MetaInsight: The Complex Review Support Unit (CRSU) network meta-analysis (NMA) web-based app

Webpage for App: http://www.nihrcrsu.org/guidance/apps/

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Department of Health Disclaimer:
The views and opinions expressed herein are those of the authors and do not necessarily reflect those of the NIHR, NHS or the Department of Health.
Structure of the Webinar

• Background and introduction to MetaInsight (10 mins)
  • Opportunity for questions

• Demonstration of the app (20 mins)
  • Opportunity for questions

• Final thoughts & plans for the future (10+ mins)
  • Opportunity for questions / suggestions
Poll 1: What is Your Background?

- Systematic reviewer / researcher
- Editor
- Clinician
- Statistician / health economist
- Other
Poll 2: What is your experience with Network Meta-analysis (NMA)?

• None whatsoever
• I have an understanding of the principles of (NMA) but no practical analysis experience
• I have an understanding of NMA and conducted NMA analysis with MetaInsight
• I have an understanding of NMA and conducted NMA analysis with software other than MetaInsight
Why was MetaInsight Created?

• Complex Review Support Unit was set up to support National Institute for Health Research (UK) reviews
  • Add value through making reviews appropriately sophisticated and more clinically relevant
  • Cochrane focus

• Since many reviews conducted without support of an expert statistician, software expertise was identified as an issue
  • Desire to increase capacity in more advanced synthesis analyses formats
  • Lack of Cochrane support for Network Meta-Analysis seemed a pressing issue
    • E.g. Not possible in RevMan
  • Wanted to present results of analyses in more user-friendly formats
    • Emphasis on visualisation
  • Real time interrogation of robustness of results to studies included and model fit
  • Software has evolved to the point where statisticians are (also) using it for its convenience and efficiency
CRSU Software Suite (http://www.nihrcrsu.org/guidance/apps/#d.en.581059)

• MetaInsight: https://crsu.shinyapps.io/metainsightc/
  Apps for carrying out network meta-analysis


• MetaDTA: https://crsu.shinyapps.io/dta_ma/
  App for carrying out diagnostic test accuracy meta-analysis


How does MetaInsight work?

• A powerful package called Shiny for making web apps was developed for the statistical package R
  • https://shiny.rstudio.com/
  • Allows us as non software developers to create analysis apps

• R acts as a backbone for the tool, it is accessed “behind the scenes” on an internet cloud (together with “helper” software, e.g. JAGS – for Bayesian simulation)
  • User does not need to download any software other than a web-browser
  • Works on modern browsers including on tablets / phones etc

• Aim to utilise existing packages where possible
  • E.g. Uses netmeta for frequentist analysis and gemtc for Bayesian analysis
  • Write bespoke code for the interface and for features not covered in existing packages (e.g. certain plots)
What is Network Meta-analysis anyway?

The network of trial evidence is analysed as a ‘whole’
What can MetaInsight do?

As of version 2.0 (available now - November 2019 -in beta via link in app)

• Network meta-analysis of binary or continuous (raw scale and standardised) outcomes
• Frequentist and Bayesian estimation routines
• Fixed and random effect models
• Many graphical outputs, all of which can be downloaded and saved
• Inconsistency / influential points diagnostics
• Treatment ranking (Bayes only)
• Flexible sensitivity analysis
• Operated via a point and click interface & updated in real time
• User guide available (for earlier version – downloadable from app)
Any questions so far?
MetalInsight Demonstration
Any Questions on the Software Demonstration?
What can MetaInsight **NOT** do?

As of version 2.0 (available now in beta via link in app) it cannot do:

- Network meta-analysis of hazard ratios & other outcomes
- Meta-regression (inclusion of study level covariates)
- Quality assessment
- Inconsistency models, treatment component models etc
- (Save analyses half way through (need to re-paste data))
- (Some other things that will no doubt be requested!)

- Seek expert advice if you require help with any of the above (possibly from the CRSU)
Will MetaInsight be Updated Further?

