

Belief in single studies

From: [Key Concepts for assessing claims about treatment effects and making well-informed treatment choices \(Version 2022\)](#)

1.2d Do not assume that a single study is a sufficient basis for a claim about treatment effects.

Explanation

The results of one study considered in isolation can be misleading. A single comparison of treatments rarely provides conclusive evidence; and results are often available from other comparisons of the same treatments. [Systematic reviews](#) of all the similar comparisons (“replications”) may yield different results from those based on the initial studies, and these should help to provide more reliable and statistically [precise](#) estimates of treatment differences. Even so, obtaining reliable estimates from treatment comparisons must always consider that important studies may remain unpublished, incompletely published, or inaccessible for other reasons.

[Randomized trials](#) of oral rehydration solutions (ORS) for children with diarrhoea are an example of single comparisons of treatments that did not provide conclusive evidence [[Hahn 2002 \(SR\)](#)]. Children with diarrhoea can become dehydrated. If they become seriously dehydrated, they can die. For more than 20 years, the World Health Organization (WHO) recommended a standard ORS with a large amount of sugar and salt mixed in water. However, some researchers believed that it might be better to use a smaller amount of sugar and salt (reduced osmolarity). Eleven randomized trials published between 1982 and 2001 compared ORS with reduced osmolarity to the standard solution. A key [outcome](#) was the number of children who needed an unscheduled fluid infusion, which indicates they were becoming seriously dehydrated. The results varied. It was not until the results of all the studies were carefully summarised in a systematic review that it was shown convincingly that a reduced osmolarity solution was substantially more effective than the standard solution. Based on combined results of all 11 studies, the WHO changed its recommendation.

Replication or reproducibility is sometimes used to describe the extent to which similar studies, such as the trials of reduced osmolarity ORS, have similar results. However, these terms are not well defined and can sometimes cause confusion [[Goodman 2016](#)].

Basis for this concept

There are several reasons why single studies can be misleading. First, studies are often too small to provide reliable results [[Button 2013](#), [Dechartres 2013 \(SR\)](#), [IntHout 2015 \(SR\)](#)]. Small studies provide statistically less precise estimates of treatment effects than large studies; the results of small studies are more inconsistent than the results of large ones [[IntHout 2015 \(SR\)](#)]; and small studies tend to overestimate treatment effects [[Dechartres 2013 \(SR\)](#)]. Second, studies that evaluate the effects of treatments often have a high risk of bias [[Wood 2008 \(SR\)](#)]. Third, the results of studies that address the same question often have inconsistent results [[Guyatt 2011c](#), [IntHout 2015 \(SR\)](#)]. Fourth, randomized trials with [statistically significant](#) results are published more often, and more quickly, than trials with statistically “non-significant” results [[Hopewell 2009 \(SR\)](#)]. Studies that show benefits, especially large benefits, are also more likely to be noticed than studies that do not [[Duyx 2017 \(SR\)](#), [Ioannidis 2005 \(SR\)](#)].

Systematic reviews use a structured approach to identify studies (including unpublished studies), to select and critically appraise the risk of [bias](#) in relevant studies, and to collect and analyse data from the studies that are included in the review. Compared to single studies, systematic reviews can:

- Increase the statistical precision of estimates and so reduce the chances of being misled by the play of [chance](#) (random errors),
- Reduce the chances of being misled by systematic errors (biases)
- Assess the consistency of estimates of treatment effects across studies and reduce the chances of being misled by inconsistency, and
- Assess the risk of reporting biases and reduce the risk of being misled by publication bias.

Implications

The results of single comparisons of treatments can be misleading. Consider all the relevant fair comparisons when making judgements about treatment effects.

References

Systematic reviews

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