Package ‘adSCCS’

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Type Package

Title Case series analysis for censored, perturbed or curtailed post-event exposures

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Description The adSCCS package fits an adapted version of the self-controlled case series method that produces unbiased estimates when the event of interest censors, curtails or otherwise affects post-event exposures.

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Description

Fits the self-controlled case series method for censored, perturbed or curtailed post-event exposures. Time dependent exposure periods and time dependent events are incorporated using the formulation of Farrington et al. (2008). The self-controlled case series method can be used to study the association between time-varying exposures and adverse health events using data only on cases. One key assumption is that the occurrence of an event does not alter the subsequent exposure history, and hence the subsequent observation period for an individual. This happens if the event or a consequence of the event is death. In other circumstances only the exposure history is censored, if no other exposure can occur after an event or if it is simply not documented. The adSCCS package fits an adapted version of the self-controlled case series method that produces unbiased estimates when the event of interest censors, curtails or otherwise affects post-event exposures.

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The main function, that fits the model is adSCCS. Before this can be used observation period, age groups and risk intervals must be set. The observation period and age groups are set using the function setAgeclass. Risk intervals following exposure are set using the function setRiskclass. Transformation of the data into the correct format for analysis is done automatically by the adSCCS function. This process can also be carried out separately using the function transformData. Approximate variance estimation is included as an option in the adSCCS function. This can be done separately using the function setappVar.

Author(s)

Maintainer: Who to complain to <kuhnertr@rki.de> Ronny Kuhnert and Heather Whitaker

References


See Also

adSCCS, transformData, transformCOX, setAgeclass, setRiskclass
Examples

data(simvaccRR1)  # Load the example data set
## ==> Define exposure periods and age classes:
riskdist<-setRiskclass(c(0,7))
# the first 7 days after the exposure are counted as risk period.
ageclass<-setAgeclass(c(30,41,51,59,67,73,78,88,101,117,129,
                       140,159,178,206,231,257,286,347,421,512,730))
# The event is highly age dependent. For this reason a lot of age
# classes are defined.

# Fit the adjusted SCCS method with variance approxamtion and
# general exposure effect
#adSCCS(simvaccRR1$id,simvaccRR1[,c("v1","v2","v3","v4")],
# simvaccRR1$event,riskdist,ageclass,general=T,apvar=T)

# Fit the adjusted SCCS method without variance approxamtion
# and individual exposure effect
#adSCCS(simvaccRR1$id,simvaccRR1[,c("v1","v2","v3","v4")],
# simvaccRR1$event,riskdist,ageclass,general=F,apvar=F)

adSCCS

| Self-controlled case series method for censored, perturbed or curtailed post-event exposures |

Description

Fits the self-controlled case series method for censored, perturbed or curtailed post-event exposures. Time dependent exposure periods and time dependent events are incorporated using the formulation of Farrington et al. (2008).

Time points are usually given in days of age.

Usage

adSCCS(id,vaccd,event,riskclass,ageclass,general=TRUE,
        apvar=TRUE,unvacc=TRUE,idstart=rep(ageclass$age[[1]],length(id)),
        idend=rep(ageclass$age[[length(ageclass$age)]],length(id)),
        casew=rep(1,length(id)))

Arguments

- **id**: a unique identifier variable for each case
- **vaccd**: a data.frame which contains the time point exposure occurred, or exposure started
- **event**: a vector of event times
- **riskclass**: a list object which defines the exposure period. This is created using the function setRiskclass.
- **ageclass**: a list object which defines the age classes and observation period. This is created using the function setAgeclass.
general logical value: (optional) if TRUE, a single exposure effect will be calculated for all doses, if FALSE a separate exposure effect will be calculated for each dose.

apvar logical value: (optional) if TRUE, the approximated variance will be calculated (this may be slow to calculate), if FALSE only the point estimates will be calculated.

unvacc logical value: (optional) if TRUE, all cases are included, if FALSE only exposed cases are included and the observation period starts with first exposure.

idstart (optional) a vector of time points defining the start of the observation period (only necessary if the start varies between cases). Times given are the 1st day of the observation period.

idend (optional) a vector of time points defining the end of the observation period (only necessary if the end varies between cases). Times given are the day after the end of the observation period.

casew (optional) a vector of case weights (only necessary if the cases are weighted).

