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Title Sample Size Estimation Functions for Studies of Interobserver Agreement

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Depends R (>= 2.10)

Description Contains basic tools for sample size estimation in studies of interobserver/interrater agreement (reliability). Includes functions for both the power-based and confidence interval-based methods, with binary or multinomial outcomes and two through six raters.

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Contents

CI3Cats *Confidence Interval Approach for the Number of Subjects Required for a Study of Interobserver Agreement with Three Outcome Categories*

Description

This function provides detailed sample size estimation information to determine the number of subjects required using the confidence interval perspective to sample size estimation for κ. This version assumes that the outcome has three categories.

Usage

```
CI3Cats(kappa0, kappaL, kappaU=NA, props, raters=2, alpha=0.05)
```

Arguments

kappa0	The anticipated preliminary value of κ.
kappaL	The desired expected lower bound for a two-sided 100(1 - α) % confidence interval for κ. Alternatively, if kappaU is set to NA, the procedure produces the number of required subjects for a one-sided confidence interval.
kappaU	The desired expected upper confidence limit for κ.
props	The anticipated prevalence of the desired trait. Note that the elements of the three element vector must be non-negative and sum to one.
raters	The number of raters that are available. This function allows between 2 and 6 raters.
alpha	The desired type I error rate.

Details

This function provides detailed sample size estimation computation for studies of interobserver agreement with three outcomes. This function employs the confidence interval perspective, determining the correct sample size that provides the specified expected confidence limits. Sample size estimation is based on the precision of the estimate, instead of a simple hypothesis testing perspective. Note that a warning message is provided if any of the expected cell counts are less than 5.

Value

N	The calculated sample size.
kappa0	The specified anticipated value of κ.
kappaL	The specified expected lower limit.
kappaU	The specified expected upper limit.
props	The anticipated proportions of individuals with the outcomes of interest.
raters	The number of raters.

alpha	The desired type I error rate.
ChiCrit	The critical value that is required for sample size estimation. It is typically not required and is not displayed in the summary output.

Author(s)

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References

Rotondi MA, Donner A. (2012). A Confidence Interval Approach to Sample Size Estimation for Interobserver Agreement Studies with Multiple Raters and Outcomes. Journal of Clinical Epidemiology, 65:778-784.

Donner A, Rotondi MA. (2010). Sample Size Requirements for Interval Estimation of the Kappa Statistic for Interobserver Agreement Studies with a Binary Outcome and Multiple Raters. International Journal of Biostatistics 6:31.

Altaye M, Donner A, Klar N. (2001). Procedures for Assessing Interobserver Agreement among Multiple Raters. Biometrics 57:584-588.

Donner A. (1999). Sample Size Requirements for Interval Estimation of the Intraclass Kappa Statistic. Communication in Statistics 28:415-429.

Bartfay E, Donner A. (2001). Statistical Inferences for Interobserver Agreement Studies with Nominal Outcome Data. The Statistician 50:135-146.

Donner A, Eliasziw M. (1987) Sample size requirements for reliability studies. Statistics in Medicine 6:441-448.

See Also

Power3Cats

Examples

```
## Not run: Suppose an investigator would like to determine the required sample size to test
kappa0=0.4 with precision of 0.2 on each side, in a study of interobserver agreement
(3 raters).  Further suppose that the prevalence of the traits are 0.30, 0.2, 0.5.
## End(Not run)

CI3Cats(kappa0=0.4, kappaL=0.3, kappaU=0.6, props=c(0.30, 0.2, 0.5), raters=3, alpha=0.05);
```

CI4Cats — *Confidence Interval Approach for the Number of Subjects Required for a Study of Interobserver Agreement with Four Outcome Categories*

Description

This function provides detailed sample size estimation information to determine the number of subjects required using the confidence interval perspective to sample size estimation for κ. This version assumes that the outcome has four categories.

Usage

```
CI4Cats(kappa0, kappaL, kappaU=NA, props, raters=2, alpha=0.05)
```

Arguments

kappa0	The preliminary (anticipated) value of κ.
kappaL	The desired expected lower bound for a two-sided 100(1 - α) % confidence interval for κ. Alternatively, if kappaU is set to NA, the procedure produces the number of required subjects for a one-sided confidence interval.
kappaU	The desired expected upper confidence limit for κ.
props	The anticipated prevalence of the desired trait. Note that the elements of the four element vector must be non-negative and sum to one.
raters	The number of raters that are available. This function allows between 2 and 6 raters.
alpha	The desired type I error rate.

