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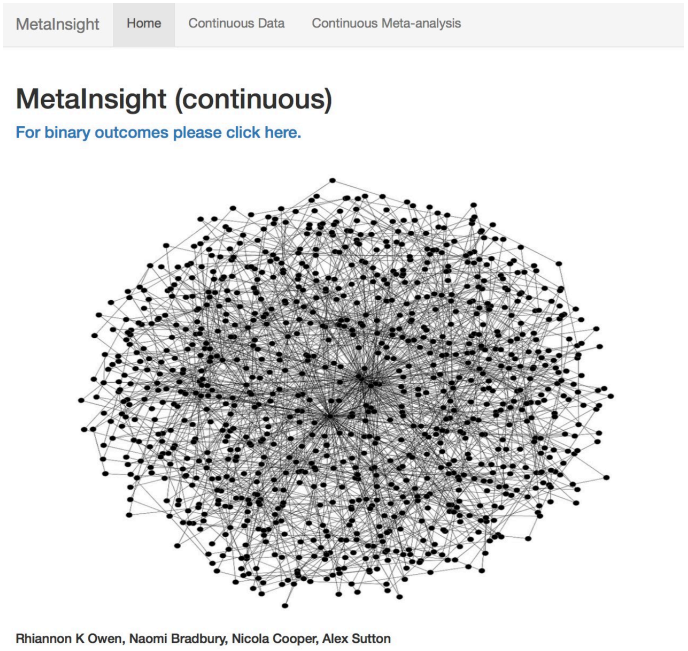
MetaInsight: an interactive web-based tool for analyzing, interrogating and visualizing network meta-analyses



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Conflicts of interest

I have no actual or potential conflict of interest in relation to this presentation.

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MetaInsight demonstration

If you would like to follow the demo on your own device please scan the QR code or go to:

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

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

Background

- Web applications are increasingly being used to analyse, explore, and visualize data
- A powerful package called Shiny has recently been developed to interact with the statistical package R[1]
  - https://shiny.rstudio.com/
- Whilst R acts as a backbone for the tool, it is accessed “behind the scenes” on an internet cloud
  - User does not need to download any software other than a web-browser
  - Works on all mobile and internet browsers (so far…!)
- Example of a Shiny web application

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

Motivation

- Through supporting NIHR funded researchers (including Cochrane) as the NIHR Complex Reviews Support Unit (CRSU), we have identified software as a barrier to greater adoption of methods. There is currently a need:
  - for results to be presented in more intuitive and user-friendly formats to facilitate improved understanding
  - to sustainably increase capacity by empowering informed non-specialists to be able to conduct more clinically relevant reviews

Network meta-analysis

- Network meta-analysis (NMA) is a powerful analysis method used to identify the best treatments for a condition and is used extensively by healthcare decision makers
- Many software routines exist for conducting NMA including:
  - `netmeta` in R[2]
  - `gemtc` in R[3]
  - `pcnetmeta` in R[4]
  - `network` in Stata[5]
  - NICE Technology Support Documents (TSD) for WinBUGS[6]
- Whilst software routines for performing NMA exist, they require considerable statistical programming expertise in WinBUGS and R, amongst others

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

How the tool was created

- At the heart of MetaInsight is the frequentist NMA package developed in R, `netmeta`[2]
- MetaInsight makes use of the many functions that `netmeta` offers e.g. network and forest plots, analysis, and assessment of inconsistency
- Additional bespoke R code was also developed specifically for the tool

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What MetaInsight adds

- A freely available tool that conducts NMA via the web, whilst leveraging established routines in R
- An interactive environment that presents results in a visually appealing format
- Performs sensitivity analysis in real time to aid decision makers ability to scrutinise the robustness of analysis findings
- Increase capacity of complex and specialist analysis approaches
- It is hoped that this tool will enable researchers to answer more clinically relevant questions (such as which treatment is the most effective overall?) and in the long term contribute to improved healthcare decision making as a result

Future work

- Possible extensions:
  - Include study-level covariates
  - Incorporate 3D plots for NMA
  - Explore the possibility of using a Bayesian framework
  - Risk of bias
- Create and re-publish the tool around a particular dataset that is ‘hard-wired’
  - E.g. allowing our tool to be supplied as a web-extra for journals publishing NMA articles
  - Allows the reader to explore the data and scrutinise assumptions of the analysis

References

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[4] Lifeng Lin, Jing Zhang, James S. Hodges, Haitao Chu (2017). Performing Arm-Based Network Meta-Analysis in R with the pcnetmeta Package. Journal of Statistical Software, 80(5), 1-25. doi:10.18637/jss.v080.i05

[5] White, I.R., 2015. Network meta-analysis. Stata journal. Stata Press, Texas.

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Thank you for listening.
Any questions?

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