Details
Fits the self-controlled case series method for censored, perturbed or curtailed post-event exposures. Time dependent exposure periods and time dependent events are incorporated using the formulation of Farrington and Whitaker.

Value
an object of class "coxph" representing the fit. See coxph.object for details.

Author(s)
Ronny Kuhnert

References

See Also
transformData, setAgeclass, setRiskclass

Examples
```R
data(simvaccRR1) # Load the example data set
##-- ==> Define exposure periods and age classes:
riskdist<-setRiskclass(c(0,7))
# the first 7 days after the exposure are counted as risk period.
ageclass<-setAgeclass(c(30,41,51,59,67,73,78,88,101,
  117,129,140,159,178,206,231,257,286,347,421,512,730))
# The event is highly age dependent. For this reason a lot of age classes are defined.

# Fit the adjusted SCCS method with variance approximation and general exposure effect
```
**setAgeclass**

Define the age classes for the adSCCS method.

**Description**

Set the observation period and age classes. These must be set before using the function adSCCS.

**Usage**

```r
setAgeclass(days)
```

**Arguments**

- `days` is a vector: the first value gives the 1st day of the observation period, the last value gives the day after the last day of the observation period. All other values define the 1st day of a new age group.

**Details**

Set the observation period and age classes, this is a necessary prerequisite to using the adSCCS function. Observation periods must be identical for all individuals. Time points are usually defined in terms of days of age, but can be defined in terms of calendar time, in which case age groups may be replaced with groups for month, season or year for example.

**Author(s)**

Ronny Kuhnert

**See Also**

- adSCCS, transformData, setRiskclass

**Examples**

```r
ageclass<-setAgeclass(c(30,41,51,59,67,73,78,88,
```

# Defines an observation period beginning at age 30 days and # ending at age 729 days, with age groups 30-40, 41-50, 51-58, ...
setappVar

Approximated variance estimation.

Description

Approximated variance estimation for the adjusted SCCS model.

Usage

setappVar(subd, beta, alpha, general = T)

Arguments

- **subd**: a data.frame that contains the formatted data (can be created using transformData)
- **beta**: vector of estimated exposure risk effects
- **alpha**: vector of estimated age effects
- **general**: logical value: if TRUE, the variance of a single exposure effect for all doses will be calculated, otherwise the variance of separate exposure effects for each dose will be calculated.

Details

Approximated variance estimation in the adjusted SCCS model.

Value

returns the covariance matrix

Author(s)

Ronny Kuhnert

References


See Also

adSCCS, transformData, setAgeclass, setRiskclass

Examples

###This function is included in the adSCCS routine.
setRiskclass

Define the exposure periods for the adSCCS method.

Description

Define the exposure periods for the adSCCS method. This is necessary before using the function adSCCS.

Usage

setRiskclass(risk)

Arguments

risk is a vector: first value gives the 1st day of the 1st exposure period, and the last value gives the day after the end of the last exposure period. Multiple exposure periods can be defined, each value gives the 1st day of a new exposure period.

Details

Set the exposure periods. This is a prerequisite to using the adSCCS function. These are defined relative to the time point of exposure, or first exposure that are given in a separate vector (vaced in the adSCCS function).

Value

It is a LIST, use

age Defines the exposure periods.
c1 Defines an identifier for the exposure periods.

