**Instructions**

Please complete the following lab assignment. You may work on the assignment in groups or on your own. However, to get credit, you must submit your own answers in Canvas. This lab is open note and open book. You may also ask the instructor and the TA questions. Please note that in most cases we will try to guide you towards answering your own question rather than directly providing you with an answer.

# Calculations

[R calculations are available here](https://www.dropbox.com/s/gn19tm3657bf9i5/lab_effect_modification.Rmd?dl=0).

[Google sheet calculations are available here](https://docs.google.com/spreadsheets/d/1QK2ZH9YAopJ-YBWL3E_MbjZnNFBP4Taks2WPbqHesvs/edit#gid=961627830).

# Q1. Temporality in cohort study

[True/False]

# In a prospective cohort study, we can determine whether a temporal relationship exists between exposure and disease.

|  |  |
| --- | --- |
| ✅ | True |
|  | False |

# Q1. Feedback

In a prospective cohort study, we can determine whether a temporal relationship exists between exposure and disease.

This is true. In a typical cohort study design, we collect exposure information from a group of people known to be disease-free. We then track their disease status over time. Under these circumstances, exposure precedes the disease in time (temporally) by definition.

Please make sure you understand why this is the correct answer. You may use the "Previous" button below to update your answer if your original answer was incorrect.

Click the "Next" button below to move on to the next question.

# Q2. Features of a cohort study

[Check all that apply]

# Which of the following are features of a prospective cohort study design?

|  |  |
| --- | --- |
| ✅ | Efficient for studying multiple outcomes |
|  | Efficient for studying diseases with a long latency |
|  | Efficient for studying rare outcomes |
| ✅ | Efficient for studying rare exposures |
| ✅ | Allows for examination of the natural course of disease/survival |

# Q2. Feedback

Which of the following are features of a prospective cohort study design?

Prospective cohort studies tend to be efficient for studying multiple outcomes and rare exposures. Additionally, prospective cohort studies often allow for the investigation of the natural course of disease/survival.

On the other hand, prospective cohort studies tend NOT to be efficient for studying diseases with long latency periods (because they take a long time to manifest) or for studying rare outcomes (because they rarely manifest at all).

Please make sure you understand why this is the correct answer. You may use the "Previous" button below to update your answer if your original answer was incorrect.

Click the "Next" button below to move on to the next question.

# Q3. Cohort advantages

[Multiple Choice]

Select one statement that does not describe an advantage of conducting a prospective cohort study.

|  |  |
| --- | --- |
|  | Precise measurement of exposure is possible. |
|  | Incidence rates can be calculated. |
|  | Recall bias is minimized compared with a case-control study. |
| ✅ | It usually costs less than a case-control study. |
|  | Many disease outcomes can be studied simultaneously. |

# Q3. Feedback

The correct answer is: It usually costs less than a case-control study. In fact, cohort studies are often not less expensive than case-control studies.

Please make sure you understand why this is the correct answer. You may use the "Previous" button below to update your answer if your original answer was incorrect.

Click the "Next" button below to move on to the next question.

# Q4. Retrospective cohort study

[True/False]

The distinguishing feature of a retrospective cohort study is that the investigators conceive the study and begin identifying and enrolling participants after outcomes have already occurred.

|  |  |
| --- | --- |
| ✅ | True |
|  | False |

# Q4. Feedback

The distinguishing feature of a retrospective cohort study is that the investigators conceive the study and begin identifying and enrolling participants after outcomes have already occurred.

