

1. **Problem**

An industry-leading company seeks a qualified candidate for a management position. A management consultancy carries out an assessment center which concludes in making a positive or negative recommendation for each candidate: From previous assessments they know that of those candidates that are actually eligible for the position (event E) 66% get a positive recommendation (event R). However, out of those candidates that are not eligible 65% get a negative recommendation. Overall, they know that only 9% of all job applicants are actually eligible.

What is the corresponding fourfold table of the joint probabilities? (Specify all entries in percent.)

- (a) $P(E \cap R)$
- (b) $P(\bar{E} \cap R)$
- (c) $P(E \cap \bar{R})$
- (d) $P(\bar{E} \cap \bar{R})$

Solution

Using the information from the text, we can directly calculate the following joint probabilities:

$$\begin{aligned} P(E \cap R) &= P(R|E) \cdot P(E) = 0.66 \cdot 0.09 = 0.0594 = 5.94\% \\ P(\bar{E} \cap \bar{R}) &= P(\bar{R}|\bar{E}) \cdot P(\bar{E}) = 0.65 \cdot 0.91 = 0.5915 = 59.15\%. \end{aligned}$$

The remaining probabilities can then be found by calculating sums and differences in the fourfold table:

	R	\bar{R}	sum
E	5.94	<i>3.06</i>	9.00
\bar{E}	<i>31.85</i>	59.15	<i>91.00</i>
sum	<i>37.79</i>	<i>62.21</i>	100.00

- (a) $P(E \cap R) = 5.94\%$
- (b) $P(\bar{E} \cap R) = 31.85\%$
- (c) $P(E \cap \bar{R}) = 3.06\%$
- (d) $P(\bar{E} \cap \bar{R}) = 59.15\%$