PRACTICAL 8

06 – 10 April 2020

Lecture 4

Epidemiology – part 2. Types of epidemiological studies. Descriptive studies. Analytical studies – types, design, conducting. Cohort studies.

EPIDEMIOLOGY
TYPES OF STUDIES IN EPIDEMIOLOGY. DESCRIPTIVE STUDIES. ECOLOGICAL STUDIES. CROSS-SECTIONAL STUDIES. POTENTIAL ERRORS IN EPIDEMIOLOGICAL STUDIES.

OBJECTIVE OF THE PRACTICAL 8:
To inform the students about the types of studies in epidemiology - units of study, advantages and disadvantages. To enable the students to analyze the design and the results from descriptive, ecological and cross-sectional studies as well as to understand the potential errors in epidemiological studies.

Enabling objectives:
At the end of the lesson the students should be able to:
1. Distinguishing between observational and experimental epidemiological studies.
2. Distinguishing between descriptive and analytical studies.
3. Determine advantages and disadvantages of descriptive, ecological and cross-sectional studies.
4. Discuss the design of ecological and cross-sectional studies.
5. Define different types of errors in epidemiological studies.
6. Determine potential confounding factors in particular studies.

SYLLABUS OF THE PRACTICAL:

1. Types of epidemiological studies – *Reference to Lecture 4*

Type of study	Alternative name	Unit of study
OBSERVATIONAL STUDIES		
Descriptive studies		
Analytical studies		
• ***Ecological***	Correlational	Populations
• ***Cross - sectional***	Prevalence	Individuals
• ***Case - control***	Case - reference	Individuals
• ***Cohort***	Follow - up	Individuals
EXPERIMENTAL STUDIES	Intervention studies	
Randomized controlled trials	Clinical trials	Patients
Field trials		Healthy people
Community trials	Community intervention studies	Community

Epidemiological study is a scientific investigation to reveal the frequency and the distribution of disease in human populations and the relationship of disease to different potential risk factors.

- **Observational**: allow nature to take its course: the investigator measures and analyze but does not intervene and does not have control over the exposure or the progress of disease.
    - ***Descriptive***: is limited to a description of the occurrence of a disease in a population and is often the first step in an epidemiological investigation
    - ***Analytical***: goes further by analyzing relationships between health status and other variables.

- **Experimental:** the investigator actively intervenes to change a disease determinant /exposure or behavior/ or the progress of a disease through the intervention. The investigator is controlling the experimental situation.
    - ***Randomized controlled trials***: an epidemiological experiment to study a new preventive or therapeutic regimen in groups of patients
    - ***Field trials***: an experiment that involve disease-free people considered to be at risk and the intervention is applied to each person individually
    - ***Community trials***: an experiment in which the intervention is applied to communities rather than individuals

2. Descriptive studies – *Reference to Lecture 4*

a) Defining the population and the disease to be studied
b) Defining the disease under study
c) Describing the disease by:

