

Package ‘simPreg’

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Title Simulate Pregnancy Data with Time-Varying Exposure

Version 0.1.0

Description Simulates pregnancy data in a time-to-event framework, allowing a time-varying exposure. Default parameters for gestational length and exposure timing are provided but may also be user-specified. Users can further specify hazard ratios for spontaneous and non-spontaneous live birth and late miscarriage/stillbirth following exposure.

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Encoding UTF-8

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haz.exposure.default *Default daily hazard of exposure*

Description

Approximate daily hazard rates of exposure by gestational day, from day 1 through day 301 of gestation.

Usage

haz.exposure.default

Format

A numeric vector of length 301. Element *i* corresponds to gestational day *i*.

haz.late.miscarriage.stillbirth.default
Default daily hazard of late miscarriage/stillbirth

Description

Approximate daily hazard rates of late miscarriage/stillbirth by gestational day, from day 1 through day 301 of gestation. Hazard rates are set to 0 for gestational days 1 through 83 because the data used to specify the default hazard do not include early miscarriage. Positive hazard rates begin at gestational day 84.

Usage

haz.late.miscarriage.stillbirth.default

Format

A numeric vector of length 301. Element *i* corresponds to gestational day *i*.

`haz.nonspont.livebirth.default`*Default daily hazard of non-spontaneous live birth*

Description

Approximate daily hazard rates of non-spontaneous live birth by gestational day, from day 1 through day 301 of gestation. Hazard rates are set to 0 for gestational days 1 through 153, reflecting that 22 weeks of gestation is approximately the lower gestational-age limit at which active neonatal care is considered in Norwegian clinical practice. Positive hazard rates begin at gestational day 154.

Usage`haz.nonspont.livebirth.default`**Format**

A numeric vector of length 301. Element *i* corresponds to gestational day *i*.

`haz.spont.livebirth.default`*Default daily hazard of spontaneous live birth*

Description

Approximate daily hazard rates of spontaneous live birth by gestational day, from day 1 through day 301 of gestation. Hazard rates are set to 0 for gestational days 1 through 153, reflecting that 22 weeks of gestation is approximately the lower gestational-age limit at which active neonatal care is considered in Norwegian clinical practice. Positive hazard rates begin at gestational day 154.

Usage`haz.spont.livebirth.default`**Format**

A numeric vector of length 301. Element *i* corresponds to gestational day *i*.

simPregProp

*Simulate distributions of pregnancy outcomes and gestational duration***Description**

Calculates proportions of pregnancies experiencing spontaneous live birth, non-spontaneous live birth, or late miscarriage/stillbirth by gestational age and timing of exposure, given daily hazard rates and hazard ratios.

Usage

```
simPregProp(
  haz.spont.livebirth = haz.spont.livebirth.default,
  haz.nonspont.livebirth = haz.nonspont.livebirth.default,
  haz.late.miscarriage.stillbirth = haz.late.miscarriage.stillbirth.default,
  haz.exposure = haz.exposure.default,
  hr.spont.livebirth = NULL,
  hr.nonspont.livebirth = NULL,
  hr.late.miscarriage.stillbirth = NULL
)
```

Arguments

haz.spont.livebirth
 Numeric vector of daily hazards of spontaneous live birth. Defaults to the package-provided `haz.spont.livebirth.default` vector of length 301.

haz.nonspont.livebirth
 Numeric vector of daily hazards of non-spontaneous live birth. Defaults to the package-provided `haz.nonspont.livebirth.default` vector of length 301.

haz.late.miscarriage.stillbirth
 Numeric vector of daily hazards of late miscarriage/stillbirth. Defaults to the package-provided `haz.late.miscarriage.stillbirth.default` vector of length 301.

haz.exposure
 Numeric vector of daily hazards of exposure. Defaults to the package-provided `haz.exposure.default` vector of length 301.

hr.spont.livebirth
 Numeric vector of hazard ratios for spontaneous live birth following exposure. Must have the same length as the hazard vectors. Defaults to `NULL`, corresponding to no effect of exposure on the hazard.

hr.nonspont.livebirth
 Numeric vector of hazard ratios for non-spontaneous live birth following exposure. Must have the same length as the hazard vectors. Defaults to `NULL`, corresponding to no effect of exposure on the hazard.

`hr.late.miscarriage.stillbirth`

Numeric vector of hazard ratios for late miscarriage/stillbirth following exposure. Must have the same length as the hazard vectors. Defaults to NULL, corresponding to no effect of exposure on the hazard.

Value

A data frame with class `preg.prop` containing the following columns:

GA Gestational age in days.

ExpGA Gestational age at exposure. NA indicates no exposure.

Outcome Pregnancy outcome: `spontaneous_live_birth`, `nonspontaneous_live_birth`, or `late_miscarriage_stillbirth`.

Prop Proportion of pregnancies corresponding to the gestational age, exposure timing, and outcome combination.

Examples

```
# Use the package-provided default hazard vectors
data.prop <- simPregProp()
head(data.prop)

# Illustrate an exposure associated with increased risk of preterm live birth
hr <- rep(1, 301)
hr[1:258] <- 2
data.prop <- simPregProp(
  hr.spont.livebirth = hr,
  hr.nonspont.livebirth = hr
)
```

simPregSamp

Sample pregnancies from simulated distributions

Description

Generates a sample of pregnancy outcomes from the proportions produced by `simPregProp()`.

Usage

```
simPregSamp(df, n, expand = FALSE)
```

Arguments

`df` A data frame with class `preg.prop`, such as the output from `simPregProp()`.

`n` Number of pregnancies to sample. Must be a positive integer.

`expand` Logical value indicating whether to expand the sampled counts into one row per pregnancy. Defaults to FALSE.

Value

A data frame with class `data.frame` containing the sampled pregnancy outcomes and their frequencies. The returned data frame retains the columns of `df` and includes an additional `Freq` column containing the number of sampled pregnancies for each gestational age, exposure timing, and outcome combination.

If `expand = TRUE`, rows are expanded so that each row represents one pregnancy, and `Freq` is set to 1.

Examples

```
# Generate pregnancy outcome proportions
data.prop <- simPregProp()

# Sample 1000 pregnancies
data.samp <- simPregSamp(data.prop, 1000)
head(data.samp)

# Expand to one row per pregnancy
data.samp <- simPregSamp(data.prop, 1000, expand = TRUE)
head(data.samp)
```

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