Package ‘dsrTest’

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Type Package

Title Tests and Confidence Intervals on Directly Standardized Rates for Several Methods

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Description Perform a test of a simple null hypothesis about a directly standardized rate and obtain the matching confidence interval using a choice of methods.

Encoding UTF-8

License GPL (>= 2)

RoxygenNote 7.2.0

Depends R (>= 2.10)

Imports stats, exactci, asht (>= 0.9.1), loglognorm,

Suggests testthat, knitr, rmarkdown, covr

URL https://github.com/mnelsonr/dsrTest

BugReports https://github.com/mnelsonr/dsrTest/issues

VignetteBuilder knitr

LazyData true

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**Description**

Perform a test of a simple null hypothesis about a directly standardized rate and obtain the matching confidence interval using a choice of methods.

**Details**

The DESCRIPTION file:

- **Package:** dsrTest
- **Type:** Package
- **Title:** Tests and Confidence Intervals on Directly Standardized Rates for Several Methods
- **Version:** 1.0.0
- **Date:** 2022-06-12
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- **Maintainer:** Michael Nelson <michael.nelson.r.pkg@gmail.com>
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- **RoxygenNote:** 7.2.0
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- **Depends:** R (>= 2.10)
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- **BugReports:** https://github.com/mnelsonr/dsrTest/issues
- **VignetteBuilder:** knitr
- **LazyData:** true

Index of help topics:

- **asymptoticControl** Control Function for Asymptotic Method
- **betaControl** Control Function for Beta Method for Confidence Intervals
- **dobsonControl** Control Function for Dobson Method Confidence
The function `dsrTest()` implements a number of different parameterizations and methods for computing confidence intervals on directly standardized rates. These methods are described in detail in Fay and Feuer (1997), Tiwari et al (2006), Ng et al (2008) and Fay and Kim (2017).

The various `<method>Control()` functions allow modifications to the general approaches.

### References


### See Also

`wspoissonTest`

### Examples

```r
## using the example from asht::wspoissonTest
## birth data on Down's syndrome from Michigan, 1950–1964
## see Table II of Fay and Feuer (1997)
```
## xfive = counts for mothers who have had 5 or more children
## nfive and ntotal are number of live births
xfive<-c(0, 8, 63, 112, 262, 295)
nfive<-c(327, 30666, 123419, 149919, 104088, 34392)
ntotal<-c(319933, 931318, 786511, 488235, 237863, 61313)
## use mult =10^5 to give rates per 100,000
## gamma method of Fay and Feuer (1997) is default
dsrTest(xfive, nfive, ntotal, method = "gamma", mult = 1e5)
## Dobson et al (1991)

dsrTest(xfive, nfive, ntotal, method = "dobson", mult = 1e5)
## Asymptotic with log transformation

dsrTest(xfive, nfive, ntotal, method = "asymptotic", mult = 1e5,
control = list(trans = "log"))

asymptoticControl

Control Function for Asymptotic Method Confidence Intervals

Description

Specify the transformation to apply to the distribution of the MLE.

Usage

asymptoticControl(trans = c("none", "log", "loglog", "logit"), ...)

Arguments

trans Transformation apply to the MLE distribution.
...

Value

A list with values
trans

betaControl

Control Function for Beta Method for Confidence Intervals

Description

Modification to the Beta method. The options are "none" or the same modifications as applied to
the Gamma Method (see gammaControl) are implemented. wmttype="none" and wmttype="tcz"
have been investigated by Tiwari et al (2006) and Ng et al (2008).

Usage

betaControl(wmttype = c("none", "tcz", "max", "mean", "minmaxavg"), ...)
**dobsonControl**

### Arguments

- **wmtype** character type of modification to the Beta Confidence Interval
- ...

Currently ignored.

### Value

a list with values

- **wmtype** modification to Beta Confidence Interval to implement

### References


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**Description**

Provides a list of arguments to pass to `poisson.exact`.

**Usage**

`dobsonControl(midp = FALSE, tsmethod = c("central", "minlike", "blaker"), ...)`

**Arguments**

- **midp** logical, use mid-p values? Currently only permitted where `tsmethod = "central"`.
- **tsmethod** character giving two-sided method
- ... Currently ignored.