This is true. As Sklo and Nieto (2019, p. 24) write, "Alternatively, in nonconcurrent cohort studies (also known as historical or retrospective cohort studies), a cohort is identified and assembled in the past on the basis of existing records and is “followed” to the present time (i.e., the time when the study is conducted) ( Figure 1-16 ). An example of this type of design is a 1992 study in which the relationship between childhood body weight and subsequent adult mortality was examined nonconcurrently on the basis of existing records of weight and height values obtained from 1933 through 1945 in school-age children who were linked to adult death records. The nonconcurrent design is also useful in occupational epidemiology, as occupational records can be linked to mortality or cancer registries. For example, a cohort of all electricians working in Norway in 1960 was followed nonconcurrently through 1990 to study the relationship of electromagnetic radiation to cancer incidence. Mixed designs with both nonconcurrent and concurrent follow-up components are also possible ( Figure 1-16 ). Nonconcurrent cohort studies are obviously less expensive and can be done more expeditiously than concurrent studies. Their main disadvantage is an obligatory reliance on available information; as a result, the type or quality of exposure or outcome data may not be well suited to fulfill the study objectives."

Please make sure you understand why this is the correct answer. You may use the "Previous" button below to update your answer if your original answer was incorrect.

Click the "Next" button below to move on to the next question.

# Q5. Retrospective cohort study

[Multiple choice]

Investigators wishing to study the association between occupational exposure and relatively rare disease are granted access to the employment records of several major factories, from which the exposures of workers over the last forty years can be documented. They are also granted access to union records, including health care records, documenting the occurrence of each case of the disease of interest in anyone who has worked in those factories. The researchers study employees at these factories in 1955 and divided them into those with a high level of exposure and those with a moderate or low level of exposure. They then compare the cumulative incidence of the disease between these two groups in the present time.

Their research described had a study design of a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

|  |  |
| --- | --- |
|  | a. cross-sectional study |
|  | b. case-control study |
|  | c. prospective cohort study |
| ✅ | d. retrospective cohort study |

# Q5. Feedback

Investigators wishing to study the association between occupational exposure and relatively rare disease are granted access to the employment records of several major factories, from which the exposures of workers over the last forty years can be documented. They are also granted access to union records, including health care records, documenting the occurrence of each case of the disease of interest in anyone who has worked in those factories. The researchers study employees at these factories in 1955 and divided them into those with a high level of exposure and those with a moderate or low level of exposure. They then compare the cumulative incidence of the disease between these two groups in the present time.

**Their research described had a study design of a retrospective cohort study.**

Here the researchers selected the participants based on exposure status and then compared the cumulative incidence rate of the disease making it a cohort study. Since all the records and measurements were collected before the time of the study, it is a retrospective study. Hence the correct answer is d – retrospective cohort study design.

Please make sure you understand why this is the correct answer. You may use the "Previous" button below to update your answer if your original answer was incorrect.

Click the "Next" button below to move on to the next question.

# Q6. Interpret relative risk

[Multiple Choice]

Researchers prospectively followed a group of 100 vegetarians and 200 non-vegetarians. After 39 years of follow-up and no loss to follow-up, 8 of vegetarians and 20 of non-vegetarians developed heart disease. The 95% confidence interval of the relative risk of 0.8 ranges from 0.6 to 0.9. Select the best interpretation of these results from the choices below.

|  |  |
| --- | --- |
|  | Vegetarians were 80% less likely to develop heart disease during 39 years of follow-up compared to non-vegetarians |
|  | The researchers should have calculated cumulative incidence rather than relative risk |
|  | The relative risk of 0.8 is not statistically significant as the 95% confidence interval contains the value 0.8 |
| ✅ | Vegetarians were 20% less likely to develop heart disease during 39 years of follow-up compared to non-vegetarians |
|  | The relative risk is statistically significant as the 95% confidence interval contains the null value of 1 |

# Q6. Feedback

The relative risk less than 1 (0.8) suggests that being vegetarian has a protective effect against the development of heart disease.

The percentage decrease for RR < 1 is calculated as: (1-RR) \* 100. Therefore, the correct interpretation is, "Vegetarians were 20% less likely to develop heart disease during 39 years of follow-up than non-vegetarians."

Please make sure you understand why this is the correct answer. You may use the "Previous" button below to update your answer if your original answer was incorrect.

Click the "Next" button below to move on to the next question.

