Package ‘nntcalc’

October 15, 2020

Type Package

Title Calculator of unadjusted, adjusted and marginal NNT

Version 1.0

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Description
This package provides functions to calculate the adjusted, the unadjusted and the marginal Laupacis NNT with the corresponding 95% confidence intervals. Available models include normal distributed outcomes with equal and unequal variances, and exponential distribution. Available regression models include one way ANOVA, linear regression, logistic regression, and Cox model.
In addition, the package provides a function to calculate the Kaplan Meier Laupacis NNT, and Kraemer & Kupfer's NNT.

Depends R (>= 3.5.0)

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Imports boot, stats, MASS, survival, mvtnorm

Encoding UTF-8

LazyData true

RoxygenNote 7.1.1

R topics documented:

`anova_data` *Data sample for the one-way ANOVA example*

Description

Data sample for the one-way ANOVA example

Usage

```
data(anova_data)
```

Format

A data frame with 1000 rows, and 2 columns. Suitable for a one-way ANOVA model.

y is the continuous dependent variable

gr is the independent factor (treatments) with four distinct levels

Author(s)

V. Vancak

Examples

```
data(anova_data)
```

`linreg_data` *Data sample for the linear regression example*

Description

Data sample for the linear regression example

Usage

```
data(linreg_data)
```

Format

A data frame with 1000 rows, and 3 columns. Suitable for a simple linear regression with a dummy variable.

y is the continuous dependent variable

gr is the allocated arm of each subject, where 1 corresponds to treatment, and 0 to control

x_var is the independent continuous variable

Author(s)

V. Vancak

Examples

```
data(linreg_data)
```

logreg_data — *Data sample for the logistic regression example*

Description

Data sample for the logistic regression example

Usage

```
data(logreg_data)
```

Format

A data frame with 1000 rows, and 3 columns. Suitable for a logistic regression model.

y is the dependent binary 0/1 variable

gr is the allocated arm of each subject, where 1 corresponds to treatment, and 0 to control

x_var is the independent continuous variable

Author(s)

V. Vancak

Examples

```
data(logreg_data)
```

nnt_kk — *Kraemer & Kupfer's NNT calculator*

Description

Calculates the parametric and the non-parametric KK-NNT. Takes two numeric vectors that are the outcomes of the treatment and control arms, and returns the estimated KK-NNT using the specified method.

Usage

```
nnt_kk(type, treat, control, decrease, dist = "none", equal.var)
```

Arguments

`type`	specification of the estimation method; 'mle' (for the Maximum Likelihood estimator) and 'non-param' (for the non-parametric MLE)
`treat`	vector of response variable of the treatment group
`control`	vector of response variable of the control group
`decrease`	logical TRUE or FALSE. Indicates whether the MCID change is decrease in the response variable
`dist`	distribution type (only for the 'mle' type estimator); "norm" (Normal), "expon" (Exponential). The default value is 'none'
`equal.var`	logical TRUE or FALSE; Indicates whether the variances are equal - for normal distribution only. The default value is TRUE

Value

The estimated Kraemer & Kupfer's NNT and its confidence intervals using the specified estimation method.

References

Kraemer, H. C., & Kupfer, D. J. (2006). Size of treatment effects and their importance to clinical research and practice. Biological psychiatry, 59(11), 990-996.

Vancak, V., Goldberg, Y., & Levine, S. Z. (2020). Systematic analysis of the number needed to treat. Statistical Methods in Medical Research, 0962280219890635.

Examples

```
nnt_kk( type     = "non-param",
        treat    = rnorm(100, 100, 10),
        control  = rnorm(100, 110, 20),
        dist     = "none",
        decrease  = TRUE )
```

`nnt_l` *Laupacis' unadjusted NNT calculator*

Description

Calculates Laupacis' type NNT. Takes two numeric vectors that are the outcomes of the treatment and control arms, and returns the estimated NNT using the specified estimation method.

Usage

```
nnt_l(type, treat, control, cutoff, decrease, dist = "none", equal.var = TRUE)
```

Arguments

`type`	specification of the estimation method; 'mle' (for the Maximum Likelihood estimator), 'fl' (for Furukawa & Leucht's estimator), 'laupacis' (for the non-parametric MLE estimator)
`treat`	vector of response variable of the treatment group
`control`	vector of response variable of the control group
`cutoff`	a scalar that is the MCID
`decrease`	logical TRUE or FALSE. Indicates whether the MCID change is decrease in the response variable
`dist`	distribution type (if specified); "normal" (Normal), "expon" (Exponential). The default value is 'none'.
`equal.var`	logical TRUE or FALSE; Indicates whether the variances are equal - for normal distribution only. The default value is TRUE.

Value

The estimated Laupacis' NNT and its confidence intervals using the specified estimation method.

References

Laupacis, A., Sackett, D. L., & Roberts, R. S. (1988). An assessment of clinically useful measures of the consequences of treatment. New England journal of medicine, 318(26), 1728-1733.

Vancak, V., Goldberg, Y., & Levine, S. Z. (2020). Systematic analysis of the number needed to treat. Statistical Methods in Medical Research, 0962280219890635.

Furukawa, T. A., & Leucht, S. (2011). How to obtain NNT from Cohen's d: comparison of two methods. PloS one, 6(4), e19070.

