

# Package ‘fmsb’

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**Depends** R (>= 2.2.0)

**Suggests** Epi, vcd

**Description** Several utility functions for the book entitled  
“Practices of Medical and Health Data Analysis using R”  
(Pearson Education Japan, 2007) with Japanese demographic  
data and some demographic analysis related functions.

**License** GPL (>= 2)

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CaretakerRatio	<i>Caretaker Ratio</i>
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---

### Description

Caretaker ratio. Defined as the ratio of the aged population who may need care to caretaking females population.

### Usage

CaretakerRatio(PM, PF)

**Arguments**

PM	The integer vector to give age-specific population from age 0 to more than 80 for males.
PF	The integer vector to give age-specific population from age 0 to more than 80 for females.

**Value**

CR	Caretaker Ratio.
----	------------------

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

Preston SH, Heuveline P, Guillot M (2001) Demography: Measuring and Modeling Population Processes. Blackwell Publishing, Oxford.

Newell C (1988) Methods and Models in Demography. The Guilford Press, New York.

Rowland DT (2003) Demographic methods and concepts. Oxford Univ. Press, Oxford.

**Examples**

```
# Caretaker Ratio in Japan in 2015. The value 81.72 is much higher than
# 46 observed in UK in 1990.
CaretakerRatio(PM=Jpop$M2015, PF=Jpop$F2015)
```

---

 CM

---

*Coale and McNeil's model nuptiality and its fitting*


---

**Description**

Implementing Coale and McNeil's model (1972) for the age-specific probability of first marriage and fitting the model to actual data.

**Usage**

```
CM(scale=0.8, a0=18, k=2)
fitCM(initialpar=c(0.8, 18, 2), data, ages=10:60, mode=1, Method="Nelder-Mead", ...)
```

**Arguments**

scale	The parameter C of the Coale-McNeil model, the scale parameter for total nuptiality. Almost same as 1-(probability of never marrying for whole life)
a0	The parameter a0 of the Coale-McNeil model, the age of the beginning of first marriage. The beginning means about 1% of the population having ever married.
k	The parameter k of the Coale-McNeil model, how fast the population marry after a0.
initialpar	Initial value for the parameters to be estimated. If not given, c(0.8, 18, 2) is used.
data	Actual vector of the age-specific probability of first marriage when the mode is 1, otherwise the proportion ever married by each age.
ages	The age ranges for the data. It must be within the range from 10 to 60. Default is 10:60. It must have the same lengths as data.
mode	The mode of fitting, 1 means fitting for the probability of first marriage, otherwise fitting for the proportion ever married. Default is 1.
Method	The method to be used in optim() function. Default is "Nelder-Mead".
...	Other options to be passed to optim().

**Value**

CM() returns model schedule of nuptiality for ages from 10 to 60 as a list, composed of g (the numeric vector for the probability of first marriage happening for each age), G (the numeric vector for the proportion ever married by each age), mu (mean age of first marriage among total population), and sigma (standard deviation of the ages of first marriage). fitCM() returns the numeric vector of fitted parameters C, a0 and k, RMSE for those values, and the flag of convergence.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

Coale AJ, McNeil DR (1972) The distribution by age of the frequency of first marriage in a female cohort. *Journal of the American Statistical Association*, 67(340): 743-749.doi: [10.1080/01621459.1972.10481287](https://doi.org/10.1080/01621459.1972.10481287)

Newell C (1988) *Methods and Models in Demography*. The Guilford Press, New York.

**See Also**

[CT](#)

**Examples**

```
# The data of Japanese population census 2010 for the whole country
# The proportion of ever married females for ages from 15 to 60.
# http://www.e-stat.go.jp/SG1/estat/List.do?bid=000001034991&cycodes=0
Ages <- 15:60
```

```

EverMarriedFemales <- c(0.003081039, 0.003203058, 0.006502558,
0.014261608, 0.028378604, 0.048903318, 0.07596101, 0.110311095,
0.153365573, 0.2090648, 0.273819118, 0.342672073, 0.41259517,
0.479789489, 0.536291775, 0.589919881, 0.631937609, 0.663719195,
0.691411757, 0.71775138, 0.740807817, 0.760155848, 0.775400475,
0.788445244, 0.799522713, 0.81108241, 0.821591503, 0.830695486,
0.840776283, 0.846773585, 0.85921777, 0.867991763, 0.876908992,
0.886388747, 0.894302114, 0.902385961, 0.909329207, 0.914662575,
0.920327092, 0.925013244, 0.929551158, 0.933150578, 0.935851652,
0.938421122, 0.940089719, 0.943223398)

res <- fitCM(initialpar=c(0.8, 18, 2), data=EverMarriedFemales,
  ages=Ages, mode=2)
print(res)
plot(Ages, EverMarriedFemales,
  main="Proportion ever married by each age\n for 2010 Japanese females")
fitted <- CM(res[1], res[2], res[3])
lines(Ages, fitted$G[6:51], col="red")
NoteForm <- "C=%3.1f, a0=%3.1f, k=%3.1f\n mu=%3.1f, sd=%3.1f"
text(40, 0.2, sprintf(NoteForm, res[1], res[2], res[3], fitted$mu, fitted$sigma))
# mean age of first marriage happening
print(sum(Ages*fitted$g[Ages-9]/sum(fitted$g[Ages-9])))

```

---

CronbachAlpha

*Calculate Cronbach's alpha coefficient.*


---

### Description

Calculate Cronbach's alpha coefficient from a matrix or data.frame with more than 2 columns.

### Usage

```
CronbachAlpha(X)
```

### Arguments

X                    A matrix or data.frame with more than 2 columns.

### Value

Single numeric value of Cronbach's alpha.

### Author(s)

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

### References

Bland JM, Altman DG (1997) Statistics notes: Cronbach's alpha. *BMJ*, 314: 572.

**Examples**

```

QUEST <- data.frame(
  Q1=c(1, 5, 2, 3, 4, 2, 3, 4, 3, 2),
  Q2=c(2, 4, 1, 2, 4, 1, 2, 5, 2, 1),
  Q3=c(2, 5, 1, 3, 3, 2, 2, 4, 2, 2))
CronbachAlpha(QUEST)

```

---

CT

*Coale and Trussell's model marital fertility and its fitting*


---

**Description**

Implementing Coale and Trussell's model of age-specific marital fertility rates and fitting the model to actual ASMFR.

**Usage**

```

CT(M=1, m=0)
fitCT(initialpar=c(1.0, 1.0), data, Method="Nelder-Mead", ...)

```

**Arguments**

M	The parameter M of the CT model, the scale (peak height) parameter of fertility
m	The parameter m of the CT model, the strength of downward discordance from natural fertility with aging
initialpar	Initial value for the parameters to be estimated. If not given, c(1.0, 1.0) is used.
data	Actual vector of ASMFR (which must be given for from age 12 to age 49 for each age) to be used to obtain the best-fit parameters of the CT's model.
Method	The method to be used in optim() function. Default is "Nelder-Mead".
...	Other options to be passed to optim().

**Value**

CT() returns model ASMFR for ages from 12 to 49. fitCT() returns the numeric vector of fitted parameters M and m, RMSE for those values, and the flag of convergence.

**Author(s)**

Minato Nakazawa <minatonakazawa@gmail.com> <http://minato.sip21c.org/>

**References**

Coale AJ, Trussell TJ (1978) Technical Note: Finding the Two Parameters That Specify a Model Schedule of Marital Fertility. Population Index, 44(2): 203-213.

**See Also**[Jfert](#)**Examples**

```

ASMFR <- c(0, 0, 0, Jfert$ASMFR2000[1:35]) # Jfert's ASMFR should be rearranged to 12:49
res <- fitCT(ASMFR)
FLAG <- res[4]
while (FLAG>0) {
  res <- fitCT(res[1:2], ASMFR)
  FLAG <- res[4]
}
print(res)

```

Denny

*Denny's model mortality for lx and its fitting***Description**

Implementing Denny's model mortality function of lx and fitting the model to actual lx of given lifetable.

**Usage**

```

Denny(a, b, c, t)
fitDenny(initialpar=rep(0.1, 3), data, mode=3, Method="Nelder-Mead", ...)

```

**Arguments**

- |            |   |
|------------|---|
| a          | The parameter a of the Denny model, $l(t)=1/(1+a*(t/(105-t))^3+b*\sqrt{\exp(t/(105-t))-1}+c*(1-\exp(-2*t))$ .   |
| b          | The parameter b of the Denny model, $l(t)=1/(1+a*(t/(105-t))^3+b*\sqrt{\exp(t/(105-t))-1}+c*(1-\exp(-2*t))$ .   |
| c          | The parameter c of the Denny model, $l(t)=1/(1+a*(t/(105-t))^3+b*\sqrt{\exp(t/(105-t))-1}+c*(1-\exp(-2*t))$ .   |
| t          | Age (vector OK) in years. The t must be less than 105, otherwise the value by Denny() become 0.   |
| initialpar | Initial value for the parameters to be estimated. If not given, rep(0.1, 3) is used.  |
| data       | Actual vector of qx in the lifetable to be used to obtain the best-fit parameters of the Denny's model. If the ages for qx are equal or elder than 105 years old, those will be ignored in fitting. |
| mode       | Which of lifetable functions should be used to calculate the RMSE: 1 qx, 2 dx, otherwise lx. Default is 3.  |
| Method     | The method to be used in optim() function. Default is "Nelder-Mead".  |
| ...        | Other options to be passed to optim().  |

**Value**

Denny() returns model lx for the same length with t. fitDenny() returns the numeric vector of fitted parameters a, b, and c, RMSE for those values, and the flag of convergence.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

Denny C (1997) A model of the probability of survival from birth. Mathematical and Computer Modelling, 26: 69-78. doi: [10.1016/S08957177\(97\)001702](https://doi.org/10.1016/S08957177(97)001702)

**See Also**

[Jlife](#)

**Examples**

```
res <- fitDenny(,qxto1x(Jlife$qx2005M))
FLAG <- res[5]
while (FLAG>0) {
  res <- fitDenny(res[1:3], qxto1x(Jlife$qx2005M))
  FLAG <- res[5]
}
print(res)
```

---

geary.test

*Geary's test for normality about kurtosis.*

---

**Description**

Geary's test for normality. Null hypothesis is that the data obeys to normal distribution.

**Usage**

```
geary.test(X)
```

**Arguments**

X                    A numeric vector.

**Value**

statistic            Geary's test statistic G  
p.value              The significant probability of the null-hypothesis testing.



**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**Examples**

```
geary.test(rnorm(100))
geary.test(20:50)
```

---

GompertzMakeham

*Gompertz-Makeham's model mortality for  $u(x)$  and its fitting*

---

**Description**

Implementing Gompertz-Makeham's model mortality function of the force of mortality  $u(x)$  with conversion into  $q_x$  and fitting the model to actual  $q_x$  of given lifetable.

**Usage**

```
GompertzMakeham(A, B, C, t)
fitGM(initialpar=c(0.01, 0.0003, 0.07), data, mode=1, Method="Nelder-Mead", ...)
```

**Arguments**

A	The parameter A of the Gompertz-Makeham model $u(t)=A*\exp B*t+C$ .
B	The parameter B of the Gompertz-Makeham model $u(t)=A*\exp B*t+C$ .
C	The parameter C of the Gompertz-Makeham model $u(t)=A*\exp B*t+C$ .
t	Age (vector OK) in years
initialpar	Initial value for the parameters to be estimated. If not given, c(0.01, 0.0003, 0.07) is used.
data	Actual vector of $q_x$ in the lifetable to be used to obtain the best-fit parameters of the Gompertz-Makeham model.
mode	Which of lifetable functions should be used to calculate the RMSE, which is to be minimized in <code>optim()</code> function: 1 $q_x$ , 2 $dx$ , otherwise 1x. Default is 1.
Method	The method to be used in <code>optim()</code> function. Default is "Nelder-Mead".
...	Other options to be passed to <code>optim()</code> .

**Value**

GompertzMakeham() returns model  $q_x$  for the same length with t, where  $u(x)$  is internally converted into  $q_x$ . fitGM() returns the numeric vector of fitted parameters of A, B and C, RMSE for those values, and the flag of convergence.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**See Also**[Jlife](#)**Examples**

```
res <- fitGM(Jlife$qx2005M)
FLAG <- res[5]
while (FLAG>0) {
  res <- fitGM(res[1:3], Jlife$qx2005M)
  FLAG <- res[5]
}
print(res)
```

---

gstem

*Draw the stem and leaf plot in a graphic device.*

---

**Description**

Capture the output of stem() function and plot them into graphic devices. However, the result of setting scale parameter as 2 may be controversial.

**Usage**

```
gstem(X, scale)
```

**Arguments**

X	A numeric vector.
scale	Parameter to control plot length of graph. Default is 1.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**Examples**

```
x <- rnorm(100, 10, 1)
stem(x)
stem(x, 2)
layout(t(1:2))
gstem(x)
gstem(x, 2)
```

H27MPJ

*Tentative model population of Japan in Heisei 27 (2015)***Description**

The data gives the age-class specific model population of Japan in smoothed Heisei 27 (2015) to calculate directly adjusted mortality rate.

