**Epidemiological analysis** is the analysis of the level, structure and dynamics of the incidence rate for any period of time or at the moment. In the study of incidence over a time interval, the results of systematic observation are taken. The analysis currently uses the results of a simultaneous (transverse) examination. Its purpose is to establish the causes and conditions that determine the manifestations of the epidemic process.

**Epidemiological analysis** is part of epidemiological surveillance, which is implemented in two time categories - retrospectively and expeditiously. The main task of a retrospective epidemiological analysis is to assess the status and development trends of the epidemic process, which is designed to identify risk areas, risk groups, time periods and risk factors.

**The incidence rate reflects**:

The frequency of newly diagnosed cases of the disease in a population group (risk group) for a given period (time) in a given territory;

 ... The proportion of cases (proportion of new cases) of the disease in the same group for the same time in the same territory.

**Incidence rates (incidence)** • Measurement of the frequency of new cases (outcomes) in a risk population - That is, only among those who have a non-zero probability of developing the outcome (the denominator should not include people who are not at risk of developing the disease!) the frequency of IOCI per 100 operations, the frequency of UTI caused by MRSA per 100 patients • In analytical epidemiology, they are most often used in the context of cohort Research • The basis for many analytical techniques: - Risk ratio - Risk difference - Survival analysis and others

**Cumulative incidence (CI)** • The total number of new cases of the disease (or other outcome) in the risk population • As a rule, it is measured over a certain period of time (more often than a year) • Calculation formula: •

|  |  |  |
| --- | --- | --- |
| **СI=** | **Number of new cases** | **х10х** |
| **Risk population** |

For ease of perception, it is multiplied by a multiple of 10 (100, 1000, 10.000, 100.000), so that the result is more than 1 - For example: 5.5 per 1000 people, and not 0.055 (per 1 person)

Thus, the cumulative incidence rate is the proportion of healthy individuals at the beginning of the study who fall ill during the considered period of time.

The magnitude of cumulative morbidity is directly related to the length of the observation period Y (risk period taken into account): the longer it is, the cumulative morbidity is higher. Duration should therefore always be taken into account in parallel with the cumulative incidence rate and taken into account when interpreting its values.

**Incidence Density (Risk) •**

Cumulative incidence does not take into account the duration of exposure (does not take into account the duration of exposure) - A person with a catheterization duration of 1 day is equalized with the one whose catheter was installed for 10 days. The incidence density takes into account the duration of exposure (exposure)

|  |  |  |
| --- | --- | --- |
| **ID=** | **Number of new cases** | **х10х** |
| **Sum of risk time** |

The incidence density can be used to calculate the risk of developing an outcome • The incidence density is preferable to cumulative incidence if the duration of the exposure matters - In the case of short exposures, the incidence density and cumulative incidence are equal • The incidence density allows estimating the incidence in populations whose size varies over time - For cumulative incidence need a fixed population

|  |  |
| --- | --- |
| **AIR=** | **CI** |
| **Study period** |

**The average incidence rate**

*Tasks for the section "Analysis of incidence according to epidemiological studies"*

* For the analysis of the incidence according to epidemiological studies, various indicators are used, for the calculation and interpretation of which a set of tasks is developed and adapted based on various publications [Introduction to Applied Epidemiology and Biostatistics<https://www.cdc.gov/csels/dsepd/ss1978/lesson3/index.html>; <http://sphweb.bumc.bu.edu/otlt/MPH-Modules/EP/EP713_DiseaseFrequency/EP713_DiseaseFrequency_print.html>; <https://www.cdc.gov/csels/dsepd/>].  
    
  Examples of solving the problem:
* In January 2010, 1010 young people were invited to participate in a 10-year prospective study to determine their risk of developing type I diabetes. This group underwent an initial blood test to determine if they had diabetes or not. Participants were retested annually over the next 10 years. From the group of young people who joined the study:
* • no one was diagnosed with diabetes in the initial blood screening
* • 1000 people remained disease free for all 10 years of the study
* • during the study, 6 people developed diabetes at the time indicated in the table below.
* • 2 people who were initially free from disease were lost for observation during the study at the time indicated in the table below

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| **------** | ------ | + |  |  |  |  |  |  |  |
| **------** | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | + |
| **------** | ------ | ------ | ------ | ------ | ------ | ------ | + |  |  |
| **------** | + |  |  |  |  |  |  |  |  |
| **------** | ------ | ------ | ------ | + |  |  |  |  |  |
| **------** | ------ | + |  |  |  |  |  |  |  |
| **------** | ------ | ------ | ------ | ? |  |  |  |  |  |
| **------** | ------ | ------ | ------ | ------ | ? |  |  |  |  |

Designations:

? lost for later observation

  + a positive blood test for diabetes

---- continued observation without disease

The total number of man-years of observation was 10064:

Question. Calculate all possible incidence rates.

**Decision**.

According to the conditions of the problem, you can calculate the incidence rate, for example, for 2012, the incidence density indicator, cumulative incidence and the average incidence rate for the year.

Incidence / incidence rate, e.g. 2012

IR (Incidence Rate) == 2/1009 \* 10000 = 19.8 cases of diabetes per 10000 population of the corresponding age

Morbidity density

ID (Incidence Density) = type 1 diabetes cases per 10,000 person-years

The cumulative incidence rate for 10 years

CI (Cumulative Incidence) = 6/1010 \* 10,000 = 59.4 cases of diabetes per 10,000 young adults

The average incidence rate per year for the group over a 10-year period = 59.4 / 10 = 5.9% of the population per year.

**Terms of tasks:**

**You are performing one of the options**  **(Variant 1 for subgroup A,**

**Variant 2 for subgroup B):**

**Variant 1 .**

A descriptive study of mortality among sick women with diabetes involved 218 women with diabetes and 3,823 women without diabetes. By the end of the study, 72 women with diabetes and 511 women without diabetes had died. Women with diabetes were observed in a total of 1862 person-years; women without diabetes observed a total of 36,653 person-years.

Question: Calculate mortality rates for women with and without diabetes.

**Variant 1 .**

In 2013, the United States recorded 44,232 new cases of Acquired Immunodeficiency Syndrome (AIDS). The average annual US population in 2013 was approximately 290,809,777. Altogether, 200,000 people are registered with acquired immunodeficiency syndrome (AIDS).

Question: Calculate your possible AIDS incidence rates.