

ON THE USE OF DISCOUNT RATES IN ONE-WAY SENSITIVITY ANALYSES



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Introduction

Due to decision uncertainty in economic analyses, deterministic OWSA are an important component of economic evaluations in order to assess the impact of individual parameters on the result of the analysis. For this, relevant parameters are varied in a comparable manner to rank their relative influence on results. The results of an OWSA are typically presented graphically in form of a Tornado diagram.

Pharmacoeconomic guidelines^{1,2} give guidance on good modelling practice and recommend the inclusion of discount rates for costs and effects in sensitivity analyses. However, the guidelines do not specify the type of sensitivity analyses or these parameters.

Still, discount rates are surprisingly often included, but rather than varying them according to a pre-specified distribution comparable to that of other parameters, they are tested at arbitrary lower and upper bounds relative to their base case value. These lower and upper bounds however do not lie within the same range as those of other parameters and thus their combination in the same Tornado diagram may be misleading.

Methods

A targeted literature review was conducted in the PubMed database with the aim of identifying publications of economic analyses which included a Tornado diagram in their OWSA. Search terms for different types of economic analyses (i.e. cost-benefit, cost-effectiveness and cost-utility analyses) were combined with search terms for Tornado diagrams and OWSA.

All records identified with this search strategy were exported and stored in a Microsoft Excel® file. This Excel file was used to document the study selection process.

The study selection was accomplished through two levels of screening in order to identify publications in accordance with pre-set selection criteria.

In order to be eligible for inclusion, publications had to:

- Be a cost-effectiveness analysis
- Include an OWSA whose results were presented in a Tornado diagram.
- Be published between 01 January 2015 and 01 April 2019 (the day on which the search was run in the database).
- Employ a time horizon of ten years or more.

No restrictions were made with regard to disease or condition.

The first level of study selection entailed screening titles and abstracts and determining whether the eligibility criteria were met. The second level involved accessing the full text articles of the studies included during the first level and repeating the selection process until a decision to include or exclude was taken for all publications included in this screening stage. Both the first and second level of study selection were conducted by a single reviewer.

Results

In total, 431 records were retrieved from PubMed. Of these, 303 were excluded (97 at abstract screening) because they did not meet the inclusion criteria. After full text screening, 128 publications were included in this study. The flow chart of the TLR is presented in Figure 1.