- time

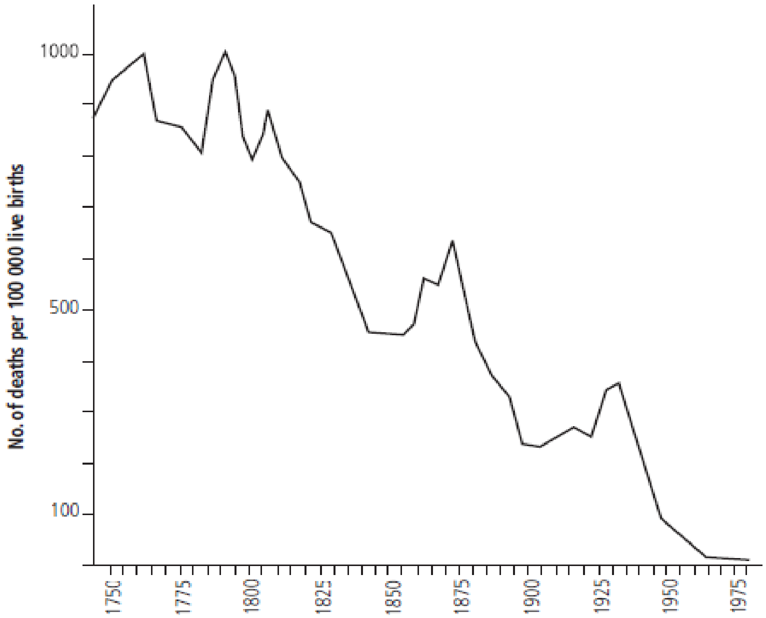


Figure 1. *Maternal mortality rates in Sweden, 1750–1975*

A classic example of descriptive data is shown in Figure 1, which charts the pattern of maternal mortality in Sweden since the middle of the eighteenth century, showing maternal death rates per 100 000 live births.2 Such data can be of great value when identifying factors that have caused such a clear downward trend. It is interesting to speculate on the possible changes in the living conditions of young women in the 1860s and 1870s which might have caused the temporary rise in maternal mortality at that time. In fact, this was a time of great poverty in Sweden and almost one million Swedes emigrated; most went to the United States of America.

- place

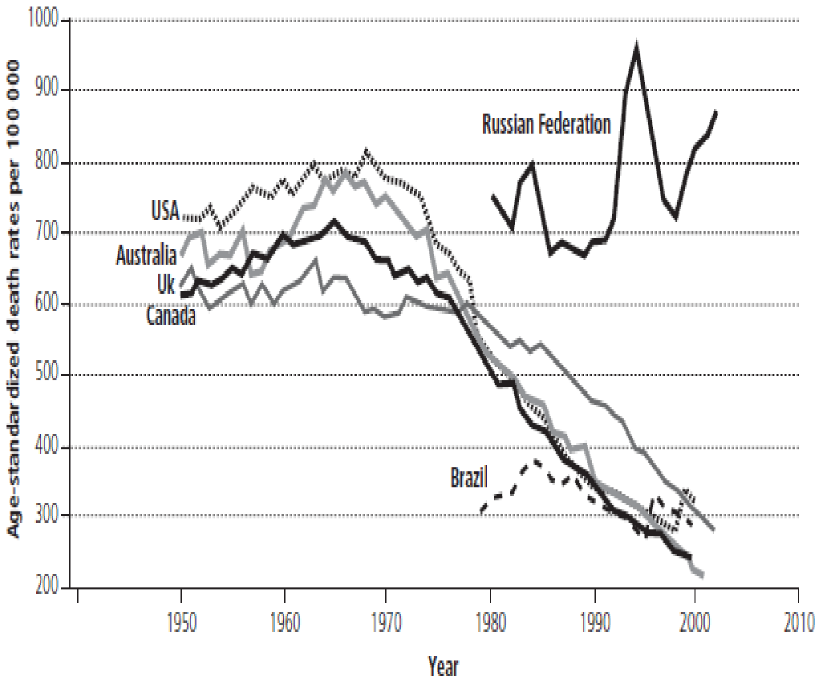


Figure 2. *Age-standardized death rates from heart disease among men aged 30 years or more, 1950–2002*

Figure 2 is also based on routine death statistics and provides an example of the change in death rates of heart disease over time in six countries. It shows that death rates from heart disease have fallen by up to 70% in the last three decades in several countries, including Australia, Canada, the United Kingdom and the United States of America. Yet during the same time, the rates in other countries – such as Brazil and the Russian Federation – have remained the same or increased.3 The next step in investigating this difference would require information about the comparability of the death certificates, changes in the incidence and case-fatality of the disease, and changes in the risk factors to which the relative populations have been exposed.

- person – age, sex, ethnicity, marital status etc.

