

Package ‘LYG’

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Title LYG

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Depends R ($\geq 3.5.0$), survey, data.table, matrixStats

Description Estimating life-years gained from prevention services.

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NeedsCompilation no

R topics documented:

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LYG-package	<i>Life Years Gained</i>
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Description

To estimate individualized life-years gained from prevention services.

Details

The current bedrock of precision prevention is selecting high-risk individuals for screening or other prevention services. However, those at highest risk do not necessarily have highest benefit from prevention services, if those at highest risk tend to be elderly or have comorbidities that substantially reduce their life-years gained from the service. This package computes individuals' expected gain in life-years from prevention services which can be used as an alternative to using individualized risk as the selection criterion. The expected life-years gained are estimated from combining trial and survey data.

Author(s)

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References

Wang, L., Katki, H.A., Chaturvedi, A.K., Cheung, L.C. (2023). Moving from individualized risk-based prevention to benefit-based prevention: Estimating individualized life-years gained from prevention services as a basis for eligibility.

data	<i>Data for examples</i>
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Description

Data for [lyg](#) examples.

Details

Data frames for the trial data (samp.t) and for the survey data (samp.s).

See Also

[lyg](#)

Examples

```
data(data, package="LYG")

# Display a few rows of the data sets
samp.s[1:5, ]
samp.t[1:5, ]
```

lyg	<i>Life Years Gained</i>
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Description

Estimates individualized life years gained from prevention services

Usage

```
lyg(fit.survey, fit2.survey, fit.trial=NULL, fit2.trial=NULL,
    time.eff.end=NULL, time.cutoff=NULL, treatment=NULL,
    x0=NULL, calc.var=FALSE, save.memory=FALSE)
```

Arguments

<code>fit.survey</code>	Return object from <code>coxph</code> or <code>svycoxph</code> for the major event of interest in the data from a survey or an observational study (see details). NOTE: If this object is returned from <code>coxph</code> , then the data frame used for the fit must still be in memory.
<code>fit2.survey</code>	Return object from <code>coxph</code> or <code>svycoxph</code> for the competing event in the data from a survey or an observational study (see details). NOTE: If this object is returned from <code>coxph</code> , then the data frame used for the fit must still be in memory.
<code>fit.trial</code>	NULL or return object from <code>coxph</code> or <code>svycoxph</code> for the major event of interest in the trial data (see details). NOTE: If this object is returned from <code>coxph</code> , then the data frame used for the fit must still be in memory.
<code>fit2.trial</code>	NULL or return object from <code>coxph</code> or <code>svycoxph</code> for the competing event in the trial data (see details). NOTE: If this object is returned from <code>coxph</code> , then the data frame used for the fit must still be in memory.
<code>time.eff.end</code>	The time when the intervention effect on reducing the risk of the major event becomes zero. The default is the maximum event time.
<code>time.cutoff</code>	The cutoff time for life years gained estimation. The default is the maximum event time.
<code>treatment</code>	If the trial cox regression model(s) of treatment is not provided, i.e., <code>fit.trial=NULL</code> , and <code>fit2.trial=NULL</code> , <code>treatment</code> should be provided by the user. <code>treatment</code> should be a numeric vector of length 2 for the effects of the treatment (i.e., log-HR) on the major event of interest and on the competing event, which is obtained from external data sources besides the survey/observational data, when the trial data is not available. The default for <code>treatment</code> is NULL when <code>fit.trial</code> is provided.
<code>x0</code>	Matrix or data frame of covariate values to compute estimates for. This object must have column names as the names of the parameter estimates in <code>fit.survey</code> . The default is the matrix formed by merging together <code>model.matrix(fit.survey)</code> and <code>model.matrix(fit2.survey)</code> .
<code>calc.var</code>	TRUE or FALSE to compute variance estimates. The default is FALSE.
<code>save.memory</code>	TRUE or FALSE to save memory when the estimates are computed. Setting this option to TRUE will cause the program to run slower but save a substantial amount of memory. See details. The default is FALSE.

Details

See the manuscript for complete details of the methods.

The same data must be used for the fits `fit.survey` and `fit2.survey`. Likewise, the same data must be used for the fits `fit.trial` and `fit2.trial`. Also, `fit.trial` and `fit2.trial` must be fit with only a single covariate which is a binary treatment variable.

When `save.memory = TRUE`, the program will loop over the distinct covariate profiles in the data `x0` in order to reduce the memory needed. One way to make the program run faster when `save.memory = TRUE`, is to use categorical covariates in `fit.survey`.

Value

A list containing the estimated life years gained and their variances.

Examples

```

data(data, package="LYG")

x0 <- data.frame(x1 = quantile(samp.s$x1, prob=c(.10, .25, .5, .75, .90)),
                x2 = quantile(samp.s$x2, prob=c(.10, .25, .5, .75, .90)))
names(x0) # should match with the names of covariates in model cox_s.d1 and cox_s.d2.

# Example 1 the log-HR of the treatment is estimated from a random trial
# Fit Cox regression models for the outcome and the treatment to the trial data
cox_t.d1 <- coxph(Surv(t_t, d1_t) ~ y, data=samp.t, robust=TRUE, ties="breslow")
cox_t.d2 <- coxph(Surv(t_t, d2_t) ~ y, data=samp.t, robust=TRUE, ties="breslow")
# Estimate log-HR for other predictors using a observational study.
cox_s.d1 <- coxph(Surv(t_s, d1_s) ~ x1, data = samp.s, robust=TRUE, ties = "breslow")
cox_s.d2 <- coxph(Surv(t_s, d2_s) ~ x1 + x2, data = samp.s, robust=TRUE, ties = "breslow")

ret <- lyg(fit.survey = cox_s.d1, fit2.survey = cox_s.d2,
          fit.trial = cox_t.d1, fit2.trial=cox_t.d2, x0 = x0, save.memory=F)

# Example 2 the log-HR of the treatment is obtained from external data source. There is no trial data

ret <- lyg(fit.survey = cox_s.d1, fit2.survey = cox_s.d2, x0 = x0,
          treatment=c(-0.8846782, -0.006756576), save.memory=F)

# Example 3 the log-HR of the treatment is estimated from the observational study
cox_s.d1 <- coxph(Surv(t_s, d1_s) ~ x1 + y, data = samp.s, robust=TRUE, ties = "breslow")
cox_s.d2 <- coxph(Surv(t_s, d2_s) ~ x1 + x2, data = samp.s, robust=TRUE, ties = "breslow")

ret <- lyg(fit.survey = cox_s.d1, fit2.survey = cox_s.d2, x0 = x0, treatment="y", save.memory=F)

# Example 4
# Fit Cox regression models for the outcome and other predictors to the observational study with a
# complex sample design
ds.s <- svydesign(ids=~PSU, strata = ~strata, weights=~wt,
                data=samp.s, nest = TRUE)
svycox_s.d1 <- svycoxph(Surv(t_s, d1_s) ~ x1, ds.s)
svycox_s.d2 <- svycoxph(Surv(t_s, d2_s) ~ x1 + x2, ds.s)

ret <- lyg(fit.survey = svycox_s.d1, fit2.survey = svycox_s.d2,
          fit.trial = cox_t.d1, fit2.trial=cox_t.d2, x0 = x0, save.memory=F)

```

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