Package 'GWG'

February 19, 2015

Type Package

Title Calculation of probabilities for inadequate and excessive gestational weight gain

Version 1.0

Date 2013-01-17

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Description Based on calculations of 758 women this package calculates positive predictive values (PPV) and negative predictive values (NPV) for inadequate and excessive gestational weight gain (GWG) for different prevalences for different BMI categories.

License GPL (>= 2)

LazyData yes

LazyLoad yes

Repository CRAN

Date/Publication 2013-01-17 11:27:33

NeedsCompilation no

R topics documented:

GWG-package *Calculation of probabilities for inadequate or excessive gestational weight gain.*

Description

The package calculates probabilities for inadequate or excessive gestational weight gain (GWG) for different prevalences for different BMI categories. The sensitivities and specificities that are required to calculate the probabilities for inadequate or excessive GWG are based on a dataset of 758 women from two merged German cohorts (LMU cohort: delivered in the Departement of Obsterics and Gynecology of the University of Munich, LMU from Dezember 2010 to October 2011 and November 2011 to September 2012; PEACHES cohort (Programming of Enhanced Adiposity Risk in CHildhood - Early Screening (ongoing cohort study)): delivered in maternity clinics near to Munich, Germany, with inclusion criteria among other things: pre-gestational body mass index >=30 kg/m2). The total gestational weight gain was defined as difference between maternal pre-pregnancy weight and last weight measurement before delivery if performed in the 37th week or later. According to the IOM/NRC guidelines adequate total GWG was classified as total weight gain of 11.5-16 kg for normal weight women, 7-11.5 kg for overweight women and 5-9 kg for obese women. In accordance with IOM inadequate GWG was defined as GWG below and excessive GWG as values above the recommended GWG. Cut-off points for inadequate and excessive GWG were calculated for each week according to the IOM/NRC guidelines, whereby during pregnancy a linear progression of GWG is assumed with different slopes in the first trimester (week 1-13) and the following two trimesters (week 14-40). We divided pregnancy in four-week intervals according to the recommended intervals due to German guidelines for pregnancy visits. For example, interval ten includes the time period from 36 completed gestational weeks and 1 day (36/1 weeks) to 40 completed gestational weeks and 0 days (40/0 weeks). We calculated prognostic values for inadequate and excessive GWG for each month starting with the 2nd month (week 4/1-8/0) because of too little observations in the 1st. Categories of body mass index (BMI), calculated by dividing weight in kilograms by squared height in meters, were defined according to the IOM/NRCand WHO criterion (underweight: <18.5 kg/m^2, normal weight: 18.5 - 24.9 kg/m^2, overweight: 25-29.9 kg/m^2, obese: >= 30 kg/m^2). We excluded underweight women, because of negligible small prevalence. In the study, 367 of the women included were normal weight, 204 overweight and 186 were obese.

Details

Package: GWG

Type: Package

Version: 1.0

Date: 2013-01-16

License: GPL (>= 2)

LazyLoad: yes

Author(s)

Christina Riedel

Maintainer: Christina Riedel <christina.riedel@med.uni-muenchen.de>

References

Knabl J, Riedel C, Gmach J et al. (2013). Prediction of excessive or inadequate gestational weight gain from week-specific IOM/NRC cut-off values. submitted.

Rasmussen KM, Yaktine AL, eds. Institute of Medicine (2009). Weight Gain During Pregnancy: Reexamining the Guidelines. Committee to Reexamine IOM Pregnancy Weight Guidelines. Washington, DC: National Academy Press.

World Health Organisation (2003). Diet, nutrition and the prevention of chronic diseases. In: World Health Organisation, editor. WHO Technical Report Series. Geneva: World Health Organisation. 2003. p. 1-149.

`lr` *Likelihood ratios given sensitivity and specificity of a test*

Description

Computes positive and negative likelihood ratios (LRs) given sensitivity and specificity of a test. LRs can be used to calculate the probability of disease after a positive or negative test.

Usage

```
lr(se, sp)
```

Arguments

`se`	sensitivity of a test (values between 0 and 1)
`sp`	specificity of a test (values between 0 and 1)

Details

LRs are calculated as follows:

$$LRpos = \frac{sensitivity}{1 - specificity}$$

$$LRneg = \frac{1 - sensitivity}{specificity}$$

Value

`lrpos`	the positive likelihood ratio
`lrneg`	the negative likelihood ratio

References

Fletcher R, Fletcher S (2005). Clinical epidemiology: the essentials (4th ed). Lippincott Williams & Wilkins. Philadelphia.

