Supplementary material REQ-2024-003

Concept of odd and odds ratio (OR)

If, in a group, we call P the proportion of individuals with disease E, we call **odd** to the magnitude **P/(1-P).** Examples:

- If the relative frequency of "E" is 0.8; the odd is 0.8/0.2=4 and it means that there are 4 "E" for every non-"E".
- If the relative frequency of "E" is 0.5, the odd is 1; That is, there is an "E" for every non-"E."
- If the relative frequency of "E" is 0.2, the odd is 0.2/0.8 = 0.25 which is equal to 1/4 and says that there is one "E" for every 4 not "E"
- If the relative frequency of "E" is 0.05, the odd is 0.05 / 0.95 = 0.0526

In this last example, the odd takes a value quite close to P. In general, **small proportions correspond to odd values very similar to those of the proportion**, since, in these cases, the denominator 1-P is close to 1 and, therefore, P/(1-P) is close to P.

Example: If P is 0.01, it is odd = 0.01 / 0.99 = 0.0101.

Just as the relative risk, RR, is defined as the ratio of two Specific Risks, the **odds ratio (OR),** It is defined as the ratio of two odds**:** the odds of patients in those exposed to a certain factor divided by the odds of patients in those not exposed. Let's look at an example**:** of a total of 300,000 individuals, 100,000 have contact with the health system (HS), 50,000 acquire an infection ("I+") and 40,000 are infected and have had contact with the HS.

- Specific risk in those exposed to HS: R_1 = 40.000 / 100.000 = **0.40**
- Specific risk in those not exposed to SS: R_0 = 10.000 / 200.000 = **0.05**

Relative Risk of SS exposure for infection: RR = 0.40 / 0.05 =**8**

	HS	**No HS**	TOTAL		
I +	**A =** 40,000	**B =** 10,000	**M_1 =** 50,000	→	**P_1** = 4 / 5 = **0.80**
I -	**C =** 60,000	**D =** 190,000	**M_0 =** 250,000	→	**P_0** = 6 / 25 = **0.24**
Until	**N_1=**100,000	**N_0** = 200,000	**N =** 300,000	→	**P_1 / P_0 = 0.80 / 0.24 = 3.3**
	R_1 = 0.40	R_0 = 0.05	→	**RR = 0.40/0.05 = 8**	

From the Specific Risks we can calculate the odds and OR:

ODD (R_1) = 0.40 / 0.60 = 40000 / 60000 = **0.67**

ODD (R_0) = 0.05 / 0.95 = 10000 / 190000 = **0.0526**

OR = ODD (R_1) / ODD (R_0) = 0.67 / 0.0526 **= 12.7**

That is, in these data, exposure to HS multiplies the proportion (or percentage) of infection by 8 and multiplies the odd, the number of infected per healthy person, by 12.7.