Package ‘ClinSigMeasures’

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Author Mike Malek-Ahmadi <michael.malekahmadi@bannerhealth.com>, Kjera Schack <kgschack@asu.edu>

Maintainer Mike Malek-Ahmadi <michael.malekahmadi@bannerhealth.com>

Description Provides measures of effect sizes for summarized continuous variables as well as diagnostic accuracy statistics for 2x2 table data. Includes functions for Cohen's d, robust effect size, Cohen's q, partial eta-squared, coefficient of variation, odds ratio, likelihood ratios, sensitivity, specificity, positive and negative predictive values, Youden index, number needed to treat, number needed to diagnose, and predictive summary index.

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Contents

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cohens_d *Cohen's d Calculation*

Description

Calculates a Cohen's d effect size using the means and standard deviations of two independent groups

Usage

```
cohens_d(Group1_Mean, Group1_SD, Group2_Mean, Group2_SD)
```

Arguments

`Group1_Mean`	Mean for Group 1
`Group1_SD`	Standard Deviation for Group 1
`Group2_Mean`	Mean for Group 2
`Group2_SD`	Standard Deviation for Group 2

Value

A single value representing the Cohen's d effect size

Author(s)

Mike Malek-Ahmadi

References

1. Cohen, Jacob (1988). Statistical Power Analysis for the Behavioral Sciences. Routledge. ISBN 978-1-134-74270-7.

2. Malek-Ahmadi M, Perez SE, Chen K, Mufson EJ. Neuritic and diffuse plaque associations with memory in non-cognitively impaired elderly. J Alzheimers Dis 2016;53(4):1641-1652.

Examples

```
#From Table 2 in Malek-Ahmadi et al (2016)
#comparing groups with (0.75+/-0.35) and without (0.49+/-0.29) neuritic plaques
#on a global cognitive score (z-score).

cohens_d(0.75, 0.35, 0.49, 0.29)
```

`cohens_q` *Cohen's q Calculation*

Description

Calculates Cohen's q for the effect size of the difference between two correlation values

Usage

```
cohens_q(corr1, corr2)
```

Arguments

`corr1`	Correlation for First Group
`corr2`	Correlation for Second Group

Value

A single value representing Cohen's q

Author(s)

Mike Malek-Ahmadi

References

1. Cohen, Jacob (1988). Statistical Power Analysis for the Behavioral Sciences. Routledge. ISBN 978-1-134-74270-7.

2. Yang G, Li D, Rao Y, Lu F. The relationship between cortical thickness and language comprehension varies with sex in healthy young adults: a large sample analysis. Neuroreport 2020;31(2):184-188.

Examples

```
#From Yang et al (2020), Cohen's q for the difference between female and male correlation
#values for vocabulary comprehension and cortical thickness.

cohens_q (0.318, 0.174)
```

cv *Coefficient of Variation Calculation*

Description

Calculates the coefficient of variation for a mean and standard deviation

Usage

```
cv(Mean, SD)
```

Arguments

`Mean`	Mean for a dataset
`SD`	Standard Deviation for a dataset

Value

A single value representing the Coefficient of Variation

Author(s)

Mike Malek-Ahmadi

References

1. Everitt B (1998). The Cambridge Dictionary of Statistics. Cambridge, UK New York: Cambridge University Press. ISBN 978-0521593465.

2. Bedeian AG, Mossholder KW. On the use of the coefficient of variation as a measure of diversity. Organizational Research Methods 2000;3(3):285-297.

Examples

```
#From Bedeian & Mossholder (2000), Table 2 Group A data.

cv(28, 7)
```

`lr_neg` *Likelihood Ratio Negative Calculation From a 2x2 Table*

Description

Calculates diagnostic test likelihood ratio negative and 95 percent confidence intervals for data from a 2x2 table

Usage

```
lr_neg(Cell1, Cell2, Cell3, Cell4)
```

Arguments

`Cell1`	Value for cases with a positive test
`Cell2`	Value for controls with a positive test
`Cell3`	Value for cases with a negative test
`Cell4`	Value for controls with a negative test

Value

Likelihood Ratio Negative and 95 percent confidence intervals

Author(s)

Mike Malek-Ahmadi

References

1. Grimes DA, Schultz KF. Refining clinical diagnosis with likelihood ratios. Lancet 2005;365:1500-1505.

2. Dujardin B, Van den Ende J, Van Gompel A, Unger JP, Van der Stuyft P. Likelihood ratios: a real improvement for clinical decision making? European Journal of Epidemiology 1994 Feb;10(1):29-36.