3. Analytical studies – *Reference to Lecture 4*

- Ecological studies - advantages, disadvantages, examples

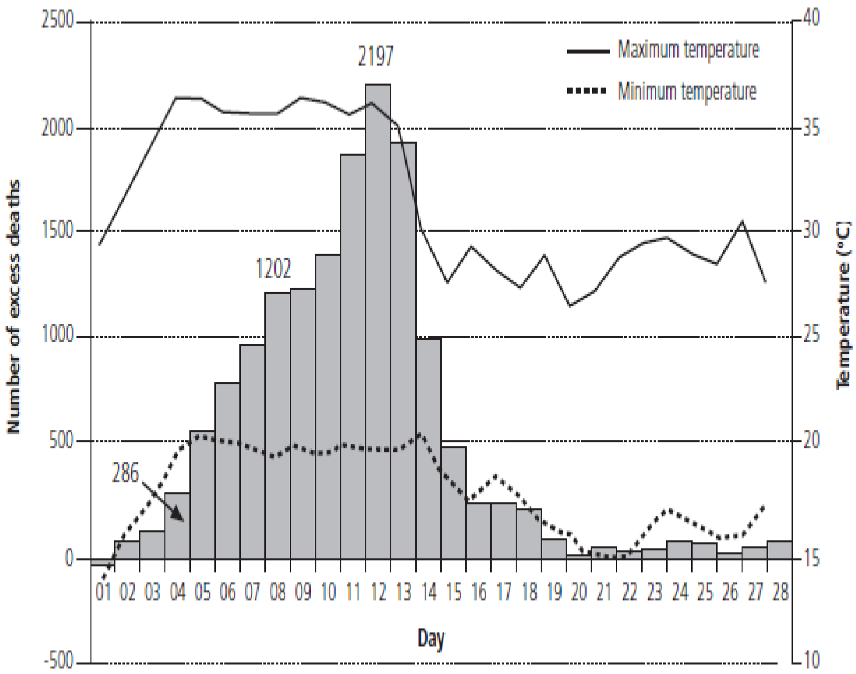
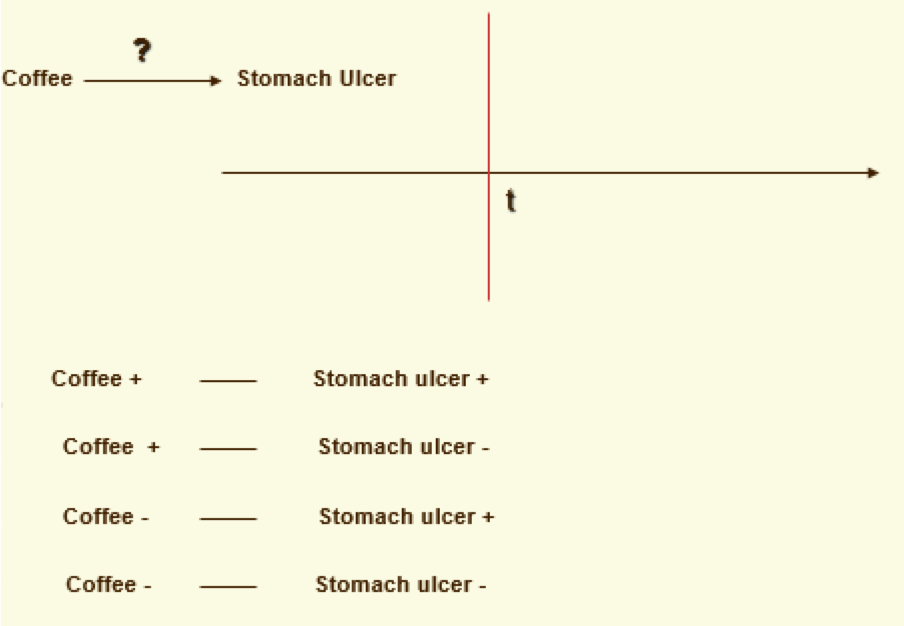


Figure 3. *Deaths during heat wave in Paris, 2003*

The increasing death rate during the heat wave in France in 2003 (Figure 3) correlated well with increasing temperature, although increasing daily air pollution also played a role. This increase of deaths occurred mainly among elderly people and the immediate cause of death was often recorded as heart or lung disease.

- Cross-sectional studies - advantages, disadvantages, examples



- ✓ Measure the prevalence of disease at a particular moment (point prevalence) and the data are collected directly from the study subjects in a short period of time.
- ✓ Measure the exposure and the effect at the same time and it is not possible to determine the whether the exposure preceded or resulted from the disease

Figure 4. *Association between coffee intake and stomach ulcer*

4. Potential errors in epidemiological studies – *Reference to Lecture 4*

- Random error: when a value of the sample measurement diverges – due to chance alone – from that of the true population value.
- Systematic error: (or bias) occurs in epidemiology when results differ in a systematic manner from the true values - selection bias, measurement bias
- Confounding: definition of the term, examples, ways of controlling

Confounding can occur when another exposure exists in the study population and is associated both with the disease and the exposure being studied.