Examples

```
lr(se=0.9, sp=0.7)

#The  positive likelihood ratio is 3 and the egative likelihood ratio is 0.14
```

`normalweight` *Probabilities for inadequate or excessive gestational weight gain (GWG) for normal weight women for different months in pregnancy*

Description

The category of body mass index (BMI) for normal weight woman, calculated by dividing weight in kilograms by squared height in meters was defined according to the IOM/NRC and WHO criterion (normal weight: 18.5 - 24.9 kg/m^2). According to the IOM/NRC guidelines adequate total GWG was classified as total weight gain of 11.5-16 kg for normal weight women. In accordance with IOM inadequate GWG was defined as GWG below and excessive GWG as values above the recommended GWG.

Usage

```
normalweight(prevalence, month, weight_gain, path = system.file("NW_above.RData",
             "NW_below.RData", package = "GWG"))
```

Arguments

`prevalence`	Probability of disease (values between 0 and 1), in this case probability for excessive or inadequate GWG in the population where the mother comes from for normal weight women (a priori risk) (examples can be obtainted from http://www.en.soziale-paediatrie.med.uni-muenchen.de/research/tools/index.html)
`month`	Month of pregnancy (values between 2 and 10). One month was defined as 4 weeks, e.g. month 2 was defined as pregnancy week 5 up to and including 9
`weight_gain`	Weight gain of woman in the specific month of pregnancy (values: "excessive" or "inadequate")
`path`	Path the data is located

Value

`month`	Month of pregnancy
`prevalence`	Prevalence for excessive or inadequate GWG in the population where the mother comes from (a priori risk)

PPVexcessive	The PPVexcessive gives information whether the total GWG at the end of pregnancy will be excessive in case of exceed the week specific cut-off value (test positive) for a special month for normal weight women
NPVexcessive	The NPVexcessive gives information if the total GWG at the end of pregnancy will not be excessive (adequate or inadequate) in case of not having an excessive weight gain (test negative) for normal weight women
PPVinadequate	The PPVinadequate gives information whether the total GWG at the end of pregnancy will be inadequate in case of fall below the week specific cut-off value for a special month for normal weight women
NPVinadequate	The NPVinadequate gives information if the total GWG at the end of pregnancy will not be inadequate (adequate or excessive) in case of not having an inadequate weight gain for normal weight women

References

Knabl J, Riedel C, Gmach J et al. (2013). Prediction of excessive or inadequate gestational weight gain from week-specific IOM/NRC cut-off values. submitted.

Rasmussen KM, Yaktine AL, eds. Institute of Medicine (2009). Weight Gain During Pregnancy: Reexamining the Guidelines. Committee to Reexamine IOM Pregnancy Weight Guidelines. Washington, DC: National Academy Press.

World Health Organisation (2003). Diet, nutrition and the prevention of chronic diseases. In: World Health Organisation, editor. WHO Technical Report Series. Geneva: World Health Organisation. 2003. p. 1-149.

Examples

```
options(digits=3)

normalweight(0.39,5, "excessive")

#For a normal weight woman in Germany whose weight gain is excessive in the
#5th month of pregnancy (a priori risk = 0.39) the probability of excessive
#total GWG at the end of pregnancy is 0.696

normalweight(0.19,5, "inadequate")

#For a normal weight woman in Germany whose weight gain is inadequate in the
#5th month of pregnancy (a priori risk = 0.19) the probability of inadequate
#total GWG at the end of pregnancy is 0.479
```

NW_above *Sensitivity, specificity, positive and negative likelihood ratios for prediction of excessive GWG for normal weight women*

Description

This dataset include the sensitivity and specificity for prediction of excessive GWG at the end of pregnancy from exceeding the respective cut-off values in each respective month as well as the likelihood ratio to assess how much the information on exceeding the cut-off values improves the a priori probabilities for excessive and adequate total GWG for normal weight women (starting with the 2nd month or week 4/1-8/0). The data is based on 367 normal weight women from two German cohorts (see Description).

Usage

```
data("NW_above")
```

Format

A data frame with 9 observations on the following 13 variables.

month month of pregnancy

se.est vector of sensitivity estimators

se.lower vector of lower bound of the confidence interval of the sensitivity estimators

se.upper vector of upper bound of the confidence interval of the sensitivity estimators

sp.est vector of specificity estimators

sp.lower vector of lower bound of the confidence interval of the specificity estimators

sp.upper vector of upper bound of the confidence interval of the specificity estimators

lr.pos.est vector of positive likelihood ratio estimators

lr.pos.lower vector of lower bound of the confidence interval of the positive likelihood ratio estimators

lr.pos.upper vector of upper bound of the confidence interval of the positive likelihood ratio estimators

lr.neg.est vector of negative likelihood ratio estimators

lr.neg.lower vector of lower bound of the confidence interval of the negative likelihood ratio estimators

lr.neg.upper vector of upper bound of the confidence interval of the negative likelihood ratio estimators

Details

Exact binomial 95% confidence intervals (CI) were calculated for sensitivity and specificity and the 95% CI of the likelihood ratios were calculated as suggested by Simel et al. (1991).

