

# Package: ClinSigMeasures (via r-universe)

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**Type** Package

**Title** Clinical Significance Measures

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**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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cohens_d	<i>Cohen's d Calculation</i>
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### 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. Lerner 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, pliabilitys, 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(Cell11, Cell12, Cell13, Cell14)
```

**Arguments**

Cell11	Value for cases with a positive test
Cell12	Value for controls with a positive test
Cell13	Value for cases with a negative test
Cell14	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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