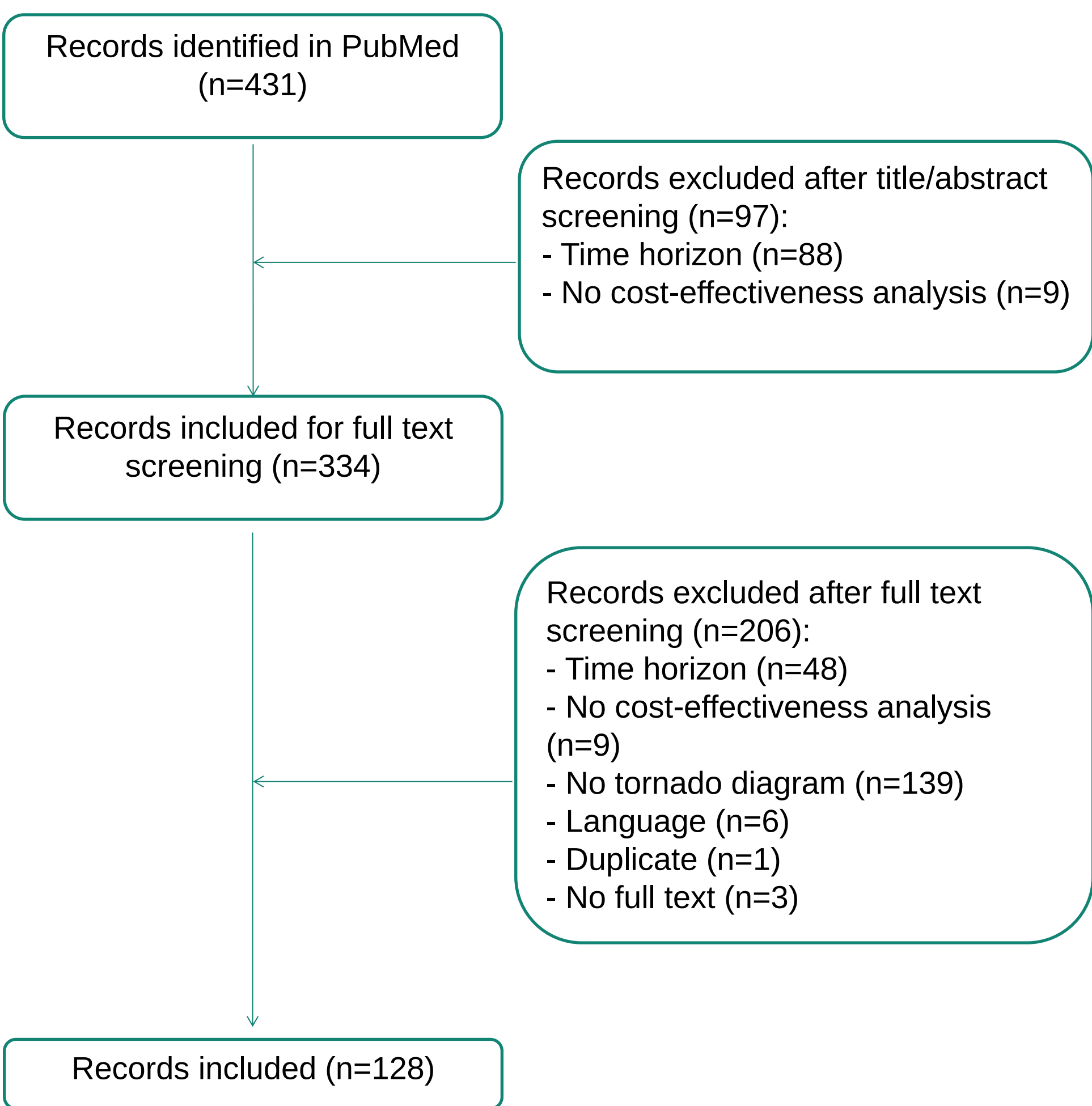


Figure 1. TLR flow chart

In a following step, these 128 publications were reviewed to check whether discount rates were part of the OWSA and if this was the case, whether they were included in the Tornado diagram as well. Of all included studies, 53 (41.4%) did not include discount rates in the OWSA, whereas another 14 (10.9%) did include discount rates, but they were not part of the Tornado diagram. The remaining 61 (47.7%) included discount rates in the Tornado diagram.