Source

Knabl J, Riedel C, Gmach J et al. (2013). Prediction of excessive or inadequate gestational weight gain from week-specific IOM/NRC cut-off values. submitted.

References

Simel D, Samsa G, Matchar D (1991). Likelihood ratios with confidence: Sample size estimation for diagnostic test studies. Journal of Clinical Epidemiology 44.p 763 - 770.

Examples

```
data("NW_above")

#Plot of positive likelihood ratios for excessive GWG for normal weight women
plot(NW_above$month, NW_above$lr.pos.est,
     xlim=c(1,10),
     ylim=c(0,20),
     main="LR+ for excessive GWG",
     ylab="likelihood ratio",
     xlab="month",
     cex.main=2,
     font.main=1,
     cex.lab=1.9,
     cex.axis=1.5)
lines(NW_above$month, NW_above$lr.pos.est, lty=1,lwd=4)
lines(NW_above$month, NW_above$lr.pos.lower, lty=2,lwd=4)
lines(NW_above$month, NW_above$lr.pos.upper, lty=2,lwd=4)
abline(h=2,lwd=1, col="grey")
abline(h=4,lwd=1, col="grey")
abline(h=6,lwd=1, col="grey")
abline(h=8,lwd=1, col="grey")
abline(h=10,lwd=1, col="grey")
abline(h=12,lwd=1, col="grey")
abline(h=14,lwd=1, col="grey")
abline(h=16,lwd=1, col="grey")
abline(h=18,lwd=1, col="grey")
axis(1, c(3,5,7,9), cex.axis=1.5)
legend("topleft", c("lr+ estimate", "lr+ confidence interval"),
       col=c("black", "black"), lty=c(1,2),
       bg="white", cex=1.5, lwd=c(3,3))
```

NW_below *Sensitivity, specificity, positive and negative likelihood ratios for prediction of inadequate GWG for normal weight women*

Description

This dataset include the sensitivity and specificity for prediction of inadequate GWG at the end of pregnancy from falling below the respective cut-off values in each respective month as well as the likelihood ratio to assess how much the information on falling below the cut-off values improves the a priori probabilities for inadequate and adequate total GWG for normal weight women (starting with the 2nd month or week 4/1-8/0). The data is based on 367 normal weight women from two German cohorts (see Description).

Usage

```
data("NW_below")
```

Format

A data frame with 9 observations on the following 13 variables.

month month of pregnancy

se.est vector of sensitivity estimators

se.lower vector of lower bound of the confidence interval of the sensitivity estimators

se.upper vector of upper bound of the confidence interval of the sensitivity estimators

sp.est vector of specificity estimators

sp.lower vector of lower bound of the confidence interval of the specificity estimators

sp.upper vector of upper bound of the confidence interval of the specificity estimators

lr.pos.est vector of positive likelihood ratio estimators

lr.pos.lower vector of lower bound of the confidence interval of the positive likelihood ratio estimators

lr.pos.upper vector of upper bound of the confidence interval of the positive likelihood ratio estimators

lr.neg.est vector of negative likelihood ratio estimators

lr.neg.lower vector of lower bound of the confidence interval of the negative likelihood ratio estimators

lr.neg.upper vector of upper bound of the confidence interval of the negative likelihood ratio estimators

Details

Exact binomial 95% confidence intervals (CI) were calculated for sensitivity and specificity and the 95% CI of the likelihood ratios were calculated as suggested by Simel et al. (1991).

Source

Knabl J, Riedel C, Gmach J et al. (2013). Prediction of excessive or inadequate gestational weight gain from week-specific IOM/NRC cut-off values. submitted.

References

Simel D, Samsa G, Matchar D (1991). Likelihood ratios with confidence: Sample size estimation for diagnostic test studies. Journal of Clinical Epidemiology 44.p 763 - 770.

