Developing a **digi**tal **c**ounterfactual **a**nalysis **t**ool (**DigiCAT**)

to identify active ingredients in mental health

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The Wellcome Trust Data Prize

- Funds digital tools for mental health research
- Three stages:

  - Discovery Phase (11 teams)

  - Prototyping Phase (5 teams) ← *we are here*

  - Scaling up Phase (3 teams)

Why a counterfactual analysis tool?

- Substantial value in using observational (pre-existing) data
- Challenging to identify **active ingredients** observational data, e.g.:

SES, previous mental health etc.
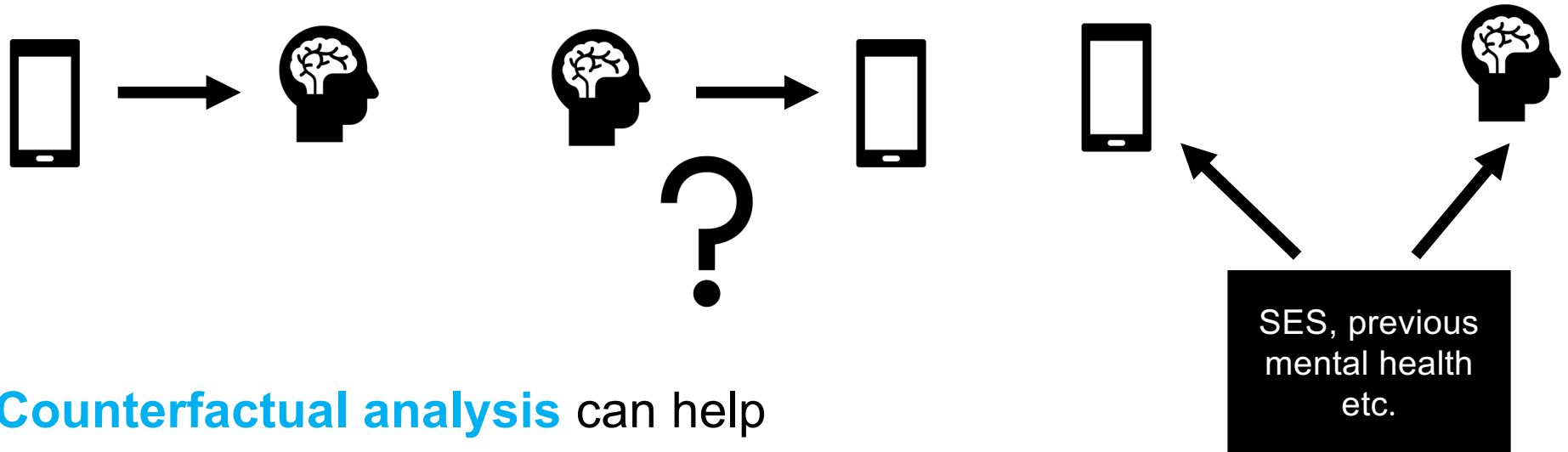
- **Counterfactual analysis** can help

Prototyping phase

- Develop a **digital tool prototype** to make counterfactual analysis more accessible to mental health field

- Address under-utilisation in mental health research:
  - Technically complex, lack of familiarity & training, lack of **accessible tools**

- Existing tools/packages have important limitations e.g.:
  - Missing data
  - Non-binary active ingredients
  - Complex survey data

Tool goals

- Promote knowledge, uptake, and principled use of counterfactual analysis in mental health research:
  - Test active ingredients to **inform treatment development**
  - Get more **value out of existing data**
  - **Reduce resources wasted** on active ingredients that don't have a genuine effect on mental health

Our approach to tool development

- Provide easy *point & click* interface accompanied by *tutorials & guidance*

- *R* for backend, *Shiny* for frontend

- Informed by diverse *user consultations* AND *lived experience expert input*

- Embed **Findable Accessible Interoperable Reusable** principles
  - Code/materials available, clearly commented/documented etc.

