Package ‘tidycmprsk’

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`add_cuminc` | *Additional Functions for tbl_cuminc()*

**Description**

- `add_p()` Add column with p-value comparing incidence across stratum
- `add_n()` Add column with the total N, or N within stratum
- `add_nevent()` Add column with the total number of events, or number of events within stratum
- `inline_text()` Report statistics from a `tbl_cuminc()` table inline

**Usage**

```r
## S3 method for class 'tbl_cuminc'
add_p(x, pvalue_fun = gtsummary::style_pvalue, ...)

## S3 method for class 'tbl_cuminc'
add_n(x, location = NULL, ...)

## S3 method for class 'tbl_cuminc'
add_nevent(x, location = NULL, ...)

## S3 method for class 'tbl_cuminc'
inline_text(x, time = NULL, column = NULL, outcome = NULL, level = NULL, ...)
```

**Arguments**

- `x` object of class `tbl_cuminc`
- `pvalue_fun` function to style/format p-values. Default is `gtsummary::style_pvalue`
- `...` These dots are for future extensions and must be empty.
location  location to place Ns. When "label" total Ns are placed on each variable’s label row. When "level" level counts are placed on the variable level for categorical variables, and total N on the variable’s label row for continuous.

time  time of statistic to report

column  column name of the statistic to report

outcome  string indicating the outcome to select from. If NULL, the first outcome is used.

level  if estimates are stratified, level of the stratum to report

Example Output

p-values

The p-values reported in cuminc(), glance.tidycuminc() and add_p.tbl_cuminc() are Gray’s test as described in Gray RJ (1988) *A class of K-sample tests for comparing the cumulative incidence of a competing risk*, Annals of Statistics, 16:1141-1154.

See Also

Other tbl_cuminc tools: tbl_cuminc()

Examples

```r
# Example 1 ----------------------------------
add_cuminc_ex1 <-
cuminc(Surv(ttdeath, death_cr) ~ 1, trial) %>%
tbl_cuminc(times = c(12, 24), label_header = "**Month {time}**") %>%
add_nevent() %>%
add_n()

# Example 2 ----------------------------------
add_cuminc_ex2 <-
cuminc(Surv(ttdeath, death_cr) ~ trt, trial) %>%
tbl_cuminc(times = c(12, 24),
  outcomes = c("death from cancer", "death other causes"),
  label_header = "**Month (time)**") %>%
add_p() %>%
add_nevent(location = c("label", "level")) %>%
add_n(location = c("label", "level"))

# inline_text() ------------------------------
inline_text(add_cuminc_ex2, time = 12, level = "Drug A")
inline_text(add_cuminc_ex2, column = p.value)
```
Functions for tidycrr objects

Description

Functions for tidycrr objects

Usage

## S3 method for class 'tidycrr'
coef(object, ...)

## S3 method for class 'tidycrr'
vcov(object, ...)

## S3 method for class 'tidycrr'
model.matrix(object, ...)

## S3 method for class 'tidycrr'
model.frame(formula, ...)

## S3 method for class 'tidycrr'
terms(x, ...)

Arguments

... not used
formula a formula
x, object a tidycrr object

Value

coeff vector, model matrix, model frame, terms object

Examples

mod <- crr(Surv(ttdeath, death_cr) ~ age + grade, trial)
coef(mod)
model.matrix(mod) %>% head()
model.frame(mod) %>% head()
terms(mod)
base_methods_cuminc  Functions for tidycuminc objects

Description

Functions for tidycuminc objects

Usage

## S3 method for class 'tidycuminc'
model.frame(formula, ...)

## S3 method for class 'tidycuminc'
model.matrix(object, ...)

Arguments

formula  a formula
...
object  a tidycuminc object

Value

a model frame, or model matrix

Examples

fit <- cuminc(Surv(ttdeath, death_cr) ~ trt, trial)
model.matrix(fit) %>% head()
model.frame(fit) %>% head()

broom_methods_crr  Broom methods for tidycrr objects

Description

Broom methods for tidycrr objects
## Usage

```r
## S3 method for class 'tidycrr'
tidy(x, exponentiate = FALSE, conf.int = FALSE, conf.level = x$conf.level, ...)
```

```r
## S3 method for class 'tidycrr'
glance(x, ...)
```

```r
## S3 method for class 'tidycrr'
augment(x, times = NULL, probs = NULL, newdata = NULL, ...)
```

### Arguments

- **x**: a tidycrr object
- **exponentiate**: Logical indicating whether or not to exponentiate the coefficient estimates. Defaults to `FALSE`.
- **conf.int**: Logical indicating whether or not to include a confidence interval in the tidied output. Defaults to `FALSE`.
- **conf.level**: Level of the confidence interval. Default matches that in `crr(conf.level=)` (typically, 0.95)
- **times**: not used
- **probs**: Numeric vector of quantiles to obtain estimates at
- **newdata**: A `base::data.frame()` or `tibble::tibble()` containing all the original predictors used to create x. Defaults to `NULL`.

