Package ‘precisely’

October 14, 2022

Type Package

Title Estimate Sample Size Based on Precision Rather than Power

Version 0.1.2

Maintainer Malcolm Barrett <malcolmbarrett@gmail.com>

Description Estimate sample size based on precision rather than power. ‘precisely’ is a study planning tool to calculate sample size based on precision. Power calculations are focused on whether or not an estimate will be statistically significant; calculations of precision are based on the same principles as power calculation but turn the focus to the width of the confidence interval. ‘precisely’ is based on the work of ‘Rothman and Greenland’ (2018).

License MIT + file LICENSE

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

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

Depends R (>= 3.2.0)

Imports dplyr, ggplot2, magrittr, purrr, rlang, shiny, shinycssloaders, shinythemes, tidyr

Suggests covr, ggrepel, knitr, rmarkdown, spelling, testthat, vdiffr

VignetteBuilder knitr

Encoding UTF-8

Language en-US

RoxygenNote 7.1.2

NeedsCompilation no

Author Malcolm Barrett [aut, cre] (<https://orcid.org/0000-0003-0299-5825>)

Repository CRAN

Date/Publication 2021-10-10 04:30:02 UTC
**R topics documented:**

- `launch_precisely_app` .................................................. 2
- `map_precisely` .......................................................... 2
- `n_risk_difference` ..................................................... 3
- `plot_sample_size` ...................................................... 4
- `precision_risk_difference` ........................................... 6
- `theme_precisely` ....................................................... 8
- `upper_risk_difference` ................................................. 8

**Index**

<table>
<thead>
<tr>
<th>launch_precisely_app</th>
<th>Launch precisely Shiny app</th>
</tr>
</thead>
</table>

**Description**

`launch_precisely_app()` launches a Shiny app to calculate and plot precision, sample size, and upper limit calculations.

**Usage**

`launch_precisely_app()`

**Description**

`map_precisely()` is a wrapper around `tidyr::crossing()` and `purrr::pmap_dfr()` to give a set of values to any of the calculation functions in precisely. All possible combinations of the values are passed to the function, returning a tibble where each row is the result for each combination.

**Usage**

`map_precisely(.f, ...)`

**Arguments**

- `.f` a function in precisely
- `...` arguments passed to `.f`. All possible combinations of argument values are given to the function.

**Value**

a tibble
**n_risk_difference**

**Examples**

```r
map_precisely(
  n_risk_difference,
  precision = seq(from = .02, to = .20, by = .005),
  exposed = c(.2, .4),
  unexposed = c(.1, .3),
  group_ratio = 1
)
```

**Description**

These functions calculate the sample size needed to estimate a measure with a certain precision. For ratio measures, like the risk ratio, rate ratio, and odds ratio, this is the ratio of the upper to lower limit of the confidence interval. For difference measures, like the risk difference or rate difference, this is the absolute width of the confidence interval.

**Usage**

```r
n_risk_difference(precision, exposed, unexposed, group_ratio, ci = 0.95)
n_risk_ratio(precision, exposed, unexposed, group_ratio, ci = 0.95)
n_rate_difference(precision, exposed, unexposed, group_ratio, ci = 0.95)
n_rate_ratio(precision, exposed, unexposed, group_ratio, ci = 0.95)
n_odds_ratio(
  precision,
  exposed_cases,
  exposed_controls,
  group_ratio,
  ci = 0.95
)
```

**Arguments**

- **precision**: For differences, the width of the CI. For ratios, the ratio of the upper to lower CI.
- **exposed**: The risk or rate among the exposed cohort.
- **unexposed**: The risk or rate among the unexposed cohort.
- **group_ratio**: In cohort studies, the ratio of the unexposed to the exposed. In case-control studies, the ratio of the controls to the cases.
ci The confidence interval as a probability or percent. Default is .95.
exposed_cases The proportion of exposed cases.
exposed_controls The proportion of exposed controls.

Value
a tibble with sample size, effect measure, and precision

References

Examples

# From Rothman and Greenland 2018

n_risk_difference(
  precision = .08,
  exposed = .4,
  unexposed = .3,
  group_ratio = 3,
  ci = .90
)

n_risk_ratio(
  precision = 2,
  exposed = .4,
  unexposed = .3,
  group_ratio = 3
)

plot_sample_size  Plot precisely

Description
Simple line plots for the output of map_precisely(). Use dplyr::group_by() to create multiple lines on the plot.
Usage

plot_sample_size(.df, xlab = "Sample Size", ylab = "Precision", line_size = 1)

plot_precision(.df, xlab = "Precision", ylab = "Sample Size", line_size = 1)

plot_upper_limit(.df, xlab = "Sample Size", ylab = "Upper Limit", line_size = 1)

Arguments

.df a data frame with values to plot, possibly from map_precisely().

xlab Label for the x-axis.

ylab Label for the y-axis.

line_size The width of the line. Default is 1.