# Q7. Name study design

[Multiple Choice]

It is well known that the use of urinary catheters conveys a substantial risk of urinary tract infection (UTI). A group of physicians believes that, in an intensive care setting, the use of one type A urinary catheter is more likely to encourage infection than the use of other types. They therefore retrospectively reviewed medical records over a recent period for all uses of urinary catheters in an ICU.

They find that 200 new UTI's occurred during 1000 ICU patient-days of catheterization with the type A catheter, as compared to 100 new UTI's during 5000 ICU-patient days of catheterization with all other types. Noting the increased frequency of new UTI's when the type A catheter is used, they regard their hypothesis as confirmed.

To reduce nosocomial UTIs, they recommend discontinuing the use of type A catheter in the ICU.

**The study design described above is a \_\_\_\_\_\_\_\_\_\_\_\_:**

|  |  |
| --- | --- |
|  | prospective cohort study |
| ✅ | retrospective cohort study |
|  | nested case-control study |
|  | case-cohort study |
|  | case-control study |

# 

# Q7. Feedback

The researchers selected the participants based on exposure status (type of catheter) and retrospectively followed them to investigate people who develop the disease (UTI), hence this is a retrospective cohort study.

Please make sure you understand why this is the correct answer. You may use the "Previous" button below to update your answer if your original answer was incorrect.

Click the "Next" button below to move on to the next question.

# Q8. Attributable risk

[Multiple choice]

It is well known that the use of urinary catheters conveys a substantial risk of urinary tract infection (UTI). A group of physicians believes that, in an intensive care setting, the use of one type A urinary catheter is more likely to encourage infection than the use of other types. They therefore retrospectively reviewed medical records over a recent period for all uses of urinary catheters in an ICU.

They find that 200 new UTI's occurred during 1000 ICU patient-days of catheterization with the type A catheter, as compared to 100 new UTI's during 5000 ICU-patient days of catheterization with all other types. Noting the increased frequency of new UTI's when the type A catheter is used, they regard their hypothesis as confirmed.

To reduce nosocomial UTIs, they recommend discontinuing the use of type A catheter in the ICU.

What is the risk of UTIs attributed to type A catheter?

|  |  |
| --- | --- |
|  | 20 new UTI's per 1000 patient-days of catheterization |
| ✅ | 200 new UTI's per 1000 patient-days of catheterization |
|  | 180 new UTI's per 1000 patient-days of catheterization |
|  | There is insufficient information to calculate the risk of UTIs attributed to type A catheter |

# Q8. Feedback

What is the risk of UTIs attributed to type A catheter?

The correct answer is 180 new UTI's per 1000 patient-days of catheterization.

Attributable risk = risk in exposed – risk in unexposed

Attributable risk = (200 / 1000) – (100 / 5000)

Attributable risk = 0.2 – 0.02

Attributable risk = 0.18

Attributable risk = 0.18 \* 1000 = 180 new UTIs per 1000 patient-days of catheterization

Please make sure you understand why this is the correct answer. You may use the "Previous" button below to update your answer if your original answer was incorrect.

Click the "Next" button below to move on to the next question.

**Q9. Calculate RR**

[Multiple choice]

It is well known that the use of urinary catheters conveys a substantial risk of urinary tract infection (UTI). A group of physicians believes that, in an intensive care setting, the use of one type A urinary catheter is more likely to encourage infection than the use of other types. They therefore retrospectively reviewed medical records over a recent period for all uses of urinary catheters in an ICU.

They find that 200 new UTI's occurred during 1000 ICU patient-days of catheterization with the type A catheter, as compared to 100 new UTI's during 5000 ICU-patient days of catheterization with all other types. Noting the increased frequency of new UTI's when the type A catheter is used, they regard their hypothesis as confirmed.

To reduce nosocomial UTIs, they recommend discontinuing the use of type A catheter in the ICU.

