Package ‘MIWilson’

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Title Implementing the MI-Wilson Confidence Interval
Version 1.0.0
Description Implements the Wilson confidence interval for binomial proportions given multiple imputations of missing data (detailed theory provided in "Wilson Confidence Intervals for Binomial Proportions With Multiple Imputation for Missing Data" (A. Lott & J. Reiter, 2018)). Our package also implements a Wald confidence interval and allows for both MIDs object and proportion vector arguments.
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Bm

Calculate between-imputation variance of the response mean

\[ \frac{\sum (\bar{Q}_l - \bar{Q})}{m - 1} \]

Description

Calculate between-imputation variance of the response mean

\[ \frac{\sum (\bar{Q}_l - \bar{Q})}{m - 1} \]

Usage

Bm(qhats, m)

Arguments

qhats vector of Qhats(means of response for each imputed dataset)
m number of imputed datasets

Value

Bm: the between-dataset variance of the response mean

Examples

imp = mice::mice(mice::nhanes)
qhats = Qhats(imp, "hyp")
m = imp$m
Bm(qhats, m)
dof

Calculate degrees of freedom used in calculating confidence intervals of t-distributed proportion point estimate $\bar{Q}_m$

**Description**

Calculate degrees of freedom used in calculating confidence intervals of t-distributed proportion point estimate $\bar{Q}_m$

**Usage**

dof(qhats, m, nrow)

**Arguments**

- **qhats**: vector of Qhats (means of response for each imputed dataset)
- **m**: number of imputed datasets
- **nrow**: number of observations in the imputed dataset

**Value**

degrees of freedom

**Examples**

```r
imp = mice::mice(mice::nhanes)
qhats = Qhats(imp, "hyp")
m = imp$m
nrow = imp$data %>% nrow()
dof(qhats, m, nrow)
```

mi_wald

Calculates the specified Wald CI of a binomial proportion variable, given imputed data sets.

**Description**

Calculates the specified Wald CI of a binomial proportion variable, given imputed data sets.

**Usage**

```r
mi_wald(mids_obj, response, ci_level = 0.95, summaries = TRUE)
```
Arguments

mids_obj  mids object created by mice package
response  string name of response variable (must be 0-1 valued)
ci_level  desired confidence interval level (defaults to 95%)
summaries boolean: should summary helper values be printed (default TRUE)

Value

two-length vector of Wald lower CI and upper CI

Examples

imp = mice::mice(mice::nhanes %>% dplyr::mutate(hyp = hyp-1))
mi_wald(imp, "hyp", 0.95)

mi_wald_phat  Calculates the MI-Wald interval if given a vector of observed binomial proportions (one for each imputed data frame)

Description

Calculates the MI-Wald interval if given a vector of observed binomial proportions (one for each imputed data frame)

Usage

mi_wald_phat(phats, n, ci_level = 0.95, summaries = TRUE)

Arguments

phats  vector of binomial proportions (one for each imputation)
n  the common number of observations over the imputed dataframes
ci_level  desired confidence interval level (default 95%)
summaries  boolean: should summary helper values be printed (default TRUE)

Value

Two-length vector of Wilson lower CI and upper CI

Related Functions

- mi_wald
- mi_wilson_phat
mi_wilson

Examples

phats = c(0.2, 0.23, 0.25)
mi_wald_phat(phats, 100, 0.99, TRUE)

mi_wilson

Calculates the specified Wilson CI of a binomial proportion variable, given imputed data sets.

Description

Calculates the specified Wilson CI of a binomial proportion variable, given imputed data sets.