### Value

- a tibble

### See Also

- Other `crr()` functions: `crr()`, `predict.tidycrr()`

### Examples

```r
crr <- crr(Surv(ttdeath, death_cr) ~ age + grade, trial)
tidy(crr)
glance(crr)
augment(crr, times = 12)
```
Description

Broom methods for tidy cuminc objects

Usage

## S3 method for class 'tidycuminc'
tidy(x, times = NULL, conf.int = TRUE, conf.level = x$conf.level, ...)

## S3 method for class 'tidycuminc'
glance(x, ...)

Arguments

x
  object of class 'tidycuminc'

times
  Numeric vector of times to obtain risk estimates at

conf.int
  Logical indicating whether or not to include a confidence interval in the tidied output. Defaults to FALSE.

conf.level
  Level of the confidence interval. Default matches that in cuminc(conf.level=) (typically, 0.95)

...
  not used

Value

a tibble

tidy() data frame

The returned tidy() data frame returns the following columns:

<table>
<thead>
<tr>
<th>Column Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>outcome</td>
<td>Competing Event Outcome</td>
</tr>
<tr>
<td>time</td>
<td>Numeric follow-up time</td>
</tr>
<tr>
<td>estimate</td>
<td>Risk estimate</td>
</tr>
<tr>
<td>std.error</td>
<td>Standard Error</td>
</tr>
<tr>
<td>n.risk</td>
<td>Number at risk at the specified time</td>
</tr>
<tr>
<td>n.event</td>
<td>If the times= argument is missing, then the number of events that occurred at time t. Otherwise, it is the cumulative number of events since the last time listed.</td>
</tr>
<tr>
<td>n.censor</td>
<td>If the times= argument is missing, then the number of censored obs at time t. Otherwise, it is the cumulative number of censored observations since the last time listed.</td>
</tr>
<tr>
<td>cum.event</td>
<td>Cumulative number of events at specified time</td>
</tr>
<tr>
<td>cum.censor</td>
<td>Cumulative number of censored observations at specified time</td>
</tr>
</tbody>
</table>

If tidy(time=) is specified, then n.event and n.censor are the cumulative number of events/censored
in the interval. For example, if tidy(time = c(0, 12, 18)) is passed, n.event and n.censor at 
time = 18 are the cumulative number of events/censored in the interval (12, 18).

**p-values**

The p-values reported in cuminc(), glance.tidycuminc() and add_p.tbl_cuminc() are Gray’s 

**Confidence intervals**

The confidence intervals for cumulative incidence estimates use the recommended method in *Competing Risks: A Practical Perspective* by Melania Pintilie.

\[
\exp(z*se/(x*log(x)))
\]

where \(x\) is the cumulative incidence estimate, \(se\) is the standard error estimate, and \(z\) is the z-score associated with the confidence level of the interval, e.g. \(z = 1.96\) for a 95% CI.

**See Also**

Other cuminc() functions: cuminc()

**Examples**

```r
cuminc <- cuminc(Surv(ttdeath, death_cr) ~ trt, trial)
tidy(cuminc)
glance(cuminc)

# restructure glance to one line per outcome

# restructure glance to one line per outcome
glance(cuminc) %>%
  tidyr::pivot_longer(
    everything(),
    names_to = c(".value", "outcome_id"),
    names_pattern = "(.*)_(.*)"
  )
```

---

**crr**

*Competing Risks Regression*

**Description**

Competing Risks Regression
cuminc

Usage

## S3 method for class 'formula'
crr(formula, data, failcode = NULL, conf.level = 0.95, ...)

crr(x, ...)

## Default S3 method:
crr(x, ...)

Arguments

formula formula with `Surv()` on LHS and covariates on RHS. The event status variable must be a factor, with the first level indicating 'censor' and subsequent levels the competing risks. The `Surv(time2=)` argument cannot be used.
data data frame
failcode Indicates event of interest. If `failcode=` is `NULL`, the first competing event will be used as the event of interest. Default is `NULL`.
conf.level confidence level. Default is 0.95.
... passed to methods
x input object

Value
tidyCrr object

See Also

Other crr() functions: `broom_methods_crr, predict.tidyCrr()`

Examples

crr(Surv(ttdeath, death_cr) ~ age + grade, trial)