Details

This function provides detailed sample size estimation computation for studies of interobserver agreement with four outcomes. This function employs the confidence interval perspective, determining the correct sample size that provides the specified expected confidence limits. Sample size estimation is based on the precision of the estimate, instead of a simple hypothesis testing perspective. Note that a warning message is provided if any of the expected cell counts are less than 5.

Value

N	The calculated sample size.
kappa0	The specified anticipated value of κ.
kappaL	The specified expected lower limit.
kappaU	The specified expected upper limit.
props	The anticipated proportions of individuals with the outcomes of interest.
raters	The number of raters.
alpha	The desired type I error rate.
ChiCrit	The critical value that is required for sample size estimation. It is typically not required and is not displayed in the summary output.

Author(s)

Michael Rotondi, <mrotondi@yorku.ca>

References

Rotondi MA, Donner A. (2012). A Confidence Interval Approach to Sample Size Estimation for Interobserver Agreement Studies with Multiple Raters and Outcomes. Journal of Clinical Epidemiology, 65:778-784.

Donner A, Rotondi MA. (2010). Sample Size Requirements for Interval Estimation of the Kappa Statistic for Interobserver Agreement Studies with a Binary Outcome and Multiple Raters. International Journal of Biostatistics 6:31.

Altaye M, Donner A, Klar N. (2001). Procedures for Assessing Interobserver Agreement among Multiple Raters. Biometrics 57:584-588.

Donner A. (1999). Sample Size Requirements for Interval Estimation of the Intraclass Kappa Statistic. Communication in Statistics 28:415-429.

Bartfay E, Donner A. (2001). Statistical Inferences for Interobserver Agreement Studies with Nominal Outcome Data. The Statistician 50:135-146.

Donner A, Eliasziw M. (1987) Sample size requirements for reliability studies. Statistics in Medicine 6:441-448.

See Also

Power4Cats

Examples

```
## Not run: Suppose an investigator would like to determine the required sample size to test
kappa0=0.4 with precision of 0.1 on each side, in a study of interobserver agreement.
Further suppose that the prevalence of the traits are 0.30, 0.2, 0.2, 0.3.
## End(Not run)

CI4Cats(kappa0=0.4, kappaL=0.3, kappaU=0.5, props=c(0.30, 0.2, 0.2, 0.3), alpha=0.05);
```

CI5Cats — *Confidence Interval Approach for the Number of Subjects Required for a Study of Interobserver Agreement with Five Outcome Categories*

Description

This function provides detailed sample size estimation information to determine the number of subjects required using the confidence interval perspective to sample size estimation for κ. This version assumes that the outcome has five categories.

Usage

```
CI5Cats(kappa0, kappaL, kappaU=NA, props, raters=2, alpha=0.05)
```

Arguments

kappa0	The anticipated preliminary value of κ.
kappaL	The desired expected lower bound for a two-sided 100(1 - α) % confidence interval for κ. Alternatively, if kappaU is set to NA, the procedure produces the number of required subjects for a one-sided confidence interval.
kappaU	The desired expected upper confidence limit for κ.
props	The anticipated prevalence of the desired traits. Note that the elements of the five element vector must be non-negative and sum to one.
raters	The number of raters that are available. This function allows between 2 and 6 raters.
alpha	The desired type I error rate.

Details

This function provides detailed sample size estimation computation for studies of interobserver agreement with five outcomes. This function employs the confidence interval perspective, determining the correct sample size that provides the specified expected confidence limits. Sample size estimation is based on the precision of the estimate, instead of a simple hypothesis testing perspective. Note that a warning message is provided if any of the expected cell counts are less than 5.

Value

N	The calculated sample size.
kappa0	The specified anticipated value of κ.
kappaL	The specified expected lower limit.
kappaU	The specified expected upper limit.
props	The anticipated proportions of individuals with the outcomes of interest.
raters	The number of raters.
alpha	The desired type I error rate.
ChiCrit	The critical value that is required for sample size estimation. It is typically not required and is not displayed in the summary output.

Author(s)

Michael Rotondi, <mrotondi@yorku.ca>

References

Rotondi MA, Donner A. (2012). A Confidence Interval Approach to Sample Size Estimation for Interobserver Agreement Studies with Multiple Raters and Outcomes. Journal of Clinical Epidemiology, 65:778-784.

Donner A, Rotondi MA. (2010). Sample Size Requirements for Interval Estimation of the Kappa Statistic for Interobserver Agreement Studies with a Binary Outcome and Multiple Raters. International Journal of Biostatistics 6:31.