Usage

mi_wilson(mids_obj, response, ci_level = 0.95, summaries = TRUE)

Arguments

mids_obj mids object created by mice package
response string name of response variable (must be 0-1 valued)
ci_level desired confidence interval level (defaults to 95%)
summaries boolean: should summary helper values be printed (default TRUE)

Value
two-length vector of Wilson lower CI and upper CI

Examples

imp = mice::mice(mice::nhanes %>% dplyr::mutate(hyp = hyp-1))
mi_wilson(imp, "hyp", 0.95)

mi_wilson_phat

Calculates the MI-Wilson interval if given a vector of observed binomial proportions (one for each imputed data frame)

Description

Calculates the MI-Wilson interval if given a vector of observed binomial proportions (one for each imputed data frame)

Usage

mi_wilson_phat(phats, n, ci_level = 0.95, summaries = TRUE)
Arguments

phats vector of binomial proportions (one for each imputation)
n the common number of observations over the imputed dataframes
ci_level desired confidence interval level (default 95%)
summaries boolean: should summary helper values be printed (default TRUE)

Value
two-length vector of Wilson lower CI and upper CI

Examples

phats = c(0.2, 0.23, 0.25)
mi_wilson_phat(phats, 100, 0.99, TRUE)

Qbar

Calculate Qbar (average response over MICE datasets)

Description

Calculate Qbar (average response over MICE datasets)

Usage

Qbar(qhats)

Arguments

qhats vector of Qhats(response means for each imputed dataset)

Value

Qbar: the average response over MICEd datasets.

Examples

imp = mice::mice(mice::nhanes)
qhats = Qhats(imp, "hyp")
Qbar(qhats)
### Qhats

*Calculate Qhats (means of response for each imputed dataset)*

#### Description

Calculate Qhats (means of response for each imputed dataset)

#### Usage

Qhats(mids_obj, response)

#### Arguments

- **mids_obj**: mids object created by mice package
- **response**: string name of binary response variable

#### Value

Qhats: vector of response means for each imputed dataset

#### Examples

```r
imp = mice::mice(mice::nhanes)
Qhats(imp, "hyp")
```

---

### Rm

*Helper function for getting rm, a key component for calculating degrees of freedom and the wilson CI directly*

#### Description

Helper function for getting rm, a key component for calculating degrees of freedom and the wilson CI directly

#### Usage

Rm(qhats, m, nrow)

#### Arguments

- **qhats**: vector of Qhats (means of response for each imputed dataset)
- **m**: number of imputed datasets
- **nrow**: number of observations in the imputed dataset
### Examples

```r
imp = mice::mice(mice::nhanes)
qhats = Qhats(imp, "hyp")
m = imp$m
nrow = imp$data %>% nrow()
Tm(qhats, m, nrow)
```

---

**Tm**  
*Estimate variance of proportion point estimate $\tilde{Q}_m$*

**Description**

Estimate variance of proportion point estimate $\tilde{Q}_m$

**Usage**

```r
Tm(qhats, m, nrow)
```

**Arguments**

- `qhats`: vector of Qhats (means of response for each imputed dataset)
- `m`: number of imputed datasets
- `nrow`: number of observations in the imputed dataset

**Value**

variance of proportion point estimate

**Examples**

```r
imp = mice::mice(mice::nhanes)
qhats = Qhats(imp, "hyp")
m = imp$m
nrow = imp$data %>% nrow()
Tm(qhats, m, nrow)
```
**Ubar**

*Calculate Ubar (average response variance over MICE datasets)*

**Description**

Calculate Ubar (average response variance over MICE datasets)

**Usage**

```r
Ubar(qhats, m, nrow)
```

**Arguments**

- `qhats`: vector of Qhats (means of response for each imputed dataset)
- `m`: number of imputed datasets
- `nrow`: number of observations in the imputed dataset

**Value**

Ubar: average response variance over MICE datasets

**Examples**

```r
imp = mice::mice(mice::nhanes)
qhats = Qhats(imp, "hyp")
m = imp$m
nrow = imp$data %>% nrow()
Ubar(qhats, m, nrow)
```

---

**Uhats**

*Calculate Uhats (variance for each imputed dataset)*

**Description**

Calculate Uhats (variance for each imputed dataset)

**Usage**

```r
Uhats(qhats, nrow)
```

**Arguments**

- `qhats`: vector of Qhats (means of response for each imputed dataset)
- `nrow`: number of observations in the imputed dataset
Value

Uhats: vector of response variances for each imputed dataset

Examples

imp = mice::mice(mice::nhanes)
qhats = Qhats(imp, "hyp")
nrow = imp$data %>% nrow()
Uhats(qhats, nrow)
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