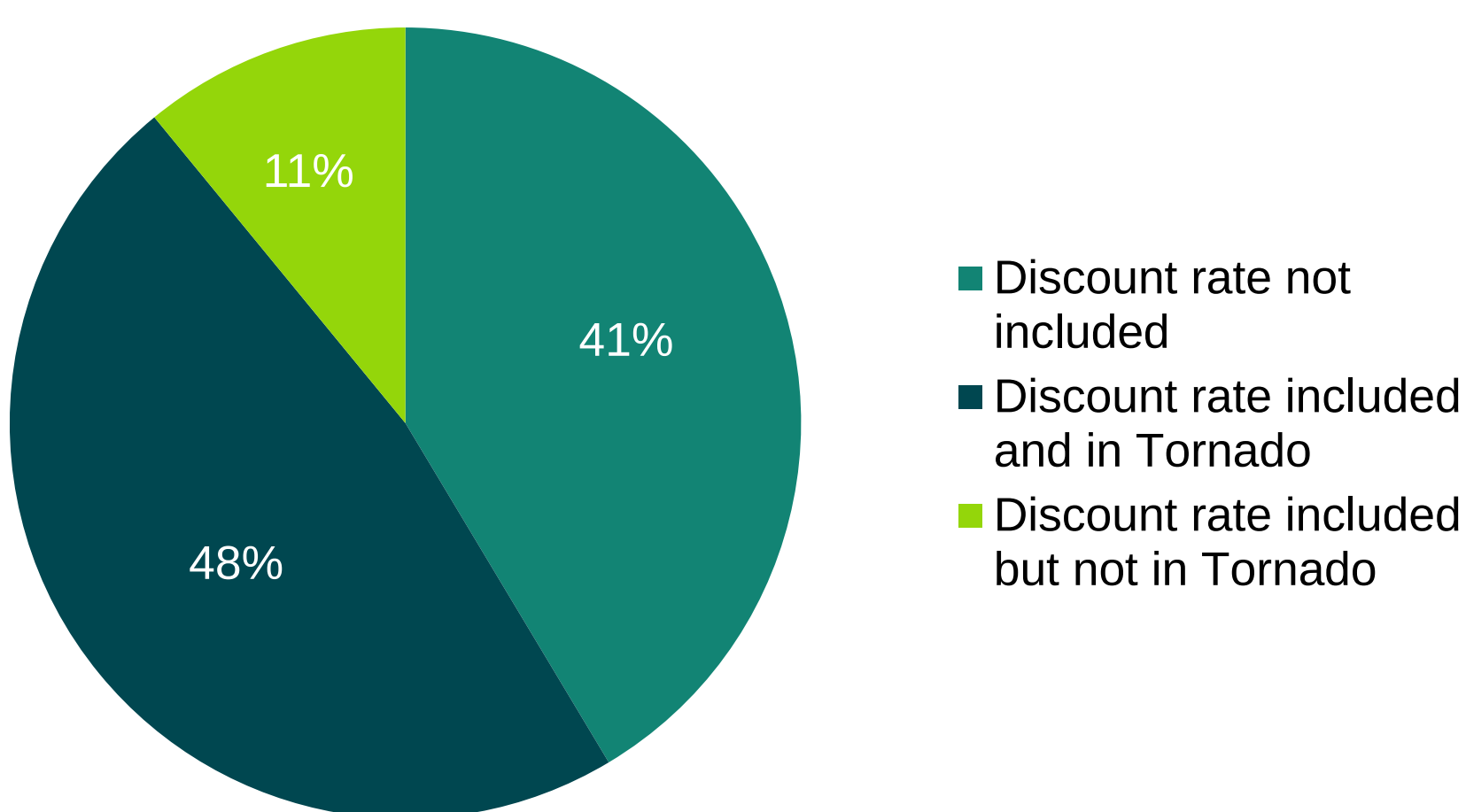


Figure 2. Inclusion of discount rates

In the publications where discount rates were indeed included in the Tornado diagram, the rates were varied according to pre-specified upper and lower bounds. The most commonly used discount rate was 3%, which was varied to 0% in the lower bound and 5% in the upper bound (applied in 14 publications). Another common upper bound was 6% (applied in 11 articles).

Less common discount rates were 2%, 3.5%, 4% or 5%, with bounds ranging from 0% to 10%. In 11 studies, only partial information was reported, i.e. the base case discount rates were usually reported, but either one or both bounds were not reported. A summary is presented in Figure 3.

The chosen discount rates were often also reflective of country-specific guidelines on discounting.