**Usage**

H27MPJ

**Format**

A named vector containing 21 observations, where names show age-classes.

**Source**

<https://www.mhlw.go.jp/content/12601000/000638712.pdf>

**References**

Tamura K. (2008) How do we die?: death date from vital statistics of the Japanese population. *The Waseda study of politics and public law*, 87: 27-57.

Hadwiger

*Hadwiger's model fertility and its fitting***Description**

Implementing Hadwiger's model of age-specific fertility rates and fitting the model to actual ASFR.

**Usage**

```
Hadwiger(a=3.4, b=2.5, c=22.2)
fitHad(initialpar=c(3.4, 2.5, 22.2), data, Method="Nelder-Mead", ...)
```

**Arguments**

- a The parameter a of the Hadwiger model,  $ASFR(x) = a*b/c*(c/x)^{1.5}*exp(-b^2*(c/x+x/c-2))$  for age x from 15 to 54.
- b The parameter b of the Hadwiger model,  $ASFR(x) = a*b/c*(c/x)^{1.5}*exp(-b^2*(c/x+x/c-2))$  for age x from 15 to 54.
- c The parameter c of the Hadwiger model,  $ASFR(x) = a*b/c*(c/x)^{1.5}*exp(-b^2*(c/x+x/c-2))$  for age x from 15 to 54.

initialpar	Initial value for the parameters to be estimated. If not given, c(3.4, 2.5, 22.2) is used.
data	Actual vector of ASFR (which must be given for from ages from 15 to 54 for each age) to be used to obtain the best-fit parameters of the Hadwiger's model.
Method	The method to be used in optim() function. Default is "Nelder-Mead".
...	Other options to be passed to optim().

**Value**

Hadwiger() returns model ASFR for ages from 15 to 54. fitHad() returns the numeric vector of fitted parameters a, b and c, RMSE for those values, and the flag of convergence.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

Chandola T, Coleman DA, Horns RW (1999) Recent European fertility patterns: fitting curves to 'distorted' distributions. Population Studies, 53(3): 317-329. doi: [10.1080/00324720308089](https://doi.org/10.1080/00324720308089)

**See Also**

[Jfert](#)

**Examples**

```
res <- fitHad(,Jfert$ASFR2000)
FLAG <- res[5]
while (FLAG>0) {
  res <- fitHad(res[1:3], Jfert$ASFR2000)
  FLAG <- res[5]
}
print(res)
```

---

IndexOfDissimilarity    *Index of dissimilarity (ID)*

---

**Description**

Index of dissimilarity between the 2 age-distributions.

**Usage**

```
IndexOfDissimilarity(X, Y)
```

**Arguments**

- X A vector of age-specific standard populations (or percentage) for each age.  
 Y A vector of age-specific target populations (or percentage) for each age.

**Value**

- ID Index of dissimilarity, which is a half of sum of absolute differences of percentages for each age, where NA is automatically treated as 0.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

- Preston SH, Heuveline P, Guillot M (2001) Demography: Measuring and Modeling Population Processes. Blackwell Publishing, Oxford.  
 Newell C (1988) Methods and Models in Demography. The Guilford Press, New York.  
 Rowland DT (2003) Demographic methods and concepts. Oxford Univ. Press, Oxford.

**Examples**

```
# Dissimilarities of Japanese population structure were increasing
# from 1960-1980 (0.132) to 1980-2000 (0.156).
IndexOfDissimilarity(Jpopl$M1980+Jpopl$F1980, Jpopl$M2000+Jpopl$F2000)
IndexOfDissimilarity(Jpopl$M1980+Jpopl$F1980, Jpopl$M1960+Jpopl$F1960)
```

---

 IRCI

---

*Calculate a incidence rate with confidence interval*


---

**Description**

Calculate a incidence rate with confidence interval.

**Usage**

```
IRCI(a, PT, conf.level=0.9)
```

**Arguments**

- a Number of cases  
 PT Person-years of observed population at risk  
 conf.level Probability for confidence intervals. Default is 0.9.

**Value**

IR	Point estimate of incidence rate.
IRL	Lower limit of confidence interval
IRU	Upper limit of confidence interval

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

Rothman KJ (2012) Epidemiology: An Introduction. 2nd Ed., Oxford University Press, Oxford.

**Examples**

IRCI(8, 85000)

---

IRCI Pois                      *Calculate incidence rate with its confidence intervals by exact method*

---

**Description**

Calculate incidence rate with its confidence intervals by exact method using Poisson distribution.

**Usage**

```
IRCI Pois(a, PT, conf.level=0.9)
```

**Arguments**

a	Number of cases
PT	Person-years of observed population at risk
conf.level	Probability for confidence intervals. Default is 0.9.

**Value**

IR	Point estimate of incidence rate.
IRL	Lower limit of confidence interval
IRU	Upper limit of confidence interval

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

[https://www.statsdirect.com/help/rates/poisson\\_rate\\_ci.htm](https://www.statsdirect.com/help/rates/poisson_rate_ci.htm)

**Examples**

```
IRCI Pois(8, 85000)
```

---

 JASM

*Japanese mortality data*


---

**Description**

The data gives the sex and age-class (by five) specific numbers of death in Showa 60 (S60 = 1985), Heisei 2 (H02 = 1990), Heisei 7 (H07 = 1995), Heisei 12 (H12 = 2000), Heisei 17 (H17 = 2005), Heisei 22 (H22 = 2010) and Heisei 27 (H27 = 2015), and corresponding populations.

**Usage**

```
JASM
```

**Format**

A data frame with 18 observations on 30 variables.

[, 1]	AGECLASS	Factor w/18 levels	Age class (years old)
[, 2]	S60MODEL	numeric	Model population in 1985
[, 3]	S60M	numeric	Number of males' death by age classes in 1985
[, 4]	H02M	numeric	Number of males' death by age classes in 1990
[, 5]	H07M	numeric	Number of males' death by age classes in 1995
[, 6]	H12M	numeric	Number of males' death by age classes in 2000
[, 7]	H17M	numeric	Number of males' death by age classes in 2005
[, 8]	H22M	numeric	Number of males' death by age classes in 2010
[, 8]	H27M	numeric	Number of males' death by age classes in 2015
[, 9]	S60F	numeric	Number of females' death by age classes in 1985
[, 10]	H02F	numeric	Number of females' death by age classes in 1990
[, 11]	H07F	numeric	Number of females' death by age classes in 1995
[, 12]	H12F	numeric	Number of females' death by age classes in 2000
[, 13]	H17F	numeric	Number of females' death by age classes in 2005
[, 14]	H22F	numeric	Number of females' death by age classes in 2010
[, 14]	H27F	numeric	Number of females' death by age classes in 2015
[, 15]	S60MP	numeric	Number of males' population by age classes in 1985
[, 16]	H02MP	numeric	Number of males' population by age classes in 1990
[, 17]	H07MP	numeric	Number of males' population by age classes in 1995
[, 18]	H12MP	numeric	Number of males' population by age classes in 2000
[, 19]	H17MP	numeric	Number of males' population by age classes in 2005
[, 20]	H22MP	numeric	Number of males' population by age classes in 2010
[, 20]	H27MP	numeric	Number of males' population by age classes in 2015
[, 21]	S60FP	numeric	Number of females' population by age classes in 1985
[, 22]	H02FP	numeric	Number of females' population by age classes in 1990
[, 23]	H07FP	numeric	Number of females' population by age classes in 1995
[, 24]	H12FP	numeric	Number of females' population by age classes in 2000

[ , 25]	H17FP	numeric	Number of females' population by age classes in 2005
[ , 26]	H22FP	numeric	Number of females' population by age classes in 2010
[ , 26]	H27FP	numeric	Number of females' population by age classes in 2015

### Details

Japanese mortality data by sex and age-class (by five) given as national official vital statistics from 1985 to 2015, every 5 years.

- AGECLASS: Labels for age classes. [0-4] to [85-].
- S60MODEL: Age class specific model population of Japan in 1985.
- S60M-H27M: Age class specific number of death of males in 1985-2015.
- S60F-H27F: Age class specific number of death of females in 1985-2015.
- S60MP-H27MP: Age class specific number of males' population in 1985-2015.
- S60FP-H27FP: Age class specific number of females' population in 1985-2015.

### Source

<https://www.stat.go.jp/english/data/nenkan/66nenkan/index.html>

### References

Ministry of Health, Labor and Welfare of Japan: Vital Statistics.

---

Jfert *Age-specific fertility rates and age-specific marital fertility rates in Japan.*

---

### Description

Age-specific fertility and marital fertility rates for aged 15-54 Japanese women in Japan, from 1950 to 2015, every five years.

### Usage

Jfert

### Format

A data frame with 40 observations on 29 variables.

[ , 1]	Age	integer	Ages of women
[ , 2]	ASFR1950	numeric	Age-specific fertility rates of Japanese women in 1950.
[ , 3]	ASFR1955	numeric	Age-specific fertility rates of Japanese women in 1955.
[ , 4]	ASFR1960	numeric	Age-specific fertility rates of Japanese women in 1960.



[, 5]	ASFR1965	numeric	Age-specific fertility rates of Japanese women in 1965.
[, 6]	ASFR1970	numeric	Age-specific fertility rates of Japanese women in 1970.
[, 7]	ASFR1975	numeric	Age-specific fertility rates of Japanese women in 1975.
[, 8]	ASFR1980	numeric	Age-specific fertility rates of Japanese women in 1980.
[, 9]	ASFR1985	numeric	Age-specific fertility rates of Japanese women in 1985.
[, 10]	ASFR1990	numeric	Age-specific fertility rates of Japanese women in 1990.
[, 11]	ASFR1995	numeric	Age-specific fertility rates of Japanese women in 1995.
[, 12]	ASFR2000	numeric	Age-specific fertility rates of Japanese women in 2000.
[, 13]	ASFR2005	numeric	Age-specific fertility rates of Japanese women in 2005.
[, 14]	ASFR2010	numeric	Age-specific fertility rates of Japanese women in 2010.
[, 15]	ASFR2015	numeric	Age-specific fertility rates of Japanese women in 2015.
[, 16]	ASMFR1950	numeric	Age-specific marital fertility rates of Japanese married women in 1950.
[, 17]	ASMFR1955	numeric	Age-specific marital fertility rates of Japanese married women in 1955.
[, 18]	ASMFR1960	numeric	Age-specific marital fertility rates of Japanese married women in 1960.
[, 19]	ASMFR1965	numeric	Age-specific marital fertility rates of Japanese married women in 1965.
[, 20]	ASMFR1970	numeric	Age-specific marital fertility rates of Japanese married women in 1970.
[, 21]	ASMFR1975	numeric	Age-specific marital fertility rates of Japanese married women in 1975.
[, 22]	ASMFR1980	numeric	Age-specific marital fertility rates of Japanese married women in 1980.
[, 23]	ASMFR1985	numeric	Age-specific marital fertility rates of Japanese married women in 1985.
[, 24]	ASMFR1990	numeric	Age-specific marital fertility rates of Japanese married women in 1990.
[, 25]	ASMFR1995	numeric	Age-specific marital fertility rates of Japanese married women in 1995.
[, 26]	ASMFR2000	numeric	Age-specific marital fertility rates of Japanese married women in 2000.
[, 27]	ASMFR2005	numeric	Age-specific marital fertility rates of Japanese married women in 2005.
[, 28]	ASMFR2010	numeric	Age-specific marital fertility rates of Japanese married women in 2010.
[, 29]	ASMFR2015	numeric	Age-specific marital fertility rates of Japanese married women in 2015.

## Details

The calculations were the numbers of live births divided by the numbers of women for ASFR (15-54), and the numbers of legitimate live births divided by the numbers of married women for ASMFR (15-54). Data sources are all official publication as vital statistics and national population census, so that the data are given with 5 years intervals.

- Age: Ages of women, from 15 to 54.
- ASFR1950-ASFR2015: Age-specific fertility rates for all women aged 15-54 for 1950-2015, every 5 years.
- ASMFR1950-ASMFR2015: Age-specific marital fertility rates for married women aged 15-54 for 1950-2015, every 5 years.

## Source

<https://warp.da.ndl.go.jp/info:ndljp/pid/1334623/www.stat.go.jp/english/data/chouki/02.htm>  
<https://warp.da.ndl.go.jp/info:ndljp/pid/1334623/www.stat.go.jp/data/chouki/zuhyou/02-29-b.xls>  
[https://www.ipss.go.jp/syoushika/tohkei/Popular/P\\_Detail2021.asp?fname=T04-09.htm](https://www.ipss.go.jp/syoushika/tohkei/Popular/P_Detail2021.asp?fname=T04-09.htm)

## References

Ministry of Health, Labor and Welfare of Japan: Vital Statistics. / Ministry of Internal Affairs and Communications, Statistics Bureau: Population Census.

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Jlife *Completed lifetables in Japan.*

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## Description

The qx column of the completed lifetables in Japan, from "1891-1898" to "2015", mostly every 5 years.

## Usage

Jlife

## Format

A data frame with 117 observations (NAs are filled for the ages with no survivors) on 43 variables.