Altaye M, Donner A, Klar N. (2001). Procedures for Assessing Interobserver Agreement among Multiple Raters. Biometrics 57:584-588.

Donner A. (1999). Sample Size Requirements for Interval Estimation of the Intraclass Kappa Statistic. Communication in Statistics 28:415-429.

Bartfay E, Donner A. (2001). Statistical Inferences for Interobserver Agreement Studies with Nominal Outcome Data. The Statistician 50:135-146.

Donner A, Eliasziw M. (1987) Sample size requirements for reliability studies. Statistics in Medicine 6:441-448.

See Also

Power5Cats

Examples

```
## Not run: Suppose an investigator would like to determine the required sample size to test
kappa0=0.4 with precision of 0.1 on each side, in a study of interobserver agreement.
Further suppose that the prevalence of the traits are 0.13, 0.17, 0.2, 0.2, 0.3.
## End(Not run)

CI5Cats(kappa0=0.4, kappaL=0.3, kappaU=0.5, props=c(0.13, 0.17, 0.2, 0.2, 0.3), alpha=0.05);
```

CIBinary *Confidence Interval Approach for the Number of Subjects Required for a Study of Interobserver Agreement with a Binary Outcome*

Description

This function provides detailed sample size estimation information to determine the number of subjects required using the confidence interval perspective to sample size estimation for κ. This version assumes that the outcome has two categories.

Usage

```
CIBinary(kappa0, kappaL, kappaU=NA, props, raters=2, alpha=0.05)
```

Arguments

kappa0	The preliminary value of κ.
kappaL	The desired expected lower bound for a two-sided 100(1 - α) % confidence interval for kappa. Alternatively, if kappaU is set to NA, the procedure produces the number of required subjects for a one-sided confidence interval.
kappaU	The desired expected upper confidence limit for kappa.
props	The anticipated prevalence of the desired trait. Note that specifying props as either a single value, or two values that sum to one provides the same result.
raters	The number of raters that are available. This function allows between 2 and 6 raters.
alpha	The desired type I error rate.

Details

This function provides detailed sample size estimation computation for studies of interobserver agreement with a binary outcome. This function employs the confidence interval perspective, determining the correct sample size that provides the specified expected confidence limits. Sample size estimation is based on the precision of the estimate, instead of a simple hypothesis testing perspective. Note that a warning message is provided if any of the expected cell counts are less than 5.

Value

`N`	The calculated sample size.
`kappa0`	The specified anticipated value of κ.
`kappaL`	The specified expected lower limit.
`kappaU`	The specified expected upper limit.
`props`	The anticipated proportion of individuals with the outcome.
`raters`	The number of raters.
`alpha`	The desired type I error rate.
`ChiCrit`	The critical value that is required for sample size estimation. It is typically not required and is not displayed in the summary output.

Author(s)

Michael Rotondi, <mrotondi@yorku.ca>

References

Rotondi MA, Donner A. (2012). A Confidence Interval Approach to Sample Size Estimation for Interobserver Agreement Studies with Multiple Raters and Outcomes. Journal of Clinical Epidemiology, 65:778-784.

Donner A, Rotondi MA. (2010). Sample Size Requirements for Interval Estimation of the Kappa Statistic for Interobserver Agreement Studies with a Binary Outcome and Multiple Raters. International Journal of Biostatistics 6:31.

Altaye M, Donner A, Klar N. (2001). Procedures for Assessing Interobserver Agreement among Multiple Raters. Biometrics 57:584-588.

Donner A. (1999). Sample Size Requirements for Interval Estimation of the Intraclass Kappa Statistic. Communication in Statistics 28:415-429.

Bartfay E, Donner A. (2001). Statistical Inferences for Interobserver Agreement Studies with Nominal Outcome Data. The Statistician 50:135-146.

Donner A, Eliasziw M. (1987) Sample size requirements for reliability studies. Statistics in Medicine 6:441-448.

See Also

PowerBinary

Examples

```
## Not run: Suppose an investigator would like to determine the required sample size to test
kappa0=0.4 with precision of 0.1 on each side, in a study of interobserver agreement.
Further suppose that the prevalence of the trait of interest is 0.30.
## End(Not run)
CIBinary(kappa0=0.4, kappaL=0.3, kappaU=0.5, props=0.30, alpha=0.05);
```

`FixedN3Cats` *Calculation of the Lowest Expected Value, kappaL for a fixed sample size in a Study of Interobserver Agreement with a Multinomial Outcome (3 Levels)*

Description

This function provides the potential lower bound for a 100(1 - α) % confidence interval that can be calculated for a fixed sample size, n, and an anticipated value of κ. This version assumes that the outcome has three categories.

