

# What is Incidence Rate Ratio? (Definition & Example)

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Incidence Rate Ratio (IRR) is a statistical measure used to compare the incidence rate of a particular event or outcome between two or more groups. It is calculated by dividing the incidence rate in one group by the incidence rate in another group. This ratio provides a quantifiable measure of the difference in the risk of experiencing the event between the groups.

For example, if we want to compare the incidence rate of lung cancer between smokers and non-smokers, we would calculate the IRR by dividing the incidence rate of lung cancer in smokers by the incidence rate in non-smokers. A resulting IRR of 2 would indicate that smokers have twice the risk of developing lung cancer compared to non-smokers.

IRR is commonly used in epidemiological studies to evaluate the effects of different risk factors on the occurrence of diseases or health outcomes. It allows for a more precise comparison of the risk between groups than simply looking at the absolute numbers. Therefore, IRR is a useful tool in understanding the relationship between risk factors and health outcomes.

## **What is Incidence Rate Ratio? (Definition & Example)**

**An incidence rate ratio allows us to compare the incident rate between two different groups.**

**For example, suppose it's known that people who smoke develop lung cancer at a rate of 7 per 100 person-years.**

**Conversely, suppose it's known that people who do not smoke develop lung cancer at a rate of 1.5 per 100 person-years.**

**We would calculate the incidence rate ratio (often abbreviated IRR) as:**

**IRR = Incidence rate among smokers / Incidence rate among non-smokers**  
**IRR = (7/100) / (1.5/100)**  
**IRR = 4.67**

**Here's how we would interpret this value: The lung cancer rate among smokers is 4.67 times as high as the rate among non-smokers.**

**How to Interpret Incidence Rate Ratios**

**Here is how to interpret an incidence rate ratio (IRR):**

**IRR Less than 1: This indicates that the incident rate is lower in an exposed group compared to an unexposed group.**

**For example, if smokers developed lung cancer at a rate of 7 per 100 person-years and non-smokers developed lung cancer at a rate of 10 per 100 person-years, then the IRR would be  $7/10 = 0.7$ .**

**This would mean that smokers experience the incidence (lung cancer) less often than non-smokers.**

**IRR Equal to 1: This indicates that the incident rate is equal among those in an exposed group and those in an unexposed group.**

For example, if smokers developed lung cancer at a rate of 7 per 100 person-years and non-smokers developed lung cancer at a rate of 7 per 100 person-years, then the IRR would be  $7/7 = 1$ .

This would mean that smokers experience the incidence (lung cancer) just as often as non-smokers.

**IRR Greater than 1:** This indicates that the incident rate is greater in an exposed group compared to an unexposed group.

For example, if smokers developed lung cancer at a rate of 7 per 100 person-years and non-smokers developed lung cancer at a rate of 1.5 per 100 person-years, then the IRR would be  $7/1.5 = 4.67$ .

This would mean that smokers experience the incidence (lung cancer) more often than non-smokers.

Why is Incidence Rate Ratio Useful?

Incidence rate ratio is a useful metric because it's so easy to interpret and it allows us to immediately understand if exposure to something increases or decreases the rate of some incidence.

For example, just knowing that the IRR of smoking is 4.67 tells us that lung cancer occurs far more often in smokers compared to non-smokers.

We also know that the larger the value for IRR, the greater the ratio of some incident in an exposed group compared to an unexposed group.

Conversely, the closer IRR is to 1 the smaller the difference in the incident rate between an exposed group and an unexposed group.

Example: Calculating Incidence Rate Ratio

Suppose a doctor collects data on how often individuals develop a disease, based on their BMI (body mass index).

The following table summarizes the data:

BMI	Disease rate per 100 person-years
> 30	1.48
25 - 30	1.12
< 25	0.54

Using this table, we can calculate the following metrics:

**Incidence Rate Ratio of (BMI > 30) vs. (BMI 25-30) =  $1.48 / 1.12 = 1.32$**

**Interpretation: The disease rate among individuals with BMI > 30 is 1.32 times as high as the rate among individuals with BMI between 25 and 30.**

**Incidence Rate Ratio of (BMI > 30) vs. (BMI < 25) =  $1.48 / 0.54 = 2.74$**

**Interpretation: The disease rate among individuals with BMI > 30 is 2.74 times as high as the rate among individuals with BMI less than 25.**

**Incidence Rate Ratio of (BMI 25-30) vs. (BMI < 25) =  $1.12 / 0.54 = 2.07$**

**Interpretation: The disease rate among individuals with BMI between 25 and 30 is 2.07 times as high as the rate among individuals with BMI less than 25.**