[, 1]	Age	integer	Ages of women
[, 2]	qx1895M	numeric	qx of completed lifetable functions of Japanese men in 1891-1898.
[, 3]	qx1895F	numeric	qx of completed lifetable functions of Japanese women in 1891-1898.
[, 4]	qx1901M	numeric	qx of completed lifetable functions of Japanese men in 1899-1903.
[, 5]	qx1901F	numeric	qx of completed lifetable functions of Japanese women in 1899-1903.
[, 6]	qx1911M	numeric	qx of completed lifetable functions of Japanese men in 1909-1913.
[, 7]	qx1911F	numeric	qx of completed lifetable functions of Japanese women in 1909-1913.
[, 8]	qx1923M	numeric	qx of completed lifetable functions of Japanese men in 1921-1925.
[, 9]	qx1923F	numeric	qx of completed lifetable functions of Japanese women in 1921-1925.
[, 10]	qx1928M	numeric	qx of completed lifetable functions of Japanese men in 1926-1930.
[, 11]	qx1928F	numeric	qx of completed lifetable functions of Japanese women in 1926-1930.
[, 12]	qx1935M	numeric	qx of completed lifetable functions of Japanese men in 1935-1936.
[, 13]	qx1935F	numeric	qx of completed lifetable functions of Japanese women in 1935-1936.
[, 14]	qx1947M	numeric	qx of completed lifetable functions of Japanese men in 1947.
[, 15]	qx1947F	numeric	qx of completed lifetable functions of Japanese women in 1947.
[, 16]	qx1951M	numeric	qx of completed lifetable functions of Japanese men in 1950-1952.
[, 17]	qx1951F	numeric	qx of completed lifetable functions of Japanese women in 1950-1952.
[, 18]	qx1955M	numeric	qx of completed lifetable functions of Japanese men in 1955.
[, 19]	qx1955F	numeric	qx of completed lifetable functions of Japanese women in 1955.
[, 20]	qx1960M	numeric	qx of completed lifetable functions of Japanese men in 1960.
[, 21]	qx1960F	numeric	qx of completed lifetable functions of Japanese women in 1960.
[, 22]	qx1965M	numeric	qx of completed lifetable functions of Japanese men in 1965.
[, 23]	qx1965F	numeric	qx of completed lifetable functions of Japanese women in 1965.
[, 24]	qx1970M	numeric	qx of completed lifetable functions of Japanese men in 1970.
[, 25]	qx1970F	numeric	qx of completed lifetable functions of Japanese women in 1970.
[, 26]	qx1975M	numeric	qx of completed lifetable functions of Japanese men in 1975.
[, 27]	qx1975F	numeric	qx of completed lifetable functions of Japanese women in 1975.

[, 28]	qx1980M	numeric	qx of completed lifetable functions of Japanese men in 1980.
[, 29]	qx1980F	numeric	qx of completed lifetable functions of Japanese women in 1980.
[, 30]	qx1985M	numeric	qx of completed lifetable functions of Japanese men in 1985.
[, 31]	qx1985F	numeric	qx of completed lifetable functions of Japanese women in 1985.
[, 32]	qx1990M	numeric	qx of completed lifetable functions of Japanese men in 1990.
[, 33]	qx1990F	numeric	qx of completed lifetable functions of Japanese women in 1990.
[, 34]	qx1995M	numeric	qx of completed lifetable functions of Japanese men in 1995.
[, 35]	qx1995F	numeric	qx of completed lifetable functions of Japanese women in 1995.
[, 36]	qx2000M	numeric	qx of completed lifetable functions of Japanese men in 2000.
[, 37]	qx2000F	numeric	qx of completed lifetable functions of Japanese women in 2000.
[, 38]	qx2005M	numeric	qx of completed lifetable functions of Japanese men in 2005.
[, 39]	qx2005F	numeric	qx of completed lifetable functions of Japanese women in 2005.
[, 40]	qx2010M	numeric	qx of completed lifetable functions of Japanese men in 2010.
[, 41]	qx2010F	numeric	qx of completed lifetable functions of Japanese women in 2010.
[, 42]	qx2015M	numeric	qx of completed lifetable functions of Japanese men in 2015.
[, 43]	qx2015F	numeric	qx of completed lifetable functions of Japanese women in 2015.

### Details

qx columns were cited from the completed life tables in Japan for the 1st to 21st one (7th one was not made, so that it is missing).

- Age: Ages from 0 to 116.
- qx1895M-qx2015M: qx of 1st to 22nd completed lifetables for Japanese men.
- qx1895F-qx2015F: qx of 1st to 22nd completed lifetables for Japanese women.

### Source

<https://warp.da.ndl.go.jp/info:ndljp/pid/1334623/www.stat.go.jp/english/data/chouki/02.htm><https://warp.da.ndl.go.jp/collections/content/info:ndljp/pid/11423429/www.stat.go.jp/data/chouki/zuhyou/02-35.xls> <https://www.mhlw.go.jp/toukei/saikin/hw/life/20th/index.html> <https://www.mhlw.go.jp/toukei/saikin/hw/life/21th/index.html> <https://www.mhlw.go.jp/toukei/saikin/hw/life/22th/index.html>

### References

Ministry of Health, Labor and Welfare of Japan: Completed lifetables. / Ministry of Internal Affairs and Communications, Statistics Bureau: Historical Statistics of Japan.

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Jpop

*Japanese population data*

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### Description

The data gives the sex and age specific population for the all census results in Japan.

**Usage**

Jpop

**Format**

A data frame with 86 observations on 61 variables.

[, 1]	Age	Factor w/86 levels	Ages (years old, combined for 85+)
[, 2]	M1888	numeric	Age specific population of males in 1888
[, 3]	F1888	numeric	Age specific population of females in 1888
[, 4]	M1893	numeric	Age specific population of males in 1893
[, 5]	F1893	numeric	Age specific population of females in 1893
[, 6]	M1898	numeric	Age specific population of males in 1898
[, 7]	F1898	numeric	Age specific population of females in 1898
[, 8]	M1903	numeric	Age specific population of males in 1903
[, 9]	F1903	numeric	Age specific population of females in 1903
[, 10]	M1908	numeric	Age specific population of males in 1908
[, 11]	F1908	numeric	Age specific population of females in 1908
[, 12]	M1913	numeric	Age specific population of males in 1913
[, 13]	F1913	numeric	Age specific population of females in 1913
[, 14]	M1918	numeric	Age specific population of males in 1918
[, 15]	F1918	numeric	Age specific population of females in 1918
[, 16]	M1920	numeric	Age specific population of males in 1920
[, 17]	F1920	numeric	Age specific population of females in 1920
[, 18]	M1925	numeric	Age specific population of males in 1925
[, 19]	F1925	numeric	Age specific population of females in 1925
[, 20]	M1930	numeric	Age specific population of males in 1930
[, 21]	F1930	numeric	Age specific population of females in 1930
[, 22]	M1935	numeric	Age specific population of males in 1935
[, 23]	F1935	numeric	Age specific population of females in 1935
[, 24]	M1940	numeric	Age specific population of males in 1940
[, 25]	F1940	numeric	Age specific population of females in 1940
[, 26]	M1947	numeric	Age specific population of males in 1947
[, 27]	F1947	numeric	Age specific population of females in 1947
[, 28]	M1950	numeric	Age specific population of males in 1950
[, 29]	F1950	numeric	Age specific population of females in 1950
[, 30]	M1955	numeric	Age specific population of males in 1955
[, 31]	F1955	numeric	Age specific population of females in 1955
[, 32]	M1960	numeric	Age specific population of males in 1960
[, 33]	F1960	numeric	Age specific population of females in 1960
[, 34]	M1965	numeric	Age specific population of males in 1965
[, 35]	F1965	numeric	Age specific population of females in 1965
[, 36]	M1970	numeric	Age specific population of males in 1970
[, 37]	F1970	numeric	Age specific population of females in 1970
[, 38]	M1975	numeric	Age specific population of males in 1975
[, 39]	F1975	numeric	Age specific population of females in 1975
[, 40]	M1980	numeric	Age specific population of males in 1980
[, 41]	F1980	numeric	Age specific population of females in 1980
[, 42]	M1985	numeric	Age specific population of males in 1985

[, 43]	F1985	numeric	Age specific population of females in 1985
[, 44]	M1990	numeric	Age specific population of males in 1990
[, 45]	F1990	numeric	Age specific population of females in 1990
[, 46]	M1995	numeric	Age specific population of males in 1995
[, 47]	F1995	numeric	Age specific population of females in 1995
[, 48]	M2000	numeric	Age specific population of males in 2000
[, 49]	F2000	numeric	Age specific population of females in 2000
[, 50]	M2005	numeric	Age specific population of males in 2005
[, 51]	F2005	numeric	Age specific population of females in 2005
[, 52]	M2010	numeric	Age specific population of males in 2010
[, 53]	F2010	numeric	Age specific population of females in 2010
[, 54]	M2015	numeric	Age specific population of males in 2015
[, 55]	F2015	numeric	Age specific population of females in 2015
[, 56]	M2015J	numeric	Age specific population of Japanese males in 2015
[, 57]	F2015J	numeric	Age specific population of Japanese females in 2015
[, 58]	M2020	numeric	Age specific population of males in 2020
[, 59]	F2020	numeric	Age specific population of females in 2020
[, 60]	M2020J	numeric	Age specific population of Japanese males in 2020
[, 61]	F2020J	numeric	Age specific population of Japanese females in 2020

### Details

Japanese population data by sex and age given as national official census record.

- Age: Ages, combined for 85+.
- M1888-M2020: Age specific number of males' population in 1988-2020.
- F1888-F2020: Age specific number of females' population in 1988-2020.
- M2015J-M2020J: Age specific number of the Japanese population of males in 2015-2020.
- F2015J-F2020J: Age specific number of the Japanese population of females in 2015-2020.

### Source

<https://www.stat.go.jp/english/data/kokusei/index.html> <https://warp.da.ndl.go.jp/info:ndljp/pid/1334623/www.stat.go.jp/english/data/chouki/02.htm> <https://www.e-stat.go.jp/stat-search/files/data?fileid=000007809775&rcount=3> <https://www.e-stat.go.jp/stat-search/file-download?statInfId=000032142404&fileKind=0>

### References

Statistics Bureau, Ministry of Internal Affairs and Communications: Population Census, 1888-2020.

Jpopl

*Japanese population data (unshrunk version)***Description**

The data gives the sex and age specific population for the all census results in Japan.

**Usage**

Jpopl

**Format**

A data frame with 111 observations on 67 variables.

[, 1]	Age	Factor w/111 levels	Ages (years old, combined for 110+)
[, 2]	M1888	numeric	Age specific population of males in 1888
[, 3]	F1888	numeric	Age specific population of females in 1888
[, 4]	M1893	numeric	Age specific population of males in 1893
[, 5]	F1893	numeric	Age specific population of females in 1893
[, 6]	M1898	numeric	Age specific population of males in 1898
[, 7]	F1898	numeric	Age specific population of females in 1898
[, 8]	M1903	numeric	Age specific population of males in 1903
[, 9]	F1903	numeric	Age specific population of females in 1903
[, 10]	M1908	numeric	Age specific population of males in 1908
[, 11]	F1908	numeric	Age specific population of females in 1908
[, 12]	M1913	numeric	Age specific population of males in 1913
[, 13]	F1913	numeric	Age specific population of females in 1913
[, 14]	M1918	numeric	Age specific population of males in 1918
[, 15]	F1918	numeric	Age specific population of females in 1918
[, 16]	M1920	numeric	Age specific population of males in 1920
[, 17]	F1920	numeric	Age specific population of females in 1920
[, 18]	M1925	numeric	Age specific population of males in 1925
[, 19]	F1925	numeric	Age specific population of females in 1925
[, 20]	M1930	numeric	Age specific population of males in 1930
[, 21]	F1930	numeric	Age specific population of females in 1930
[, 22]	M1935	numeric	Age specific population of males in 1935
[, 23]	F1935	numeric	Age specific population of females in 1935
[, 24]	M1940	numeric	Age specific population of males in 1940
[, 25]	F1940	numeric	Age specific population of females in 1940
[, 26]	M1947	numeric	Age specific population of males in 1947
[, 27]	F1947	numeric	Age specific population of females in 1947
[, 28]	M1950	numeric	Age specific population of males in 1950
[, 29]	F1950	numeric	Age specific population of females in 1950
[, 30]	M1955	numeric	Age specific population of males in 1955
[, 31]	F1955	numeric	Age specific population of females in 1955
[, 32]	M1960	numeric	Age specific population of males in 1960

[,33]	F1960	numeric	Age specific population of females in 1960
[,34]	M1965	numeric	Age specific population of males in 1965
[,35]	F1965	numeric	Age specific population of females in 1965
[,36]	M1970	numeric	Age specific population of males in 1970
[,37]	F1970	numeric	Age specific population of females in 1970
[,38]	M1975	numeric	Age specific population of males in 1975
[,39]	F1975	numeric	Age specific population of females in 1975
[,40]	M1980	numeric	Age specific population of males in 1980
[,41]	F1980	numeric	Age specific population of females in 1980
[,42]	M1985	numeric	Age specific population of males in 1985
[,43]	F1985	numeric	Age specific population of females in 1985
[,44]	M1990	numeric	Age specific population of males in 1990
[,45]	F1990	numeric	Age specific population of females in 1990
[,46]	M1995	numeric	Age specific population of males in 1995
[,47]	F1995	numeric	Age specific population of females in 1995
[,48]	M2000	numeric	Age specific population of males in 2000
[,49]	F2000	numeric	Age specific population of females in 2000
[,50]	M2000J	numeric	Age specific population of Japanese males in 2000
[,51]	F2000J	numeric	Age specific population of Japanese females in 2000
[,52]	M2005	numeric	Age specific population of males in 2005
[,53]	F2005	numeric	Age specific population of females in 2005
[,54]	M2005J	numeric	Age specific population of Japanese males in 2005
[,55]	F2005J	numeric	Age specific population of Japanese females in 2005
[,56]	M2010	numeric	Age specific population of males in 2010
[,57]	F2010	numeric	Age specific population of females in 2010
[,58]	M2010J	numeric	Age specific population of Japanese males in 2010
[,59]	F2010J	numeric	Age specific population of Japanese females in 2010
[,60]	M2015	numeric	Age specific population of males in 2015
[,61]	F2015	numeric	Age specific population of females in 2015
[,62]	M2015J	numeric	Age specific population of Japanese males in 2015
[,63]	F2015J	numeric	Age specific population of Japanese females in 2015
[,64]	M2020	numeric	Age specific population of males in 2020
[,65]	F2020	numeric	Age specific population of females in 2020
[,66]	M2020J	numeric	Age specific population of Japanese males in 2020
[,67]	F2020J	numeric	Age specific population of Japanese females in 2020

## Details

Japanese population data by sex and age given as national official census record.