Examples

```
#From Table 1 in Dujardin et al (1994)

lr_neg(72, 9, 25, 137)
```

lr_pos — *Likelihood Ratio Positive Calculation From a 2x2 Table*

Description

Calculates diagnostic test likelihood ratio positive and 95 percent confidence intervals for data from a 2x2 table

Usage

```
lr_pos(Cell1, Cell2, Cell3, Cell4)
```

Arguments

`Cell1`	Value for cases with a positive test
`Cell2`	Value for controls with a positive test
`Cell3`	Value for cases with a negative test
`Cell4`	Value for controls with a negative test

Value

Likelihood Ratio Positive and 95 percent confidence intervals

Author(s)

Mike Malek-Ahmadi

References

1. Grimes DA, Schultz KF. Refining clinical diagnosis with likelihood ratios. Lancet 2005;365:1500-1505.

2. Dujardin B, Van den Ende J, Van Gompel A, Unger JP, Van der Stuyft P. Likelihood ratios: a real improvement for clinical decision making? European Journal of Epidemiology 1994 Feb;10(1):29-36.

Examples

```
#From Table 1 in Dujardin et al (1994)

lr_pos(72, 9, 25, 137)
```

nnd — *Number Needed to Diagnose Calculation From a 2x2 Table*

Description

Calculates the Number Needed to Diagnose for data from a 2x2 table

Usage

```
nnd(Cell1, Cell2, Cell3, Cell4)
```

Arguments

Cell1	Value for cases with a positive test
Cell2	Value for controls with a positive test
Cell3	Value for cases with a negative test
Cell4	Value for controls with a negative test

Value

Number Needed to Diagnose

Author(s)

Mike Malek-Ahmadi

References

1. Larner AJ. Number Needed to Diagnose, Predict, or Misdiagnose: Useful Metrics for Non-Canonical Signs of Cognitive Status? Dement Geriatr Cogn Disord Extra 2018;8:321–327

Examples

```
#From Shaikh (2011), page 3, 2x2 table for "Diagnostic Test Evaluation"
#NND is the inverse of the Youden Index (1 / Youden Index)

nnd(105, 171, 15, 87)
```

nnt *Number Needed to Treat Calculation From a 2x2 Table*

Description

Calculates number needed to treat and 95 percent confidence intervals for data from a 2x2 table

Usage

```
nnt(Cell1, Cell2, Cell3, Cell4)
```

Arguments

Cell1	Value for cases with a positive outcome
Cell2	Value for cases with a negative outcome
Cell3	Value for controls with a positive outcome
Cell4	Value for controls with a negative outcome

Value

Number Needed to Treat and 95 percent confidence intervals

Author(s)

Mike Malek-Ahmadi

References

1. Cook RJ, Sackett DL. The number needed to treat: a clinically useful measure of treatment effect [published correction appears in BMJ 1995 Apr 22;310(6986):1056]. BMJ. 1995;310(6977):452-454.

2. Zar HJ, Cotton MF, Strauss S et al Effect of isoniazid prophylaxi on mortality of tuberculosis in children with HIV: randomised controlled trial. BMJ 2007; 136-9.

Examples

```
#Mortality data from Zar et al (2007)

nnt(121, 11, 110, 21)
```

npv — *Negative Predictive Value Calculation From a 2x2 Table*

Description

Calculates diagnostic test negative predictive value and 95 percent confidence intervals for data from a 2x2 table

Usage

```
npv(Cell1, Cell2, Cell3, Cell4)
```

Arguments

`Cell1`	Value for cases with a positive test
`Cell2`	Value for controls with a positive test
`Cell3`	Value for cases with a negative test
`Cell4`	Value for controls with a negative test

Value

Negative Predictive Value and 95 percent confidence intervals

Author(s)

Mike Malek-Ahmadi

References

1. Trevethan R. Sensitivity, specificity, and predictive values: Foundations, pliabilities, and pitfalls in research and practice. Frontiers in Public Health 2017;5:307.

2. Safari S, Baratloo A, Elfil M, Negida A. Evidence Based Emergency Medicine Part 2: Positive and negative predictive values of diagnostic tests. Emerg (Tehran) 2015;3(3):87-88.

