

## A significant dialogue

"I found that the estimated risk ratio (RR=2.5) is statistically significant."

"Great. What does that mean?"

"It means (for most people) that the  $p$ -value is smaller than 0.05"

"And what does *that* mean?"

"It means that the probability of getting this result by chance is smaller than 0.05"

"Nope."

"It means that the probability that RR=1 is smaller than 0.05"

"Nope."

"It means that if we reject the null, the probability of making a mistake is smaller than 0.05"

"Nope."

"It means that the probability of observing this result, if the null is true, is smaller than 0.05"

"Close."

"It means that the probability of observing this result or more extreme results, if the null is true, is smaller than 0.05"

"Right. So what does *that* mean?"

"It means one of the following: either the null is true and we observed something that is uncommon to observe, or the null is false."

"So?"

"So we prefer the second possibility: we prefer to reject the null (to declare that the null is false)."

"Does that mean that the estimate RR=2.5 should now be taken more seriously than before? Have we gathered evidence that it is credible/worthy/trustworthy/reliable/...?"

"Yes."

"No."

"Why not? We just called it 'statistically significant'."

"You are interpreting the word 'significant' in contemporary English. The term was coined many years ago, and at that time it was understood differently. It meant that the estimate *signified* (showed) evidence against the null—not that it had any intrinsic significance."

"Still, having rejected the null, we must have gathered some evidence for the merit of the estimate."

"Nope. Rejection of the null does not entail any inference about the estimate."

“Why not?”

“Think about it. We used the estimate ( $RR=2.5$ ) to compute a test statistic, which led to a  $p$ -value, which led to the rejection of the null ( $RR \neq 1$ ). We can't turn back and draw inference on the estimate. In logic, the fact that argument A ( $RR=2.5$ ) implies argument B ( $RR \neq 1$ ) does not lend support to argument A ( $RR=2.5$ ). It is false to claim that since A implies something about the truth of B, then B implies something about the truth of A.”

“So what have we learned about the parameter?”

“That we prefer to think that it's not null.”

“But ‘not null’ is any value other than the precise null ( $RR=1$ ). It may be 0.5 or 0.98 or 1.02 or 5.3 or 746, or anything other than 1—in either direction. What kind of knowledge have we gained by concluding that ‘it's not null’? Sounds like uninteresting, insignificant knowledge.”

“That's the knowledge that is claimed by the words ‘statistically significant’. That's the knowledge that is gained from a small  $p$ -value.”

“And everyone knows that?”

“Not everyone. But you know it now.”

Forthcoming:

A non-significant dialogue

A confident dialogue