- Age: Ages, combined for 110+.
- M1888-M2020: Age specific number of males' population in Japan for 1888-2020.
- F1888-F2020: Age specific number of females' population in Japan for 1888-2020.
- M2000J-M2020J: Age specific number of Japanese males' population in Japan for 2000-2020 by every 5 years.
- F2000J-F2020J: Age specific number of Japanese females' population in Japan for 2000-2020 by every 5 years.

**Source**

<https://www.stat.go.jp/english/data/kokusei/index.html> <https://warp.da.ndl.go.jp/info:ndljp/pid/1334623/www.stat.go.jp/english/data/chouki/02.htm> <https://www.e-stat.go.jp/stat-search/files/data?fileid=000007809775&rcount=3> <https://www.e-stat.go.jp/stat-search/file-download?statInfId=000032142404&fileKind=0>

**References**

Statistics Bureau, Ministry of Internal Affairs and Communications: Population Census, 1888-2020.

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Jvital

*Longitudinal data of several vital statistics in Japan*

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**Description**

The data gives longitudinal data of several vital statistics in Japan. Included indices are crude birth rates, crude death rates, infant mortality rates, and so on.

**Usage**

Jvital

**Format**

A data frame with 116 observations on 17 variables.

[, 1]	YEAR	numeric	Year
[, 2]	CBR	numeric	Crude birth rates of Japan
[, 3]	CDR	numeric	Crude death rates of Japan
[, 4]	IMR	numeric	Infant mortality rates of Japan
[, 5]	NMR	numeric	Neonatal mortality rates of Japan
[, 6]	NIR	numeric	Natural increase rates of Japan
[, 7]	SBRPB	numeric	Stillbirth rates of Japan
[, 8]	SARPB	numeric	Spontaneous abortion rates of Japan
[, 9]	ACRPB	numeric	Artificial contraception rates of Japan
[, 10]	PNMPB	numeric	Perinatal mortalities per birth of Japan
[, 11]	MR	numeric	Marriage rates of Japan
[, 12]	DR	numeric	Divorce rates of Japan
[, 13]	TFR	numeric	Total fertility rates of Japan
[, 14]	ASMRM	numeric	Age-standardized mortality rates of males in Japan
[, 15]	ASMRF	numeric	Age-standardized mortality rates of females in Japan
[, 16]	PNMPLB	numeric	Perinatal mortalities per live births of Japan
[, 17]	MMR	numeric	Maternal mortality rates per 100000 births in Japan



## Details

Longitudinal vital statistics in Japan provided as national official vital statistics every year from 1899 to 2019, except for 1944-1946.

- YEAR: Calendar year.
- CBR: Crude birth rate. Number of all live birth / mid-year population 1000.
- CDR: Crude death rate. Number of death / mid-year population 1000.
- IMR: Infant mortality rate. Number of death at age 0 / 1000 live births.
- NMR: Neonatal mortality rate. Number of death within 4 weeks after birth / 1000 live births.
- NIR: Natural increase rate. CBR-CDR.
- SBRPB: Stillbirth rate per birth. Number of stillbirths / 1000 births.
- SARPB: Spontaneous abortion rate per birth. Number of spontaneous abortions / 1000 births.
- ACRPB: Artificial contraception (= induced abortion) rate per birth. Number of induced abortions / 1000 births.
- PNMPB: Perinatal mortality per birth. [(Number of stillbirths after gestational age 22 weeks) + (Number of early neonatal deaths within a week after birth)] per 1000 births. The denominator is the sum of the number of stillbirths after gestational age 22 weeks and the number of live births. This definition was established in 1995, but PNMPB also includes some values before 1995.
- MR: Marital rate. The number of marriages / mid-year population 1000.
- DR: Divorce rate. The number of divorces / mid-year population 1000.
- TFR: Total fertility rate. The sum of age-specific fertility rates, which is the number of births divided by the number of women's population for each age.
- ASMRM: Age-standardized mortality rate of males, per mid-year population 1000, where the standard population is the model population in 1985.
- ASMRF: Age-standardized mortality rate of females, per mid-year population 1000, where the standard population is the model population in 1985.
- PNMPLB: Perinatal mortality per live birth. [(Number of stillbirths after gestational age 28 weeks) + (Number of early neonatal deaths within a week after birth)] per 1000 live births (Note: the denominator does not include stillbirths!). This definition stood until 1994, but PNMPLB also includes values after 1995, for comparison.
- MMR: Maternal mortality rate (actually ratio) per birth. (Number of maternal deaths during pregnancy or postpartum periods within 42 days [90 days until 1978] after the delivery due to reproduction-related causes) / (Number of total births = live births + stillbirths)\* 100,000.

## Source

<https://www.mhlw.go.jp/toukei/list/dl/81-1a2.pdf> <https://www.mhlw.go.jp/toukei/saikin/hw/jinkou/geppo/nengai10/toukei02.html> <https://www.ipss.go.jp/p-info/e/psj2012/PSJ2012-05.xls> <https://www.mhlw.go.jp/english/database/db-hw/vs01.html> <https://www.e-stat.go.jp/stat-search/files/data?sinfid=000022220050&ext=csv> <https://www.mhlw.go.jp/toukei/saikin/hw/jinkou/kakutei12/> <https://www.e-stat.go.jp/stat-search/files/data?sinfid=000022220091&ext=csv> <https://www.mhlw.go.jp/toukei/saikin/hw/jinkou/kakutei13/> <https://www.mhlw.go.jp/toukei/saikin/hw/jinkou/kakutei13/>

[//www.mhlw.go.jp/toukei/saikin/hw/jinkou/kakutei14/](http://www.mhlw.go.jp/toukei/saikin/hw/jinkou/kakutei14/) <https://www.mhlw.go.jp/toukei/saikin/hw/jinkou/kakutei15/> <https://www.mhlw.go.jp/toukei/saikin/hw/jinkou/kakutei16/> <https://www.mhlw.go.jp/toukei/saikin/hw/jinkou/kakutei17/> <https://www.mhlw.go.jp/toukei/saikin/hw/jinkou/kakutei18/> <https://www.mhlw.go.jp/toukei/saikin/hw/jinkou/kakutei19/>

## References

Ministry of Health, Labor and Welfare of Japan: Vital Statistics.

National Institute for Population and Social Security Research: Table 5-28 of Population Statistics of Japan 2012.

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Jvital2013byPref	<i>Cross sectional data of several vital statistics in Japan 2013 for each prefecture</i>
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## Description

The data gives cross sectional data of several vital statistics in Japan 2013 for each prefecture. Included indices are crude birth rates, crude death rates, infant mortality rates, and so on.

## Usage

Jvital2013byPref

## Format

A data frame with 47 observations on 34 variables.

[, 1]	PNAME	factor w/47 levels	The name (in roma-ji) for prefectures
[, 2]	JCODE	numeric	Prefecture number defined by Geographical Information Authority of Japan
[, 3]	CBR	numeric	Crude birth rates
[, 4]	CDR	numeric	Crude death rates
[, 5]	IMR	numeric	Infant mortality rates
[, 6]	NMR	numeric	Neonatal mortality rates
[, 7]	NIR	numeric	Natural increase rates
[, 8]	SBRPB	numeric	Stillbirth rates
[, 9]	SARPB	numeric	Spontaneous abortion rates
[, 10]	ACRPB	numeric	Artificial contraception rates
[, 11]	PNMPB	numeric	Perinatal mortalities per birth
[, 12]	SBRA22W	numeric	Stillbirth rate after gestational age of 22 weeks per birth
[, 13]	ENMR	numeric	Early neonatal mortality rate per live birth
[, 14]	MR	numeric	Marriage rates
[, 15]	DR	numeric	Divorce rates
[, 16]	TFR	numeric	Total fertility rates
[, 17]	CSM.ALL	numeric	Cause-specific mortality for all causes
[, 18]	CSM.CANCER	numeric	Cause-specific mortality for cancer

[, 19]	CSM. HD	numeric	Cause-specific mortality for heart disease except for hypertension
[, 20]	CSM. PNEUM	numeric	Cause-specific mortality for pneumonia
[, 21]	CSM. CEVD	numeric	Cause-specific mortality for cerebrovascular disease
[, 22]	CSM. SEN	numeric	Cause-specific mortality for senescence
[, 23]	CSM. ACC	numeric	Cause-specific mortality for accidents
[, 24]	CSM. SUI	numeric	Cause-specific mortality for suicide
[, 25]	CSM. KF	numeric	Cause-specific mortality for kidney failure
[, 26]	CSM. COPD	numeric	Cause-specific mortality for chronic obstructive pulmonary disease
[, 27]	CSM. AA	numeric	Cause-specific mortality for aneuysm of aorta
[, 28]	CSM. LIVD	numeric	Cause-specific mortality for liver disease
[, 29]	CSM. DIAB	numeric	Cause-specific mortality for diabetes
[, 30]	CSM. SEP	numeric	Cause-specific mortality for sepsis
[, 31]	CSM. MNP	numeric	Cause-specific mortality for miscellaneous neoplasms
[, 32]	CSM. DEM	numeric	Cause-specific mortality for dementia
[, 33]	CSM. TB	numeric	Cause-specific mortality for tuberculosis
[, 34]	CSM. TA	numeric	Cause-specific mortality for traffic accidents

## Details

Official vital statistics in Japan in 2013 for each prefecture.

- PNAME: The name (in roma-ji) for prefectures.
- JCODE: Prefecture number defined by Geographical Information Authority of Japan. From 1 to 47.
- CBR: Crude birth rate. Number of all live birth / mid-year population 1000.
- CDR: Crude death rate. Number of death / mid-year population 1000.
- IMR: Infant mortality rate. Number of death at age 0 / 1000 live births.
- NMR: Neonatal mortality rate. Number of death within 4 weeks after birth / 1000 live births.
- NIR: Natural increase rate. CBR-CDR.
- SBRPB: Stillbirth rate per birth. Number of stillbirths / 1000 births.
- SARPB: Spontaneous abortion rate per birth. Number of spontaneous abortions / 1000 births.
- ACRPB: Artificial contraception (= induced abortion) rate per birth. Number of induced abortions / 1000 births.
- PNMPB: Perinatal mortality per birth. [(Number of stillbirths after gestational age 22 weeks) + (Number of early neonatal deaths within a week after birth)] per 1000 births. The denominator is the sum of the number of stillbirths after gestational age 22 weeks and the number of live births. This definition was established in 1995, but PNMPB also includes some values before 1995.
- SBRA22W: Stillbirth rate after gestational age of 22 weeks per 1000 births.
- ENMR: Early neonatal mortality rate per 1000 live births.
- MR: Marital rate. The number of marriages / mid-year population 1000.
- DR: Divorce rate. The number of divorces / mid-year population 1000.

