

# Package ‘wtcrsk’

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**Type** Package

**Title** Competing risks regression models with covariate-adjusted censoring weight

**Version** 1.3

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**Description** Estimation and regression modeling of subdistribution functions for competing risks data with adjustment for covariate-dependent censoring, as described in He et al. (2013).

**License** GPL (>= 2)

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## R topics documented:

wtcrsk-package . . . . .	2
Cens . . . . .	2
cr.wt . . . . .	3
cr.wt.COX . . . . .	5
cr.wt.COX.str . . . . .	6
cr.wt.KM . . . . .	7
cr.wt.KM.str . . . . .	8
Crsk . . . . .	9
plot.crrwt.pred . . . . .	9
predict.crrwt . . . . .	10
print.crrwt . . . . .	11
summary.crrwt . . . . .	11

<b>Index</b>	<b>13</b>
--------------	-----------

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wcrsk-package	<i>Competing risks regression models with covariate-adjusted censoring weight</i>
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### Description

Estimation and regression modeling of subdistribution functions for competing risks data with adjustment for covariate-dependent censoring, as described in He et al. (2013).

### Details

Package:	wcrsk
Type:	Package
Version:	1.3
Date:	2014-05-01
License:	GPL >= 2

### Author(s)

Peng He

Maintainer: Peng He <saturnhp@gmail.com>

### References

He P, Scheike TH and Zhang MJ, A proportional hazards regression model for the subdistribution with covariates adjusted censoring weight for competing risks data, Technical Report #61, Division of Biostatistics, Medical College of Wisconsin, November 2013.

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Cens	<i>Term to specify the censoring distribution.</i>
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### Description

Term to specify the censoring distribution.

### Usage

Cens(t, ic)

**Arguments**

t	A vector of observed times.
ic	A vector of cause indicators.

**Author(s)**

Peng He

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crr.wt *Competing risks regression using different weights.*

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**Description**

Regression modeling of subdistribution functions in competing risks with adjustments for covariate-dependent censoring.

**Usage**

```
crr.wt(formula, data, weight = c("KM", "COX", "KM.Strata", "COX.Strata"), cens.formula,
cause = 1, strata.var, variance = TRUE, var.conservative = FALSE)
```

**Arguments**

formula	a formula object, with the response on the left of a ~ operator, and the terms on the right. The response must be a competing risks object as returned by the Crsk function.
data	a data.frame in which to interpret the variables named in the formula.
weight	type of weight for modeling. "KM" - Kaplan-Meier weight. "COX" - Cox regression adjusted weight. "KM.strata" - stratified Kaplan-Meier adjusted weight. "COX.strata" - stratified COX regression adjusted weight.
cens.formula	a formula object, with the response on the left of a ~ operator, and the terms on the right. The response must be a censoring object in the format of Cens(t, ic). This option is needed only for weight="COX" or weight="COX.strata". See the example for more details
cause	code of cause that is of interest.
strata.var	a categorical stratification variable, needed only for weight="KM.strata" or weight="COX.strata".
variance	Includes variance calculation if TRUE, Skips variance calculation if FALSE.
var.conservative	Includes minor term of variance of beta if FALSE, no minor term for variance of beta if TRUE.

## Details

Fits the subdistribution hazards regression model with adjustments to covariate-dependent censoring as described in He et al. (2013). In addition, this function includes two new weights - "KM.strata" and "COX.strata" for fitting stratified models for the censoring distribution. `strata.var` is an option for users to specify the stratification variable, which has to be categorical with levels. When fitting the regression model using the "COX.strata" weight, the stratification variable cannot be included in your censoring-dependent covariates set. If `cens.formula` was not specified but either "COX" or "COX.strata" weight was used, by default the function uses "z" as the set of covariates for `cens.formula` with necessary removal of the specified stratification variable.

Return values `W.lambda` and `W.beta` are used for prediction calculations. Incomplete observations are removed before the model fitting.

## Value

<code>weight</code>	type of weight used for modeling the censoring distribution.
<code>varname</code>	covariate names.
<code>converge</code>	1 if the iterative algorithm covered. 0 if not.
<code>cens.det</code>	for <code>weight="COX"</code> and <code>weight="COX.strata"</code> only, 0 if there is a problem with the determinant of the information matrix when fitting the censoring distribution, 1 if no problem with determinant.
<code>beta</code>	estimated regression coefficients.
<code>beta_se</code>	estimated standard errors for regression coefficients.
<code>time</code>	a vector of observed failure times
<code>a10</code>	a vector of estimated cumulative baseline subdistribution hazards at observed failure times.
<code>a10se</code>	a vector of estimated standard errors for estimated cumulative baseline subdistribution hazards.
<code>W_lambda</code>	used for prediction function.
<code>W_beta</code>	used for prediction function.
<code>n</code>	total number of observations.
<code>n.missing</code>	number of observations with missing values.