Value

a ggplot

Examples

library(dplyr)
library(ggplot2)

map_precisely(
  n_risk_difference,
  precision = seq(from = .02, to = .20, by = .005),
  exposed = .4,
  unexposed = .3,
  group_ratio = 1
) %>%
  plot_sample_size()

map_precisely(
  precision_odds_ratio,
  n_cases = seq(from = 500, to = 1000, by = 10),
  exposed_cases = .6,
  exposed_controls = .4,
  group_ratio = 1:4
) %>%
  group_by("Control/Case Ratio" = factor(group_ratio)) %>%
  plot_precision()

map_precisely(
  upper_rate_ratio,
  upper_limit = seq(1.5, 2.5, by = .1),
precision_risk_difference

Estimate precision of a measure based on sample size

Description

These functions calculate the precision of an estimate given a certain sample size. For ratio measures, like the risk ratio, rate ratio, and odds ratio, this is the ratio of the upper to lower limit of the confidence interval. For difference measures, like the risk difference or rate difference, this is the absolute width of the confidence interval.

Usage

precision_risk_difference(
  n_exposed,
  exposed,
  unexposed,
  group_ratio,
  ci = 0.95
)

precision_rate_difference(
  n_exposed,
  exposed,
  unexposed,
  group_ratio,
  ci = 0.95
)

precision_risk_ratio(n_exposed, exposed, unexposed, group_ratio, ci = 0.95)

precision_rate_ratio(n_exposed, exposed, unexposed, group_ratio, ci = 0.95)
**precision_odds_ratio**

```r
precision_odds_ratio(
  n_cases, 
  exposed_cases, 
  exposed_controls, 
  group_ratio, 
  ci = 0.95
)
```

**Arguments**

- `n_exposed, n_cases`
  In cohort studies, the number of exposed participants. In case-control studies, the number of cases.
- `exposed`
  The risk or rate among the exposed cohort.
- `unexposed`
  The risk or rate among the unexposed cohort.
- `group_ratio`
  In cohort studies, the ratio of the unexposed to the exposed. In case-control studies, the ratio of the controls to the cases.
- `ci`
  The confidence interval as a probability or percent. Default is .95.
- `exposed_cases`
  The proportion of exposed cases.
- `exposed_controls`
  The proportion of exposed controls.

**Value**

a tibble with precision, effect measure, and sample size

**References**


**Examples**

```r
# From Rothman and Greenland 2018

precision_odds_ratio(
  n_cases = 500, 
  exposed_cases = .6, 
  exposed_controls = .4, 
  group_ratio = 2
)
```
theme_precisely  Minimalist themes for precision plots

Description

Minimalist themes for precision plots

Usage

theme_precisely(base_size = 14, base_family = "", ...)

Arguments

base_size  base font size, given in pts.
base_family  base font family
...  additional arguments passed to ggplot2::theme()

upper_risk_difference  Estimate sample size based on probability that upper limit is below level of concern.

Description

These functions calculate sample size based on probability that upper limit is below level of concern. The idea behind this approach is to use precision to provide support for the absence of effect. These functions calculate sample size where, when the true effect is null, the upper limit of the confidence interval of the estimate of interest has a probability of being at or under a specified level of concern.

Usage

upper_risk_difference(
  upper_limit,
  prob,
  exposed,
  unexposed,
  group_ratio,
  ci = 0.95
)

upper_risk_ratio(upper_limit, prob, exposed, unexposed, group_ratio, ci = 0.95)

upper_rate_difference(
  upper_limit,
  prob,
  exposed,
upper_risk_difference

unexposed,
group_ratio,
ci = 0.95
)

upper_rate_ratio(upper_limit, prob, exposed, unexposed, group_ratio, ci = 0.95)

upper_odds_ratio(
  upper_limit,
  prob,
  exposed_cases,
  exposed_controls,
  group_ratio,
  ci = 0.95
)

Arguments

upper_limit
  The upper limit of the confidence interval, a level of concern.
prob
  The probability of the estimated upper limit of the confidence interval being at
  or below the level of concern.
exposed
  The risk or rate among the exposed cohort.
unexposed
  The risk or rate among the unexposed cohort.
group_ratio
  In cohort studies, the ratio of the unexposed to the exposed. In case-control
  studies, the ratio of the controls to the cases.
ci
  The confidence interval as a probability or percent. Default is .95.
exposed_cases
  The proportion of exposed cases.
exposed_controls
  The proportion of exposed controls.

Value

A tibble with sample size, effect measure, upper limit, and probability.

References

29(5):599-603.

Examples

# From Rothman and Greenland 2018

upper_rate_ratio(
  upper_limit = 2,
  prob = .90,
  exposed = .01,
unexposed = .01,
group_ratio = 1
)
Index

dplyr::group_by(), 4

ggplot2::theme(), 8

launch_precisely_app, 2

map_precisely, 2
map_precisely(), 4, 5

n_odds_ratio(n_risk_difference), 3
n_rate_difference(n_risk_difference), 3
n_rate_ratio(n_risk_difference), 3
n_risk_difference, 3
n_risk_ratio(n_risk_difference), 3

plot_precision(plot_sample_size), 4
plot_sample_size, 4
plot_upper_limit(plot_sample_size), 4
precision_odds_ratio
  (precision_risk_difference), 6
precision_rate_difference
  (precision_risk_difference), 6
precision_rate_ratio
  (precision_risk_difference), 6
precision_risk_difference, 6
precision_risk_ratio
  (precision_risk_difference), 6
purrr::pmap_dfr(), 2

theme_precisely, 8
tidyr::crossing(), 2

upper_odds_ratio
  (upper_risk_difference), 8
upper_rate_difference
  (upper_risk_difference), 8
upper_rate_ratio
  (upper_risk_difference), 8
upper_risk_difference, 8
upper_risk_ratio
  (upper_risk_difference), 8