• The CRSU funding runs out in 2020, but we have a time extension to March 2021
• We intend to work on developing this and the other apps for at least until the end of the grant
• Looking to secure funding for hosting the apps for the next decade (currently approx. 600 hours a month)
Can You Give us an *Exclusive* Scoop on what may be Included in the Future?
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Yes!
Improved Summary of Analysis Figures

• Based on:
Tan, Sze Huey et al. Novel presentational approaches were developed for reporting network meta-analysis. Journal of Clinical Epidemiology, Volume 67, Issue 6, 672 – 680. (2014)
• Not routinely used, but elegant and concise summary of NMA results
### Summary Forest Plot Matrix for Smoke Alarm Uptake

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Odds Ratio (95% CI)</th>
<th>Rank</th>
<th>Odds Ratio (95% CI)</th>
<th>Rank</th>
<th>Odds Ratio (95% CI)</th>
<th>Rank</th>
<th>Odds Ratio (95% CI)</th>
<th>Rank</th>
<th>Odds Ratio (95% CI)</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usual Care</td>
<td>0.96 (0.40 to 2.31)</td>
<td>1.3</td>
<td>3.2 (1.03 to 11.27)</td>
<td>3.3</td>
<td>2.6 (1.16 to 8.17)</td>
<td>2.7</td>
<td>2.7 (0.85 to 8.80)</td>
<td>1.7</td>
<td>3.5 (0.80 to 25.30)</td>
<td>NA</td>
</tr>
<tr>
<td>Education</td>
<td>0.98 (0.80 to 14.23)</td>
<td>Rank 6</td>
<td>3.3 (0.23 to 22.61)</td>
<td>2.3</td>
<td>2.0 (0.59 to 12.50)</td>
<td>NA</td>
<td>2.3 (3.53 to 27.74)</td>
<td>Rank 6</td>
<td>3.6 (0.60 to 31.20)</td>
<td>NA</td>
</tr>
<tr>
<td>Equipment</td>
<td>0.81 (0.26 to 3.58)</td>
<td>Rank 3</td>
<td>0.82 (0.30 to 2.22)</td>
<td>0.87 (0.16 to 4.05)</td>
<td>NA</td>
<td>1.1 (0.19 to 0.01)</td>
<td>1.1 (0.19 to 0.01)</td>
<td>2.3 (0.46 to 10.23)</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Equipment+HI</td>
<td>1 (0.18 to 3.97)</td>
<td>Rank 4</td>
<td>1.2 (0.33 to 7.60)</td>
<td>1.2 (0.33 to 7.60)</td>
<td>2.8 (0.50 to 7.83)</td>
<td>Rank 4</td>
<td>4.6 (3.97 to 5.85)</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment+Fitting+HI</td>
<td>0.13 (0.21 to 12.60)</td>
<td>Rank 4</td>
<td>1.3 (0.21 to 12.60)</td>
<td>1.3 (0.21 to 12.60)</td>
<td>2.6 (0.53 to 13.18)</td>
<td>Rank 4</td>
<td>2.1 (0.26 to 10.49)</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Key**
- NA: results in black. Pale grey NA results in grey.
- A total of 7 interventions were compared in this NMA.
- Interventions are displayed in the order that they were entered in the analysis.

**Heterogeneity:** betwee-en-study variance: 0.69; 95% CI (0.123 to 2.201)
NMA & pairwise MA estimates and plots on the same graph

Probability best

Heterogeneity estimate presented

Column showing Head-to-Head Trial counts

Graph can extend easily to another page
Alex, Swap to HTML for the Grand Finale!
Poll 3: Which new features would you most want to see? (Please click up to 2)

• Quality assessment displays
• Ability to analyse hazard ratios or other outcomes not supported
• Meta-regression (inclusion of covariates)
• Show R code used “behind the scenes” (to improve reproducibility / use to teach R coding)
• More customisability of the Bayesian analysis
• Threshold analysis (as described in - Phillippo, D, Dias, S, Welton, N, Caldwell, D, Taske, N & Ades, T, 2019, ‘Threshold Analysis as an Alternative to GRADE for Assessing Confidence in Guideline Recommendations Based on Network Meta-analyses’. Annals of Internal Medicine, vol 170., pp. 538-546)
Poll 4: After this presentation, are you

• More likely to conduct a network meta-analysis
• Less likely to conduct a network meta-analysis

Poll 5: If you were planning on doing a network meta-analysis would you consider using MetaInsight?

• Yes
• No
Summary

Hope software (eventually) presents a complete solution to peoples needs for conducting and reporting network meta-analysis

• Already good functionality

Always grateful for feedback (good or bad) / suggestions
Any final questions, comments or suggestions?
Thank you for your time

MetaInsight:
https://crsu.shinyapps.io/metainsightc/

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