Package 'metaconfoundr'

August 6, 2022

Title Visualize 'Confounder' Control in Meta-Analyses

Version 0.1.1

Description Visualize 'confounder' control in meta-analysis.
'metaconfoundr' is an approach to evaluating bias in studies used in
meta-analyses based on the causal inference framework. Study groups
create a causal diagram displaying their assumptions about the
scientific question. From this, they develop a list of important
'confounders'. Then, they evaluate whether studies controlled for
these variables well. 'metaconfoundr' is a toolkit to facilitate this
process and visualize the results as heat maps, traffic light plots,
and more.

License MIT + file LICENSE

URL https://github.com/malcolmbarrett/metaconfoundr

BugReports https://github.com/malcolmbarrett/metaconfoundr/issues

Depends R (>= 3.5.0)

Imports dplyr (>= 1.0.0), forcats, ggplot2 (>= 3.3.1), magrittr,
purrr, rlang (>= 0.1.2), shiny, stringr, tibble, tidyr (>=
1.0.0), tidyselect

Suggests covr, knitr, metafor, patchwork, readr, rio, rmarkdown,
roxygen2, spelling, testthat (>= 3.0.0), vdiffr

VignetteBuilder knitr

Config/testthat/edition 3

Encoding UTF-8

Language en-US

LazyData true

RoxygenNote 7.1.2

NeedsCompilation no

Author Malcolm Barrett [aut, cre] (<https://orcid.org/0000-0003-0299-5825>),
Julie M. Petersen [aut] (<https://orcid.org/0000-0001-7845-4545>),
Ludovic Trinquart [aut] (<https://orcid.org/0000-0002-3028-4900>)

Maintainer Malcolm Barrett <malcolmbarrett@gmail.com>

Repository CRAN

Date/Publication 2022-08-06 14:00:10 UTC

R topics documented:

---

count_non_confounders   *Count and plot non-confounders*

Description

Count and plot non-confounders

Usage

```
count_non_confounders(.df)

plot_non_confounders(.df, ..., geom = ggplot2::geom_col, sort = TRUE)
```

Arguments

.df	A data frame, usually the result of metaconfoundr()
...	Arguments passed to geom
geom	The ggplot2 geom to use
sort	Logical. Should the results be sorted?

Value

a tibble or ggplot

Examples

```
ipi %>%
  metaconfoundr() %>%
  plot_non_confounders(size = 3, geom = ggplot2::geom_point)
```

---

facet_constructs   *Facet by constructs*

Description

A helper function to facet by constructs in '`mc_heatmap()` and `mc_trafficlight()`

Usage

```
facet_constructs(...)
```

Arguments

... Arguments passed to `ggplot2::facet_grid()`

Value

a facet component

See Also

Other plots: `geom_cochrane()`, `mc_heatmap()`, `scale_fill_cochrane()`, `theme_mc()`

---

geom_cochrane   *Add Cochrane-style symbols to heatmaps and traffic light plots*

Description

Add Cochrane-style symbols to heatmaps and traffic light plots

Usage

```
geom_cochrane(
  mapping = ggplot2::aes(shape = control_quality),
  data = NULL,
  stat = "identity",
  position = "identity",
  ...,
  na.rm = FALSE,
  show.legend = NA,
  inherit.aes = TRUE
)
```

Arguments

mapping	Set of aesthetic mappings created by [aes()](#) or [aes_()](#). If specified and inherit.aes = TRUE (the default), it is combined with the default mapping at the top level of the plot. You must supply mapping if there is no plot mapping.
data	The data to be displayed in this layer. There are three options:
	If NULL, the default, the data is inherited from the plot data as specified in the call to [ggplot()](#).
	A data.frame, or other object, will override the plot data. All objects will be fortified to produce a data frame. See [fortify()](#) for which variables will be created.
	A function will be called with a single argument, the plot data. The return value must be a data.frame, and will be used as the layer data. A function can be created from a formula (e.g. ~ head(.x, 10)).
stat	The statistical transformation to use on the data for this layer, as a string.
position	Position adjustment, either as a string, or the result of a call to a position adjustment function.
...	Other arguments passed on to [layer()](#). These are often aesthetics, used to set an aesthetic to a fixed value, like colour = "red" or size = 3. They may also be parameters to the paired geom/stat.
na.rm	If FALSE, the default, missing values are removed with a warning. If TRUE, missing values are silently removed.
show.legend	logical. Should this layer be included in the legends? NA, the default, includes if any aesthetics are mapped. FALSE never includes, and TRUE always includes. It can also be a named logical vector to finely select the aesthetics to display.
inherit.aes	If FALSE, overrides the default aesthetics, rather than combining with them. This is most useful for helper functions that define both data and aesthetics and shouldn't inherit behaviour from the default plot specification, e.g. [borders()](#).