Usage

```
FixedN3Cats(kappa0, n, props, raters=2, alpha=0.05)
```

Arguments

`kappa0`	The preliminary value of κ.
`n`	The total number of available subjects.
`props`	The anticipated prevalence of the desired trait. Note that the elements of the three element vector must be non-negative and sum to one.
`raters`	The number of raters that are available. This function allows between 2 and 6 raters.
`alpha`	The desired type I error rate.

Details

This function calculates the expected lower bound of a one-sided confidence interval for a fixed sample size, n, and an anticipated value of κ, kappa0. This function can illustrate the amount of precision available in the estimation of κ for a fixed sample size. Note that a warning message is provided if any of the expected cell counts are less than 5.

Value

`n`	The specified sample size.
`kappa0`	The specified anticipated value of κ.
`kappaL`	The calculated expected lower limit.
`props`	The anticipated proportion of individuals with the outcome.

raters	The number of raters.
alpha	The desired type I error rate.
ChiCrit	The critical value that is required for sample size estimation. It is typically not required and is not displayed in the summary output.

Author(s)

Michael Rotondi, <mrotondi@yorku.ca>

References

Rotondi MA, Donner A. (2012). A Confidence Interval Approach to Sample Size Estimation for Interobserver Agreement Studies with Multiple Raters and Outcomes. Journal of Clinical Epidemiology, 65:778-784.

Donner A, Rotondi MA. (2010). Sample Size Requirements for Interval Estimation of the Kappa Statistic for Interobserver Agreement Studies with a Binary Outcome and Multiple Raters. International Journal of Biostatistics 6:31.

Altaye M, Donner A, Klar N. (2001). Procedures for Assessing Interobserver Agreement among Multiple Raters. Biometrics 57:584-588.

Donner A. (1999). Sample Size Requirements for Interval Estimation of the Intraclass Kappa Statistic. Communication in Statistics 28:415-429.

Bartfay E, Donner A. (2001). Statistical Inferences for Interobserver Agreement Studies with Nominal Outcome Data. The Statistician 50:135-146.

Donner A, Eliasziw M. (1987) Sample size requirements for reliability studies. Statistics in Medicine 6:441-448.

Examples

```
## Not run: Suppose an investigator would like to determine the expected lower bound for
kappa0=0.7 assuming he has access to 80 subjects and 5 raters.  Further suppose that
the prevalence of the trait is 0.50.
## End(Not run)
FixedN3Cats(kappa0=0.7, n=80, props=c(0.33, 0.34, 0.33), alpha=0.05, raters=5);
```

FixedN4Cats — *Calculation of the Lowest Expected Value, kappaL, for a fixed sample size in a Study of Interobserver Agreement with a Multinomial Outcome (4 Levels)*

Description

This function provides the potential lower bound for a 100(1 - α) % confidence interval that can be calculated for a fixed sample size, n, and an anticipated value of κ, kappa0. This version assumes that the outcome of interest has four levels.

Usage

```
FixedN4Cats(kappa0, n, props, raters=2, alpha=0.05)
```

Arguments

kappa0	The anticipated value of κ.
n	The total number of available subjects.
props	The anticipated prevalence of the desired trait. Note that the elements of the four element vector must be non-negative and sum to one.
raters	The number of raters that are available. This function allows between 2 and 6 raters.
alpha	The desired type I error rate.

Details

This function calculates the expected lower bound of a one-sided confidence interval for a fixed sample size, n, and an anticipated value of κ, kappa0. This function can illustrate the amount of precision available in the estimation of κ for a fixed sample size. Note that a warning message is provided if any of the expected cell counts are less than 5.

Value

n	The specified sample size.
kappa0	The specified anticipated value of κ.
kappaL	The calculated expected lower limit.
props	The anticipated proportion of individuals with the outcome.
raters	The number of raters.
alpha	The desired type I error rate.
ChiCrit	The critical value that is required for sample size estimation. It is typically not required and is not displayed in the summary output.

Author(s)

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References

Rotondi MA, Donner A. (2012). A Confidence Interval Approach to Sample Size Estimation for Interobserver Agreement Studies with Multiple Raters and Outcomes. Journal of Clinical Epidemiology, 65:778-784.

