exercise 4: test diagnostico.

tuberculosis $\frac{15}{10000}$

① problem: "before" "after" ⇒ so better to use a table.

T = tuberculosis
$\bar{T}$ = not tube.

	before (B)	after (A)
T	15/10000	15 − 5 + 3 / 10000 = 13/10000
$\bar{T}$	9985/10000	9.987/10000

(5 died, 3 new)

a) tuberculosis at "before"?

$$P(T \cap B) = \frac{15}{10000} = 0,0015 //$$

b) incidence

$$R = \text{Incidence proportion} = \frac{\text{number of new cases during period}}{\text{population at risk at start of period}} \quad (\text{"during these 5 years"})$$

$$R(T) = \frac{3}{9985} = 3,005 \cdot 10^{-4} // \approx 0,03\%$$

② At the start, 15 people already had T, so people at risk was 10.000 − 15 = 9985

c) incident rate (absolute risk) $= \frac{\text{nº of new cases during period}}{\text{total person-time at risk}} =$

$$= \frac{3}{(9985) \cdot 5 \text{ years}} = \frac{3}{49.925} = 6 \cdot 10^{-5} // \text{ per person-years}$$

(total time)

d) prevalence = proportion of individuals with tuberculosis.
At the end of 5 years (after)

$$P(T) = \frac{13}{10000} = 0,0003 = 3 \cdot 10^{-4}$$

exercise 4: test diagnostics

(2) C = varicella/chickenpox

V = vaccinated $\bar{V}$ = unvaccinated.

$P(C \cap V) = \frac{18}{160}$ $P(\bar{C} \cap V) = \frac{142}{160}$

$P(C \cap \bar{V}) = \frac{30}{70}$ $P(\bar{C} \cap \bar{V}) = \frac{40}{70}$

	Chicken pox	not chickenp	Total
Vaccinated	18/160	142/160	160
not vacci	30/70	40/70	70

a) relative risk of varicella of vaccinated people → up (numerator) $\Rightarrow RR(C) = \frac{18/160}{30/70} = \frac{0,1125}{0,4286} = 0,2625$

0,26 = 26% means that vaccinated children had only a 26% risk of chickenpox compared to unvaccinated.

26% are less likely to get chickenpox

b) Odd ratio = $\frac{\text{event } (C)}{\text{non-event } (\bar{C})}$ disease

varicella of vaccinated people

$OR = \frac{\text{exposed (vacc)}}{\text{unexp. (unvaccinated)}}$

Vaccinados: $Odds_V = \frac{C}{\bar{C}} = \frac{18}{142} = 0,127$

$OR = \frac{0,127}{0,75} \simeq 0,169$ //

no vacc: $Odds_{\bar{V}} = \frac{C}{\bar{C}} = \frac{30}{40} = 0,75$

*can also just use the formula

so 0,169 is the odds of V children of getting chickpox

c) what's more suitable?

- RR(C): seguir a las personas para ver quien desarrolla la enfermedad teniendo gente expuesta (vaccinate) y no expuesta (unvaccinated)
- Odds(OR): estudio comparando con gente ya enferma (cases) y se compara con gente no enferma (controls).

Therefore, RR(C) is more suitable.

(3)

	Test +	Test −	Total
D = sick	2020	140	2160
$\bar{D}$ = healthy	80	7760	7840

} = 10.000 people in total

a) sensitivity $P(+/D) = \frac{P(+ \cap D)}{P(D)} = \frac{2020}{2160} \simeq 0,93518$

specifity $P(-/\bar{D}) = \frac{P(- \cap \bar{D})}{7840} = \frac{7760}{7840} \simeq 0,9898$

b) $PPV = P(D/+) = \frac{P(D \cap +)}{P(+)} = \frac{2020}{2020+80} = \frac{2020}{2100} = 0,962$ //

$NPV = P(\bar{D}/-) = \frac{P(\bar{D} \cap -)}{P(-)} = \frac{7760}{7760+140} = 0,982$ //

c) $P(\text{correct diagnosis}) = P(D \cap +) + P(\bar{D} \cap -) = \frac{2020 + 7760}{10.000} = 0,978$ //

people tested