Value

a geom

See Also

Other plots: [facet_constructs()](#), [mc_heatmap()](#), [scale_fill_cochrane()](#), [theme_mc()](#)

---

ipi_data	*IPI data*

Description

These data represent 14 analyses (retrospective cohorts and sibling-matched designs) to evaluate the association between short interpregnancy interval (<6 months versus 18-23 months) and risk of preterm birth (<37 weeks gestation) and the adequacy of confounder control (Petersen et al.). Adequacy of confounder control was determined overall for each study as well as by variable and construct (groupings of conceptually related variables).These studies are a subset of studies originally identified in a systematic review by Ahrens et al. to summarize associations between short interpregnancy interval and a variety of perinatal outcomes in high-resource settings.

Usage

```
ipi

ipi_wide

ipi_metaanalysis
```

Format

An object of class `tbl_df` (inherits from `tbl`, `data.frame`) with 407 rows and 5 columns.

An object of class `tbl_df` (inherits from `tbl`, `data.frame`) with 37 rows and 14 columns.

An object of class `tbl_df` (inherits from `tbl`, `data.frame`) with 11 rows and 9 columns.

Source

Ahrens et al. (2019)

References

Ahrens KA, Nelson H, Stidd RL, Moskosky S, Hutcheon JA. Short interpregnancy intervals and adverse perinatal outcomes in high-resource settings: An updated systematic review. Paediatr Perinat Epidemiol. 2019;33(1):O25-O47.

Petersen JM, Barrett M, Ahrens K, Murray EJ, Hogue C, Mumford S, Bryant Mantha A, Fox MP, Gadupudi S, Trinquart L. Confounder Matrix: A Tool to Assess Confounding Bias in Systematic Reviews of Observational Studies. 2020

---

label_robins	*Label values using ROBINS approach*

Description

`label_robins()` is a helper function to modify metaconfoundr labels to use ROBINS-like labels: low risk, some concerns, high risk.

Usage

```
label_robins()
```

Value

a character vector of ROBINS labels

Examples

```
mc_heatmap(metaconfoundr(ipi)) +
  ggplot2::scale_fill_ordinal(labels = label_robins())

mc_heatmap(metaconfoundr(ipi)) +
  scale_fill_cochrane(labels = label_robins())
```

---

launch_metaconfoundr_app

Launch metaconfoundr Shiny app

Description

launch_metaconfoundr_app() launches a Shiny app to create visualizations of confounding control in meta-analyses

Usage

```
launch_metaconfoundr_app()
```

Value

A Shiny app

---

mc_detect_layout   *Tidy metaconfoundr data layouts*

Description

mc_longer() and mc_wider() are helper functions to put metaconfoundr() for long and wide data sets, respectively. results into a tidy format. mc_detect_layout() chooses between the two automatically based on the number of variables in the data frame. mc_study_values() helps standardize evaluations of control quality.

Usage

```
mc_detect_layout(...)

mc_longer(
  study = contains("construct"),
  construct = contains("construct"),
  variable = matches("variable|factor"),
  control_quality = contains("control_quality"),
  is_confounder = contains("confounder"),
  study_values = mc_study_values()
)

mc_study_values(inadequate = 0, some_concerns = 1, adequate = 2)

mc_wider(
  construct = contains("construct"),
  variable = matches("variable|factor"),
  is_confounder = contains("confounder"),
  study = everything(),
  study_values = mc_study_values()
)
```

Arguments

`...`	Additional arguments passed to `mc_wider()` or `mc_longer()`
`study`	The column with the name of the studies
`construct`	The domain or construct column
`variable`	The column that describes the confounding variables
`control_quality`	
	The column that describes the confounding control quality
`is_confounder`	The column that describes if a variable is a confounder
`study_values`	What are the levels of `control_quality`? Use `mc_study_values()` to set up.
`inadequate`	Which value signifies inadequate control?
`some_concerns`	Which value signifies control with some concerns?
`adequate`	Which value signifies adequate control?

Value

a function that tidies the data

---

mc_heatmap *Plot a heatmap or traffic light plot of* metaconfoundr() *summaries*

Description

mc_heatmap() and mc_trafficlight() visualize the results of metaconfoundr(), summarizing the quality of confounder control in each study.