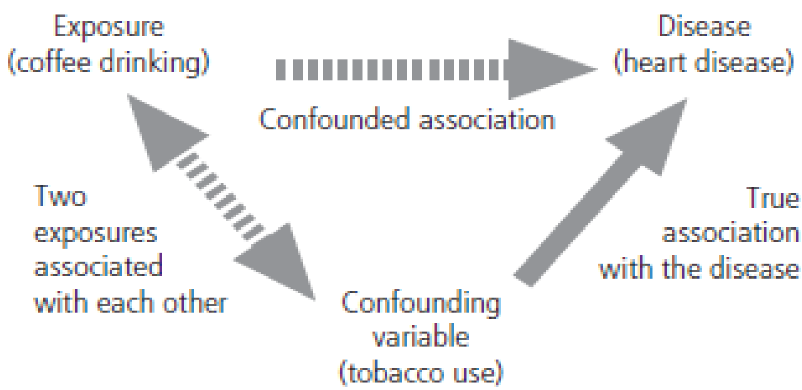
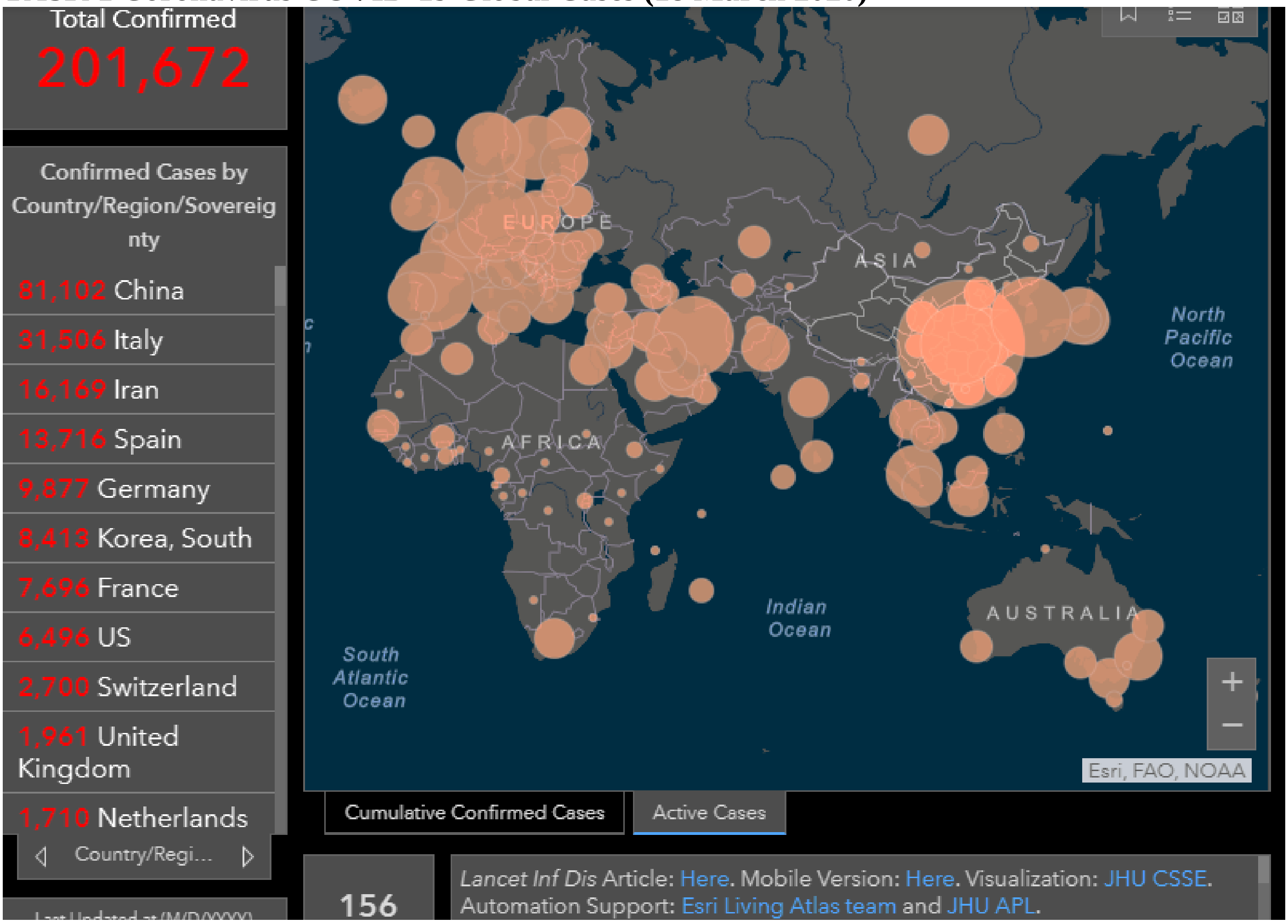


Figure 4. *Confounding: relationship between coffee drinking (exposure), heart disease (outcome), and a third variable (tobacco use)*

- ✓ Confounding occurs when the effects of two exposures (risk factors) have not been separated and the analysis concludes that the effect is due to one variable rather than the other. To be a confounding factor, two conditions must be met.
- ✓ Confounding arises because non-random distribution of risk factors in the source population also occurs in the study population thus providing misleading estimates of effect.