Examples

```
nnt_l( type      = "mle",
       treat     = rnorm(1000, 110, 10),
       control   = rnorm(1000, 100, 10),
       cutoff    = 100,
       equal.var = TRUE,
       dist      = "normal",
       decrease  = FALSE )
```

---

nnt_survreg *NNT-KM and NNT-COX calculator*

Description

Calculates Laupacis' type adjusted and marginal NNT(y|x) for survival data. Takes a data-set suitable for a survival analysis, a fixed time point y, and an explanatory variables x, and returns the estimated adjusted NNT(y|x), and the estimated unadjusted and marginal NNT(y). In the Cox-model-based estimators, the baseline hazard is estimated by the Breslow's nonparametric MLE. In the unadjusted estimator of NNT(y), the survival probabilities are estimated by the Kaplan-Meier nonparametric MLE.

Usage

```
nnt_survreg(response, status, x, group, adj, time.point, data)
```

Arguments

`response`	vector of the response variable; times of the events/censoring
`status`	column that contains 0/1 indicator, where 1 is failure time, and 0 is censoring time.
`x`	vector of the explanatory variable.
`group`	allocated arm variable where 1 corresponds to the treatment arm, and 0 to the control arm.
`adj`	the x value that the NNT(y|x) need to be adjusted for. The default value is the mean of x.
`time.point`	the fixed time point y for NNT(y|x), and NNT(y)
`data`	analyzed data frame that contains the required variables for the computations.

Value

The estimated unadjusted, marginal and adjusted NNTs with their corresponding 95 percent confidence intervals.

References

Therneau, T. M., & Lumley, T. (2014). Package survival. Survival analysis Published on CRAN, 2, 3.

Kaplan, E. L., & Meier, P. (1958). Nonparametric estimation from incomplete observations. Journal of the American statistical association, 53(282), 457-481.

Cox, D. R., & Oakes, D. (1984). Analysis of survival data (Vol. 21). CRC Press.

Cox, D. R. (1972). Regression models and life-tables. Journal of the Royal Statistical Society: Series B (Methodological), 34(2), 187-202.

Examples

```
data(survreg_data)

nnt_survreg( response = survreg_data$stop,
             status   = survreg_data$status,
                   x  = survreg_data$x.1,
               group  = survreg_data$x,
                  adj = -1,
           time.point = 0.5,
                 data = survreg_data )
```

`nnt_x` *Laupacis' adjusted and marginal NNT calculator in linear and generalized regression models.*

Description

Calculates Laupacis' unadjusted, adjusted and marginal NNT. Takes a data-set suitable for a regression analysis and returns the estimated adjusted NNT(x), the estimated unadjusted, and the estimated marginal NNT given the explanatory variable, and a specified model.

Usage

```
nnt_x(model, response, x, cutoff, base, group, adj, decrease, data)
```

Arguments

`model`	specification of the regression model; anova for the one-way ANOVA model, linreg for the linear regression, and logreg for the logistic regression with the logit link-function.
`response`	vector of the response variable (i.e., the dependent variable).
`x`	vector of the explanatory variable.
`cutoff`	the MCID threshold. This argument is suitable for continuous response variables, namely for ANOVA and linear regression.
`base`	control group of the x variable in the one-way ANOVA model.

`group`	allocated arm variable where 1 corresponds to the treatment arm, and 0 to the control arm. Suitable for linear and logistic regression.
`adj`	value that the NNT need to be adjusted for. The default value is mean of x.
`decrease`	logical TRUE or FALSE. Indicates whether the MCID change is decrease in the response variable
`data`	data frame that contains the required variables for the computations.

Value

The estimated unadjusted, marginal and adjusted NNT with their corresponding 95 percent confidence intervals given a specified model, and adjusted for a specified value of the explanatory variables.

Examples

```
data(anova_data)

### SUCCESS = INCREASE
nnt_x(        model     = "anova",
              response  = anova_data$y,
              x         = anova_data$gr,
              cutoff    = 0,
              base      = 1,
              decrease  = FALSE,
              data      = anova_data)

### SUCCESS = DECREASE
nnt_x(        model     = "anova",
              response  = anova_data$y,
              x         = anova_data$gr,
              cutoff    = 2,
              base      = 4,
              decrease  = TRUE,
              data      = anova_data)

data(linreg_data)

### SUCCESS = INCREASE
nnt_x(        model    = "linreg",
              response = linreg_data$y,
              x        = linreg_data$x_var,
              cutoff   = 3,
              group    = linreg_data$gr,
              decrease = FALSE,
              adj      = 2.6,
              data     = linreg_data )

### SUCCESS = DECREASE
inv_data = data.frame( y = linreg_data$y, x_var = linreg_data$x_var, gr = 1 - linreg_data$gr )

nnt_x(  model    = "linreg",
       response  = inv_data$y,
        x        = inv_data$x_var,
        cutoff   = 3,
        group    = inv_data$gr,
```

```
        decrease = TRUE,
        adj      = 2.6,
        data     = inv_data )

data(logreg_data)

nnt_x( model    = "logreg",
       response = logreg_data$y,
       x        = logreg_data$x_var,
       group    = logreg_data$gr,
       adj      = 1.5,
       data     = logreg_data )
```

`survreg_data` *Data sample for the survival analysis example*

Description

Data sample for the survival analysis example

Format

A data frame with 1000 rows, and 4 columns. Suitable for the Cox regression model. The file was generated using the `simple.surv.sim` function from the `survsim` package.

status is the status of each subject, where 1 corresponds to event, and 0 to censoring

stop is the time of the event/censoring

x is the allocated arm of each subject where 1 corresponds to treatment, and 0 to control

x.1 is continuous explanatory variable

Author(s)

V. Vancak

References

Moriña, D., Navarro, A., & Soler, M. D. M. (2018). Package `survsim`.

Examples

```
data(survreg_data)
```

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