic traditions and concerns.

Descriptive Epidemiology

1. Condition, frequency, and severity—the basic tools of epidemiologic analysis, including case definitions and populations, incidence, prevalence, and case-fatality rates.
2. Using data to describe disease and injuries—Vital statistics, public health surveillance, and measures of health status, including methods for describing quantitatively the natural/clinical history, frequency, and changes in communicable diseases, non-communicable disease, and

injuries (Epidemiological process).

3. Patterns of disease and injuries—Application of the basic tools of epidemiology to generate hypotheses based upon person, place, and time; changes and differences in rates; exposures; incubation periods; and disease spread; Epidemiological models (ecological trias, wheel model, network of causality and chain of infection)

Association and Causation

1. Estimation—Measures of the strength of association, graphical display of data, and measures of risk, relative risk, attributable risk, and population impact.
2. Inference—Concepts of statistical significance and confidence intervals.
3. Bias, confounding, and adjustment—Identification of bias, confounding, and effect modification/interaction and methods to prevent and take into account their impact.
4. Causation—Principles of contributory cause based upon evidence of association, the "cause" precedes the "effect" and "altering the "cause" alters the "effect."

Analytic Epidemiology

1. Basic epidemiologic study designs and their applications to population health including ecologic or population comparison, cross-sectional, case-control, and retrospective and prospective cohort.
2. Experimental studies—randomized clinical trials, community trials, and their applications to understanding disease or injury etiology and the benefits and harms of intervention.

Evidence-Based Public Health

1. Harm, benefit, and cost analyses—Evidence-based recommendations regarding benefits, harms, and cost effectiveness of interventions.
2. Intervention effectiveness—Evidence-based evaluation of degree of success of interventions.

Applications to Policy and Basic and Clinical Sciences

1. Outbreak investigation, testing, and screening—Application of epidemiologic methods to basic and clinical sciences.
2. Public health policy—Application of results from investigations and analyses to policymaking; Levels of prevention; Immunization
3. Special epidemiologic applications—Molecular and genetic epidemiology, environmental health and safety, unintentional injury and violence prevention, and behavioral sciences.

Practical education: exercises, other forms of education research related activities

1. Data bases on population morbidity and mortality – importance, legislation, reports, types of reports, internet data gathering.
2. Basic indicators of epidemiology – morbidity, mortality, general, specific and standard rates.
3. Epidemiologic methods – descriptive method practical application.
4. Epidemiologic questionnaire – importance, parts, creation.
5. Measurement errors practical significance and examples.
6. Epidemiologic methods – anamnestic studies practical application.
7. Epidemiologic methods – cohort studies practical application.
8. Epidemiologic methods – experiment examples, practical application.
9. Outbreak investigation – data bases for detection, step-by-step examination of infectious epidemics, examples.
10. Evidence-based recommendations, prqctical application (nosocomial infections)
11. Public health policy – Immunization programs
12. Public Health policy – Screening programs and diagnostic tests

Literature

Compulsory

1. Robert H. Friis. Epidemiology 101, 2nd Edition. Burlington: Massachusets, Jones & Bartlett Learning 2018

Additional

1. A Dictionary of Epidemiology, Sixth Edition, Edited by Miquel Porta, International Epidemiological Association, Oxford University Press, 2014
2. Antony Stewart. Basic Statistics and Epidemiology: A Practical Guide, Fourth Edition. CRC Press 2016
3. Bonita, Ruth. Basic epidemiology, 2nd edition. World Health Organization 2006

Number of active classes				Other:
Lectures: 30	Practice: 30	Other types of teaching:	Research related activities:	

Teaching methods

Ex-cathedra theoretical lectures, practical sessions with active aprticipation of previously prepared students, with apropriate literature anounced during previous practical session

Student activity assessment (maximally 100 points)

Pre-exam activities	**points**	**Final exam**	**points**
Lectures	10	Written	70
Practices	20	Oral	
Colloquium		.....	
Essay			

The types of examination can differ from those listed in the above table (written, oral, project presentation, essay ...)

Maximum length is one A4 format page.

Specifications should be submitted for every course in the study program. If the same course can be found in different study programs then the course should be presented only once in the Course Inventory. The Course Inventory is a unique publication for all first and second degree study programs.

Each course should be a separate file so that it can be connected via a hyperlink to the teaching staff (in the Teaching Staff List) and the study plan Table 5.1, and 5.1a.