Examples

```
data("NW_below")

#Plot of positive likelihood ratios for inadequate GWG for normal weight women
plot(NW_below$month, NW_below$lr.pos.est,
     xlim=c(1,10),
     ylim=c(0,20),
     main="LR+ for inadequate GWG",
     ylab="likelihood ratio",
     xlab="month",
     cex.main=2,
     font.main=1,
     cex.lab=1.9,
     cex.axis=1.5)
lines(NW_below$month, NW_below$lr.pos.est, lty=1,lwd=4)
lines(NW_below$month, NW_below$lr.pos.lower, lty=2,lwd=4)
lines(NW_below$month, NW_below$lr.pos.upper, lty=2,lwd=4)
abline(h=2,lwd=1, col="grey")
abline(h=4,lwd=1, col="grey")
abline(h=6,lwd=1, col="grey")
abline(h=8,lwd=1, col="grey")
abline(h=10,lwd=1, col="grey")
abline(h=12,lwd=1, col="grey")
abline(h=14,lwd=1, col="grey")
abline(h=16,lwd=1, col="grey")
abline(h=18,lwd=1, col="grey")
axis(1, c(3,5,7,9), cex.axis=1.5)
legend("topleft", c("lr+ estimate", "lr+ confidence interval"),
       col=c("black", "black"), lty=c(1,2),
       bg="white", cex=1.5, lwd=c(3,3))
```

---

obese *Probabilities for inadequate or excessive gestational weight gain (GWG) for obese women for different months in pregnancy*

Description

The category of body mass index (BMI) for obese woman, calculated by dividing weight in kilograms by squared height in meters was defined according to the IOM/NRC and WHO criterion (obese: BMI >= 30 kg/m^2). According to the IOM/NRC guidelines adequate total GWG was classified as total weight gain of 5-9 kg for obese women. In accordance with IOM inadequate GWG was defined as GWG below and excessive GWG as values above the recommended GWG.

Usage

```
obese(prevalence, month, weight_gain, path = system.file("OB_above.RData",
             "OB_below.RData", package = "GWG"))
```

Arguments

prevalence	Probability of disease (values between 0 and 1), in this case probability for excessive or inadequate GWG in the population where the mother comes from for obese women (a priori risk) (examples can be obtainted from http://www.en.soziale-paediatrie.med.uni-muenchen.de/research/tools/index.html)
month	Month of pregnancy (values between 2 and 10). One month was defined as 4 weeks, e.g. month 2 was defined as pregnancy week 5 up to and including 9
weight_gain	Weight gain of woman in the specific month of pregnancy (values: "excessive" or "inadequate")
path	Path the data is located

Value

month	Month of pregnancy
prevalence	Prevalence for excessive or inadequate GWG in the population where the mother comes from (a priori risk)
PPVexcessive	The PPVexcessive gives information whether the total GWG at the end of pregnancy will be excessive in case of exceed the week specific cut-off value (test positive) for a special month for obese women
NPVexcessive	The NPVexcessive gives information if the total GWG at the end of pregnancy will not be excessive (adequate or inadequate) in case of not having an excessive weight gain (test negative) for obese women
PPVinadequate	The PPVinadequate gives information whether the total GWG at the end of pregnancy will be inadequate in case of fall below the week specific cut-off value for a special month for obese women
NPVinadequate	The NPVinadequate gives information if the total GWG at the end of pregnancy will not be inadequate (adequate or excessive) in case of not having an inadequate weight gain for obese women

References

Knabl J, Riedel C, Gmach J et al. (2013). Prediction of excessive or inadequate gestational weight gain from week-specific IOM/NRC cut-off values. submitted.

Rasmussen KM, Yaktine AL, eds. Institute of Medicine (2009). Weight Gain During Pregnancy: Reexamining the Guidelines. Committee to Reexamine IOM Pregnancy Weight Guidelines. Washington, DC: National Academy Press.

World Health Organisation (2003). Diet, nutrition and the prevention of chronic diseases. In: World Health Organisation, editor. WHO Technical Report Series. Geneva: World Health Organisation. 2003. p. 1-149.

Examples

```
options(digits=3)

obese(0.65,5, "excessive")
```

```
#For an obese woman in Germany whose weight gain is excessive in the
#5th month of pregnancy (a priori risk = 0.65) the probability of excessive
#total GWG at the end of pregnancy is 0.894

obese(0.13,5, "inadequate")

#For an obese woman in Germany whose weight gain is inadequate in the
#5th month of pregnancy (a priori risk = 0.13) the probability of inadequate
#total GWG at the end of pregnancy is 0.288
```

OB_above *Sensitivity, specificity, positive and negative likelihood ratios for prediction of excessive GWG for obese women*

Description

This dataset include the sensitivity and specificity for prediction of excessive GWG at the end of pregnancy from exceeding the respective cut-off values in each respective month as well as the likelihood ratio to assess how much the information on exceeding the cut-off values improves the a priori probabilities for excessive and adequate total GWG for obese women (starting with the 2nd month or week 4/1-8/0). The data is based on 186 obese women from two German cohorts (see Description).