- TFR: Total fertility rate. The sum of age-specific fertility rates, which is the number of births divided by the number of women's population for each age.
- CSM.ALL: Cause-specific mortality for all causes. Similar to CDR, but the denominator is mid-year population 100000 instead of 1000.
- CSM.CANCER: Cause-specific mortality for cancer. The number of deaths caused by cancer / mid-year population 100000.
- CSM.HD: Cause-specific mortality for heart disease except for hypertension / mid-year population 100000.
- CSM.PNEUM: Cause-specific mortality for pneumonia / mid-year population 100000.
- CSM.CEVD: Cause-specific mortality for cerebrovascular disease / mid-year population 100000.
- CSM.SEN: Cause-specific mortality for senescence / mid-year population 100000.
- CSM.ACC: Cause-specific mortality for accidents / mid-year population 100000.
- CSM.SUI: Cause-specific mortality for suicide / mid-year population 100000.
- CSM.KF: Cause-specific mortality for kidney failure / mid-year population 100000.
- CSM.COPD: Cause-specific mortality for chronic obstructive pulmonary disease / mid-year population 100000.
- CSM.AA: Cause-specific mortality for aneurysm of aorta / mid-year population 100000.
- CSM.LIVD: Cause-specific mortality for liver disease / mid-year population 100000.
- CSM.DIAB: Cause-specific mortality for diabetes / mid-year population 100000.
- CSM.SEP: Cause-specific mortality for sepsis / mid-year population 100000.
- CSM.MNP: Cause-specific mortality for miscellaneous neoplasms / mid-year population 100000.
- CSM.DEM: Cause-specific mortality for dementia / mid-year population 100000.
- CSM.TB: Cause-specific mortality for tuberculosis / mid-year population 100000.
- CSM.TA: Cause-specific mortality for traffic accidents / mid-year population 100000.

### Source

<https://www.mhlw.go.jp/toukei/saikin/hw/jinkou/kakutei13/xls/hyo.xls> <https://www.mhlw.go.jp/toukei/saikin/hw/jinkou/kakutei13/xls/sankou.xls>

### References

Ministry of Health, Labor and Welfare of Japan: Vital Statistics 2013.

---

Kappa.test

*Calculate Cohen's kappa statistics for agreement*


---

**Description**

Calculate Cohen's kappa statistics for agreement and its confidence intervals followed by testing null-hypothesis that the extent of agreement is same as random, kappa statistic equals zero.

**Usage**

```
Kappa.test(x, y=NULL, conf.level=0.95)
```

**Arguments**

x	If y is not given, x must be the square matrix that the rows and columns show the ratings of different rater (or repeated measure) and the values indicate the numbers of data having that combination. If y is given, x must be the result of ratings by the first rater (or first time measurement).
y	If given, y must be the result of ratings by the second rater (or second time measurement). As default, it is not given.
conf.level	Probability for confidence intervals for kappa statistics. Default is 0.95.

**Value**

Result\$statistic	Z score to test null-hypothesis.
Result\$estimate	Calculated point estimate of Cohen's kappa statistic.
Result\$conf.int	A numeric vector of length 2 to give upper/lower limit of confidence intervals.
Result\$p.value	The significant probability as the result of null-hypothesis testing.
Judgement	The judgement for the estimated kappa about the extent of agreement, given by Landis JR, Koch GG (1977) <i>Biometrics</i> , 33: 159-174: If kappa is less than 0, "No agreement", if 0-0.2, "Slight agreement", if 0.2-0.4, "Fair agreement", if 0.4-0.6, "Moderate agreement", if 0.6-0.8, "Substantial agreement", if 0.8-1.0, "Almost perfect agreement".

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

Landis JR, Koch GG (1977) The measurement of observer agreement for categorical data. *Biometrics*, 33: 159-174.

**See Also**[Kappa](#)**Examples**

```
res <- Kappa.test(matrix(c(20, 10, 5, 15), 2, 2))
str(res)
print(res)
Kappa.test(c(1, 1, 3, 1, 1, 2, 1, 2, 1, 1), c(2, 1, 3, 1, 3, 2, 1, 3, 3, 3))
```

lifetable

*Lifetable functions with mutual conversions***Description**

Lifetable related functions.

**Usage**

```
lifetable(mx, ns=NULL, class=5, mode=1)
lifetable2(mx, ax=0.5, n=1)
lifetable3(lx, ax=0.5, n=1)
clifetable(qx)
lxtodx(lx)
dxtolx(dx)
qxtodx(qx)
dxtoqx(dx)
qxtomx(qx, ax=0.5, n=1, mmax=NULL)
mxtomx(mx, ax=0.5, n=1)
qxtolx(qx)
lxtoqx(lx)
uxtoqx(ux)
hlifetable(mx, ax=0.5, n=5, pix=0, Nx=NULL, conf.level=0.95)
getax(lx, Tx, n=5)
```

**Arguments**

mx	Lifetable function mx, meaning the age (class)-specific death rates.
ns	If given as a vector with the same length as mx, the duration for each age (class). Default is NULL: same duration with class is automatically used.
n	If given as a vector with the same length as mx or qx, the duration for each age (class). Default is 1, which means the length for all age-classes being 1 year.
class	Age-class of lifetable() function. Default is 5.

mode	How to set $a_x$ and correction method in conversion from $m_x$ to $q_x$ . 1 and 11: all $a_x$ is 0.5 except the open-ended class [where $a_x$ is reciprocal of $m_x$ ], 2, 4, 12, 14: $a_x$ is 0.1 for age 0, 0.4 for age 1-4, 0.5 for the other ages except the open-ended class [where $a_x$ is reciprocal of $m_x$ ], 3, 5, 13, 15: $a_x$ is 0.3 for age 0, 0.4 for age 1-4, 0.5 for the other ages except the open-ended class [where $a_x$ is reciprocal of $m_x$ ], 6 and 16: Males value given in Preston SH (2001), pp.48 Table 3.3, 7 and 17: Females value given in Preston SH (2001), pp.48 Table 3.3. If less than 10, simply calculating $q_x$ as $n \cdot m_x / (1 + n \cdot (1 - a_x) \cdot m_x)$ (Note: In the formula of Preston SH (2001) pp.47, the function is given as $n \cdot m_x / (1 + (n - a_x) \cdot m_x)$ . The difference is due to the formulation of $a_x$ . In this function, $a_x$ is given for single age, same as Newell C (1988), pp.71) except for the open-ended class where $q_x = 1$ , otherwise calculating $q_x$ by Greville's method. Default is 1.
$a_x$	Lifetable function $a_x$ , fraction of last year lived. Default is 0.5 (scalar) for all classes. It can be given as scalar or vector. Note: This argument can only be specified in <code>lifetable2()</code> or <code>lifetable3()</code> , not in <code>lifetable()</code> .
$q_x$	Lifetable function $q_x$ , which means the probability of dying between age $x$ and $x+1$ (for <code>lifetable()</code> , $x+class$ ).
$m_{max}$	To calculate $m_x$ from $q_x$ , $m_x$ at the maximum open-ended age-class cannot be calculated from $q_x$ . In such situation, $m_{max}$ gives a value for it. Default is NULL.
$l_x$	Lifetable function $l_x$ , which means number of people left alive at age $x$ from 100,000 newborns.
$dx$	Lifetable function $dx$ , which means number of people dying between age $x$ and $x+1$ (for <code>lifetable()</code> , $x+class$ ) from 100,000 newborns. Differentials of $l_x$ .
$u_x$	The force of mortality.
$pix$	age-(class)-specific proportions of unhealthy people.
$N_x$	Population of $x$ th age-class, which is needed to calculate confidence intervals.
<code>conf.level</code>	The level of confidence intervals. Default is 0.95.
$T_x$	Lifetable function $T_x$ , which means sum of person-years lived above age $x$ .

**Value**

ages	Lifetable's exact age $x$ , which is the beginning of each interval.
$n$	Duration of each interval. If $n_s$ is not given, the value of the class is repeatedly used.
$m_x$	Lifetable function $m_x$ , meaning the age (class)-specific death rates.
$q_x$	Lifetable function $q_x$ , which means the probability of dying between age $x$ and $x+1$ (for <code>lifetable()</code> , $x+class$ ).
$a_x$	Lifetable function $a_x$ , which means the average number of person-years lived in the interval by those dying in the interval. In <code>lifetable()</code> , it's automatically specified by mode.
$l_x$	Lifetable function $l_x$ , which means number of people left alive at age $x$ from 100,000 newborns.

dx	Lifetable function dx, which means number of people dying between age x and x+1 (for lifetable(), x+class) from 100,000 newborns. Differentials of lx.
Lx	Lifetable function Lx, which means person-years lived between age x and x+class.
Tx	Lifetable function Tx, which means person-years lived above age x.
ex	Lifetable function ex, which means expectation of life at age x.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

- Preston SH, Heuveline P, Guillot M (2001) Demography: Measuring and Modeling Population Processes. Blackwell Publishing, Oxford.
- Newell C (1988) Methods and Models in Demography. The Guilford Press, New York.
- Sullivan DF (1971) A single index of mortality and morbidity. HSMHA Health Reports, 86: 347-354.

**See Also**

[Jlife](#)

**Examples**

```
lifetable(c(0.0087, 0.00015, 0.00019, 0.00098, 0.0013, 0.0011, 0.0014, 0.0019,
           0.0029, 0.0048, 0.0071, 0.011, 0.019, 0.028, 0.041, 0.072, 0.11,
           0.19), class=5, mode=11)
lifetable2(c(0.008314, 0.000408, 0.000181, 0.000187, 0.000282, 0.000307, 0.000364,
            0.000566, 0.000884, 0.001445, 0.002485, 0.004210, 0.007219, 0.012054,
            0.018259, 0.029920, 0.049689, 0.085545, 0.177987),
           ax = c(0.1, 0.4, rep(0.5, 16), NA), n = c(1, 4, rep(5, 16), NA) )
lifetable3(lx=c(1.0, 0.8499, 0.8070, 0.7876, 0.7762, 0.7691, 0.7502, 0.7362,
              0.7130, 0.6826, 0.6525, 0.6223, 0.5898, 0.5535, 0.5106, 0.4585,
              0.3965, 0.3210, 0.2380, 0.1516, 0.0768, 0.0276, 0.0059, 0.0006, 0),
           n=c(rep(1, 5), rep(5, 20)), ax=c(0.3, rep(0.5, 24))) # Newell, Table 13.1
clifetable(Jlife$qx2000F)
```

---

mhchart

*Draw maternity history charts.*

---

**Description**

To compare the maternity histories among several human populations, this kind of graph is useful, inspired by Wood JW (1994) "Dynamics of Human Reproduction", Aldine de Gruyter, New York.

**Usage**

```
mhchart(LIST, XLIM=c(15,45), COL="black", FILL="white", BWD=1, ...)
```



**Arguments**

LIST	The list of groups with their maternity histories from first birth to the last birth. Usually the first childbirth age is estimated as median by Kaplan-Meier method, the second childbirth age was given by adding the median of first birth intervals to the first childbirth age by Kaplan-Meier method, and so on.
XLIM	The limit of x axis, which means the range of reproductive ages. Default is 15 and 45.
COL	The border color. Default is black.
FILL	The painting color. Default is white.
BWD	The line width of the boxes. Default is 1.
...	Other parameters handed to <code>barplot()</code> to draw axes and background.

**Value**

No value is returned.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**Examples**

```
Developing <- c(18, 21, 24, 27, 30, 33.5, 37)
Hutterite <- c(23, 25, 27, 29, 31, 33, 35, 37, 39)
Gainj <- c(27, 31, 35, 39)
Japan <- c(29, 34)
x <- list(
  Developing=Developing,
  Hutterite=Hutterite,
  Gainj=Gainj,
  Japan=Japan)
mhchart(rev(x), COL="blue", FILL="pink", BWD=2, XLIM=c(15, 45),
  main="Maternity histories for selected populations",
  xlab="Maternal age (years)")
```

---

NagelkerkeR2

*Calculate Nagelkerke's R squared.*

---

**Description**

To evaluate the goodness of fit of the logistic regression model, calculating Nagelkerke's R squared from the result of `glm()`. The Nagelkerke's R squared means the power of explanation of the model.

**Usage**

```
NagelkerkeR2(rr)
```

**Arguments**

rr                    The object with class "glm" and "lm", which would be generated by glm().

**Value**

N                    The number of observations in which the model were fitted.  
R2                    Nagelkerke's R squared.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

Nagelkerke N (1991) A note on a general definition of the coefficient of determination. *Biometrika*, 78: 691-692.

Faraway JJ (2006) *Extending the linear models with R: Generalized linear, mixed effects and non-parametric regression models*. Chapman and Hall.

<http://minato.sip21c.org/grad/infop-text2012.pdf>

**Examples**

```
res <- glm(cbind(ncases,ncontrols) ~ agegp+alcgp+tobgp, data=esoph, family=binomial())
summary(res)
NagelkerkeR2(res)
```

---

oddsratio

*Calculate odds ratio and its confidence intervals*

---

**Description**

Calculate odds ratio and its confidence intervals based on approximation, followed by null-hypothesis (odds ratio equals to 1) testing.

**Usage**

```
oddsratio(a, b, c, d, conf.level=0.95, p.calc.by.independence=TRUE)
```

**Arguments**

a                    A scalar or a matrix. If matrix, it has to be 2 by 2, which contains the number of individuals who both suffer from exposure and disease as [1, 1], the number of individuals who suffer from disease but not exposed as [2, 1], the number of individuals who suffer from exposure but are healthy as [1, 2] and the number of individuals who neither suffered from exposure nor disease as [2, 2].

b                    If a is a scalar, this has to be given as the number of individuals who suffer from disease but not exposed. Otherwise, ignored.

c	If a is a scalar, this has to be given as the number of individuals who suffer from exposure but are healthy. Otherwise, ignored.
d	If a is a scalar, this has to be given as the number of individuals who neither suffered from exposure nor disease. Otherwise, ignored.
conf.level	Probability for confidence intervals. Default is 0.95.
p.calc.by.independence	Logical. If TRUE, calculating p-value by testing the null-hypothesis of independence between exposure and disease. Otherwise, calculating p-value by inverse-function of confidence intervals calculation (the result becomes the same as the vcd package). Default TRUE.

