

Answer on Question #73770 – Math – Statistics and Probability

Question

The probability that a person over 60 years of age in a certain community drinks alcohol is $\frac{2}{5}$ and the probability that a person over 60 years of age has heart disease is $\frac{2}{15}$.

The probability that a person over 60 years of age drinks alcohol and has heart disease is $\frac{1}{16}$. Are "drinking alcohol" and "heart disease" independent events?

Solution

Events A and B will be independent by definition if

$$P(A \text{ and } B) = P(A) * P(B).$$

In our case the probability of event A := "a person over 60 years of age in a certain community drinks alcohol " is $\frac{2}{5}$.

The probability of event B := "a person over 60 years of age has heart disease" is $\frac{2}{15}$. If they are independent, then

$$P(A \text{ and } B) = P(A) * P(B) = \frac{2}{5} * \frac{2}{15} = \frac{4}{75}$$

But the probability that "a person over 60 years of age drinks alcohol and has heart disease" is $\frac{1}{16}$. As long as $\frac{4}{75} \neq \frac{1}{16}$, they are not independent.

Answer: "drinking alcohol" and "heart disease" are not independent events.