## Author(s)

Peng He

## References

He P, Scheike TH and Zhang MJ, A proportional hazards regression model for the subdistribution with covariates adjusted censoring weight for competing risks data, Technical Report #61, Division of Biostatistics, Medical College of Wisconsin, November 2013.

## See Also

[predict.crrwt](#), [print.crrwt](#), [summary.crrwt](#), [crr.wt.KM](#), [crr.wt.COX](#), [crr.wt.KM.str](#), [crr.wt.COX.str](#)

**Examples**

```

# Simulated data
set.seed(123321)
t <- rexp(200)
ic <- sample(0:2,200,replace=TRUE)
z <- matrix(runif(600),nrow=200)
colnames(z) <- c("z1","z2","z3")
dat <- data.frame(t,ic,z)

# Model fitting with a Kaplan-Meier weight
print(out.KM <- crr.wt(Crsk(t,ic)~z1+z2+z3,data=dat,weight="KM",cause=1))

# Model fitting with a Cox weight
print(out.COX <- crr.wt(Crsk(t,ic)~z1+z2+z3,data=dat,weight="COX",cause=1,Cens(t,ic)~z1+z2))

# Summary information
summary(out.COX)

# Prediction of cumulative incidence probability
newdata <- data.frame(c(.2,.3,.5),c(.9,.1,.6),c(.3,.9,.2))
colnames(newdata) <- c("z1","z2","z3")
pred.COX <- predict(out.COX,z=newdata)

# Plots of prediction
plot(pred.COX)
plot(pred.COX,multiple=1)
plot(pred.COX,multiple=1,se=1)

```

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crr.wt.COX

*Regression modeling of subdistribution function using the Cox weight.*


---

**Description**

Fits a subdistribution hazards regression model using the Cox model adjusted weight. Use predicted censoring probability based on the Cox model for each individual.

**Usage**

```
crr.wt.COX(t, ic, z, zc, variance, var.conservative)
```

**Arguments**

t	a vector of observed times.
ic	a vector of cause indicators.
z	a matrix of covariates for fitting the model.
zc	a matrix of associated covariates for fitting the censoring distribution.
variance	Includes variance calculation if TRUE, Skips variance calculation if FALSE.

var.conservative

Includes minor term of variance of beta if FALSE, no minor term for variance of beta if TRUE.

### Details

More details are given in the reference.

### Value

a "crrwt" class object.

### Author(s)

Peng He

### References

He P, Scheike TH and Zhang MJ, A proportional hazards regression model for the subdistribution with covariates adjusted censoring weight for competing risks data, Technical Report #61, Division of Biostatistics, Medical College of Wisconsin, November 2013.

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crr.wt.COX.str

*Regression modeling of subdistribution functions using the stratified Cox weight.*

---

### Description

Fits a subdistribution hazards regression model using the stratified Cox model adjusted weight. Use predicted censoring probability based on the stratified Cox model for each individual.

### Usage

```
crr.wt.COX.str(t, ic, z, zc, strata.var, variance, var.conservative)
```

### Arguments

t	a vector of observed times.
ic	a vector of cause indicators.
z	a matrix of covariates for fitting the model.
zc	a matrix of covariates for fitting the censoring distribution.
strata.var	a vector contains information about strata membership.
variance	Includes variance calculation if TRUE, Skips variance calculation if FALSE.
var.conservative	Includes minor term of variance of beta if FALSE, no minor term for variance of beta if TRUE.

**Details**

Same estimating procedure with a different weight.

**Value**

a "crrwt" class object.

**Author(s)**

Peng He

---

crr.wt.KM	<i>Regression modeling of subdistribution functions using Kaplan-Meier weight.</i>
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**Description**

Fits a subdistribution hazards regression model using the Kaplan-Meier weight. This is the same model as Fine and Gray (1999).

**Usage**

```
crr.wt.KM(t, ic, z, variance, var.conservative)
```

**Arguments**

t	a vector of observed times.
ic	a vector of cause indicators.
z	a matrix of covariates for fitting the model.
variance	Includes variance calculation if TRUE, Skips variance calculation if FALSE.
var.conservative	Includes minor term of variance of beta if FALSE, no minor term for variance of beta if TRUE.

**Details**

More details are given in the reference.

**Value**

a "crrwt" class object.