The relative risk for UTI associated with the type A catheter compared to other catheters is:

|  |  |
| --- | --- |
|  | 12 |
|  | 8 |
| ✅ | 10 |
|  | 4 |

# Q9. Feedback

The relative risk for UTI associated with the type A catheter compared to other catheters is 10.

Risk of UTIs in people with type A catheter = 200 / 1000 = 0.2

Risk of UTIs in people with other types of catheter = 100 / 5000 = 0.02

Hence, relative risk = 0.2 / 0.02 = 10

Please make sure you understand why this is the correct answer. You may use the "Previous" button below to update your answer if your original answer was incorrect.

Click the "Next" button below to move on to the next question.

**Q10. Calculate cumulative incidence ratio**

[Multiple choice]

Since 1948, the Framingham Heart Study (FHS) has followed 1333 males and 1661 females in order to investigate the relationship between risk factors and the development of cardiovascular disease.

Data from the FHS on serum cholesterol levels and coronary heart disease (CHD) in men and women as shown in the tablebelow. For this question, assume that everyone was followed for 20 years without a loss to follow up. Use the lowest level of serum cholesterol as the reference category.

|  |  |  |  |
| --- | --- | --- | --- |
| **Group** | **Serum Cholesterol (mg/1,000 mL)** | **New CHD cases** | **Population at risk** |
| **Men** | | | |
| 1 | Less than 210 | 16 | 454 |
| 2 | 210 - 244 | 29 | 455 |
| 3 | 245 or more | 51 | 424 |
| **Women** | | | |
| 1 | Less than 210 | 8 | 445 |
| 2 | 210 - 244 | 16 | 527 |
| 3 | 245 or more | 30 | 689 |

The **cumulative incidence ratio** (CIR) for men in group 2 and 3, respectively, is:

|  |  |
| --- | --- |
|  | 1.81 and 3.41 |
|  | 0.55 and 1.81 |
| ✅ | 0.29 and 3.41 |
|  | 1.74 and 3.13 |

**Q10. Feedback**

Since 1948, the Framingham Heart Study (FHS) has followed 1333 males and 1661 females in order to investigate the relationship between risk factors and the development of cardiovascular disease.

Data from the FHS on serum cholesterol levels and coronary heart disease (CHD) in men and women as shown in the tablebelow. For this question, assume that everyone was followed for 20 years without a loss to follow up. Use the lowest level of serum cholesterol as the reference category.

|  |  |  |  |
| --- | --- | --- | --- |
| **Group** | **Serum Cholesterol (mg/1,000 mL)** | **New CHD cases** | **Population at risk** |
| **Men** | | | |
| 1 | Less than 210 | 16 | 454 |
| 2 | 210 - 244 | 29 | 455 |
| 3 | 245 or more | 51 | 424 |
| **Women** | | | |
| 1 | Less than 210 | 8 | 445 |
| 2 | 210 - 244 | 16 | 527 |
| 3 | 245 or more | 30 | 689 |

The **cumulative incidence ratio** (CIR) for men in group 2 and 3, respectively, is 1.81 and 3.41.

CIR = risk in exposed / risk in unexposed

Group 2 = (29/455)/ (16/454)

Group 2 = 1.8085

Group 3 = (51/424)/ (16/454)

Group 3 = 3.4130

Please make sure you understand why this is the correct answer. You may use the "Previous" button below to update your answer if your original answer was incorrect.

Click the "Next" button below to move on to the next question.

**Q11. Calculate confidence interval**

[Multiple choice]

Since 1948, the Framingham Heart Study (FHS) has followed 1333 males and 1661 females in order to investigate the relationship between risk factors and the development of cardiovascular disease.