Examples

```
#From Figure 2 in Safari et al (2015)

npv(15, 6, 25, 34)
```

odds_ratio *Odds Ratio Calculation From a 2x2 Table*

Description

Calculates an odds ratio and 95 percent confidence intervals for data from a 2x2 table

Usage

```
odds_ratio(Cell1, Cell2, Cell3, Cell4)
```

Arguments

Cell1	Value for cases with the factor/exposure of interest
Cell2	Value for cases without the factor/exposure of interest
Cell3	Value for controls with the factor/exposure of interest
Cell4	Value for controls without the factor/exposure of interest

Value

Odds ratio and 95 percent confidence intervals

Author(s)

Mike Malek-Ahmadi

References

1.Mufson EJ, Malek-Ahmadi M, Perez SE, Chen K. Braak staging, plaque pathology, and APOE status in elderly persons without cognitive impairment. Neurobiol Aging 2016;37:147-153.

Examples

```
# From Table 1 in Mufson et al (2016), using data for sex (Male/Female)
#and Braak stage group classification (I-II/III-V).

#Female/Braak III-V = 46, Female/Braak I-II = 14, Male/Braak III-V = 32,
#Male/Braak I-II = 31.

odds_ratio(46, 14, 32, 31)
```

partial_eta_sq — *Partial Eta Squared Calculation*

Description

Calculates partial eta squared effect size for ANOVAs

Usage

```
partial_eta_sq(SS.Between, SS.Error)
```

Arguments

`SS.Between`	Sum of Squares Between from ANOVA Output
`SS.Error`	Sum of Squares Error from ANOVA Output

Value

A single value representing partial eta squared

Author(s)

Mike Malek-Ahmadi

References

1. Levine TR, Hullett CR. Eta squared, partial eta squared, and misreporting of effect size in communication research. Human Communication Research 2002;28:612-625.

Examples

```
#From Levine & Hullett (2002), Example 1 in Table 1

partial_eta_sq(2500, 800)
```

ppv — *Positive Predictive Value Calculation From a 2x2 Table*

Description

Calculates diagnostic test positive predictive value and 95 percent confidence intervals for data from a 2x2 table

Usage

```
ppv(Cell1, Cell2, Cell3, Cell4)
```

Arguments

`Cell1`	Value for cases with a positive test
`Cell2`	Value for controls with a positive test
`Cell3`	Value for cases with a negative test
`Cell4`	Value for controls with a negative test

Value

Positive Predictive Value and 95 percent confidence intervals

Author(s)

Mike Malek-Ahmadi

References

1. Trevethan R. Sensitivity, specificity, and predictive values: Foundations, pliabilities, and pitfalls in research and practice. Frontiers in Public Health 2017;5:307.

2. Safari S, Baratloo A, Elfil M, Negida A. Evidence Based Emergency Medicine Part 2: Positive and negative predictive values of diagnostic tests. Emerg (Tehran) 2015;3(3):87-88.

Examples

```
#From Figure 2 in Safari et al (2015)

ppv(15, 6, 25, 34)
```

---

psi — *Predictive Summary Index Calculation From a 2x2 Table*

Description

Calculates the Predictive Summary Index for data from a 2x2 table

Usage

```
psi(Cell1, Cell2, Cell3, Cell4)
```

Arguments

`Cell1`	Value for cases with a positive test
`Cell2`	Value for controls with a positive test
`Cell3`	Value for cases with a negative test
`Cell4`	Value for controls with a negative test

Value

Predictive Summary Index

Author(s)

Mike Malek-Ahmadi

References

1. Linn S, Grunau PD. New patient-oriented summary measure of net total gain in certainty for dichotomous diagnostic tests. Epidemiol Perspect Innov 2006;3:11.