**Author(s)**

Peng He

## References

He P, Scheike TH and Zhang MJ, A proportional hazards regression model for the subdistribution with covariates adjusted censoring weight for competing risks data, Technical Report #61, Division of Biostatistics, Medical College of Wisconsin, November 2013.

Fine JP and Gray RJ (1999), A proportional hazards model for the subdistribution of a competing risk. *Journal of The American Statistical Association* 94, 496-509.

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crr.wt.KM.str	<i>Regression modeling of subdistribution functions using the stratified Kaplan-Meier weight.</i>
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## Description

Fits a subdistribution hazards regression model using the stratified Kaplan-Meier adjusted weight. Use predicted censoring probability based on the stratified Kaplan-Meier estimate for each individual.

## Usage

```
crr.wt.KM.str(t, ic, z, strata.var, variance, var.conservative)
```

## Arguments

t	a vector of observed times.
ic	a vector of cause indicators.
z	a matrix of covariates for fitting the model.
strata.var	a vector contains information about strata membership.
variance	Includes variance calculation if TRUE, Skips variance calculation if FALSE.
var.conservative	Includes minor term of variance of beta if FALSE, no minor term for variance of beta if TRUE.

## Details

Same estimating procedure with a different weight.

## Value

a "crrwt" class object.

## Author(s)

Peng He



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Crsk                      *Create a competing risks object.*

---

**Description**

Combine observed time and cause indicator to be a competing risks object.

**Usage**

```
Crsk(t, ic)
```

**Arguments**

t                      A vector of observed times.  
ic                     A vector of cause indicators.

**Author(s)**

Peng He

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plot.crrwt.pred            *Plot function for a 'crrwt.pred' class object.*

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**Description**

Making plots of cumulative incidence function over time.

**Usage**

```
## S3 method for class 'crrwt.pred'  
plot(x, multiple = 0, se = 0, ...)
```

**Arguments**

x                      a 'crrwt.pred' class object.  
multiple              if multiple = 0, plots are overlaid. If multiple = 1, plots are separated.  
se                     if se = 0, no 95% point-wise confidence interval. If se = 1, a 95% point-wise confidence interval is included. "se" option only works when multiple = 1 (separate plots).  
...                    same as the generic 'plot' function

**Author(s)**

Peng He

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predict.crrwt                      *Compute predictive CIFs for given set of covariates.*

---

### Description

This is a function to calculate prediction of the cumulative incidence function (CIF) as well as its variance at observed failure times given in original data.

### Usage

```
## S3 method for class 'crrwt'  
predict(object, z, ...)
```

### Arguments

object	a 'crrwt' class object obtained from crr.wt function.
z	sets of covariates used for prediction, each row represents a new set of covariates.
...	additional arguments affecting the predictions produced.

### Details

More derivations are given in the reference.

### Value

z	given sets of covariates.
time	observed failure times.
F1	predicted cumulative incidence probabilities at observed failure times.
F1sd	standard errors of predicted cumulative incidence probabilities.

### Author(s)

Peng He

### References

He P, Scheike TH and Zhang MJ, A proportional hazards regression model for the subdistribution with covariates adjusted censoring weight for competing risks data, Technical Report #61, Division of Biostatistics, Medical College of Wisconsin, November 2013.

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print.crrwt	<i>Print function for a "crrwt" class object.</i>
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**Description**

Display major contents of a 'crrwt' class object.

**Usage**

```
## S3 method for class 'crrwt'  
print(x, ...)
```

**Arguments**

x	A 'crrwt' class object obtained from crr.wt function.
...	further arguments passed to or from other methods.

**Details**

Display parameter estimates as well as their standard errors from a fitted regression model.

**Author(s)**

Peng He

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summary.crrwt	<i>Summary function for 'crrwt' class object</i>
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**Description**

Display parameter estimates, standard errors, and results from Wald's tests.

**Usage**

```
## S3 method for class 'crrwt'  
summary(object, ...)
```

**Arguments**

object	An 'crrwt' class object obtained from crr.wt function.
...	additional arguments affecting the summary produced.

**Details**

Results are summarized and structured as a table.

**Author(s)**

Peng He

# Index

## \*Topic **package**

wtcrsk-package, [2](#)

Cens, [2](#)

crr.wt, [3](#)

crr.wt.COX, [4, 5](#)

crr.wt.COX.str, [4, 6](#)

crr.wt.KM, [4, 7](#)

crr.wt.KM.str, [4, 8](#)

Crsk, [9](#)

plot.crrwt.pred, [9](#)

predict.crrwt, [4, 10](#)

print.crrwt, [4, 11](#)

summary.crrwt, [4, 11](#)

wtcrsk (wtcrsk-package), [2](#)

wtcrsk-package, [2](#)