

Primer on 95% CIs for the Number Needed To Treat

Few, if any, therapeutic interventions benefit every patient. One way to gauge the likelihood that one patient will benefit is to calculate the number needed to treat (NNT) — that is, the number of patients who must be treated for one to benefit. The general approach is as follows:

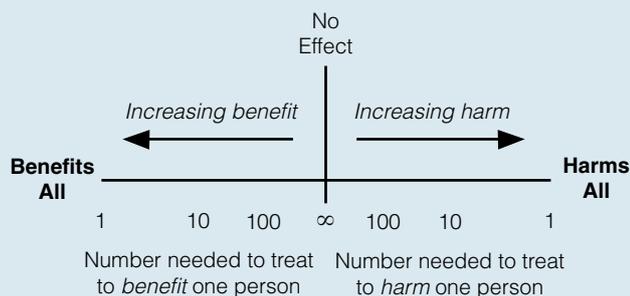
$$\frac{\text{Percentage with outcome}_{\text{standard treatment}} - \text{Percentage with outcome}_{\text{new treatment}}}{\text{Absolute risk reduction}}$$

$$100/\text{Absolute risk reduction} = \text{Number needed to treat}$$

For example, consider a randomized trial in which 50% of the participants die in the control group and 40% die in the intervention group. The absolute risk reduction for death is thus 10%, and the NNT to avoid a death is 10 (100/10)*. This treatment would be preferred over a competing treatment whose NNT to avoid death was 20.

NNT can be calculated using any dichotomous outcome (an outcome that a patient either experiences or does not experience). In most cases, the NNT is calculated by using an adverse outcome — one that most persons would prefer to avoid (e.g., angina, myocardial infarction, cardiac death, any death). But because different outcomes are possible, an NNT of 10 is not always preferable to an NNT of 20 (e.g., if the former were for angina and the latter for any death). Therefore, an NNT should always be accompanied by a clearly specified outcome.

As is the case with all variables measured in research, the NNT is an estimate. The precision of the estimate is largely a function of how many people were studied and is reflected by using a 95% CI. The 95% CI for an NNT is the range of values in which we would expect to find the “true” NNT 95% of the time.† In some cases, the range may also include the possibility of harm. A 95% CI for an NNT that contains the possibility for both harm and benefit passes through infinity. In other words, an intervention with no effect has an NNT of infinity. This notion is probably most easily understood by considering the continuum of possible NNTs:



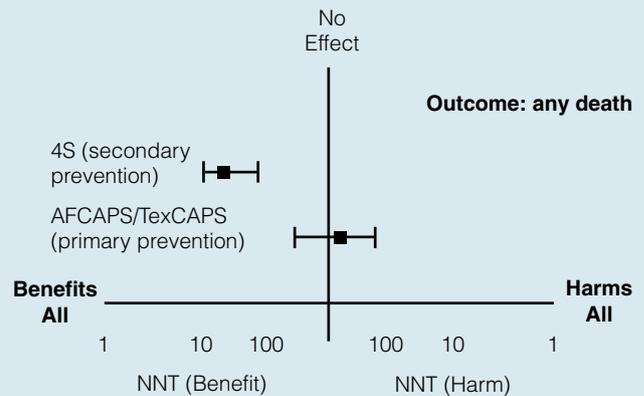
*For readers who prefer decimals, $NNT = 1/\text{Absolute risk reduction}$. In this example, 1/0.1 or 10.

†Apologies to statistical purists who would direct the reader toward a more formal definition for a 95% CI: “The interval computed from the sample data which, were the study repeated multiple times, would contain the unknown parameter 95% of the time.”

95% CIs for NNTs that contain the possibility of both harm and benefit are probably best communicated graphically. Altman introduced the concept in a recent article in the *BMJ*,¹ and proposed the following labels: NNT (benefit) and NNT (harm).

The importance of a graphic display is best demonstrated by example. Consider 95% CIs for NNTs for lipid-lowering therapy. The outcome is death from any cause. In the Scandinavian Simvastatin Survival Study (4S)² (which studied simvastatin in patients who had either angina or previous myocardial infarction), the 95% CIs for NNTs did not pass through infinity. The NNT (benefit) was 30 (95% CI, 19 to 68). In the Air Force Coronary/Texas Atherosclerosis Prevention Study (AFCAPS/TexCAPS)³ (which studied lovastatin in patients without heart disease who had normal cholesterol levels), however, the CI does pass through infinity. The NNT (harm) was 1130; 95% CI, NNT (benefit) 153 to ∞ to NNT (harm) 120. For most of us, these data would be better summarized in a figure:

NNT and the 95% CIs for NNT are relatively new concepts.



Whether they represent a genuine advance in communicating data to clinicians is unknown. As always, we are interested in your thoughts.

References

1. Altman DG. Confidence intervals for the number needed to treat. *BMJ*. 1998;317:1309-12.
2. Scandinavian Simvastatin Survival Study Group. Randomized trial of cholesterol lowering in 4444 patients with coronary heart disease: the Scandinavian Simvastatin Survival Study (4S). *Lancet*. 1994;344:1383-9.
3. Down JR, Clearfield M, Weis S, et al. Primary prevention of acute coronary events with lovastatin in men and women with average cholesterol levels: results of AFCAPS/TexCAPS. *JAMA*. 1998;279:1615-22.