Package: survexp.fr (via r-universe)

August 24, 2024

Type Package

Title Relative Survival, AER and SMR Based on French Death Rates

Version 1.1

Date 2022-04-19

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Depends R (>= 3.5.0), survival

Imports WriteXLS, stats, graphics

LazyData Yes

Description It computes Relative survival, AER and SMR based on French death rates.

License GPL (>= 2)

RoxygenNote 7.1.2

NeedsCompilation no

Repository CRAN

Date/Publication 2022-04-19 17:30:02 UTC

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survexp.fr-package *Relative survival, AER and SMR based on French death rates*

Description

Relative survival, AER and SMR based on French death rates

Author(s)

Jean-Philippe Jais and Hugo Varet

AER *Absolute Excess Risk (AER)*

Description

Computes the AER, its confidence interval and its associated p-value

Usage

```
AER(
  futime,
  status,
  age,
  sex,
  entry_date,
  PY.stand = 10000,
  ratetable = survexp.fr::survexp.fr,
  alpha = 0.05
)
```

Arguments

futime	follow-up time of the subjects in days
status	0 if censored or 1 if dead at futime
age	age in days
sex	"male" or "female"
entry_date	entry date in the study
PY.stand	value to get the AER for stand person-years
ratetable	a table of event rates, such as survexp.fr or survexp.us
alpha	determines the confidence level (1-alpha) of the confidence interval

Details

The Absolute Excess Risk (AER) is defined as:

$$AER = O - E$$

where O is the observed number of deaths and E is the expected number based on the patients'characteristics (sex, age and entry date in the study). This function uses an additive Poisson model to compute the AER.

Value

A list containing the AER with the corresponding number of person-years (`PY.stand` argument), its confidence interval, its p-value, the observed number of deaths, the expected number of deaths and the observed number of person-years

Author(s)

Jean-Philippe Jais and Hugo Varet

References

N. Breslow and N. Day, Statistical methods in cancer research, Volume II - The design and analysis of cohort studies, World Health Organization, 1987

P. Dickman, A. Sloggett, M. Hills and T. Hakulinen, Regression models for relative survival, Statistics in Medicine, 2004

C. Elie, Y. De Rycke, J.-P. Jais and P. Landais, Appraising relative and excess mortality in population-based studies of chronic diseases such as end-stage renal disease, Clinical Epidemiology, 2011

Examples

```
attach(data.example)
AER(futime, status, age, sex, entry_date)
```

`data.example` *Example data to illustrate the functions*

Description

Example data to illustrate the functions

Format

A data frame with 200 observations on the following 5 variables.

`sex` `"male"` or `"female"`

`age` age in days

`entry_date` entry date in the study

`status` status at follow-up time: 0 if alive, 1 if dead

`futime` follow-up time in days

LR *Log-Rank test between an observed and an expected survival curve*

Description

Log-Rank test between an observed and an expected survival curve

Usage

```
LR(futime, status, age, sex, entry_date, ratetable = survexp.fr::survexp.fr)
```

Arguments

futime	follow-up time of the subjects in days
status	0 if censored or 1 if dead at futime
age	age in days
sex	"male" or "female"
entry_date	entry date in the study
ratetable	a table of event rates, such as survexp.fr or survexp.us

Details

The Log-Rank is calculated as:

$$LR = (O - E)^2/E$$

where O is the observed number of deaths and E is the expected number based on the patients' characteristics (sex, age and entry date in the study). It follows a Khi-2 distribution with one degree of freedom, which allows to compute its p-value.

Value

A list containing the observed number of deaths, the expected number of deaths, the Log-Rank statistic and its p-value

Author(s)

Hugo Varet

References

R. Peto and J. Peto, Asymptotically Efficient Rank Invariant Test Procedures, Journal of the Royal Statistical Society, 1972

Examples

```
attach(data.example)
LR(futime, status, age, sex, entry_date)
```

SMR *Standardized Mortality Ratio (SMR)*

Description

Computes the SMR, its confidence interval and its associated p-value

Usage

```
SMR(
  futime,
  status,
  age,
  sex,
  entry_date,
  ratetable = survexp.fr::survexp.fr,
  alpha = 0.05
)
```

Arguments

`futime`	follow-up time of the subjects in days
`status`	0 if censored or 1 if dead at `futime`
`age`	age in days
`sex`	`"male"` or `"female"`
`entry_date`	entry date in the study
`ratetable`	a table of event rates, such as `survexp.fr` or `survexp.us`
`alpha`	determines the confidence level (1-`alpha`) of the confidence interval

Details

The SMR is estimated using two different methods.

