Patient

Calculating absolute risk and relative risk

Many reports in the media about the benefits of treatments present risk results as relative risk reductions rather than absolute risk reductions. This often makes the treatments seem better than they actually are. Here we explain the difference between absolute and relative risk to enable you to make more informed decisions about whether to take a treatment or not.

What are absolute and relative risks?

Absolute risk of a disease is your risk of developing the disease over a time period. We all have absolute risks of developing various diseases such as heart disease, cancer, stroke, etc. The same absolute risk can be expressed in different ways. For example, say you have a 1 in 10 risk of developing a certain disease in your life. This can also be said to be a 10% risk, or a 0.1 risk - depending on whether you use percentages or decimals.

Relative risk is used to compare the risk in two different groups of people. For example, the groups could be smokers and non-smokers. All sorts of groups are compared to others in medical research to see if belonging to a group increases or decreases your risk of developing certain diseases. For example, research has shown that smokers have a higher risk of developing heart disease compared to (relative to) non-smokers.

A couple of examples may illustrate this better:

An example when talking about risks of disease

Say the absolute risk of developing a disease is 4 in 100 in non-smokers. Say the relative risk of the disease is increased by 50% in smokers. The 50% relates to the 4 - so the absolute increase in the risk is 50% of 4, which is 2. So, the absolute risk of smokers developing this disease is 6 in 100.

An example when talking about treatments

Say men have a 2 in 20 risk of developing a certain disease by the time they reach the age of 60. Then, say research shows that a new treatment reduces the relative risk of getting this disease by 50%. The 50% is the relative risk reduction, and is referring to the effect on the 2. 50% of 2 is 1. So this means that the absolute risk is reduced from from 2 in 20, to 1 in 20.

Number needed to treat (NNT)

A figure which is often quoted in medical research is the NNT. This is the number of people who need to take the treatment for one person to benefit from the treatment.

For example, say a pharmaceutical company reported that medicine X reduced the relative risk of developing a certain disease by 25%. If the absolute risk of developing the disease was 4 in 100 then this 25% reduction in relative risk would reduce the absolute risk to 3 in 100.

However, this can be looked at another way. If 100 people do not take the medicine, then 4 in those 100 people will get the disease. If 100 people do take the medicine, then only 3 in those 100 people will get the disease. Therefore, 100 people need to take the treatment for one person to benefit and not get the disease. So, in this example, the NNT is 100.

A quick way of obtaining the NNT for a treatment is to divide 100 by the absolute reduction in percentage points in risk when taking the medicine. Here is another quick example. Say the absolute risk of developing complications from a certain disease is 4 in 20. Say a medicine reduces the relative risk of getting these complications by 50%. This reduces the absolute risk from 4 in 20, to 2 in 20. In percentage terms, 4 in 20 is 20%, and, 2 in 20 is 10%. Therefore, the reduction in absolute risk in taking this medicine is from 20% to 10% - a reduction of 10 percentage points. The NNT would be 100 divided by 10. That is, 10 people would need to take the medicine for one to benefit.

Helping to decide about taking a treatment

The decision on whether to take a treatment needs to balance various things, such as:

- What is the absolute risk of getting the disease to start with?

- How serious is the disease anyway?

- How much is the absolute risk reduced with treatment?

- What are the risks or side-effects in taking the treatment?

- How much does the treatment cost? Is it worth it to an individual if the individual is paying, or is it worth it to the country if the government is paying?

It may help to look at a couple of examples:

Say your absolute risk of developing a certain disease is 4 in 1,000. If a treatment reduces the relative risk by 50%, it means the 4 is reduced by 50%. Therefore, the treatment reduces the absolute risk from 4 in 1,000 to 2 in 1,000. Not really much in absolute terms.

- If it were a minor disease, one which you are likely to recover from, you are not likely to bother to take the treatment.

- If it is a fatal disease, you might consider taking the treatment - any reduction in risk may be better than none. However:

  - Say there was a 1 in 100 risk of developing serious side-effects from treatment. You are then not likely to want the treatment, as the risk from serious side-effects is higher than the risk from the disease.

  - If there were no risk from the treatment, you might consider the treatment worthwhile.

  - If the treatment were very expensive:

    - Then you may not be able to afford it and decide to take the risk without treatment.

    - If the government is paying, it might decide not to fund this treatment, as the reduction in absolute risk is not great and many people would need treatment to benefit one person.

However, on the other hand, say your absolute risk of developing a different disease is 4 in 10 and a treatment reduces the relative risk by 50%. Your absolute risk goes down to 2 in 10 - this is now a big reduction.

- If it were a minor disease that you are likely to recover from, you may still take the treatment if there were no risk of side-effects, so as not to be troubled with the disease.

- If it is a fatal disease, you are likely definitely to want treatment, provided the risk of side-effects was much lower than the risk of getting the disease.

- If the treatment were very expensive:

    - If the government is paying, it is more likely to decide to fund this treatment, as the reduction in absolute risk is greater than the previous example and fewer people would need treatment to benefit one person.

In summary

Treatments for medical conditions are often quoted in the press along the lines ... "New treatment reduces your risk of X disease by 25%". Whilst this sounds good, it usually refers to the **relative** risk. However, the benefit really depends on how common or rare the disease is. A large reduction of relative risk for a rare disease might not mean much reduction in the absolute risk. For example, a 75% reduction in relative risk for something that has a 4 in a million absolute risk of happening brings the absolute risk down to 1 in a million.

When deciding on whether to take a treatment, ideally you should decide with your doctor if the reduction in the absolute risk outweighs the risks, side-effects and costs of treatment.

Disclaimer: This article is for information only and should not be used for the diagnosis or treatment of medical conditions. Egton Medical Information Systems Limited has used all reasonable care in compiling the information but makes no warranty as to its accuracy. Consult a doctor or other healthcare professional for diagnosis and treatment of medical conditions. For details see our conditions.

Peer reviewed by: Prof Cathy Jackson, MRCGP 31/01/2018	

View this article online at: patient.info/news-and-features/calculating-absolute-risk-and-relative-risk

Discuss Calculating absolute risk and relative risk and find more trusted resources at Patient.

Patient Access

To find out more visit www.patientaccess.com
or download the app

Follow us