Meta-Analytical Methods

This page describes the computational methods used in Quantitative Synthesis (QNS).

Data Analyzed

Any study included (adjudicated, in dual screening) during Screening and with Extraction was marked "Complete" is analyzed on QNS. If dual extraction is configured for the nest, only adjudicated data is analyzed in QNS.

Analyses

Summary (Pooled Estimates)

Any study with one or more arms extracted are analyzed in the summary table. The rows of the summary table correspond to individual study arms, or an intervention. Columns are estimates (singular for a study arms or pooled for interventions) of the data element being analyzed.

For continuous mean & standard deviation (SD) and dichotomous data elements, pooled estimates are computed via the Inverse Variance method. When random effects are specified, between-study variance is estimated using the Dersimonian-Laird estimator. For dichotomous data, the Haldane-Anscambe correction is conditionally applied for 0 event counts. For continuous mean & SD, missing SDs are imputed. All inferential statistics, at the arm and intervention level, are computed using Normal approximations (logit transformed, for dichotomous data). For data elements with means but not an SD configured, the arithmetic mean is computed, and no inferential statistics are computed.

For medians, pooled estimates & inferentials are computed as the Weighted Median of Medians, described in McGrath et al.

All computational methods are implemented as a transcription, with minor modifications, of the peer-reviewed work in the R packages meta, metafor, and metamedian. As these are open source, our modifications are similarly made publicly available for modification & audit in the Javascript package shukra. Pooled estimates specifically are computed by the pooling module. To ensure correctness, all methods in shukra, and therefore used in QNS, are tested for equality to estimates computed in the upstream packages.

Network Meta-Analysis (NMA)

Any multi-arm study with two or more arms extracted are analyzed in NMA. If the user-configured intervention grouping assigns the same intervention to two or more arms in the study, they are pooled; if it assigns the same intervention to all arms in the study, the study is discarded from the NMA.

Before performing the NMA, connected components of the intervention graph are identified. Each

connected component is analyzed in a separate NMA, and the results of the NMAs are combined in outputs and visuals. No effect estimates will be provided for interventions that belong to different connected components.