The classic method is:

$$SMR = O/E$$

where O is the observed number of deaths and E is the expected number based on the patients' characteristics (sex, age and entry date in the study).

The SMR is also estimated performing a Poisson model where O is the dependant variable and E is an offset.

Value

A list containing the observed number of deaths, the expected number of deaths, the "classic" SMR (with its confidence interval and its p-value) and the SMR calculated by a Poisson model (with its confidence interval and its p-value)

Author(s)

Jean-Philippe Jais and Hugo Varet

References

N. Breslow and N. Day, Statistical methods in cancer research, Volume II - The design and analysis of cohort studies, World Health Organization, 1987

Examples

```
attach(data.example)
SMR(futime, status, age, sex, entry_date)
```

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survexp.fr *French data for the expected survival and person years functions*

Description

French data for the expected survival and person years functions

Details

Death rates are available from 1977 to 2019 for males and females aged from 0 to 99

Source

https://www.insee.fr/fr/statistiques/fichier/5390366/fm_t68.xlsx

References

Institut National de la Statistique et des Etudes Economiques

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survexp_plot *Observed Kaplan-Meier, expected and relative survival curves*

Description

Displays the observed Kaplan-Meier, expected and relative survival curves

Usage

```
survexp_plot(
  futime,
  status,
  age,
  sex,
  entry_date,
  ratetable = survexp.fr::survexp.fr,
  main = "Observed and expected survival",
  xlab = "Time (years)",
  ylab = "Survival",
  col.km = "black",
  lwd.km = 2,
  lty.km = 1,
  conf.int.km = TRUE,
  col.exp = "blue",
  lwd.exp = 2,
  lty.exp = 1,
  main.rel = "Relative survival",
  ylab.rel = "Relative survival",
  col.rel = "black",
  lwd.rel = 2,
  lty.rel = 1,
  times = seq(0, max(futime, na.rm = TRUE)/365.241, length = 6)[-1],
  alpha = 0.05,
  xscale = 365.241,
  ...
)
```

Arguments

`futime`	follow-up time of the subjects in days
`status`	0 if censored or 1 if dead at `futime`
`age`	age in days
`sex`	`"male"` or `"female"`
`entry_date`	entry date in the study
`ratetable`	a table of event rates, such as `survexp.fr` or `survexp.us`
`main`	main title of the Kaplan-Meier and expected survivals plot
`xlab`	x-label of the plot
`ylab`	y-label of the plot
`col.km`	color of the observed survival curve
`lwd.km`	line width of the observed survival curve
`lty.km`	line type of the observed survival curve
`conf.int.km`	`TRUE` to display the confidence interval of the observed survival

col.exp	color of the expected survival curve
lwd.exp	line width of the expected survival curve
lty.exp	line type of the expected survival curve
main.rel	main title of the relative survival plot
ylab.rel	y-label of the relative survival plot
col.rel	color of the relative survival curve
lwd.rel	line width of the relative survival curve
lty.rel	line type of the relative survival curve
times	times to draw the confidence intervals of the relative survival
alpha	determines the confidence level (1-alpha) of the confidence intervals for the relative survival
xscale	see the xscale argument in plot.survfit
...	other arguments to be passed in plot.survfit

Details

This function displays the observed and expected survivals, and the relative survival which is defined as:

$$r(t) = exp(-exp(\beta) \times t)$$

where $exp(\beta)$ is the excess risk by time unit estimated by an additive Poisson model.

Value

A matrix containing the values of relative survivals and their confidence intervals for each time of times

Author(s)

Hugo Varet

References

M. Pohar and J. Stare, Making relative survival analysis relatively easy, Computers in Biology and Medicine, 2007

M. Pohar and J. Stare, Relative survival analysis in R, Computers Methods and Programs in Biomedicine, 2006

Examples

```
attach(data.example)
survexp_plot(futime, status, age, sex, entry_date)
```

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