2. Shaikh SA. Measures Derived from a 2 x 2 Table for an Accuracy of a Diagnostic Test. J Biomet Biostat 2011, 2:5

Examples

```
#From Shaikh (2011), page 3, 2x2 table for "Diagnostic Test Evaluation"

psi(105, 171, 15, 87)
```

---

robust_effect_size   *Robust effect size for comparison of means between two groups*

Description

Calculates the robust effect size for a two-group comparison using the means, standard deviations, and sample sizes for each group

Usage

```
robust_effect_size(M1, M2, SD1, SD2, N1, N2)
```

Arguments

M1	Mean for Group 1
M2	Mean for Group 2
SD1	Standard deviation for Group 1
SD2	Standard deviation for Group 2
N1	Sample Size for Group 1
N2	Sample Size for Group 2

Value

Robust Effect Size

Author(s)

Kjera Schack

References

Vandekar S, Tao R, Blume J. A Robust Effect Size Index [published correction appears in Psychometrika. 2020 Dec;85(4):946]. Psychometrika. 2020;85(1):232-246. doi:10.1007/s11336-020-09698-2

Examples

```
#From Table 2 in Malek-Ahmadi et al (2016)
#comparing groups with (0.75+/-0.35, n=45) and without (0.49+/-0.29, n=78) neuritic plaques
#on a global cognitive score (z-score).

robust_effect_size(0.75, 0.49, 0.35, 0.29, 45, 78)
```

---

sensitivity — *Sensitivity Calculation From a 2x2 Table*

Description

Calculates diagnostic test sensitivity and 95 percent confidence intervals for data from a 2x2 table

Usage

```
sensitivity(Cell1, Cell2, Cell3, Cell4)
```

Arguments

`Cell1`	Value for cases with a positive test
`Cell2`	Value for controls with a positive test
`Cell3`	Value for cases with a negative test
`Cell4`	Value for controls with a negative test

Value

Sensitivity and 95 percent confidence intervals

Author(s)

Mike Malek-Ahmadi

References

1. Trevethan R. Sensitivity, specificity, and predictive values: Foundations, pliabilities, and pitfalls in research and practice. Frontiers in Public Health 2017;5:307.

2. Weissberger GH, Strong JV, Stefanidis KB, Summers MJ, Bondi MW, Stricker NH. Diagnostic accuracy of memory measures in Alzheimer's dementia and mild Cognitive Impairment: a Systematic Review and Meta-Analysis. Neuropsychol Rev. 2017;27(4):354-388.

Examples

```
#Sensitivity calculation from Figure 11, Line 22 of Weissberger et al

sensitivity (121, 50, 13, 199)
```

---

specificity — *Specificity Calculation From a 2x2 Table*

Description

Calculates diagnostic test specificity and 95 percent confidence intervals for data from a 2x2 table

Usage

```
specificity(Cell1, Cell2, Cell3, Cell4)
```

Arguments

`Cell1`	Value for cases with a positive test
`Cell2`	Value for controls with a positive test
`Cell3`	Value for cases with a negative test
`Cell4`	Value for controls with a negative test

Value

Specificity and 95 percent confidence intervals

Author(s)

Mike Malek-Ahmadi

References

1. Trevethan R. Sensitivity, specificity, and predictive values: Foundations, pliabilities, and pitfalls in research and practice. Frontiers in Public Health 2017;5:307.

2. Weissberger GH, Strong JV, Stefanidis KB, Summers MJ, Bondi MW, Stricker NH. Diagnostic accuracy of memory measures in Alzheimer's dementia and mild Cognitive Impairment: a Systematic Review and Meta-Analysis. Neuropsychol Rev. 2017;27(4):354-388.

Examples

```
#Specificity calculation from Figure 11, Line 22 of Weissberger et al

specificity (121, 50, 13, 199)
```

---

youden_index *Youden Index Calculation From a 2x2 Table*

Description

Calculates the Youden Index for data from a 2x2 table

Usage

```
youden_index(Cell1, Cell2, Cell3, Cell4)
```

Arguments

`Cell1`	Value for cases with a positive test
`Cell2`	Value for controls with a positive test
`Cell3`	Value for cases with a negative test
`Cell4`	Value for controls with a negative test

Value

Youden Index

Author(s)

Mike Malek-Ahmadi

References

1. Ruopp MD, Perkins NJ, Whitcomb BW, Schisterman EF. Youden Index and optimal cut-point estimated from observations affected by a lower limit of detection. Biom J 2008;50(3):419-430.

2. Shaikh SA (2011) Measures derived from a 2 x 2 table for an accuracy of a diagnostic test. J Biomet Biostat 2:128

Examples

```
#From Shaikh (2011), page 3, 2x2 table for "Diagnostic Test Evaluation"

youden_index(105, 171, 15, 87)
```

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