Usage

```
data("OB_above")
```

Format

A data frame with 9 observations on the following 13 variables.

month month of pregnancy

se.est vector of sensitivity estimators

se.lower vector of lower bound of the confidence interval of the sensitivity estimators

se.upper vector of upper bound of the confidence interval of the sensitivity estimators

sp.est vector of specificity estimators

sp.lower vector of lower bound of the confidence interval of the specificity estimators

sp.upper vector of upper bound of the confidence interval of the specificity estimators

lr.pos.est vector of positive likelihood ratio estimators

lr.pos.lower vector of lower bound of the confidence interval of the positive likelihood ratio estimators

lr.pos.upper vector of upper bound of the confidence interval of the positive likelihood ratio estimators

lr.neg.est vector of negative likelihood ratio estimators

lr.neg.lower vector of lower bound of the confidence interval of the negative likelihood ratio estimators

lr.neg.upper vector of upper bound of the confidence interval of the negative likelihood ratio estimators

Details

Exact binomial 95% confidence intervals (CI) were calculated for sensitivity and specificity and the 95% CI of the likelihood ratios were calculated as suggested by Simel et al. (1991).

Source

Knabl J, Riedel C, Gmach J et al. (2013). Prediction of excessive or inadequate gestational weight gain from week-specific IOM/NRC cut-off values. submitted.

References

Simel D, Samsa G, Matchar D (1991). Likelihood ratios with confidence: Sample size estimation for diagnostic test studies. Journal of Clinical Epidemiology 44.p 763 - 770.

Examples

```
data("OB_above")

#Plot of positive likelihood ratios for excessive GWG for obese women
plot(OB_above$month, OB_above$lr.pos.est,
     xlim=c(1,10),
     ylim=c(0,20),
     main="LR+ for excessive GWG",
     ylab="likelihood ratio",
     xlab="month",
     cex.main=2,
     font.main=1,
     cex.lab=1.9,
     cex.axis=1.5)
lines(OB_above$month, OB_above$lr.pos.est, lty=1,lwd=4)
lines(OB_above$month, OB_above$lr.pos.lower, lty=2,lwd=4)
lines(OB_above$month, OB_above$lr.pos.upper, lty=2,lwd=4)
abline(h=2,lwd=1, col="grey")
abline(h=4,lwd=1, col="grey")
abline(h=6,lwd=1, col="grey")
abline(h=8,lwd=1, col="grey")
abline(h=10,lwd=1, col="grey")
abline(h=12,lwd=1, col="grey")
abline(h=14,lwd=1, col="grey")
abline(h=16,lwd=1, col="grey")
abline(h=18,lwd=1, col="grey")
axis(1, c(3,5,7,9), cex.axis=1.5)
legend("topleft", c("lr+ estimate", "lr+ confidence interval"),
       col=c("black", "black"), lty=c(1,2),
       bg="white", cex=1.5, lwd=c(3,3))
```

OB_below *Sensitivity, specificity, positive and negative likelihood ratios for prediction of inadequate GWG for obese women*

Description

This dataset include the sensitivity and specificity for prediction of inadequate GWG at the end of pregnancy from falling below the respective cut-off values in each respective month as well as the likelihood ratio to assess how much the information on falling below the cut-off values improves the a priori probabilities for inadequate and adequate total GWG for obese women (starting with the 2nd month or week 4/1-8/0). The data is based on 186 obese women from two German cohorts (see Description).

Usage

```
data("OB_below")
```

Format

A data frame with 9 observations on the following 13 variables.

month month of pregnancy

se.est vector of sensitivity estimators

se.lower vector of lower bound of the confidence interval of the sensitivity estimators

se.upper vector of upper bound of the confidence interval of the sensitivity estimators

sp.est vector of specificity estimators

sp.lower vector of lower bound of the confidence interval of the specificity estimators

sp.upper vector of upper bound of the confidence interval of the specificity estimators

lr.pos.est vector of positive likelihood ratio estimators

lr.pos.lower vector of lower bound of the confidence interval of the positive likelihood ratio estimators

lr.pos.upper vector of upper bound of the confidence interval of the positive likelihood ratio estimators

lr.neg.est vector of negative likelihood ratio estimators

lr.neg.lower vector of lower bound of the confidence interval of the negative likelihood ratio estimators

lr.neg.upper vector of upper bound of the confidence interval of the negative likelihood ratio estimators

Details

Exact binomial 95% confidence intervals (CI) were calculated for sensitivity and specificity and the 95% CI of the likelihood ratios were calculated as suggested by Simel et al. (1991).