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Altaye M, Donner A, Klar N. (2001). Procedures for Assessing Interobserver Agreement among Multiple Raters. Biometrics 57:584-588.

Donner A. (1999). Sample Size Requirements for Interval Estimation of the Intraclass Kappa Statistic. Communication in Statistics 28:415-429.

Bartfay E, Donner A. (2001). Statistical Inferences for Interobserver Agreement Studies with Nominal Outcome Data. The Statistician 50:135-146.

Donner A, Eliasziw M. (1987) Sample size requirements for reliability studies. Statistics in Medicine 6:441-448.

Examples

```
## Not run: Suppose an investigator would like to determine the expected lower bound for
kappa0=0.7 assuming he has access to 80 subjects and 5 raters.  Further suppose that
the prevalence of the traits of interest are 0.4, 0.4, 0.1, 0.1.
## End(Not run)
FixedN4Cats(kappa0=0.7, n=80, props=c(0.4, 0.4, 0.1, 0.1), alpha=0.05, raters=5);
```

`FixedN5Cats` *Calculation of the Lowest Expected Value, kappaL, for a fixed sample size in a Study of Interobserver Agreement with a Multinomial Outcome (5 Levels)*

Description

This function provides the potential lower bound for a 100(1 - α) % confidence interval that can be calculated for a fixed sample size, n, and an anticipated value of κ, kappa0. This version assumes that the outcome of interest has five levels.

Usage

```
FixedN5Cats(kappa0, n, props, raters=2, alpha=0.05)
```

Arguments

`kappa0`	The anticipated preliminary value of κ.
`n`	The total number of available subjects.
`props`	The anticipated prevalence of the desired traits. Note that the elements of the five element vector must be non-negative and sum to one.
`raters`	The number of raters that are available. This function allows between 2 and 6 raters.
`alpha`	The desired type I error rate.

Details

This function calculates the expected lower bound of a one-sided confidence interval for a fixed sample size, n, and an anticipated value of κ, kappa0. This function can illustrate the amount of precision available in the estimation of kappa for a fixed sample size. Note that a warning message is provided if any of the expected cell counts are less than 5.

Value

n	The specified sample size.
kappa0	The specified anticipated value of κ.
kappaL	The calculated expected lower limit.
props	The anticipated proportion of individuals with the outcome.
raters	The number of raters.
alpha	The desired type I error rate.
ChiCrit	The critical value that is required for sample size estimation. It is typically not required and is not displayed in the summary output.

Author(s)

Michael Rotondi, <mrotondi@yorku.ca>

References

Rotondi MA, Donner A. (2012). A Confidence Interval Approach to Sample Size Estimation for Interobserver Agreement Studies with Multiple Raters and Outcomes. Journal of Clinical Epidemiology, 65:778-784.

Donner A, Rotondi MA. (2010). Sample Size Requirements for Interval Estimation of the Kappa Statistic for Interobserver Agreement Studies with a Binary Outcome and Multiple Raters. International Journal of Biostatistics 6:31.

Altaye M, Donner A, Klar N. (2001). Procedures for Assessing Interobserver Agreement among Multiple Raters. Biometrics 57:584-588.

Donner A. (1999). Sample Size Requirements for Interval Estimation of the Intraclass Kappa Statistic. Communication in Statistics 28:415-429.

Bartfay E, Donner A. (2001). Statistical Inferences for Interobserver Agreement Studies with Nominal Outcome Data. The Statistician 50:135-146.

Donner A, Eliasziw M. (1987) Sample size requirements for reliability studies. Statistics in Medicine 6:441-448.

Examples

```
## Not run: Suppose an investigator would like to determine the expected lower bound for
kappa0=0.6 assuming he has access to 150 subjects and 2 raters.  Further suppose that
the prevalence of the traits of interest are 0.4, 0.2, 0.2, 0.1, 0.1.
## End(Not run)
FixedN5Cats(kappa0=0.6, n=150, props=c(0.4, 0.2, 0.2, 0.1, 0.1), alpha=0.05, raters=2);
```

`FixedNBinary` *Calculation of the Lowest Expected Value, kappaL, for a fixed sample size in a Study of Interobserver Agreement with a Binary Outcome*

Description

This function provides the potential lower bound for a 100(1 - α) % confidence interval that can be calculated for a fixed sample size, n, and an anticipated value of κ, kappa0. This version assumes that the outcome of interest is binary.