**Value**

estimate	Calculated point estimate of odds ratio.
conf.int	A numeric vector of length 2 to give upper/lower limit of confidence intervals.
p.value	The significant probability as the result of null-hypothesis testing.

**Note**

This function can also accept a matrix as argument, as suggested by Dr. Toshiaki Ara (<toshiaki.ara@gmail.com>). Thanks for a good suggestion.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

Rothman KJ (2012) Epidemiology: An Introduction. 2nd Ed., Oxford University Press, Oxford.

**Examples**

```
res <- oddsratio(5, 10, 85, 80)
str(res)
print(res)
oddsratio(12, 5, 6, 12)
oddsratio(12, 5, 6, 12, p.calc.by.independence=FALSE)
DH <- sample(c("Disease", "Health"), 100, replace=TRUE)
EN <- sample(c("Exposed", "Nonexposed"), 100, replace=TRUE)
x <- table(EN, DH)
oddsratio(x)
# same as oddsratio(x[1,1], x[2,1], x[1,2], x[2,2])
```

---

ORMH	<i>Calculate pooled odds ratio and its confidence intervals with Mantel-Haenszel's method</i>
------	---

---

**Description**

Calculate pooled odds ratio and its confidence intervals with Mantel-Haenszel's method.

**Usage**

```
ORMH(TBL, conf.level=0.95)
```

**Arguments**

TBL	A matrix with 4 columns. The first column is the number of exposed cases. The second column is the number of unexposed cases. The third column is the number of exposed controls. The forth column is the number of unexposed controls. Rows should be composed of different strata or studies.
conf.level	Probability for confidence intervals. Default is 0.95.

**Value**

estimate	Calculated point estimate of pooled odds ratio with Manterl-Haenszel's method.
conf.int	A numeric vector of length 2 to give upper/lower limit of confidence intervals.
conf.level	Simply return the value of given conf.level.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

Rothman KJ (2012) Epidemiology: An Introduction. 2nd Ed., Oxford University Press, Oxford.

**Examples**

```
# Table 10-6 of Rothman's textbook (Chapter 10).
ORMH(matrix(c(3, 9, 104, 1059, 1, 3, 5, 86), 2, 4, byrow=TRUE), conf.level=0.9)
# Figure 8-4 of Rothman's textbook (Chapter 8)
# https://www.ncbi.nlm.nih.gov/pubmed/7630245
# https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(05)74403-2/fulltext
TenStudies <- matrix(
  c(215, 229, 311-215, 306-229,
    38, 33, 59-38, 51-33,
    161, 174, 293-161, 293-174,
    76, 88, 164-76, 163-88,
    103, 105, 129-103, 133-105,
    65, 67, 120-65, 125-67,
```

```
81, 75, 113-81, 110-75,  
48, 63, 160-48, 159-63,  
22, 21, 60-22, 62-21,  
56, 51, 137-56, 140-51  
) , 10, 4, byrow=TRUE)  
ORMH(TenStudies)  
ElevenStudies <- rbind(TenStudies, c(468, 480, 229, 205))  
ORMH(ElevenStudies)
```

---

pairwise.fisher.test *Exact version of pairwise.prop.test*

---

### Description

By conducting repeatedly Fisher's exact tests instead of chi-square tests, this function can test the null-hypothesis of no difference in any pair of proportions for more than 2 groups, with adjustment of type I error for multiple comparison.

### Usage

```
pairwise.fisher.test(x, n, p.adjust.method, ...)
```

### Arguments

x	A integer vector of event occurrences
n	A integer vector of trials
p.adjust.method	A name in p.adjust.methods to specify the method to adjust type I error for multiple comparisons. Default is "holm".
...	Miscellaneous arguments to be given for fisher.test().

### Value

An object of adjusted p-values for all possible comparisons of pairs with class pairwise.htest.

### Author(s)

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>. The code of this function was provided by Dr. Shigenobu AOKI (Gunma Univ.).

### See Also

pairwise.prop.test, p.adjust.methods

**Examples**

```

pairwise.fisher.test(c(2, 4, 5), c(10, 14, 17), p.adjust.method="bonferroni")
smoker <- c(2, 1, 7)
total <- c(11, 14, 10)
names(total) <- c("A", "B", "C")
pairwise.fisher.test(smoker, total)

```

---

 PEI

*Population Expansion Index*


---

**Description**

Population Expansion Index (Bulge Index) for movement.

**Usage**

PEI(X, CLS, MODE)

**Arguments**

X	The vector to give age-specific population from age 0.
CLS	The width of age-class in X. default is 1.
MODE	If the MODE is 1, the ages of 20 to 39 years old are assumed as "easily movable ages" comparing with "relatively unmovable" 10 to 19 and 40 to 49, otherwise the ages of 15 to 34 years old are assumed as the former and 5 to 14 and 35 to 44 are assumed as the latter, as Dr. Toshio Kuroda suggested in his book. Then PEI (originally named as bulge index, but I prefer to use PEI instead) is calculated as the ratio of the population of "easily movable ages" to the population of "relatively unmovable ages" times 100. If PEI is larger than 100, net migration may be positive and vice versa. Default 1.

**Value**

The value of PEI is returned.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

Kuroda T (1976) Japan's Changing Population Structure (in Japanese). Kokon-Shoin, Tokyo.

Kuroda T (1971) A study on population composition: Special reference to Japan. (in Japanese, with abstract in English) Journal of Population Problems (Jinko-Mondai-Kenkyu), No. 119: 1-12. <https://www.ipss.go.jp/syoushika/bunken/data/pdf/j119.pdf>

## Examples

```

# Prefectural population estimates in 2018 (unit=1000 persons)
# total of males and females, by 5 year age-class
# (Data source) Download Excel file and extracted
# \url{https://www.e-stat.go.jp/stat-search/file-download?statInfId=000031807147&fileKind=0}
PPT2018 <- data.frame(
  Hokkaido = c(175, 195, 207, 229, 235, 232, 266, 304, 367, 381, 344, 341,
    354, 452, 368, 310, 252, 274),
  Aomori = c(41, 45, 51, 58, 48, 48, 59, 69, 82, 86, 83, 88, 94, 112, 89,
    75, 67, 69),
  Iwate = c(41, 47, 52, 57, 47, 50, 59, 69, 81, 82, 78, 84, 91, 106, 82,
    74, 67, 75),
  Miyagi = c(85, 93, 98, 109, 123, 119, 130, 144, 164, 163, 144, 146, 155,
    182, 139, 116, 98, 108),
  Akita = c(28, 33, 37, 40, 30, 33, 42, 51, 61, 62, 59, 69, 78, 93, 72,
    63, 61, 69),
  Yamagata = c(38, 42, 47, 51, 40, 43, 53, 61, 70, 69, 66, 73, 80, 95, 71,
    62, 58, 73),
  Fukushima = c(67, 70, 79, 89, 73, 80, 94, 105, 122, 124, 117, 129, 139,
    160, 119, 102, 89, 106),
  Ibaraki = c(106, 117, 127, 140, 132, 130, 152, 172, 204, 216, 185, 176,
    190, 233, 196, 162, 116, 125),
  Tochigi = c(73, 80, 87, 92, 83, 90, 107, 122, 142, 146, 125, 121, 131,
    157, 127, 101, 76, 84),
  Gumma = c(70, 79, 87, 97, 90, 88, 99, 113, 139, 148, 127, 117, 124, 153,
    135, 110, 82, 94),
  Saitama = c(279, 299, 312, 343, 405, 381, 407, 458, 552, 608, 508, 428,
    415, 524, 488, 411, 275, 235),
  Chiba = c(233, 251, 264, 289, 323, 310, 344, 387, 465, 513, 428, 367,
    361, 460, 430, 358, 248, 225),
  Tokyo = c(539, 516, 495, 554, 867, 911, 961, 1013, 1109, 1167, 1005,
    810, 687, 797, 750, 647, 500, 494),
  Kanagawa = c(351, 374, 385, 423, 518, 490, 529, 592, 706, 788, 679,
    551, 486, 599, 558, 479, 343, 326),
  Niigata = c(78, 88, 94, 103, 92, 94, 111, 127, 152, 154, 141, 141,
    155, 190, 151, 129, 111, 135),
  Toyama = c(37, 40, 45, 50, 44, 44, 50, 58, 75, 79, 65, 62, 65, 84,
    80, 63, 49, 60),
  Ishikawa = c(44, 48, 51, 57, 57, 53, 58, 65, 82, 86, 71, 68, 70, 86,
    80, 63, 47, 58),
  Fukui = c(30, 33, 36, 39, 33, 34, 39, 43, 52, 54, 48, 49, 50, 62, 50,
    43, 36, 44),
  Yamanashi = c(29, 32, 36, 41, 38, 35, 39, 44, 53, 60, 56, 53, 54, 64,
    54, 47, 37, 46),
  Nagano = c(76, 85, 94, 101, 79, 83, 98, 114, 143, 150, 133, 127, 130,
    159, 142, 122, 98, 129),
  Gifu = c(75, 86, 92, 101, 92, 86, 98, 112, 139, 148, 128, 122, 123,
    155, 139, 116, 90, 96),
  Shizuoka = c(137, 155, 164, 175, 150, 162, 193, 214, 256, 276, 241,
    225, 230, 284, 251, 212, 161, 173),
  Aichi = c(319, 339, 344, 374, 420, 414, 451, 484, 567, 610, 507, 434,
    397, 492, 461, 387, 276, 259),

```

```

Mie = c(67, 75, 80, 87, 82, 81, 92, 102, 125, 135, 118, 111, 109, 135,
  122, 103, 80, 88),
Shiga = c(61, 67, 69, 74, 74, 71, 79, 88, 105, 108, 89, 83, 81, 100,
  85, 69, 52, 58),
Kyoto = c(94, 102, 107, 122, 159, 136, 137, 149, 183, 197, 167, 148,
  142, 189, 180, 150, 112, 118),
Osaka = c(334, 352, 370, 418, 486, 461, 489, 529, 645, 727, 608, 507,
  465, 614, 592, 519, 367, 329),
Hyogo = c(212, 230, 242, 267, 267, 247, 279, 317, 392, 430, 367,
  334, 324, 410, 377, 313, 234, 244),
Nara = c(48, 54, 59, 67, 66, 58, 63, 71, 89, 100, 88, 81, 82,
  107, 99, 85, 60, 63),
Wakayama = c(33, 37, 39, 45, 36, 37, 44, 48, 61, 67, 60, 60, 61, 77,
  69, 59, 47, 54),
Tottori = c(22, 24, 25, 27, 22, 23, 28, 32, 37, 37, 33, 35, 39, 46,
  38, 30, 27, 36),
Shimane = c(26, 28, 29, 32, 25, 27, 32, 37, 43, 43, 38, 42, 46, 58,
  48, 39, 37, 49),
Okayama = c(75, 81, 84, 93, 97, 90, 99, 107, 130, 136, 112, 108, 114,
  142, 133, 106, 86, 104),
Hiroshima = c(113, 125, 126, 135, 136, 133, 150, 165, 201, 212, 175,
  163, 167, 211, 194, 155, 119, 137),
Yamaguchi = c(49, 55, 58, 63, 57, 55, 64, 72, 89, 94, 80, 80, 90,
  119, 104, 88, 71, 83),
Tokushima = c(26, 28, 29, 33, 29, 30, 36, 41, 48, 50, 45, 46, 52,
  64, 53, 43, 37, 46),
Kagawa = c(37, 40, 42, 46, 40, 40, 48, 54, 68, 69, 58, 57, 61, 79,
  70, 54, 45, 56),
Ehime = c(49, 55, 58, 63, 52, 54, 65, 74, 91, 93, 83, 84, 90, 115,
  98, 79, 66, 81),
Kochi = c(24, 26, 29, 32, 26, 26, 32, 37, 47, 48, 41, 44, 48, 61,
  55, 44, 37, 49),
Fukuoka = c(218, 229, 226, 241, 275, 251, 285, 321, 363, 365, 311,
  300, 315, 394, 320, 262, 205, 228),
Saga = c(34, 38, 39, 42, 35, 35, 42, 47, 53, 52, 48, 52, 57, 67,
  51, 43, 37, 46),
Nagasaki = c(53, 57, 60, 63, 51, 54, 64, 72, 83, 87, 82, 89, 98, 117,
  90, 77, 66, 79),
Kumamoto = c(74, 80, 81, 83, 75, 77, 91, 100, 112, 109, 104, 111,
  122, 142, 111, 94, 85, 105),
Oita = c(44, 48, 49, 54, 47, 46, 56, 64, 75, 75, 66, 70, 78, 97, 81,
  67, 57, 69),
Miyazaki = c(45, 50, 50, 51, 41, 42, 52, 61, 70, 67, 62, 69, 78,
  92, 72, 60, 54, 64),
Kagoshima = c(68, 74, 74, 74, 62, 65, 80, 91, 100, 97, 96, 106,
  123, 135, 101, 88, 80, 102),
Okinawa = c(82, 84, 81, 81, 72, 76, 88, 93, 104, 102, 89, 90, 93,
  97, 60, 56, 48, 52)
)
# Calculate PEI for all prefectures
# for (i in 1:47) {
#   print(PEI(PPT2018[, i], CLS=5))
# }

```



```
print(apply(PPT2018, 2, PEI, CLS=5))
```

---

percentile

*Convert numeric vector into its percentile*

---

### Description

Convert numeric vector into its percentile. For example, 1:5 will become c(0,25,50,75,100).