---

cuminc Competing Risks Cumulative Incidence

Description

Competing Risks Cumulative Incidence
Usage

## S3 method for class 'formula'
cuminc(formula, data, strata, rho = 0, conf.level = 0.95, ...)
cuminc(x, ...)

## Default S3 method:
cuminc(x, ...)

Arguments

formula formula with Surv() on LHS and covariates on RHS. The event status variable must be a factor, with the first level indicating 'censor' and subsequent levels the competing risks. The Surv(time2=) argument cannot be used.
data data frame
strata stratification variable. Has no effect on estimates. Tests will be stratified on this variable. (all data in 1 stratum, if missing)
rho Power of the weight function used in the tests.
conf.level confidence level. Default is 0.95.
... passed to methods
x input object

Value
tidy cumulative object

Confidence intervals

The confidence intervals for cumulative incidence estimates use the recommended method in Competing Risks: A Practical Perspective by Melania Pintilie.

\[ x \exp(z\times \text{se}/(x\times \log(x))) \]

where \( x \) is the cumulative incidence estimate, \( se \) is the standard error estimate, and \( z \) is the z-score associated with the confidence level of the interval, e.g. \( z = 1.96 \) for a 95\% CI.

p-values

The p-values reported in cuminc(), glance.tidycuminc() and add_p.tbl_cuminc() are Gray’s test as described in Gray RJ (1988) *A class of K-sample tests for comparing the cumulative incidence of a competing risk*, Annals of Statistics, 16:1141-1154.

See Also

Other cuminc() functions: broom_methods_cuminc
Examples

# calculate risk for entire cohort ----------
cuminc(Surv(ttdeath, death_cr) ~ 1, trial)

# calculate risk by treatment group ----------
cuminc(Surv(ttdeath, death_cr) ~ trt, trial)

predict.tidycrr

Estimate subdistribution functions for crr objects

Description

Estimate subdistribution functions for crr objects

Usage

## S3 method for class 'tidycrr'
predict(object, times = NULL, probs = NULL, newdata = NULL, ...)

Arguments

object a tidycrr object
times Numeric vector of times to obtain risk estimates at
probs Numeric vector of quantiles to obtain estimates at
newdata A base::data.frame() or tibble::tibble() containing all the original predictors used to create x. Defaults to NULL.
... not used

Value

named list of prediction estimates

See Also

Other crr() functions: broom_methods_crr, crr()

Examples

crr(Surv(ttdeath, death_cr) ~ age, trial) %>%
predict(times = 12, newdata = trial[1:10, 3])
### tbl_cuminc

**Tabular Summary of Cumulative Incidence**

#### Description

Tabular Summary of Cumulative Incidence

#### Usage

```r
## S3 method for class 'tidycuminc'

tbl_cuminc(
  x,
  times = NULL,
  outcomes = NULL,
  statistic = "{estimate}% (\{conf.low\}%, \{conf.high\}%)",
  label = NULL,
  label_header = "**Time \{time\}**",
  estimate_fun = NULL,
  conf.level = x$conf.level,
  missing = NULL,
  ...
)

tbl_cuminc(x, ...)
```

#### Arguments

- `x`: a 'tidycuminc' object created with `cuminc()`
- `times`: Numeric vector of times to obtain risk estimates at
- `outcomes`: character vector of outcomes to include. Default is to include the first outcome.
- `statistic`: string of statistic to report. Default is "{estimate}% (\{conf.low\}%, \{conf.high\}%)"
- `label`: string indicating the variable label
- `label_header`: string for the header labels; uses glue syntax. Default is "**Time \{time\}**"
- `estimate_fun`: function that styles and formats the statistics. Default is `gtsummary::style_sigfig(.x, scale = 100)`
- `conf.level`: Level of the confidence interval. Default matches that in `cuminc(conf.level=)` (typically, 0.95)
- `missing`: string to replace missing values with. Default is an em-dash, "\U2014"
- `...`: not used

#### Example Output
See Also

Other tbl_cuminc tools: `add_cuminc`

Examples

```r
# Example 1 ----------------------------------
trial <- cuminc(Surv(ttdeath, death_cr) ~ 1, trial) %>%
  tbl_cuminc(times = c(12, 24), label_header = "**Month (time)**")

# Example 2 ----------------------------------
trial <- cuminc(Surv(ttdeath, death_cr) ~ trt, trial) %>%
  tbl_cuminc(times = c(12, 24),
             outcomes = c("death from cancer", "death other causes"),
             label_header = "**Month (time)**")
```

**trial**

Results from a simulated study of two chemotherapy agents

Description

A dataset containing the baseline characteristics of 200 patients who received Drug A or Drug B. Dataset also contains the outcome of tumor response to the treatment.

Usage

`trial`

Format

A data frame with 200 rows–one row per patient

- **trt**: Chemotherapy Treatment
- **age**: Age
- **marker**: Marker Level (ng/mL)
- **stage**: T Stage
- **grade**: Grade
- **response**: Tumor Response
- **death**: Patient Died
- **death_cr**: Death Status
- **ttdeath**: Months to Death/Censor
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