

Question #74948, Math / Statistics and Probability

In a certain community, 10% of all people above 50 years of age have diabetes. A health service in this community correctly diagnoses 95% of all person with diabetes as having the disease, and incorrectly diagnoses 5% of all person without diabetes as having the disease. Find the probability that a person randomly selected from among all people of age above 50 and diagnosed by the health service as having diabetes actually has the disease.

Solution

Setting up the contingency table for the data.

	A person has diabetes	A person does not have diabetes	Total
Test positive	0.095	0.045	0.140
Test negative	0.005	0.855	0.860
Total	0.100	0.900	1.000

$$P(\text{positive \& has diabetes}) = P(\text{has diabetes}) \times P(\text{positive} \mid \text{has diabetes}) = 0.1 \times 0.95 = 0.095$$

$$P(\text{negative \& has diabetes}) = P(\text{has diabetes}) \times (1 - P(\text{positive} \mid \text{has diabetes})) = 0.1 \times (1 - 0.95) = 0.005$$

$$P(\text{positive \& no diabetes}) = P(\text{no diabetes}) \times P(\text{positive} \mid \text{no diabetes}) = 0.90 \times 0.05 = 0.045$$

$$P(\text{negative \& no diabetes}) = P(\text{no diabetes}) \times (1 - P(\text{positive} \mid \text{no diabetes})) = 0.90 \times (1 - 0.05) = 0.855$$

$$P(\text{has diabetes} \mid \text{positive}) = P(\text{positive \& has diabetes}) / P(\text{positive}) = 0.095 / 0.14 = 0.679$$

Answer: the probability that a person diagnosed as having diabetes actually has the disease is 0.679.

Answer provided by <https://www.AssignmentExpert.com>