### Usage

```
percentile(dat)
```

### Arguments

dat                    A numeric vector, which will be converted into percentile value.

### Value

A integer vector in [0,100]. Minimum value always becomes 0 and maximum always becomes 100.

### Author(s)

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

### Examples

```
percentile(1:5)
X <- runif(1000, 10, 20)
percentile(X)
```

---

PrefYLL2015

*Years of Life Lost by several causes in Japan 2015 for each prefecture*

---

### Description

The data gives years of life lost by several causes in Japan 2015 for each prefecture. There are several definitions of YLL. For example, WHO's Global Burden of Disease defines the YLL as the number of deaths multiplied by the standard life expectancy at the age at which death occurs, for a given cause, age and sex (WHO). However, Japanese Ministry of Health, Labor and Welfare gives the expected increase of the life expectancy at birth if the mortality due to each cause of death is removed from the age-specific mortality as the measure of YLL, and thus this dataset implements such data derived from the report of regional life tables in Japan (Ministry of Health, Labor and Welfare, 2015).

**Usage**

PrefYLL2015

**Format**

A data frame with 47 observations on 26 variables.

[, 1]	PNAME	factor w/47 levels	The name (in roma-ji) for prefectures
[, 2]	JCODE	numeric	Prefecture number defined by Geographical Information Authority of Japan
[, 3]	CancerM	numeric	Years of Life Lost (YLL) of males by cancer
[, 4]	CardioM	numeric	Years of Life Lost (YLL) of males by heart diseases except for hypertension
[, 5]	CerebroM	numeric	Years of Life Lost (YLL) of males by cerebrovascular disease
[, 6]	PneumoniaM	numeric	Years of Life Lost (YLL) of males by pneumonia
[, 7]	AccidentM	numeric	Years of Life Lost (YLL) of males by accident
[, 8]	TrafficM	numeric	Years of Life Lost (YLL) of males by traffic accidents
[, 9]	SuicideM	numeric	Years of Life Lost (YLL) of males by suicide
[, 10]	KidneyM	numeric	Years of Life Lost (YLL) of males by kidney failure
[, 11]	LiverM	numeric	Years of Life Lost (YLL) of males by liver disease
[, 12]	DiabetesM	numeric	Years of Life Lost (YLL) of males by diabetes
[, 13]	HypertensM	numeric	Years of Life Lost (YLL) of males by hypertension
[, 14]	TBM	numeric	Years of Life Lost (YLL) of males by tuberculosis
[, 15]	CancerF	numeric	Years of Life Lost (YLL) of females by cancer
[, 16]	CardioF	numeric	Years of Life Lost (YLL) of females by heart diseases except for hypertension
[, 17]	CerebroF	numeric	Years of Life Lost (YLL) of females by cerebrovascular disease
[, 18]	PneumoniaF	numeric	Years of Life Lost (YLL) of females by pneumonia
[, 19]	AccidentF	numeric	Years of Life Lost (YLL) of females by accident
[, 20]	TrafficF	numeric	Years of Life Lost (YLL) of females by traffic accidents
[, 21]	SuicideF	numeric	Years of Life Lost (YLL) of females by suicide
[, 22]	KidneyF	numeric	Years of Life Lost (YLL) of females by kidney failure
[, 23]	LiverF	numeric	Years of Life Lost (YLL) of females by liver disease
[, 24]	DiabetesF	numeric	Years of Life Lost (YLL) of females by diabetes
[, 25]	HypertensF	numeric	Years of Life Lost (YLL) of females by hypertension
[, 26]	TBF	numeric	Years of Life Lost (YLL) of females by tuberculosis

**Details**

Years of Life Lost by several causes in Japan 2015 for each prefecture.

- PNAME: The name (in roma-ji) for prefectures.
- JCODE: Prefecture number defined by Geographical Information Authority of Japan. From 1 to 47.
- Cancer[M|F]: YLL by cancer for males ([M]) or for females ([F]).
- Cardio[M|F]: YLL by heart disease for males ([M]) or for females ([F]).
- Cerebro[M|F]: YLL by cerebrovascular disease for males ([M]) or for females ([F]).
- Peumonia[M|F]: YLL by pneumonia for males ([M]) or for females ([F]).
- Accident[M|F]: YLL by accidents for males ([M]) or for females ([F]).

- Traffic[M|F]: YLL by traffic accidents (it's also included in Accident[M|F] for males ([M]) or for females ([F]).
- Suicide[M|F]: YLL by suicide for males ([M]) or for females ([F]).
- Kidney[M|F]: YLL by kidney failure for males ([M]) or for females ([F]).
- Liver[M|F]: YLL by liver disease for males ([M]) or for females ([F]).
- Diabetes[M|F]: YLL by diabates for males ([M]) or for females ([F]).
- Hypertension[M|F]: YLL by hypertension for males ([M]) or for females ([F]).
- TB[M|F]: YLL by tuberculosis for males ([M]) or for females ([F]).

### Source

<https://www.mhlw.go.jp/toukei/saikin/hw/life/tdfk15/dl/tdfk15-09.xls>

### References

Ministry of Health, Labor and Welfare of Japan: Vital Statistics with Life Expectancy 2015. <https://minato.sip21c.org/demography/how-to-make-pref-charts.html> (in Japanese) <https://www.who.int/whosis/whostat2006YearsOfLifeLost.pdf> WHO <https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates>

### Examples

```
require(fmsb)
x <- PrefYLL2015
COL <- ifelse(x$PNAME=="Nagano", "blue", ifelse(x$PNAME=="Okinawa", "pink",
  ifelse(x$PNAME=="Shiga", "green", "lightgrey")))
LWD <- ifelse(x$PNAME=="Nagano", 2, ifelse(x$PNAME=="Okinawa", 2, ifelse(x$PNAME=="Shiga", 2, 1)))
LTY <- ifelse(x$PNAME=="Nagano", 1, ifelse(x$PNAME=="Okinawa", 1, ifelse(x$PNAME=="Shiga", 1, 3)))
VX <- c("Cancer", "Heart\n Disease", "Cerebrovascular\n Disease", "Pneumonia",
  "Accident", "(Traffic\n Accident)", "Suicide", "Kidney\n Failure", "Liver\n Disease",
  "Diabetes", "Hypertension", "Tuberculosis")
males <- x[,3:14]
females <- x[,15:26]
layout(t(1:2))
radarchart(males, maxmin=FALSE, pcol=COL, axistype=2, pty=32, plty=LTY, plwd=LWD, vlabels=VX,
  title="YLLs in males (2015)\n (Blue: Nagano, Green: Shiga,\n Pink: Okinawa, Gray: Others)")
radarchart(females, maxmin=FALSE, pcol=COL, axistype=2, pty=32, plty=LTY, plwd=LWD, vlabels=VX,
  title="YLL in females (2015)\n (Blue: Nagano, Green: Shiga,\n Pink: Okinawa, Gray: Others)")
```

**Description**

Drawing the p-value function (a.k.a. nested confidence intervals) plot of risk ratio (RR) or odds ratio (OR) for a given 2 by 2 cross table, which is strongly recommended by Rothman KJ "Epidemiology: An introduction. 2nd Ed." Oxford Univ. Press.

Until fmsb-0.4.2, the formula to calculate p-values was not appropriate, so that the curve was not correct. Through discussion with Professor Rothman, I realized my mistake, then fixed it in fmsb-0.4.3. The feasible calculation is only possible in the manner of back-calculation from p-values to RR or OR, so that the calculation of p-values is restricted to the given range from 0.0005 to 1.

**Usage**

```
pvalueplot(XTAB, plot.OR, plot.log, xrange, add, ...)
```

**Arguments**

XTAB	A 2 by 2 matrix to draw p-value function (in another term, nested confidence intervals). The table should be given as the cross table for the exposure status being column and the health outcome status being row, opposite from usual manner for cross tabulation. To note, usually the numbers of incidence and the total observed numbers for exposed and nonexposed population as risk data, but in this function, the numbers of incidence and the remaining numbers without disease should be given as rows.
plot.OR	Logical. If you want to draw the p-value function for the odds ratio, it should be set at TRUE, otherwise the p-value function for the risk ratio is drawn. Default FALSE.
xrange	A numeric vector includes 2 elements for minimum and maximum of x axis. Default is c(0.01, 5).
plot.log	Logical. If TRUE, the horizontal axis becomes logarithmic scale. Default FALSE.
add	Logical. If TRUE, the line is overlayed on the existing pvalueplot, otherwise the graph is newly plotted. Default FALSE.
...	Other options handed down to plot() or lines(). pch, lty or col may be useful.

**Value**

The data.frame containing the set of p-values (ranging from 0.0005 to 1) and corresponding RR or OR is returned.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

Rothman KJ (2012) Epidemiology: An Introduction. 2nd Ed., Oxford University Press, Oxford.

**Examples**

```
pvalueplot(matrix(c(321, 411, 686-321, 689-411), 2, 2), xrange=c(0.7, 0.9))
pvalueplot(matrix(c(4, 386, 4, 1250), 2, 2), xrange=c(0.1, 20), plot.log=TRUE)
pvalueplot(matrix(c(468, 480, 229, 205), 2, 2), plot.OR=TRUE, xrange=c(0.7, 1.0))
```

pvpORMH

*Drawing p-value function plot by stratified or pooled cross tables***Description**

Drawing the p-value function (a.k.a. nested confidence intervals) plot of pooled odds ratios (pORs) for several 2 by 2 crosstables, which are stratified by a confounding variable or pooled for several studies, with Mantel-Haenszel's method.

**Usage**

```
pvpORMH(XTAB, xrange, add, ...)
```

**Arguments**

XTAB	A matrix with 4 columns. The first column is the number of exposed cases. The second column is the number of unexposed cases. The third column is the number of exposed controls. The forth column is the number of unexposed controls. Rows should be composed of different strata or studies.
xrange	A numeric vector includes 2 elements for minimum and maximum of x axis. Default is c(0.6, 1.2).
add	Logical. If TRUE, the line is overlayed on the existing pvalueplot, otherwise the graph is newly plotted. Default FALSE.
...	Other options handed down to plot() or lines(). pch, lty or col may be useful.

**Value**

A data.frame containing the set of p-values (ranging from 0.0005 to 1) and corresponding pORs are returned.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

Rothman KJ (2012) Epidemiology: An Introduction. 2nd Ed., Oxford University Press, Oxford.

**Examples**

```
TenStudies <- matrix(
  c(215, 229, 311-215, 306-229,
    38, 33, 59-38, 51-33,
    161, 174, 293-161, 293-174,
    76, 88, 164-76, 163-88,
    103, 105, 129-103, 133-105,
    65, 67, 120-65, 125-67,
    81, 75, 113-81, 110-75,
    48, 63, 160-48, 159-63,
    22, 21, 60-22, 62-21,
    56, 51, 137-56, 140-51
  ), 10, 4, byrow=TRUE)
ElevenStudies <- rbind(TenStudies, c(468, 480, 229, 205))
# Figure 8-4 in Chapter 8 of Rothman's textbook.
pvpORMH(TenStudies)
pvpORMH(ElevenStudies, add=TRUE, lty=2)
segments(1, 0, 1, 1, lwd=2)
```

radarchart

*Drawing radar chart (a.k.a. spider plot)***Description**

Drawing the radar chart with several lines from a data frame, which must be composed of more than 3 variables as axes and the rows indicate cases as series.