How lived experience experts will inform the tool

- Young person advisory group advising on **priority uses of the tool**:
  - Key priority include:
    - social media
    - sleep
    - academic stress
    - relationships (with peers, parents, teachers)

- Next steps:
  - Expand advisory group to including young people from lower-middle and low income countries
  - Advisory group of professional experts by experience

User consultation process

- Large-scale **survey:**
  - Global recruitment
  - Identify target audience / likely users, their needs & goals/motivations
- **Advisory group** discussions:
  - Identify which features are most needed
 - Provide feedback on prototype to inform refinement of final version

Current tool design

Our tool is an R Shiny app which is comprised of a user interface object (ui.R), which controls the layout and appearance of the app, and a server function, which transforms user input into the desired app output.

Our app will be hosted as a web application:

- Will be able to support multiple users at the same time
- Will make tool more assessable (no set up required) without sacrificing methodology or transparency
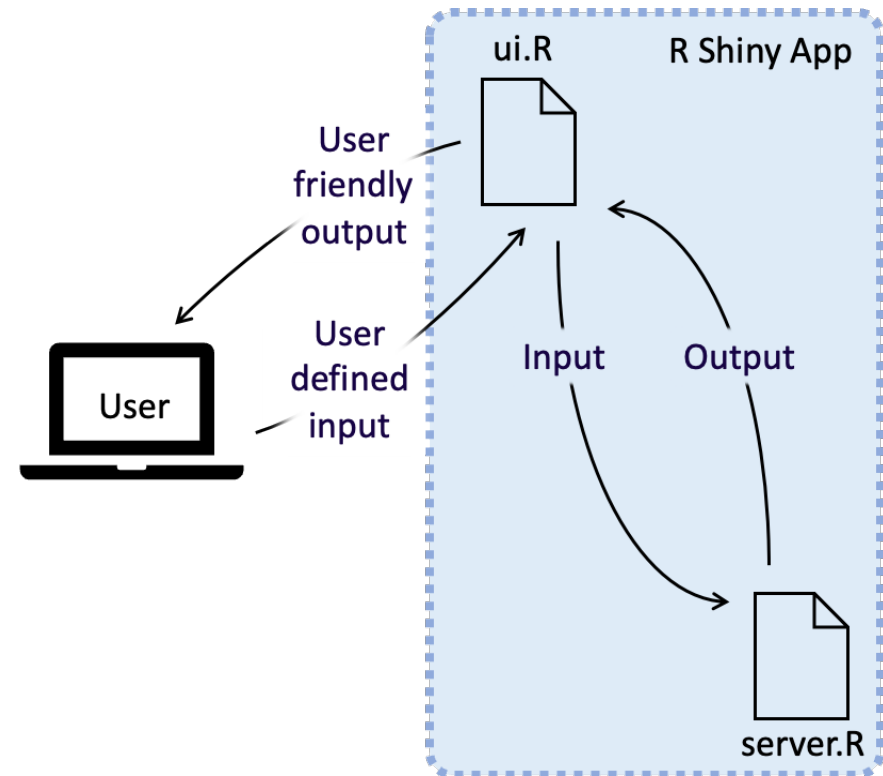
The tool

Challenges

- How we sustain the tool in the long-term?
- How can we ensure good use of the tool?

DigiCAT

- 🏠 Analysis
- ▸ Tutorial
- ☑ Terms & Conditions
- ⓘ About

How to use this tool

Step 1: Attach dataset and specify your outcome, 'treatment' and other variables

Step 2: Select your propensity model(s)

Step 3: Select your counterfactual method(s) and click Run to see the results

Get Started!

Counterfactual Analysis

The aim of counterfactual analysis is to estimate the causal effects of interventions or treatments, by comparing what actually happened (observed outcomes) with what would have happened if a different action had been taken (counterfactual outcomes). In observational settings, where random allocation into different treatments is not possible, researchers often employ methods involving 'propensity scores' (the estimated probability of receiving the treatment/intervention, based on a set of observed covariates). These propensity scores can then be used in an analysis to balance the characteristics of

Our App

With the DigiCAT app, you can upload your own data and leverage propensity score methods to conduct counterfactual analyses, gaining insights into the causal effects of specific interventions or treatments. The primary objective of the DigiCAT app is to provide researchers, regardless of their statistical background, with a user-friendly platform that removes barriers and enables them to utilize these methods effectively. Please visit our tutorial for more info on using DigiCAT.