**Value**

a list with values

- **midp**
- **tsmethod**

**See Also**

`poisson.exact`


**downs.mi**

*Downs' syndrome cases and of total live births by maternal age and birth order, Michigan, 1950-1964.*

**Description**

This data reproduces table 14.4 in Fleiss (1981) and which is drawn from a large-scale study in Michigan 1950-1964 of the effect of Maternal age and Birth order on Down Syndrome and Leukemia (Stark and Mantell, 1966).

**Usage**

downs.mi

**Format**

This data frame contains the following columns:

- **Age** The age category of the mothers.
- **BirthOrder** The birth order.
- **Cases** The number of cases of Down’s Syndrome.
- **Births** The number of live births.
- **Standard** A "standard" population, derived as the total number of births in each age category

**Source**


The original study is Stark CR and Mantel N (1966) 'Effects of maternal age and birth order on the risk of mongolism and leukemia' *J Natl Cancer Inst* **37** (5) 687–698. doi:10.1093/jnci/37.5.687

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**dsrTest**

*Tests and Confidence Intervals on Directly Standardized Rates*

**Description**

A number of methods have been proposed for calculating confidence intervals for directly standardized rates. Ng et al (2008), compare a number of methods, some of which are implemented here. The default uses the Gamma method by Fay and Feuer (1997) and implemented in *wspoissontest.*
Usage

dsrTest(
  x,
  n,
  w,
  null.value = NULL,
  alternative = c("two.sided", "less", "greater"),
  conf.level = 0.95,
  mult = 1,
  method = c("gamma", "asymptotic", "dobson", "beta", "bootstrap"),
  control = list()
)

Arguments

x       a vector of strata-specific counts.
n       a vector of strata-specific time bases for counts.
w       a vector of strata-specific weights (or standard populations).
null.value       a null hypothesis value of the directly rate, if NULL no test is done. If not NULL, provide in rate per mult.
alternative       type of alternative hypothesis.
conf.level       confidence level for the returned confidence interval.
mult       a factor to multiply the estimate and confidence intervals by, to give rates per mult.
method       Method used to perform the test and construct the confidence interval. See details.
control       list of arguments / type of modification used for each method. See details and relevant "xxxxControl" documentation

Details

Five classes of method have been implemented here:

"asymptotic" Using the normal approximation of the MLE or transformed MLE distribution - see asymptoticControl
"dobson" Uses the method proposed by Dobson et al (1991). Estimating the confidence interval on the unweighted sum is done by calling poisson.exact - both the exact method and a mid-p method are possible - see dobsonControl.

For each method there is a control function that will return a list of parameters that can be used to define sub-types of each of the broad groups
### gammaControl

**Value**

A list with class "htest" containing the following components:

- **statistic**: number of strata or summands: \( k = \text{length}(x) \)
- **parameter**: mult
- **p.value**: p-value, set to NA if `null.value = NULL`
- **conf.int**: confidence interval on the true directly standardized rate
- **estimate**: directly standardized rate
- **null.value**: null hypothesis value for the DSR
- **alternative**: alternative hypothesis type
- **method**: description of the method
- **data.name**: description of the data

### References


### See Also

`wspoissonTest`, `poisson.exact`, `gammaControl`, `dobsonControl`, `asymptoticControl`, `betaControl`

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### gammaControl

**Control Function for Gamma Method Confidence Intervals**

**Description**

Provides a list of arguments to pass to `wspoissonTest`.

**Usage**

```r
gammaControl(
    midp = FALSE,
    nmc = 0,
    wmttype = c("max", "mean", "minmaxavg", "tcz"),
    unirootTolFactor = 1e-06,
    ...
)
```
Arguments

midp logical. Use mid-p confidence distribution method? Currently only implemented where wmtype = "max"

nmc Calculation method when midp = TRUE.

wmtype type of modification for the Gamma confidence interval.

unirootTolFactor tolerance factor for uniroot where midp = TRUE and nmc = 0.

... Currently ignored.

Value

A list of arguments to pass to wspoissonTest.

If midp = TRUE, with values

midp
nmc
unirootTolFactor

If midp = FALSE, with values:

wmtype

See Also

wspoissonTest
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