Source

Knabl J, Riedel C, Gmach J et al. (2013). Prediction of excessive or inadequate gestational weight gain from week-specific IOM/NRC cut-off values. submitted.

References

Simel D, Samsa G, Matchar D (1991). Likelihood ratios with confidence: Sample size estimation for diagnostic test studies. Journal of Clinical Epidemiology 44.p 763 - 770.

Examples

```
data("OB_below")

#Plot of positive likelihood ratios for inadequate GWG for obese women
plot(OB_below$month, OB_below$lr.pos.est,
     xlim=c(1,10),
     ylim=c(0,20),
     main="LR+ for inadequate GWG",
     ylab="likelihood ratio",
     xlab="month",
     cex.main=2,
     font.main=1,
     cex.lab=1.9,
     cex.axis=1.5)
lines(OB_below$month, OB_below$lr.pos.est, lty=1,lwd=4)
lines(OB_below$month, OB_below$lr.pos.lower, lty=2,lwd=4)
lines(OB_below$month, OB_below$lr.pos.upper, lty=2,lwd=4)
abline(h=2,lwd=1, col="grey")
abline(h=4,lwd=1, col="grey")
abline(h=6,lwd=1, col="grey")
abline(h=8,lwd=1, col="grey")
abline(h=10,lwd=1, col="grey")
abline(h=12,lwd=1, col="grey")
abline(h=14,lwd=1, col="grey")
abline(h=16,lwd=1, col="grey")
abline(h=18,lwd=1, col="grey")
axis(1, c(3,5,7,9), cex.axis=1.5)
legend("topleft", c("lr+ estimate", "lr+ confidence interval"),
       col=c("black", "black"), lty=c(1,2),
       bg="white", cex=1.5, lwd=c(3,3))
```

---

overweight — *Probabilities for inadequate or excessive gestational weight gain (GWG) for overweight women for different months in pregnancy*

Description

The category of body mass index (BMI) for overweight woman, calculated by dividing weight in kilograms by squared height in meters was defined according to the IOM/NRC and WHO criterion

(overweight: BMI 25-29.9 kg/m^2). According to the IOM/NRC guidelines adequate total GWG was classified as total weight gain of 7-11.5 kg for overweight women. In accordance with IOM inadequate GWG was defined as GWG below and excessive GWG as values above the recommended GWG.

Usage

```
overweight(prevalence, month, weight_gain, path = system.file("OW_above.RData",
                  "OW_below.RData", package = "GWG"))
```

Arguments

prevalence	Probability of disease (values between 0 and 1), in this case probability for excessive or inadequate GWG in the population where the mother comes from for overweight women (a priori risk) (examples can be obtainted from http://www.en.soziale-paediatrie.med.uni-muenchen.de/research/tools/index.html)
month	Month of pregnancy (values between 2 and 10). One month was defined as 4 weeks, e.g. month 2 was defined as pregnancy week 5 up to and including 9
weight_gain	Weight gain of woman in the specific month of pregnancy (values: "excessive" or "inadequate")
path	Path the data is located

Value

month	Month of pregnancy
prevalence	Prevalence for excessive or inadequate GWG in the population where the mother comes from (a priori risk)
PPVexcessive	The PPVexcessive gives information whether the total GWG at the end of pregnancy will be excessive in case of exceed the week specific cut-off value (test positive) for a special month for overweight women
NPVexcessive	The NPVexcessive gives information if the total GWG at the end of pregnancy will not be excessive (adequate or inadequate) in case of not having an excessive weight gain (test negative) for overweight women
PPVinadequate	The PPVinadequate gives information whether the total GWG at the end of pregnancy will be inadequate in case of fall below the week specific cut-off value for a special month for overweight women
NPVinadequate	The NPVinadequate gives information if the total GWG at the end of pregnancy will not be inadequate (adequate or excessive) in case of not having an inadequate weight gain for overweight women

References

Knabl J, Riedel C, Gmach J et al. (2013). Prediction of excessive or inadequate gestational weight gain from week-specific IOM/NRC cut-off values. submitted.

Rasmussen KM, Yaktine AL, eds. Institute of Medicine (2009). Weight Gain During Pregnancy: Reexamining the Guidelines. Committee to Reexamine IOM Pregnancy Weight Guidelines. Washington, DC: National Academy Press.

World Health Organisation (2003). Diet, nutrition and the prevention of chronic diseases. In: World Health Organisation, editor. WHO Technical Report Series. Geneva: World Health Organisation. 2003. p. 1-149.