Usage

```
FixedNBinary(kappa0, n, props, raters=2, alpha=0.05)
```

Arguments

`kappa0`	The preliminary value of κ.
`n`	The total number of available subjects.
`props`	The anticipated prevalence of the desired trait. Note that specifying props as either a single value, or two values that some to one, provides the same result.
`raters`	The number of raters that are available. This function allows between 2 and 6 raters.
`alpha`	The desired type I error rate.

Details

This function calculates the expected lower bound of a one-sided confidence interval for a fixed sample size, n, and an anticipated value of κ, kappa0. This function can illustrate the amount of precision available in the estimation of kappa for a fixed sample size. Note that a warning message is provided if any of the expected cell counts are less than 5.

Value

`n`	The specified sample size.
`kappa0`	The specified anticipated value of κ.
`kappaL`	The calculated expected lower limit.
`props`	The anticipated proportion of individuals with the outcome.
`raters`	The number of raters.
`alpha`	The desired type I error rate.
`ChiCrit`	The critical value that is required for sample size estimation. It is typically not required and is not displayed in the summary output.

Author(s)

Michael Rotondi, <mrotondi@yorku.ca>

References

Rotondi MA, Donner A. (2012). A Confidence Interval Approach to Sample Size Estimation for Interobserver Agreement Studies with Multiple Raters and Outcomes. Journal of Clinical Epidemiology, 65:778-784.

Donner A, Rotondi MA. (2010). Sample Size Requirements for Interval Estimation of the Kappa Statistic for Interobserver Agreement Studies with a Binary Outcome and Multiple Raters. International Journal of Biostatistics 6:31.

Altaye M, Donner A, Klar N. (2001). Procedures for Assessing Interobserver Agreement among Multiple Raters. Biometrics 57:584-588.

Donner A. (1999). Sample Size Requirements for Interval Estimation of the Intraclass Kappa Statistic. Communication in Statistics 28:415-429.

Bartfay E, Donner A. (2001). Statistical Inferences for Interobserver Agreement Studies with Nominal Outcome Data. The Statistician 50:135-146.

Donner A, Eliasziw M. (1987) Sample size requirements for reliability studies. Statistics in Medicine 6:441-448.

Examples

```
## Not run: Suppose an investigator would like to determine the expected lower bound for
kappa0=0.7 assuming he has access to 100 subjects and 4 raters.  Further suppose that
the prevalence of the trait is 0.50.
## End(Not run)
FixedNBinary(kappa0=0.7, n=100, props=0.50, alpha=0.05, raters=4);
```

`Power3Cats` *Power-Based Approach for the Number of Subjects Required for a Study of Interobserver Agreement with Three Outcome Categories*

Description

This function provides detailed sample size estimation information to determine the number of subjects that are required to test the hypothesis $H_0 : \kappa = \kappa_0$ vs. $H_1 : \kappa = \kappa_1$, at two-sided significance level α, with power, $1 - \beta$. This version assumes that the outcome is multinomial with three levels.

Usage

```
Power3Cats(kappa0, kappa1, props, raters=2, alpha=0.05, power=0.80)
```

Arguments

`kappa0`	The null hypothesis for the κ hypothesis test.
`kappa1`	The alternate hypothesis for the κ hypothesis test.
`props`	The anticipated prevalence of the desired traits. Note that this three element vector must sum to one.

raters	The number of raters that are available. This function allows between 2 and 6 raters.
alpha	The desired type I error rate.
power	The desired level of power, recall power = 1 - type II error.

Details

This function provides detailed sample size estimation tools for studies of interobserver agreement with three levels. This function employs the power approach, rejecting κ_0 in favour of κ_1 for a pre-specified significance level and power. Note that a warning message is provided if any of the expected cell counts are less than 5.

Value

N	The calculated sample size.
kappa0	The specified null hypothesis.
kappa1	The specified alternative hypothesis.
props	The anticipated proportion of individuals with the outcome.
raters	The number of raters.
alpha	The desired type I error rate.
power	The desired level of power, recall power = 1 - type II error.

Author(s)

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References

Rotondi MA, Donner A. (2012). A Confidence Interval Approach to Sample Size Estimation for Interobserver Agreement Studies with Multiple Raters and Outcomes. Journal of Clinical Epidemiology, 65:778-784.

Donner A, Rotondi MA. (2010). Sample Size Requirements for Interval Estimation of the Kappa Statistic for Interobserver Agreement Studies with a Binary Outcome and Multiple Raters. International Journal of Biostatistics 6:31.

Altaye M, Donner A, Klar N. (2001). Procedures for Assessing Interobserver Agreement among Multiple Raters. Biometrics 57:584-588.