Data from the FHS on serum cholesterol levels and coronary heart disease (CHD) in men and women as shown in the tablebelow. For this question, assume that everyone was followed for 20 years without a loss to follow up. Use the lowest level of serum cholesterol as the reference category.

|  |  |  |  |
| --- | --- | --- | --- |
| **Group** | **Serum Cholesterol (mg/1,000 mL)** | **New CHD cases** | **Population at risk** |
| **Men** | | | |
| 1 | Less than 210 | 16 | 454 |
| 2 | 210 - 244 | 29 | 455 |
| 3 | 245 or more | 51 | 424 |
| **Women** | | | |
| 1 | Less than 210 | 8 | 445 |
| 2 | 210 - 244 | 16 | 527 |
| 3 | 245 or more | 30 | 689 |

Using the formulas provided in the appendix of the Szklo & Nieto, the 95% confidence interval for the cumulative incidence ratio for men in **group 2** is (please round to 3 decimal places at all steps of the calculation):

|  |  |
| --- | --- |
|  | (-0.014, 1.201) |
| ✅ | (0.997, 3.283) |
|  | (0.59332, 1.903) |
|  | (1.034,1.903) |

**Q11. Feedback**

Since 1948, the Framingham Heart Study (FHS) has followed 1333 males and 1661 females in order to investigate the relationship between risk factors and the development of cardiovascular disease.

Data from the FHS on serum cholesterol levels and coronary heart disease (CHD) in men and women as shown in the tablebelow. For this question, assume that everyone was followed for 20 years without a loss to follow up. Use the lowest level of serum cholesterol as the reference category.

|  |  |  |  |
| --- | --- | --- | --- |
| **Group** | **Serum Cholesterol (mg/1,000 mL)** | **New CHD cases** | **Population at risk** |
| **Men** | | | |
| 1 | Less than 210 | 16 | 454 |
| 2 | 210 - 244 | 29 | 455 |
| 3 | 245 or more | 51 | 424 |
| **Women** | | | |
| 1 | Less than 210 | 8 | 445 |
| 2 | 210 - 244 | 16 | 527 |
| 3 | 245 or more | 30 | 689 |

Using the formulas on pages 488 and 489 of Sklo & Nieto, and rounding to 3 decimal places at all steps of the calculation, the correct answer is (0.997, 3.283).

Group 2: CIR = 1.809

Standard error (SE) =

Standard error (SE) =

Standard error (SE) = 0.304

Lower limit = RR \*

Lower limit = 1.809 \*

Lower limit = 0.997

Upper limit = RR \*

Upper limit = 1.809 \*

Upper limit = 3.283

95% CI = (0.997, 3.283)

Please make sure you understand why this is the correct answer. You may use the "Previous" button below to update your answer if your original answer was incorrect.

Click the "Next" button below to move on to the next question.

**Q12. Calculate CI**

[Multiple choice]

Since 1948, the Framingham Heart Study (FHS) has followed 1333 males and 1661 females in order to investigate the relationship between risk factors and the development of cardiovascular disease.

Data from the FHS on serum cholesterol levels and coronary heart disease (CHD) in men and women as shown in the tablebelow. For this question, assume that everyone was followed for 20 years without a loss to follow up. Use the lowest level of serum cholesterol as the reference category.

|  |  |  |  |
| --- | --- | --- | --- |
| **Group** | **Serum Cholesterol (mg/1,000 mL)** | **New CHD cases** | **Population at risk** |
| **Men** | | | |
| 1 | Less than 210 | 16 | 454 |
| 2 | 210 - 244 | 29 | 455 |
| 3 | 245 or more | 51 | 424 |
| **Women** | | | |
| 1 | Less than 210 | 8 | 445 |
| 2 | 210 - 244 | 16 | 527 |
| 3 | 245 or more | 30 | 689 |

Using the formulas provided in the appendix of the Szklo & Nieto, the 95% confidence interval for the cumulative incidence ratio for men in **group 3** is (please round to 3 decimal places at all steps of the calculation):

|  |  |
| --- | --- |
|  | (1.034, 4.903) |
| ✅ | (1.979, 5.885) |
|  | (1.973, 4.983) |
|  | (1.034, 5.892) |

**Q12. Feedback**

Since 1948, the Framingham Heart Study (FHS) has followed 1333 males and 1661 females in order to investigate the relationship between risk factors and the development of cardiovascular disease.

