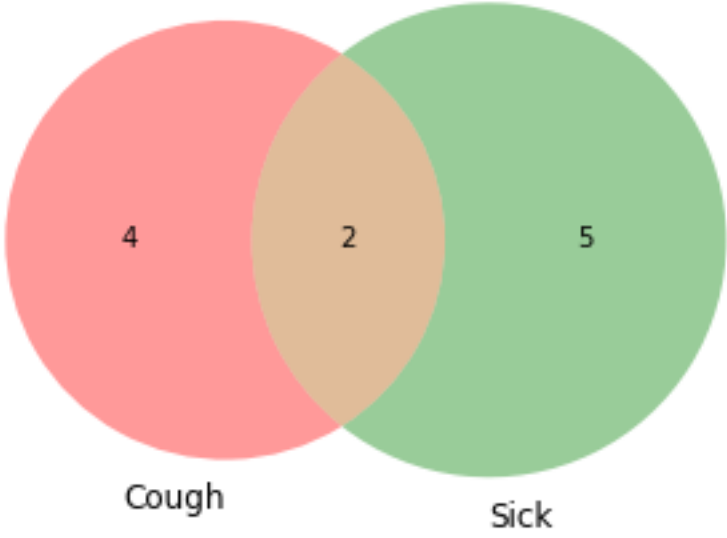


CONDITIONAL PROBABILITY

Conditional Probability is that the probability that something will happen given that the event had already happened in other words probability that something will happen is scaled with the knowledge we have over the event

Assume that we are in a place where only 14 people are living and conducted a survey if the people having cough or people are sick or both?

After the analysis we found that 6 people are having cough, 7 people are sick, 2 people are having cough and also sick, 3 people are free from both cough and sickness.



when we put it in a contingency table we get this

	Have Cough	Doesn't have cough
Are Sick	2	5
Aren't Sick	4	3

Now with this venn diagram or with the contingency table we can calculate the probability of someone who are sick and also have cough we can write it as :

$$P(\text{Are sick and have cough}) = \frac{\text{Aresickandhavecold}}{\text{Totalnumberofpeople}} = \frac{2}{14} = 0.14$$

This means the probability that the next person we will meet who has cough and also sick is around 0.14 which is small

performing on the rest of the data we get

$$P(\text{Are sick and Doesn't have cough}) = \frac{\text{AresickandDoesn'thavecough}}{\text{Totalnumberofpeople}} = \frac{5}{14} = 0.36$$

$$P(\text{Aren't sick and have cough}) = \frac{\text{Aren'tsickandhavecough}}{\text{Totalnumberofpeople}} = \frac{4}{14} = 0.29$$

$$P(\text{Aren't sick and doesn'thave cough}) = \frac{\text{Aren'tsickanddoesn'thavecough}}{\text{Totalnumberofpeople}} = \frac{3}{14} = 0.21$$

lets put them in the contingency table

	Have cough	Doesn't have cough
Are sick	2 2/14	5 5/14
Aren't sick	4 4/14	3 3/14

we can also determine the probability of some one who is sick regardless of him/her having cough or not

to get that we add 2 (Are sick and Have cough) + 5 (Are sick and Doesn't have cough) = 7 = 7/14

like wise the probability of some one who isn't sick regardless of him/her having cough or not

to get that we add 4 (Aren't sick and Have cough) + 3 (Aren't sick and Doesn't have cough) = 7 = 7/14

The probability of some one who Have cough regardless of him/her are sick or not

to get that we add 2 (Have cough and Are sick) + 4 (Have cough and Aren't sick) = 6 = 6/14

The probability of some one who Doesn't have cough regardless of him/her are sick or not

to get that we add 5 (Have cough and Are sick) + 3 (Have cough and Aren't sick) = 8 = 8/14

	Have cough	Doesn't have cough	Row total
Are sick	2 2/14	5 5/14	7 7/14
Aren't sick	4 4/14	3 3/14	7 7/14
Column total	6 6/14	8 8/14	

Now what is the probability of a person is sick and have cough give that we know he/she is sick

which can be wirtten as

P(have cough and Are sick | Are sick) : THIS IS WHAT WE CALL **CONDITIONAL PROBABILITY**

$$P(\text{Are sick and have cough} \mid \text{Are sick}) = \frac{2/14}{7/14} = 0.29$$

Probability of someone having cough given that we know that they are sick = 0.29

knowing that they are sick increases the probability that they would have cough

probability of someone doesn't have cough but are sick can be calculated as

$$P(\text{Dosen't have cough and Are sick} \mid \text{Are sick}) = \frac{5/14}{7/14} = 0.71$$

If we cleanly observer

The fraction we are doing can be rewritten as

$$P(\text{Dosen't havecoughandAresick} \mid \text{Aresick}) = \frac{P(\text{Dosen't havecoughandAresick})}{P(\text{Aresick})} = \frac{5}{7} = 0.71$$