

# An “R-Shiny” Interface Designed As a One-Stop Solution for All Kinds of Indirect Treatment Comparisons According to NICE Technical Support Documents 2, 3, and 18

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## CONCLUSIONS

This R Shiny-based web application provides an integrated, secure, and scalable solution for indirect treatment comparisons. It supports transparent and robust comparative effectiveness research by streamlining complex analyses and enhancing result interpretation through interactive visualizations and automated reporting. Hosted on Amazon Web Services, it ensures broad accessibility, empowering researchers and decision-makers with user-friendly tools for evidence synthesis, ultimately contributing to more informed healthcare decisions and improved patient outcomes.

## INTRODUCTION

- Randomized Controlled Trials (RCTs) are considered the gold standard for directly comparing treatments. However, ethical, logistical, or practical constraints often make direct comparisons with the optimal comparator unfeasible. As a result, many RCTs compare interventions against a placebo, limiting the ability to directly assess all relevant treatment options<sup>1</sup>
- Indirect Treatment Comparison (ITC) methods offer valuable evidence to support health technology assessment (HTA) agencies in decision-making when head-to-head comparisons are unavailable<sup>1</sup>
- The existence of diverse ITC techniques, including Network Meta-analysis (NMA), Multilevel Network Meta-regression (ML-NMR), Matching-Adjusted Indirect Comparison (MAIC), Simulated Treatment Comparison (STC), Propensity Score (PS) methods, and Bucher's indirect comparison<sup>2</sup>, highlights the need for a standardized user-friendly interface to streamline the calculations and reporting

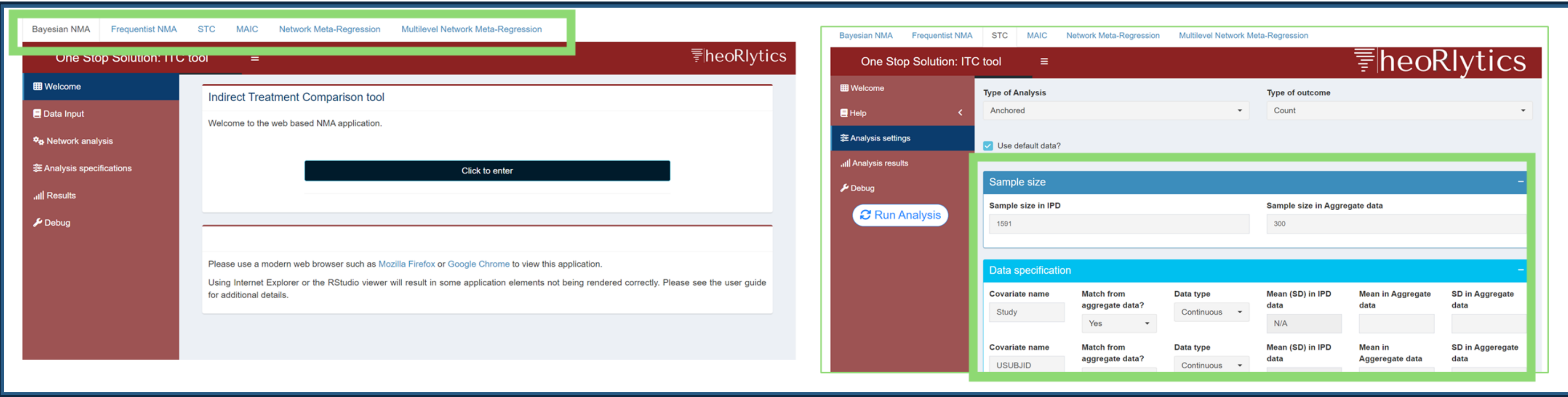
## OBJECTIVE

- To develop an "R-shiny" application interface that can standardize the ITC process, providing a comprehensive solution for both conventional and advanced ITC methodologies, including Frequentist and Bayesian NMA, NMR, MAIC, STC, and ML-NMR aligning with NICE Technical Support Documents 2, 3, and 18<sup>3-5</sup>

## METHODS

- The application was designed to incorporate aggregate data from the published evidence and individual patient-level data (IPD) from clinical trials
- The platform incorporates a range of ITC methodologies, as illustrated in **Figure 1**, enhancing flexibility for diverse research objectives:
  - a. Frequentist and Bayesian NMA:** Statistical methods to synthesize evidence from a network of trials, estimating relative treatment effects and allowing indirect comparisons within a frequentist or Bayesian statistical framework
  - b. MAIC:** A method to adjust for baseline differences across trials with a common comparator to enable more reliable ITCs
  - c. STC:** Used when IPD is available for one treatment and aggregate data for another, involving simulation to facilitate indirect comparison

