Package ‘dsrTest’

May 2, 2017

Type  Package
Title  Tests and Confidence Intervals on Directly Standardized Rates for Several Methods
Version  0.2.1
Date  2017-04-24
Author  Michael Nelson
Maintainer  Michael Nelson <michael.nelson.r.pkg@gmail.com>
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  6.0.1
Depends  R (>= 2.10)
Imports  stats, exactci, asht (>= 0.9.1), loglognorm,
         testthat, knitr, rmarkdown, covr
Suggests  testthat, knitr, rmarkdown, covr
URL  http://github.com/mnel/dsrTest
BugReports  http://github.com/mnel/dsrTest/issues
VignetteBuilder  knitr
LazyData  true
NeedsCompilation  no
Repository  CRAN
Date/Publication  2017-05-02 12:33:26 UTC

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Tests and Confidence Intervals on Directly Standardized Rates for Several Methods

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:

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betaControl Control Function for Beta Method for Confidence Intervals
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dsrTest
Tests and Confidence Intervals on Directly Standardized Rates

gammaControl
Control Function for Gamma Method Confidence Intervals

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.

Author(s)

Michael Nelson

Maintainer: Michael Nelson <michael.nelson.r.pkg@gmail.com>

References


See Also

wspoissonTest

Examples

## 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.

  ... Currently ignored.

**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).
**dobsonControl**

Usage

```r
betaControl(wmtype = c("none", "tcz", "max", "mean", "minmaxavg"), ...)
```

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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**dobsonControl**

Control Function for Dobson Method Confidence Intervals

Description

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

Usage

```r
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

Described

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 data were obtained from table 14.4 (p 249) in


The original study is

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 \texttt{wspoissontest}.

\textbf{Usage}

\begin{verbatim}
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())
\end{verbatim}

\textbf{Arguments}

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

\textbf{Details}

Five classes of method have been implemented here:

- "gamma" Calls \texttt{wspoissontest}. By default uses the Gamma Method proposed by Fay and Feuer (1997). Modifications proposed by Tiwari et al (2006) and Fay and Kim (2017) also implemented - see \texttt{gammaControl}.
- "asymptotic" Using the normal approximation of the MLE or transformed MLE distribution - see \texttt{asymptoticControl}.
- "dobson" Uses the method proposed by Dobson et al (1991). Estimating the confidence interval on the unweighted sum is done by calling \texttt{poisson.exact} - both the exact method and a mid-p method are possible - see \texttt{dobsonControl}.
- "beta" Methods based on the beta distribution by Tiwari et al (2006) - see \texttt{betaControl}. 

\textit{Tests and Confidence Intervals on Directly Standardized Rates}
"bootstrap" Approximate Bootstrap method by Swift (1995). P-values are estimated by solving for \( p \).

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

**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**

wsposissonTest, poisson.exact, gammaControl, dobsonControl, asymptoticControl, betaControl
gammaControl

Control Function for Gamma Method Confidence Intervals

Description

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

Usage

`gammaControl(midp = FALSE, nmc = 0, wmtype = c("max", "mean", "minmaxavg", "tcz"), unisrootTolFactor = 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.
- `unisrootTolFactor` 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`
- `unisrootTolFactor`

If `midp = FALSE`, with values:

- `wmtype`

See Also

- `wspoissontest`
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