Data from the FHS on serum cholesterol levels and coronary heart disease (CHD) in men and women as shown in the tablebelow. For this question, assume that everyone was followed for 20 years without a loss to follow up. Use the lowest level of serum cholesterol as the reference category.

|  |  |  |  |
| --- | --- | --- | --- |
| **Group** | **Serum Cholesterol (mg/1,000 mL)** | **New CHD cases** | **Population at risk** |
| **Men** | | | |
| 1 | Less than 210 | 16 | 454 |
| 2 | 210 - 244 | 29 | 455 |
| 3 | 245 or more | 51 | 424 |
| **Women** | | | |
| 1 | Less than 210 | 8 | 445 |
| 2 | 210 - 244 | 16 | 527 |
| 3 | 245 or more | 30 | 689 |

Using the formulas on pages 488 and 489 of Sklo & Nieto, and rounding to 3 decimal places at all steps of the calculation, the correct answer is: (1.979, 5.885)

Group 3: CIR = 3.413

Standard error (SE) =

Standard error (SE) =

Standard error (SE) = 0.278

Lower limit = RR \*

Lower limit = 3.413 \*

Lower limit = 1.979

Upper limit = RR \*

Upper limit = 3.413 \*

Upper limit = 5.885

95% CI = (1.979, 5.885)

Please make sure you understand why this is the correct answer. You may use the "Previous" button below to update your answer if your original answer was incorrect.

Click the "Next" button below to move on to the next question.

**Q13. Interpret cumulative incidence**

[Multiple choice]

Since 1948, the Framingham Heart Study (FHS) has followed 1333 males and 1661 females in order to investigate the relationship between risk factors and the development of cardiovascular disease.

Data from the FHS on serum cholesterol levels and coronary heart disease (CHD) in men and women as shown in the table below. For this question, assume that everyone was followed for 20 years without a loss to follow up. Use the lowest level of serum cholesterol as the reference category.

|  |  |  |  |
| --- | --- | --- | --- |
| **Group** | **Serum Cholesterol (mg/1,000 mL)** | **New CHD cases** | **Population at risk** |
| **Men** | | | |
| 1 | Less than 210 | 16 | 454 |
| 2 | 210 - 244 | 29 | 455 |
| 3 | 245 or more | 51 | 424 |
| **Women** | | | |
| 1 | Less than 210 | 8 | 445 |
| 2 | 210 - 244 | 16 | 527 |
| 3 | 245 or more | 30 | 689 |

Interpret the cumulative incidence ratio for **group 3** (CIR = 3.413).

|  |  |
| --- | --- |
| ✅ | The cumulative incidence of CHD among men with serum cholesterol above 244 mg/1,000 mL was approximately 3 times that of men with serum cholesterol less than 210 mg/1,000 mL |
|  | The cumulative incidence of CHD among those with serum cholesterol levels more than 244 is 241 percent higher and not significant than that of people with serum cholesterol levels less than 210 |
|  | The risk of CHD among those with serum cholesterol levels lower than 210 is 59 percent lower than that of people with serum cholesterol levels higher than 244 |
|  | The risk of incidence of CHD among those with serum cholesterol levels higher than 244 is 241 times higher compared to people with serum cholesterol levels less than 210 |
|  | The odds of incidence of CHD among those with serum cholesterol levels higher than 244 is 241 times higher compared to people with serum cholesterol levels less than 210 |

**Q13. Feedback**

Interpret the cumulative incidence ratio for **group 3** (CIR = 3.413).

The correct answer is "The cumulative incidence of CHD among men with serum cholesterol above 244 mg/1,000 mL was approximately 3 times that of men with serum cholesterol less than 210 mg/1,000 mL."

Please make sure you understand why this is the correct answer. You may use the "Previous" button below to update your answer if your original answer was incorrect.

Click the "Next" button below to move on to the next question.