Author(s)

Ronny Kuhnert

See Also

adSCCS, transformData, setAgeclass

Examples

riskclass<-setRiskclass(c(0,7,14))
# Sets 2 risk periods 0-6 days after exposure and 7-13 days after exposure
Description
A data set was generated to mirror the vaccination schedule in Germany. The objective was to evaluate the adjusted SCCS method with realistic data. The data include 4 vaccinations generated according the German STIKO recommendation and events generated according the age distribution of unexplained death in childhood and the exposure risk periods. The probability of an event in the risk period is the same as in the control period. The risk period has a length of 7 days and starts on the day of vaccination.

Usage
data(simvaccRR1)

Format
A data frame with 1000 observations on the following 6 variables.

- `id` a numeric vector, individual identifier
- `v1` a numeric vector, 1st vaccination
- `v2` a numeric vector, 2nd vaccination
- `v3` a numeric vector, 3rd vaccination
- `v4` a numeric vector, 4th vaccination
- `event` a numeric vector, event time

Source
Generated by simulation.

Examples
data(simvaccRR1)
## see adSCCS function
transformCOX

Usage

data(simvaccRR5)

Format

A data frame with 1000 observations on the following 6 variables.

- id: a numeric vector, individual identifier
- v1: a numeric vector, 1st vaccination
- v2: a numeric vector, 2nd vaccination
- v3: a numeric vector, 3rd vaccination
- v4: a numeric vector, 4th vaccination
- event: a numeric vector, event times

Source

Generated by simulation.

Examples

data(simvaccRR5)
### see adSCCS function

---

transformCOX  Formatting of exposure data

Description

Expands data into a suitable format to calculate the time-dependent proportional hazards model (Cox regression).

Usage

transformCOX(id, vaccd, event, riskclass)

Arguments

- id: vector; a unique individual identifier.
- vaccd: a data.frame which contains the time points of exposure.
- event: vector of event times.
- riskclass: a list object which defines the exposure period. Created using setRiskclass.

Details

This function formats the data as described in Whitaker HJ, Farrington CP, Spiessens B and Munsenda P. Tutorial in biostatistics: The self-controlled case series method. Statistics in Medicine 2006; 25(10): 1768-1797, section 3.1: A worked example. This differs from the standard SCCS method in that the observation period is cut after the event.
transformData

Transformation of exposure data

Description

Expands data into the correct format to use the adSCCS function.

Usage

transformData(id, vaccd, event, riskclass, ageclass)
Arguments

id vector; a unique individual identifier.

vaccd a data.frame which contains the time points of exposure.

event vector of event times.

riskclass a list object which define the exposure period. Created using the function setRiskclass.

ageclass a list object which define the age classes and observation period. Created using the function setAgeclass.

Details

This function formats data as described in Whitaker et al. 2006, section 3.1: A worked example.

Value

it is a LIST:

CC unique individual identifier

RiskCl indicator for risk status (0 = control interval, 1 = risk interval)

AgeCl factor for age class

len length of the time interval

loglen logarithm length of the time interval

event indicator for whether the event occurs in the time interval (1 for yes, otherwise 0)

dose the number of doses an individual receives

dosetype factor for dose exposure status (0 = control interval, 1 = risk interval for dose 1, 2 = risk interval for dose 2, etc...)

expr gives the accumulated number of doses received for a given individual

Author(s)

Ronny Kuhnert

References


See Also

adSCCS, setAgeclass, setRiskclass
Examples

data(simvaccRR1) # Load the example data set
# Define exposure periods and age classes:
  riskdist<-setRiskclass(c(0,7))
  # The first 7 days after the exposure are counted as risk period.
ageclass<-setAgeclass(c(30,41,51,59,67,73,78,88,101,
                         117,129,140,159,178,206,231,257,286,347,421,512,730))
  # The event is highly age dependent. For this reason a lot of
  # age classes are defined.

  #transformData(simvaccRR1$id,simvaccRR1[c("v1","v2","v3","v4")],
    # simvaccRR1$event,riskdist,ageclass)
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