Usage

```
mc_heatmap(
  .df,
  legend_title = "control quality",
  sort = FALSE,
  by_group = FALSE,
  score = c("adequate", "sum", "controlled"),
  non_confounders = FALSE
)

mc_trafficlight(
  .df,
  size = 8,
  legend_title = "control quality",
  sort = FALSE,
  by_group = FALSE,
  score = c("adequate", "sum", "controlled"),
  non_confounders = FALSE
)
```

Arguments

.df	A data frame, usually the result of metaconfoundr()
legend_title	The legend title
sort	Logical. Sort by confounder score? Calculated by [score_control()](#)
by_group	Logical. If sorted, sort within domain?
score	The approach used to calculate the score. adequate tests if the study controlled at a strictly adequate level. sum treats control_quality as an ordinal integer, summing it's values such that a higher score has better control overall. controlled tests if any control, including some concerns control, is present.
non_confounders	
	Logical. Include non-confounders? Default is FALSE.
size	The size of the points in the traffic light plot

Value

a ggplot

See Also

Other plots: facet_constructs(), geom_cochrane(), scale_fill_cochrane(), theme_mc()

Examples

```
ipi %>%
  metaconfoundr() %>%
  dplyr::mutate(variable = stringr::str_wrap(variable, 10)) %>%
  mc_heatmap() +
  theme_mc() +
  facet_constructs() +
  ggplot2::guides(x = ggplot2::guide_axis(n.dodge = 2))

ipi %>%
  metaconfoundr() %>%
  mc_trafficlight() +
  geom_cochrane() +
  facet_constructs() +
  scale_fill_cochrane() +
  theme_mc() +
  ggplot2::guides(x = ggplot2::guide_axis(n.dodge = 2))
```

---

metaconfoundr()   *Prepare a meta-analysis data set for metaconfoundr*

Description

metaconfoundr() standardizes data frames with information on how well a set of studies control for a set of variables. In this approach, a set of domain experts agree on the variables that are required to properly control for confounding for a scientific question. Then, for a given confounder, the studies are described as being adequately controlled, inadequately controlled, or controlled with some concerns. metaconfoundr() is intended to standardize data for use in mc_heatmap() and mc_trafficlight(). See the vignette on data preparation for more information on how to set up your evaluation.

Usage

```
metaconfoundr(.df, data_format = mc_detect_layout())
```

Arguments

.df	A data frame. See the vignette on data preparation for more details.
data_format	The format of the data. Detected automatically by default, but explicit options include mc_longer() and mc_wider()

Value

a tibble

Examples

```
metaconfoundr(ipi)

metaconfoundr(ipi_wide)

ipi_wide2 <- ipi_wide %>%
  dplyr::rename(scope = construct)

metaconfoundr(ipi_wide2, mc_wider(construct = "scope"))
```

---

scale_fill_cochrane   *Add Cochrane-style palettes to ggplots*

Description

Add Cochrane-style palettes to ggplots

Usage

```
scale_fill_cochrane(...)

scale_color_cochrane(...)

scale_shape_cochrane(...)
```

Arguments

...   Arguments passed to the underline scale function

Value

scales for ggplot

See Also

Other plots: `facet_constructs()`, `geom_cochrane()`, `mc_heatmap()`, `theme_mc()`

---

score_control *Add a score of confounding control*

Description

score_control() adds a variable, score, that summarizes how well a study controls for a domain or construct. Used to sort heatmaps and traffic light plots.

Usage

```
score_control(.df, score = c("adequate", "sum", "controlled"))
```

Arguments

.df   A data frame, usually the result of metaconfoundr()

score   The approach used to calculate the score. adequate tests if the study controlled at a strictly adequate level. sum treats control_quality as an ordinal integer, summing it's values such that a higher score has better control overall. controlled tests if any control, including some concerns control, is present.

Value

a tibble

Examples

```
library(dplyr)

ipi %>%
  metaconfoundr() %>%
  filter(is_confounder == "Y") %>%
  score_control("controlled") %>%
  arrange(desc(score))
```

---

summarize_control_quality
Summarize the control quality of studies

Description

summarize_control_quality() allows you to summarize how well studies control for variables within one or more domains, and how well those domains are controlled for overall. Each logical statement is a domain and can be named.

Usage

```
summarize_control_quality(.df, ..., domains = TRUE)
```

Arguments

.df	A data frame, usually the result of [metaconfoundr()](#)
...	Boolean arguments to declare adequate control logic
domains	Logical. Include the domains in the output? If FALSE, only returns overall control quality.

Value

A tibble

Examples

```
summary_df <- summarize_control_quality(
  metaconfoundr(ipi),
  Sociodemographics = `Maternal age` & `Race/ethnicity` & `Marital status`,
  Socioeconomics = `SES category` | Insurance & Education,
  "Reproductive Hx" = `Prior pregnancy outcome`
)

summary_df

summary_df %>%
  mc_trafficlight() +
  theme_mc() +
  facet_constructs() +
  geom_cochrane() +
  scale_fill_cochrane()
```

---

theme_mc   *A minimal theme for metaconfoundr plots*

Description

A minimal theme for metaconfoundr plots

Usage

```
theme_mc(base_size = 14)
```

Arguments

base_size	base font size, given in pts.

Value

a ggplot theme

See Also

Other plots: `facet_constructs()`, `geom_cochrane()`, `mc_heatmap()`, `scale_fill_cochrane()`

Index