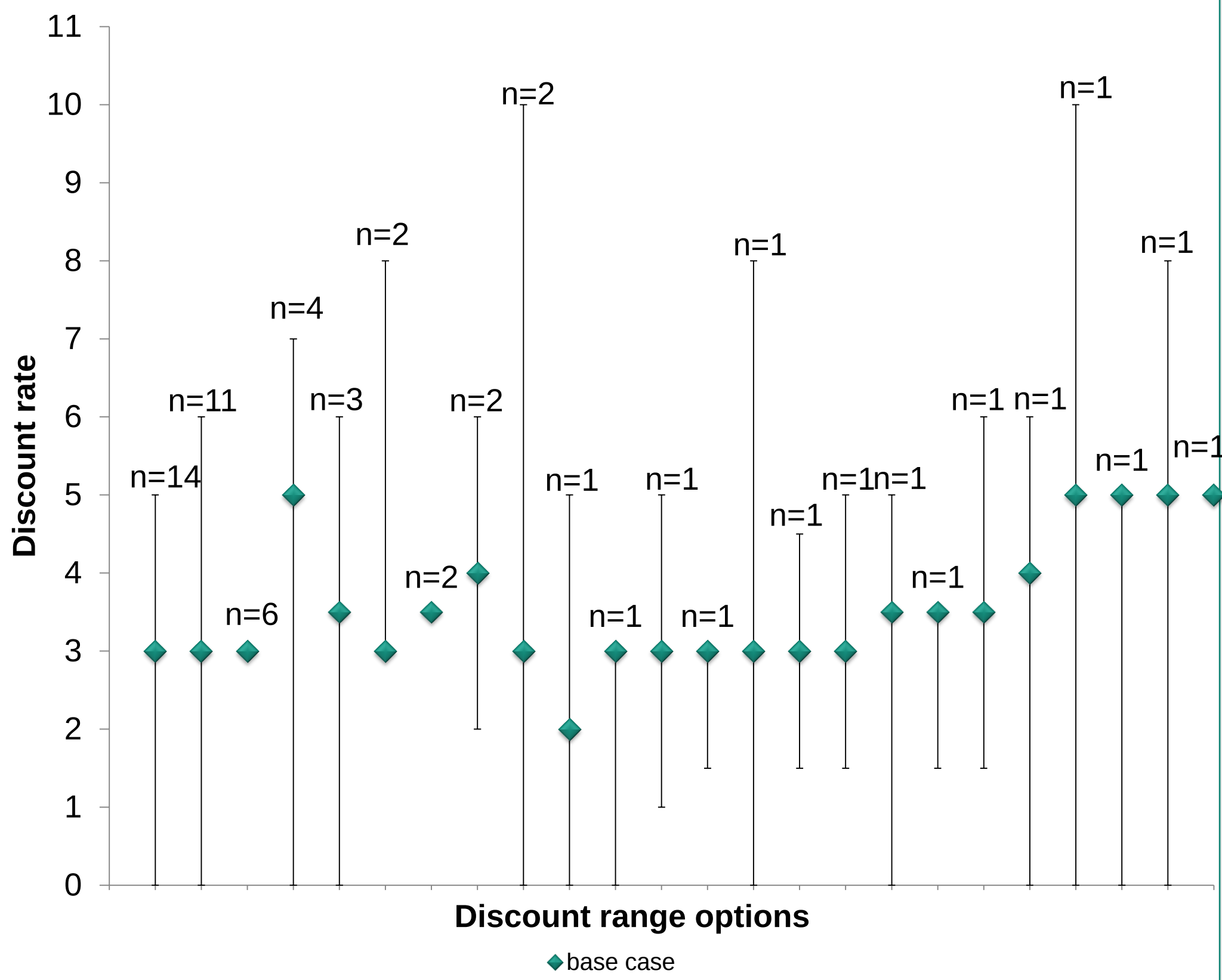


Figure 3. Reported discount rates in the literature

In Figure 4, an example of a Tornado diagram including discount rates is presented. Discount rates were varied from 3.5% in the base case to 0% and 6% in the lower and upper bound. Other parameters such as costs and coefficients of regression analysis were varied by +/- 20%. In this particular example, the discount rates for effects are ranked as more impactful than even treatment costs.