**Q14. Bias in cohort studies**

[True/False]

The loss to follow up can lead to selection bias in a cohort study

|  |  |
| --- | --- |
| ✅ | True |
|  | False |

**Q14. Feedback**

The loss to follow up can lead to selection bias in a cohort study. This is true. If the loss to follow-up is differential it may cause selection bias in a cohort study. For example, exposed people with the disease are more likely to drop out of the study compared to unexposed people with the disease or exposed people without the disease, then it may lead to selection bias due to differential attrition.

Please make sure you understand why this is the correct answer. You may use the "Previous" button below to update your answer if your original answer was incorrect.

Click the "Next" button below to move on to the next question.

**Q15. Bias in cohort studies**

[Multiple choice]

Researchers conducted a prospective cohort study of the association between smoking exposure and asthma. Some study participants were lost to follow-up (dropped out of the study) over time. The researchers were able to obtain data on the exposure and the health outcome for participants who remained in the study as well as for participants who dropped out of the study. The researchers discovered that the rate of loss to follow-up did not differ when comparing exposed and unexposed groups, among those who developed asthma. The researchers also found that the rate of loss to follow-up did not differ when comparing exposed and unexposed groups, among those who did not develop asthma.

Based on this information, which one of the following statements is most likely to be true?

|  |  |
| --- | --- |
|  | Selection bias likely occurred in this study because both exposure groups experienced loss to follow-up |
| ✅ | Selection bias likely did not occur in this study because exposure status and health outcome status did not influence whether people dropped out of the study |
|  | Selection bias likely occurred in this study because both outcome groups (people with asthma and people without asthma) experienced loss to follow-up |
|  | None of the above |

**Q15. Feedback**

The correct answer is Selection bias likely did not occur in this study because exposure status and health outcome status did not influence whether people dropped out of the study.

Since the loss to follow-up is the same in exposed and unexposed who developed asthma and is the same in exposed and unexposed who did not develop asthma, this is an example of non-differential attrition. Therefore, there will be no selection bias.

Please make sure you understand why this is the correct answer. You may use the "Previous" button below to update your answer if your original answer was incorrect.

Click the "Next" button below to move on to the next question.

**Q16. Calculate Incidence Rate Ratio**

[Fill in number]

The Nurses' Health Study (NHS) studied a large cohort of nurses for many years. The contingency table below summarizes data for a study looking at the association between body mass index (BMI) and the development of a non-fatal myocardial infarction. The MI column contains the number of non-fatal myocardial infarction that occurred in each category of BMI. The Person-Years column contains the total person-years of disease-free observation for each category of BMI.

|  |  |  |
| --- | --- | --- |
| **BMI** | **MI** | **Person-Years** |
| >30 | 85 | 99,573 |
| 25-29.9 | 67 | 148,541 |
| 20-24.9 | 113 | 349,960 |
| <20 | 41 | 177,356 |

Please calculate the incidence rate ratio comparing the incidence rate per 100,000 among nurses in the highest BMI category to the incidence rate per 100,000 among nurses in the lowest BMI category. Please round your answer to one decimal place.

\_\_\_\_\_\_\_\_\_\_\_\_

**Q16. Feedback**

Incidence Rate among BMI > 30 = (85 / 99,573) \* 100,000 = 85.4 per 100,000 person years

Incidence Rate among BMI < 20 = (41 / 177,356) \* 100,000 = 23.1 per 100,000 person years

Incidence Rate Ratio = 85.4 / 23.1 = 3.7 per 100,000 person years

So, nurses with a BMI > 30 had 3.7 times the rate of having a non-fatal myocardial infarction compared to nurses with BMI < 20 during the study period.

Please make sure you understand why this is the correct answer. You may use the "Previous" button below to update your answer if your original answer was incorrect.

Click the "Next" button below to move on to the next question.

**Feedback**

**Optional**: Please feel free to leave any comments below about the usefulness of this lab. Which parts were helpful? What could I do to improve it? What is still unclear?