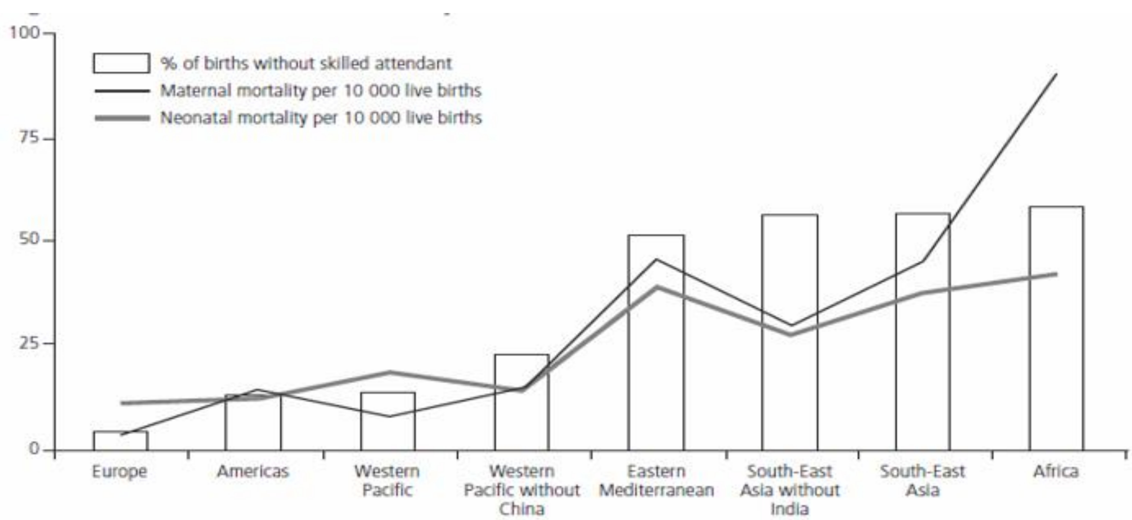
PRACTICAL WORK on discussing descriptive, ecological and cross-sectional studies.

TASK 1 Coronavirus COVID-19 Global Cases (18 March 2020)



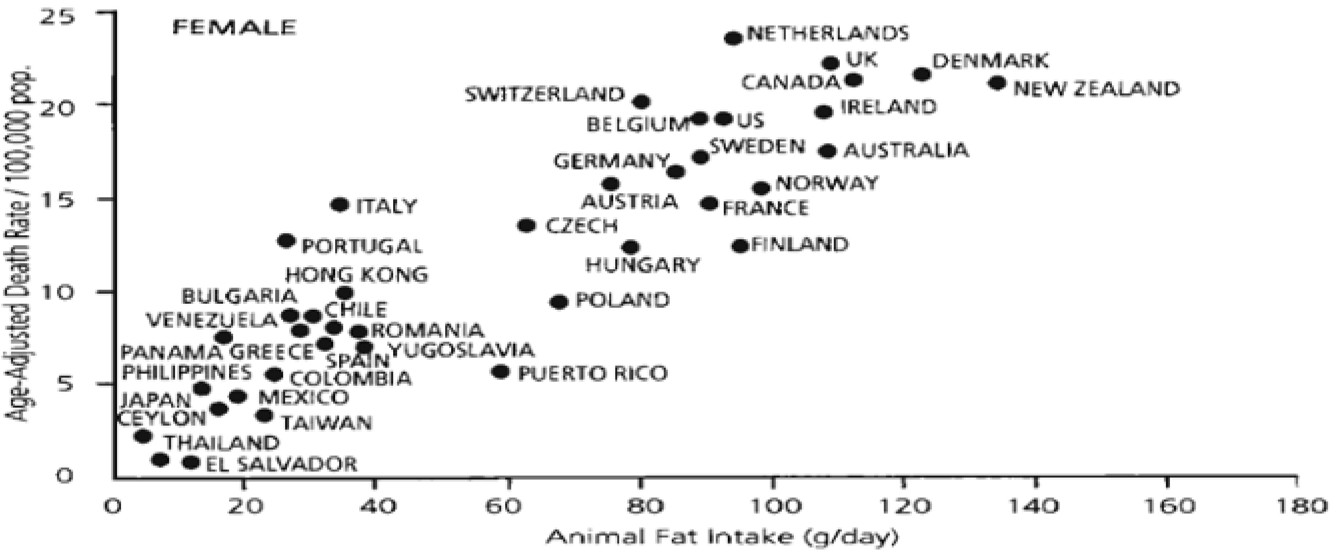
1. By using information provided analyze and compare the magnitude of epidemic:
   - in different regions: active cases (map in orange)
   - in different countries: numbers (in red)