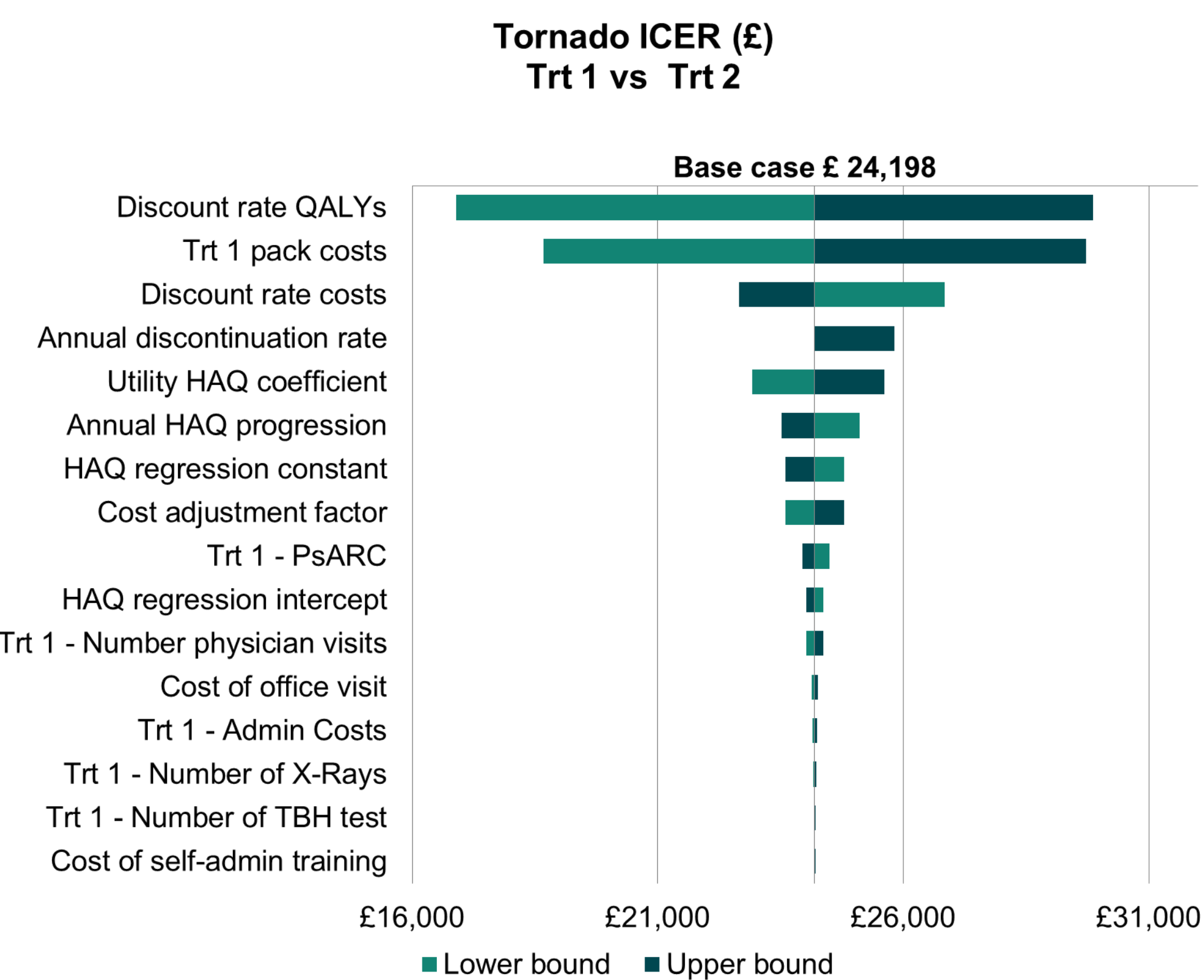


Figure 4. Example Tornado diagram

Conclusion

In the majority of included articles where the discount rate was included as part of the Tornado diagram, they were deemed one of the most influential parameters. This outcome is expected, given the large difference in variation, i.e. +/- 100% for the discount rates compared to +/- 20% or similar variations for other parameters. This discrepancy in variation ranges leads to an over-estimation of the discount rates. Furthermore, it makes it difficult to compare across studies due to this being common, but not standard practice.

References

¹NICE. Guide to the methods of technology appraisal 2013; ²Caro et al. Modeling Good Research Practices—Overview: A Report of the ISPOR-SMDM Modeling Good Research Practices Task Force—1 Med Decis Making 2012;32:667–677