Donner A. (1999). Sample Size Requirements for Interval Estimation of the Intraclass Kappa Statistic. Communication in Statistics 28:415-429.

Bartfay E, Donner A. (2001). Statistical Inferences for Interobserver Agreement Studies with Nominal Outcome Data. The Statistician 50:135-146.

Donner A, Eliasziw M. (1987) Sample size requirements for reliability studies. Statistics in Medicine 6:441-448.

See Also

CI3Cats

Examples

```
## Not run: Suppose an investigator would like to determine the required sample size to test
kappa0=0.4 vs. kappa1=0.6 with alpha=0.05 and power=0.80 in a study of
interobserver agreement.  Further suppose that the prevalence of the categories is
0.30, 0.60 and 0.10.
## End(Not run)
Power3Cats(kappa0=0.4, kappa1=0.6, props=c(0.30, 0.60, 0.10), alpha=0.05, power=0.80);
```

`Power4Cats` *Power-Based Approach for the Number of Subjects Required for a Study of Interobserver Agreement with Four Outcome Categories*

Description

This function provides detailed sample size estimation information to determine the number of subjects that are required to test the hypothesis $H_0 : \kappa = \kappa_0$ vs. $H_1 : \kappa = \kappa_1$, at two-sided significance level α, with power, $1 - \beta$. This version assumes that the outcome is multinomial with four levels.

Usage

```
Power4Cats(kappa0, kappa1, props, raters=2, alpha=0.05, power=0.80)
```

Arguments

`kappa0`	The null hypothesis for the κ hypothesis test.
`kappa1`	The alternate hypothesis for the κ hypothesis test.
`props`	The anticipated prevalence of the desired traits. Note that this four element vector must sum to one.
`raters`	The number of raters that are available. This function allows between 2 and 6 raters.
`alpha`	The desired type I error rate.
`power`	The desired level of power, recall power = 1 - type II error.

Details

This function provides detailed sample size estimation tools for studies of interobserver agreement with four levels. This function employs the power approach, rejecting κ_0 in favour of κ_1 for a pre-specified significance level and power. Note that a warning message is provided if any of the expected cell counts are less than 5.

Value

N	The calculated sample size.
kappa0	The specified null hypothesis.
kappa1	The specified alternative hypothesis.
props	The anticipated proportion of individuals with the outcome.
raters	The number of raters.
alpha	The desired type I error rate.
power	The desired level of power, recall power = 1 - type II error.

Author(s)

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References

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Bartfay E, Donner A. (2001). Statistical Inferences for Interobserver Agreement Studies with Nominal Outcome Data. The Statistician 50:135-146.

Donner A, Eliasziw M. (1987) Sample size requirements for reliability studies. Statistics in Medicine 6:441-448.

See Also

CI4Cats

Examples

```
## Not run: Suppose an investigator would like to determine the required sample size to test
kappa0=0.4 vs. kappa1=0.6 with alpha=0.05 and power=0.80 in a study of
interobserver agreement.  Further suppose that the prevalence of the categories is
0.30, 0.30, 0.30 and 0.10.
## End(Not run)
Power4Cats(kappa0=0.4, kappa1=0.6, props=c(0.30, 0.30, 0.30, 0.10), alpha=0.05, power=0.80);
```

`Power5Cats` *Power-Based Approach for the Number of Subjects Required for a Study of Interobserver Agreement with Five Outcome Categories*

Description

This function provides detailed sample size estimation information to determine the number of subjects that are required to test the hypothesis $H_0 : \kappa = \kappa_0$ vs. $H_1 : \kappa = \kappa_1$, at two-sided significance level α, with power, $1 - \beta$. This version assumes that the outcome is multinomial with five levels.

Usage

```
Power5Cats(kappa0, kappa1, props, raters=2, alpha=0.05, power=0.80)
```

Arguments

`kappa0`	The null hypothesis for the κ hypothesis test.
`kappa1`	The alternate hypothesis for the κ hypothesis test.
`props`	The anticipated prevalence of the desired traits. Note that this five element vector must sum to one.
`raters`	The number of raters that are available. This function allows between 2 and 6 raters.
`alpha`	The desired type I error rate.
`power`	The desired level of power, recall power = 1 - type II error.

Details

This function provides detailed sample size estimation tools for studies of interobserver agreement with five levels. This function employs the power approach, rejecting κ_0 in favour of κ_1 for a pre-specified significance level and power. Note that a warning message is provided if any of the expected cell counts are less than 5.