Examples

```
options(digits=3)

overweight(0.65,5, "excessive")

#For an overweight woman in Germany whose weight gain is excessive in the
#5th month of pregnancy (a priori risk = 0.65) the probability of excessive
#total GWG at the end of pregnancy is 0.901

overweight(0.07,5, "inadequate")

#For an overweight woman in Germany whose weight gain is inadequate in the
#5th month of pregnancy (a priori risk = 0.07) the probability of inadequate
#total GWG at the end of pregnancy is 0.128
```

OW_above *Sensitivity, specificity, positive and negative likelihood ratios for prediction of excessive GWG for overweight women*

Description

This dataset include the sensitivity and specificity for prediction of excessive GWG at the end of pregnancy from exceeding the respective cut-off values in each respective month as well as the likelihood ratio to assess how much the information on exceeding the cut-off values improves the a priori probabilities for excessive and adequate total GWG for overweight women (starting with the 2nd month or week 4/1-8/0). The data is based on 204 overweight women from two German cohorts (see Description).

Usage

```
data("OW_above")
```

Format

A data frame with 9 observations on the following 13 variables.

month month of pregnancy

se.est vector of sensitivity estimators

se.lower vector of lower bound of the confidence interval of the sensitivity estimators

se.upper vector of upper bound of the confidence interval of the sensitivity estimators

sp.est vector of specificity estimators

sp.lower vector of lower bound of the confidence interval of the specificity estimators

sp.upper vector of upper bound of the confidence interval of the specificity estimators

lr.pos.est vector of positive likelihood ratio estimators

lr.pos.lower vector of lower bound of the confidence interval of the positive likelihood ratio estimators

lr.pos.upper vector of upper bound of the confidence interval of the positive likelihood ratio estimators

lr.neg.est vector of negative likelihood ratio estimators

lr.neg.lower vector of lower bound of the confidence interval of the negative likelihood ratio estimators

lr.neg.upper vector of upper bound of the confidence interval of the negative likelihood ratio estimators

Details

Exact binomial 95% confidence intervals (CI) were calculated for sensitivity and specificity and the 95% CI of the likelihood ratios were calculated as suggested by Simel et al. (1991).

Source

Knabl J, Riedel C, Gmach J et al. (2013). Prediction of excessive or inadequate gestational weight gain from week-specific IOM/NRC cut-off values. submitted.

References

Simel D, Samsa G, Matchar D (1991). Likelihood ratios with confidence: Sample size estimation for diagnostic test studies. Journal of Clinical Epidemiology 44.p 763 - 770.

Examples

```
data("OW_above")

#Plot of positive likelihood ratios for excessive GWG for overweight women
plot(OW_above$month, OW_above$lr.pos.est,
     xlim=c(1,10),
     ylim=c(0,20),
     main="LR+ for excessive GWG",
     ylab="likelihood ratio",
     xlab="month",
     cex.main=2,
     font.main=1,
     cex.lab=1.9,
     cex.axis=1.5)
lines(OW_above$month, OW_above$lr.pos.est, lty=1,lwd=4)
lines(OW_above$month, OW_above$lr.pos.lower, lty=2,lwd=4)
lines(OW_above$month, OW_above$lr.pos.upper, lty=2,lwd=4)
abline(h=2,lwd=1, col="grey")
abline(h=4,lwd=1, col="grey")
abline(h=6,lwd=1, col="grey")
```

```
abline(h=8,lwd=1, col="grey")
abline(h=10,lwd=1, col="grey")
abline(h=12,lwd=1, col="grey")
abline(h=14,lwd=1, col="grey")
abline(h=16,lwd=1, col="grey")
abline(h=18,lwd=1, col="grey")
axis(1, c(3,5,7,9), cex.axis=1.5)
legend("topleft", c("lr+ estimate", "lr+ confidence interval"),
       col=c("black", "black"), lty=c(1,2),
       bg="white", cex=1.5, lwd=c(3,3))
```

`OW_below` *Sensitivity, specificity, positive and negative likelihood ratios for prediction of inadequate GWG for overweight women*

Description

This dataset include the sensitivity and specificity for prediction of inadequate GWG at the end of pregnancy from falling below the respective cut-off values in each respective month as well as the likelihood ratio to assess how much the information on falling below the cut-off values improves the a priori probabilities for inadequate and adequate total GWG for overweight women (starting with the 2nd month or week 4/1-8/0). The data is based on 204 overweight women from two German cohorts (see Description).