Figure 1: Types of data and analysis integrated into the One-stop Solution tool



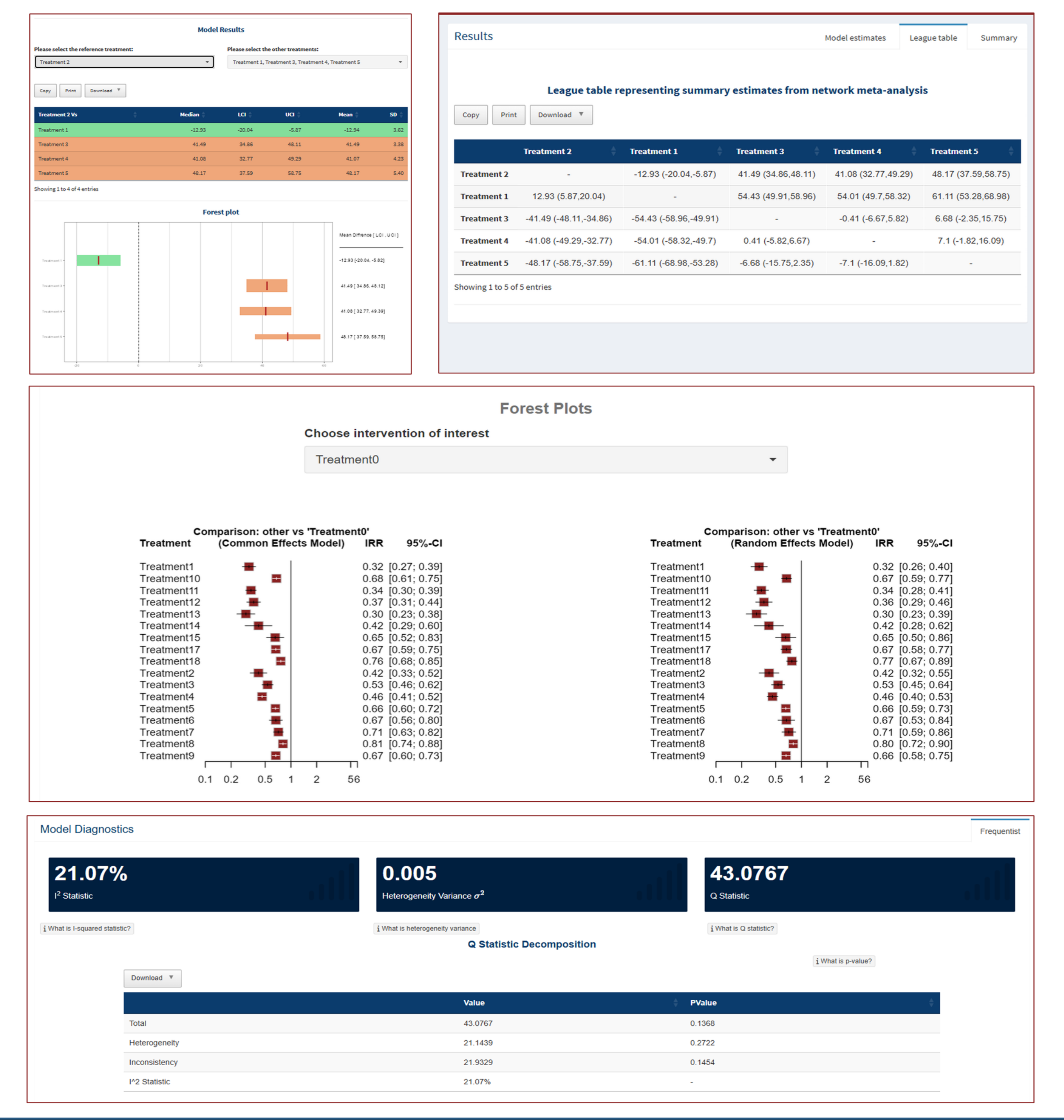
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- d. NMR:** An extension of NMA that incorporates study-level covariates to explore and account for heterogeneity in treatment effects
  - e. ML-NMR:** An advanced regression-based approach that models treatment effects while accounting for hierarchical data structures and multiple relevant covariates in a network
- It integrates features for assessing heterogeneity, including the I<sup>2</sup> statistic, and conducts feasibility checks to ensure the appropriateness of the selected ITC methodologies
  - The user-friendly web application, developed with the R Shiny framework, is deployed using Docker containers on Amazon Web Services (AWS) to ensure accessibility and scalability
  - User security is maintained with Secure Sockets Layer (SSL) certificates and Auth0 authentication

## RESULTS

Figure 2: Forest Plots, League Table, and Heterogeneity Assessment



## RESULTS (CONT'D)

- This interactive tool provides comprehensive ITC results, including treatment effect estimates with corresponding confidence or credible intervals, as well as visualizations such as network plots
- To ensure the robustness and reliability of the ITC analyses, the interface will provide functionalities for heterogeneity assessment and generate diagnostic plots, including forest plots and league tables (**Figure 2**)
- Key functionalities include the ability to summarize ITC outcomes through SUCRA values, treatment rankings, and funnel plots for bias assessment (**Figure 3**)

Figure 3: Funnel Plot, Ranking Plot, and STC Findings



- Additionally, the tool automates the generation of dynamically updated reports in Microsoft Word format, ensuring standardized documentation of the ITC process and results that allow improving transparency, reproducibility, and efficiency in reporting and save time

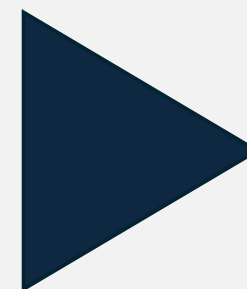
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## Disclosures

SP, AS, BS, PB, and SK, the authors, declare that they have no conflict of interest

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