Value

`N`	The calculated sample size.
`kappa0`	The specified null hypothesis.
`kappa1`	The specified alternative hypothesis.
`props`	The anticipated proportion of individuals with the outcome.
`raters`	The number of raters.
`alpha`	The desired type I error rate.
`power`	The desired level of power, recall power = 1 - type II error.

Author(s)

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References

Rotondi MA, Donner A. (2012). A Confidence Interval Approach to Sample Size Estimation for Interobserver Agreement Studies with Multiple Raters and Outcomes. Journal of Clinical Epidemiology, 65:778-784.

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Altaye M, Donner A, Klar N. (2001). Procedures for Assessing Interobserver Agreement among Multiple Raters. Biometrics 57:584-588.

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Bartfay E, Donner A. (2001). Statistical Inferences for Interobserver Agreement Studies with Nominal Outcome Data. The Statistician 50:135-146.

Donner A, Eliasziw M. (1987) Sample size requirements for reliability studies. Statistics in Medicine 6:441-448.

See Also

CI5Cats

Examples

```
## Not run: Suppose an investigator would like to determine the required sample size to test
kappa0=0.4 vs. kappa1=0.6 with alpha=0.05 and power=0.80 in a study of
interobserver agreement.  Further suppose that the prevalence of the categories is
0.30, 0.20, 0.10, 0.30 and 0.10.
## End(Not run)
Power5Cats(kappa0=0.4, kappa1=0.6, props=c(0.30, 0.20, 0.10, 0.30, 0.10), alpha=0.05, power=0.80);
```

PowerBinary — *Power-Based Approach for the Number of Subjects Required for a Study of Interobserver Agreement with a Binary Outcome*

Description

This function provides detailed sample size estimation information to determine the number of subjects that are required to test the hypothesis $H_0 : \kappa = \kappa_0$ vs. $H_1 : \kappa = \kappa_1$, at two-sided significance level α, with power, $1 - \beta$.

Usage

```
PowerBinary(kappa0, kappa1, props, raters=2, alpha=0.05, power=0.80)
```

Arguments

kappa0	The null hypothesis for the κ hypothesis test.
kappa1	The alternate hypothesis for the κ hypothesis test.
props	The anticipated prevalence of the desired trait. Note that specifying props as either a single value, or two values that some to one, provides the same result.
raters	The number of raters that are available. This function allows between 2 and 6 raters.
alpha	The desired type I error rate.
power	The desired level of power, recall power = 1 - type II error.

Details

This function provides detailed sample size estimation tools for studies of interobserver agreement with a binary outcome. This function employs the power approach, rejecting κ_0 in favour of κ_1 for a pre-specified significance level and power. Note that a warning message is provided if any of the expected cell counts are less than 5.

Value

N	The calculated sample size.
kappa0	The specified null hypothesis.
kappa1	The specified alternative hypothesis.
props	The anticipated proportion of individuals with the outcome.
raters	The number of raters.
alpha	The desired type I error rate.
power	The desired level of power, recall power = 1 - type II error.

Author(s)

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References

Rotondi MA, Donner A. (2012). A Confidence Interval Approach to Sample Size Estimation for Interobserver Agreement Studies with Multiple Raters and Outcomes. Journal of Clinical Epidemiology, 65:778-784.

Donner A, Rotondi MA. (2010). Sample Size Requirements for Interval Estimation of the Kappa Statistic for Interobserver Agreement Studies with a Binary Outcome and Multiple Raters. International Journal of Biostatistics 6:31.

Altaye M, Donner A, Klar N. (2001). Procedures for Assessing Interobserver Agreement among Multiple Raters. Biometrics 57:584-588.

Donner A. (1999). Sample Size Requirements for Interval Estimation of the Intraclass Kappa Statistic. Communication in Statistics 28:415-429.

Bartfay E, Donner A. (2001). Statistical Inferences for Interobserver Agreement Studies with Nominal Outcome Data. The Statistician 50:135-146.

Donner A, Eliasziw M. (1987) Sample size requirements for reliability studies. Statistics in Medicine 6:441-448.

See Also

CIBinary

Examples

```
## Not run: Suppose an investigator would like to determine the required sample size to test
kappa0=0.4 vs. kappa1=0.6 with alpha=0.05 and power=0.80 in a study of
interobserver agreement.  Further suppose that the prevalence of the trait is 0.30.
## End(Not run)
PowerBinary(kappa0=0.4, kappa1=0.6, props=0.30, alpha=0.05, power=0.80);
```

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