Usage

```
data("OW_below")
```

Format

A data frame with 9 observations on the following 13 variables.

month month of pregnancy

se.est vector of sensitivity estimators

se.lower vector of lower bound of the confidence interval of the sensitivity estimators

se.upper vector of upper bound of the confidence interval of the sensitivity estimators

sp.est vector of specificity estimators

sp.lower vector of lower bound of the confidence interval of the specificity estimators

sp.upper vector of upper bound of the confidence interval of the specificity estimators

lr.pos.est vector of positive likelihood ratio estimators

lr.pos.lower vector of lower bound of the confidence interval of the positive likelihood ratio estimators

lr.pos.upper vector of upper bound of the confidence interval of the positive likelihood ratio estimators

lr.neg.est vector of negative likelihood ratio estimators

lr.neg.lower vector of lower bound of the confidence interval of the negative likelihood ratio estimators

lr.neg.upper vector of upper bound of the confidence interval of the negative likelihood ratio estimators

Details

Exact binomial 95% confidence intervals (CI) were calculated for sensitivity and specificity and the 95% CI of the likelihood ratios were calculated as suggested by Simel et al. (1991).

Source

Knabl J, Riedel C, Gmach J et al. (2013). Prediction of excessive or inadequate gestational weight gain from week-specific IOM/NRC cut-off values. submitted.

References

Simel D, Samsa G, Matchar D (1991). Likelihood ratios with confidence: Sample size estimation for diagnostic test studies. Journal of Clinical Epidemiology 44.p 763 - 770.

Examples

```
data("OW_below")

#Plot of positive likelihood ratios for inadequate GWG for overweight women
plot(OW_below$month, OW_below$lr.pos.est,
     xlim=c(1,10),
     ylim=c(0,20),
     main="LR+ for inadequate GWG",
     ylab="likelihood ratio",
     xlab="month",
     cex.main=2,
     font.main=1,
     cex.lab=1.9,
     cex.axis=1.5)
lines(OW_below$month, OW_below$lr.pos.est, lty=1,lwd=4)
lines(OW_below$month, OW_below$lr.pos.lower, lty=2,lwd=4)
lines(OW_below$month, OW_below$lr.pos.upper, lty=2,lwd=4)
abline(h=2,lwd=1, col="grey")
abline(h=4,lwd=1, col="grey")
abline(h=6,lwd=1, col="grey")
abline(h=8,lwd=1, col="grey")
abline(h=10,lwd=1, col="grey")
abline(h=12,lwd=1, col="grey")
abline(h=14,lwd=1, col="grey")
abline(h=16,lwd=1, col="grey")
abline(h=18,lwd=1, col="grey")
axis(1, c(3,5,7,9), cex.axis=1.5)
legend("topleft", c("lr+ estimate", "lr+ confidence interval"),
       col=c("black", "black"), lty=c(1,2),
       bg="white", cex=1.5, lwd=c(3,3))
```

`posterior_probability` *Posterior probability of disease given prevalence and positive or negative likelihood ratio of a test*

Description

Computes the posterior probability of disease given prevalence (prior probability) and positive or negative likelihood ratio of a test. Furthermore it is possible to give out the posterior odds.

Usage

```
posterior_probability(prevalence,lrpos=-1, lrneg=-1 ,posterior_odds=FALSE)
```

Arguments

`prevalence`	The prevalence of a disease (=prior_odds).
`lrpos`	The positive likelihood ratio (only displayed on the output window if a values >= 0 has been entered).
`lrneg`	The negative likelihood ratio (only displayed on the output window if a values >= 0 has been entered).
`posterior_odds`	If TRUE the posterior odds will be displayed on the output window. Default is FALSE.

Details

$$posterior\_odds\_of\_disease = prior\_odds * pos\_likelihood\_ratio$$

$$prior\_odds = \frac{prior\_probability}{1 - prior\_probability}$$

$$posterior\_probability\_of\_disease = \frac{posterior\_odds}{1 + posterior_o dds}$$

Value

`posterior_probability_pos`
: Probability of disease given test is positive

`posterior_probability_neg`
: Probability of no disease given test is negative

`posterior_odds_pos`
: Posterior odds of test positive

`posterior_odds_neg`
: Posterior odds of test negative

References

Petrie A, Sabin C (2005). Medical statistics at a glance (2nd ed). Wiley-Blackwell. Oxford.

Examples

```
##Prevalence is 0.5 and the positive likelihood ratio is 3:
posterior_probability(0.5, lrpos=3)

#The probability of disease given test is positive is 0.75.


##Prevalence is 0.5 and the negative likelihood ratio is 0.5:
posterior_probability(0.5, lrneg=0.5, posterior_odds=TRUE)

#The probability of no disease is 0.66 given test is negative and the
#corresponding posterior odds is 0.5.
```

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