TASK 2 Neonatal and maternal mortality are related to the absence of a skilled birth attendant



1. Analyze and make a conclusion for relationship between maternal deaths and absence of skilled birth attendants in the four regions.
2. What is the possible explanation for results observed?

TASK 3 Animal fat intake and death rate due to breast cancer



1. Analyze and make a conclusion for relationship between death rate due to breast cancer and Animal fat intake.
2. What is the possible explanation for results observed?

TASK 4 Beer and obesity

Bobak M[1], Skodova Z, Marmot M.

Abstract

OBJECTIVE:

There is a common notion that beer drinkers are, on average, more 'obese' than either nondrinkers or drinkers of wine or spirits. This is reflected, for example, by the expression 'beer belly'. However, the few studies on the association between consumption of beer and abdominal obesity produced inconsistent results. We examined the relation between beer intake and waist-hip ratio (WHR) and body mass index (BMI) in a beer-drinking population.

DESIGN:

What is the design of the study …………………………………………………………………?

SETTINGS:

General population of six districts of the Czech Republic.

SUBJECTS:

A random sample of 1141 men and 1212 women aged 25-64 y (response rate 76%) completed a questionnaire and underwent a short examination in a clinic. Intake of beer, wine and spirits during a typical week, frequency of drinking, and a number of other factors were measured by a questionnaire. The present analyses are based on 891 men and 1098 women who were either nondrinkers or 'exclusive' beer drinkers (ie they did not drink any wine or spirits in a typical week).

RESULTS:

The mean weekly beer intake was 3.1 l in men and 0.3 l in women. In men, beer intake was positively related to WHR in age-adjusted analyses, but the association was attenuated and became nonsignificant after controlling for other risk factors. There appeared to be an interaction with smoking: the relation between beer intake and WHR was seen only among nonsmokers. Beer intake was not related to BMI in men. In women, beer intake was not related to WHR, but there was a weak inverse association with BMI.

CONCLUSION:

It is unlikely that beer intake is associated with a largely increased WHR or BMI.

TASKS should be submitted by mail to your group assistant as follows:

Assistant	Groups	E-mail for submission of the tasks
Assoc. prof. Mariela Kamburova	2, 6, 8, 10, 12, 13, 17, 18	mariela_kamburova@yahoo.com
Assoc. prof. Stela Georgieva	7, 9, 11, 14, 19, 20	georgieva_sl@yahoo.com
Assist. prof. Dima Tsanova	1, 3, 4, 5, 15, 16	d_krumova@abv.bg

The deadline for submission is 7 days after the date of regular class (13 April – 17 April 2020).

TEST FOR SELF-ASSESSMENT

1. The units of analysis in ecological studies are individuals:
   A. True B. False

2. Which type of study measures the prevalence of disease at a particular moment and the data are collected directly from the study subjects in a short period of time?
   A. Ecological
   B. Case – control
   C. Cross – sectional

3. An error that may occur when we attempt to explain variations in population groups on the basis of individual study results.
   A. Biological fallacy
   B. Ecological fallacy

4. Observational studies:
   A. Gather data on existing phenomena without controlling exposures or populations
   B. Test the effect of an intervention on a disease or condition
   C. Determine the effect of a new treatment

5. Matching is a method for controlling:
   A. Selection bias
   B. Recall bias
   C. Confounding

6. An error that may occur when on the basis of results for existing link between exposure and disease at the population level we attempt to draw conclusions for such association on individual level.
   A. Biological fallacy
   B. Ecological fallacy

Correct answers:
1-B/ 2-C/ 3-A/ 4-A/ 5-C/ 6-B