**Usage**

```
radarchart(df, axistype, seg, pty, pcol, plty, plwd, pdensity, pangle, pfc,
  cglty, cglwd, cglcol, axislacol, title, maxmin, na.itp, centerzero,
  vlabels, vlce, caxislabels, calce, paxislabels, palce, ...)
```

**Arguments**

df	The data frame to be used to draw radarchart. If maxmin is TRUE, this must include maximum values as row 1 and minimum values as row 2 for each variable, and actual data should be given as row 3 and lower rows. The number of columns (variables) must be more than 2.
axistype	The type of axes, specified by any of 0:5. 0 means no axis label. 1 means center axis label only. 2 means around-the-chart label only. 3 means both center and around-the-chart (peripheral) labels. 4 is *.* format of 1, 5 is *.* format of 3. Default is 0.
seg	The number of segments for each axis (default 4).
pty	A vector to specify point symbol: Default 16 (closed circle), if you don't plot data points, it should be 32. This is repeatedly used for data series.
pcol	A vector of color codes for plot data: Default 1:8, which are repeatedly used.

plty	A vector of line types for plot data: Default 1:6, which are repeatedly used.
plwd	A vector of line widths for plot data: Default 1, which is repeatedly used.
pdensity	A vector of filling density of polygons: Default NULL, which is repeatedly used.
pangle	A vector of the angles of lines used as filling polygons: Default 45, which is repeatedly used.
pfcol	A vector of color codes for filling polygons: Default NA, which is repeatedly used.
cglty	Line type for radar grids: Default 3, which means dotted line.
cglwd	Line width for radar grids: Default 1, which means thinnest line.
cglcol	Line color for radar grids: Default "navy"
axislabcol	Color of axis label and numbers: Default "blue"
title	if any, title should be typed.
maxmin	Logical. If true, data frame includes possible maximum values as row 1 and possible minimum values as row 2. If false, the maximum and minimum values for each axis will be calculated as actual maximum and minimum of the data. Default TRUE.
na.itp	Logical. If true, items with NA values are interpolated from nearest neighbor items and connect them. If false, items with NA are treated as the origin (but not pointed, only connected with lines). Default FALSE.
centerzero	Logical. If true, this function draws charts with scaling originated from (0,0). If false, charts originated from (1/segments). Default FALSE.
vlabels	Character vector for the names for variables. If NULL, the names of the variables as colnames(df) are used. Default NULL.
vlcex	Font size magnification for vlabels. If NULL, the font size is fixed at text()'s default. Default NULL.
caxislabels	Character vector for center axis labels, overwriting values specified in axistype option. If NULL, the values specified by axistype option are used. Default is NULL.
calcex	Font size magnification for caxislabels. If NULL, the font size is fixed at text()'s default. Default NULL.
paxislabels	Character vector for around-the-chart (peripheral) labels, overwriting values specified in axistype option. If NULL, the values specified by axistype option are used. Default is NULL.
palcex	Font size magnification for paxislabels. If NULL, the font size is fixed at text()'s default. Default NULL.
...	Miscellaneous arguments to be given for plot.default().

**Value**

No value is returned.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

## Examples

```
# Data must be given as the data frame, where the first cases show maximum.
maxmin <- data.frame(
  total=c(5, 1),
  phys=c(15, 3),
  psycho=c(3, 0),
  social=c(5, 1),
  env=c(5, 1))
# data for radarchart function version 1 series, minimum value must be omitted from above.
RNGkind("Mersenne-Twister")
set.seed(123)
dat <- data.frame(
  total=runif(3, 1, 5),
  phys=rnorm(3, 10, 2),
  psycho=c(0.5, NA, 3),
  social=runif(3, 1, 5),
  env=c(5, 2.5, 4))
dat <- rbind(maxmin,dat)
op <- par(mar=c(1, 2, 2, 1),mfrow=c(2, 2))
radarchart(dat, axistype=1, seg=5, plty=1, vlabels=c("Total\nQOL", "Physical\naspects",
  "Psychological\naspects", "Social\naspects", "Environmental\naspects"),
  title="(axis=1, 5 segments, with specified vlabels)", vlcex=0.5)
radarchart(dat, axistype=2, pcol=topo.colors(3), plty=1, pdensity=c(5, 10, 30),
  pangle=c(10, 45, 120), pfc=col=topo.colors(3),
  title="(topo.colors, fill, axis=2)")
radarchart(dat, axistype=3, pty=32, plty=1, axislabcol="grey", na.itp=FALSE,
  title="(no points, axis=3, na.itp=FALSE)")
radarchart(dat, axistype=1, plwd=1:5, pcol=1, centerzero=TRUE,
  seg=4, caxislabels=c("worst", "", "", "", "best"),
  title="(use lty and lwd but b/w, axis=1,\n centerzero=TRUE, with centerlabels)")
par(op)
```

---

ratedifference

*Calculate incidence rate difference and its confidence intervals*

---

## Description

Calculate incidence rate difference (a kind of attributable risk / excess risk) and its confidence intervals based on approximation, followed by null hypothesis (incidence rate difference equals to 0) testing.

## Usage

```
ratedifference(a, b, PT1, PT0, CRC=FALSE, conf.level=0.95)
```

## Arguments

a                   The number of disease occurrence among exposed cohort.  
b                   The number of disease occurrence among non-exposed cohort.



PT1	The observed person-time of the exposed cohort.
PT0	The observed person-time of the unexposed cohort.
CRC	Logical. If TRUE, calculate confidence intervals for each incidence rate. Default is FALSE.
conf.level	Probability for confidence intervals. Default is 0.95.

**Value**

estimate	Calculated point estimate of incidence rate difference.
conf.int	A numeric vector of length 2 to give upper/lower limit of confidence intervals.
p.value	The significant probability of the result of null-hypothesis testing.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

Rothman KJ (2012) Epidemiology: An Introduction. 2nd Ed., Oxford University Press, Oxford.

**Examples**

```
res <- ratedifference(136, 1709, 22050, 127650, CRC=TRUE)
str(res)
print(res)
```

---

rateratio

*Calculate incidence rate ratio and its confidence intervals*

---

**Description**

Calculate incidence rate ratio (a kind of relative risk) and its confidence intervals based on approximation, followed by null hypothesis (incidence rate ratio equals to 1) testing.

**Usage**

```
rateratio(a, b, PT1, PT0, conf.level=0.95)
```

**Arguments**

a	The number of disease occurrence among exposed cohort.
b	The number of disease occurrence among non-exposed cohort.
PT1	The observed person-time of the exposed cohort.
PT0	The observed person-time of the unexposed cohort.
conf.level	Probability for confidence intervals. Default is 0.95.

**Value**

estimate	Calculated point estimate of incidence rate ratio.
conf.int	A numeric vector of length 2 to give upper/lower limit of confidence intervals.
p.value	The significant probability of the result of null-hypothesis testing.

**Author(s)**

Minato Nakazawa <minatonakazawa@gmail.com> <http://minato.sip21c.org/>

**References**

Rothman KJ (2012) Epidemiology: An Introduction. 2nd Ed., Oxford University Press, Oxford.

**Examples**

```
res <- rateratio(136, 1709, 22050, 127650)
str(res)
print(res)
```

---

RCI

*Calculate risk and its confidence interval*

---

**Description**

Calculate risk and its confidence interval by the simple asymptotic method.

**Usage**

```
RCI(a, N, conf.level=0.9)
```

**Arguments**

a	Number of cases
N	Number of population at risk
conf.level	Probability for confidence intervals. Default is 0.9.

**Value**

R	Point estimate of risk.
RL	Lower limit of confidence interval
RU	Upper limit of confidence interval

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

Rothman KJ (2012) *Epidemiology: An Introduction*. 2nd Ed., Oxford University Press, Oxford.

**Examples**

```
# By simple asymptotic method
RCI(20, 100)
# By Wilson Score (without continuity correction)
prop.test(20, 100, conf.level=0.9, correct=FALSE)
# By Exact method
binom.test(20, 100, conf.level=0.9)
```

---

riskdifference      *Calculate risk difference and its confidence intervals*

---

**Description**

Calculate risk difference (a kind of attributable risk / excess risk) and its confidence intervals based on approximation, followed by null hypothesis (risk difference equals to 0) testing.

**Usage**

```
riskdifference(a, b, N1, N0, CRC=FALSE, conf.level=0.95)
```

**Arguments**

a	The number of disease occurrence among exposed cohort.
b	The number of disease occurrence among non-exposed cohort.
N1	The population at risk of the exposed cohort.
N0	The population at risk of the unexposed cohort.
CRC	Logical. If TRUE, calculate confidence intervals for each risk. Default is FALSE.
conf.level	Probability for confidence intervals. Default is 0.95.

**Value**

estimate	Calculated point estimate of risk difference.
conf.int	A numeric vector of length 2 to give upper/lower limit of confidence intervals.
p.value	The significant probability of the result of null-hypothesis testing.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

Rothman KJ (2012) *Epidemiology: An Introduction*. 2nd Ed., Oxford University Press, Oxford.

**Examples**

```
res <- riskdifference(321, 411, 686, 689, CRC=TRUE)
str(res)
print(res)
```

---

riskratio	<i>Calculate risk ratio and its confidence intervals</i>
-----------	--

---

**Description**

Calculate risk ratio (a kind of relative risk) and its confidence intervals based on approximation, followed by null hypothesis (risk ratio equals to 1) testing.

**Usage**

```
riskratio(X, Y, m1, m2, conf.level=0.95, p.calc.by.independence=TRUE)
```

**Arguments**

X	The number of disease occurrence among exposed cohort.
Y	The number of disease occurrence among non-exposed cohort.
m1	The number of individuals in exposed cohort group.
m2	The number of individuals in non-exposed cohort group.
conf.level	Probability for confidence intervals. Default is 0.95.
p.calc.by.independence	Logical. If TRUE, calculating p-value by testing the null-hypothesis of independence between exposure and disease. Otherwise, calculating p-value by inverse-function of confidence intervals calculation (the result becomes the same as the vcd package). Default TRUE.

**Value**

estimate	Calculated point estimate of risk ratio.
conf.int	A numeric vector of length 2 to give upper/lower limit of confidence intervals.
p.value	The significant probability of the result of null-hypothesis testing.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

Rothman KJ (2012) Epidemiology: An Introduction. 2nd Ed., Oxford University Press, Oxford.

**Examples**

```
res <- riskratio(5, 10, 90, 90)
str(res)
print(res)
riskratio(12, 5, 18, 17)
riskratio(12, 5, 18, 17, p.calc.by.independence=FALSE)
```

roc

*Calculate Receiver Operating Characteristic (ROC) curve***Description**

Calculate Receiver Operating Characteristic (ROC) curve's each performance set of [sensitivity, 1-specificity], each distance of the performance from the worst performance [0, 1], and each piece of area under the curve, for each cutoff point, as list. Fittest cut off is suggested as the set of [sensitivity, 1-specificity] which gives the longest distance from [0, 1] (though it's not common). If option maxdist=FALSE is given, the distances are calculated from the best performance [1, 0] and fittest cut off is the set of [sensitivity, 1-specificity] which gives minimum distance from best performance.

**Usage**

```
roc(values, iscase, maxdist=TRUE)
```

**Arguments**

values	A numeric vector of measured values.
iscase	A logical (or 0/1) vector of diagnostics. Negative result must be given by FALSE or 0.
maxdist	A logical value to specify the method of distance calculation to seek the best cutoff. Default TRUE.

**Value**

cutoff	The numeric vector of cutoff points, which are composed of the all unique values among the given measurements and the maximum cutoff is maximum measurement plus 1. Therefore, the minimum cutoff gives [1, 1] and the maximum cutoff gives [0, 0] as the performance set of [sensitivity, 1-specificity], respectively.
sens	The numeric vector of sensitivities for all cutoff points.
falsepos	The numeric vector of 1-specificities (false positiveness) for all cutoff points.
distance	The numeric vector of distance between actual performance set and the worst performance.
aucpiece	The numeric vector of the pieces of areas under the curve.
maxdist	Same as the given argument maxdist.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**See Also**

[ROC](#)

**Examples**

```
scores <- c(15, 20, 19, 28, 26, 17, 13, 22, 23, 24)
diagno <- c(0, 0, 0, 1, 1, 1, 0, 1, 1, 1)
res <- roc(scores, diagno)
print(res)
plot(res)
```

---

S60MPJ

*Model population of Japan in Showa 60 (1985)*

---

**Description**

The data gives the age-class (by five) specific model population of Japan in Showa 60 (1985) to calculate directly adjusted mortality rate.

**Usage**

S60MPJ

**Format**

A vector containing 18 observations.

**Source**

<https://www.mhlw.go.jp/toukei/list/dl/81-1b1.pdf>, page 55.

**References**

Tamura K. (2008) How do we die?: death date from vital statistics of the Japanese population. *The Waseda study of politics and public law*, 87: 27-57.

---

 Siler

*Siler's model mortality for qx and its fitting*


---

**Description**

Implementing Siler's model mortality function of  $q_x$  and fitting the model to actual  $q_x$  of given lifetable.

**Usage**

```
Siler(a1, b1, a2, a3, b3, t)
fitSiler(initialpar=c(0.01,3,1e-4,1e-5,0.1), data, mode=1, Method="Nelder-Mead", ...)
```

**Arguments**

a1	The parameter a1 of the Siler model, $q(t)=a1*\exp(-b1*t)+a2+a3*\exp(b3*t)$ .
b1	The parameter b1 of the Siler model, $q(t)=a1*\exp(-b1*t)+a2+a3*\exp(b3*t)$ .
a2	The parameter a2 of the Siler model, $q(t)=a1*\exp(-b1*t)+a2+a3*\exp(b3*t)$ .
a3	The parameter a3 of the Siler model, $q(t)=a1*\exp(-b1*t)+a2+a3*\exp(b3*t)$ .
b3	The parameter b3 of the Siler model, $q(t)=a1*\exp(-b1*t)+a2+a3*\exp(b3*t)$ .
t	Age (vector OK) in years
initialpar	Initial value for the parameters to be estimated. If not given, c(0.01, 0.0003, 0.07) is used.
data	Actual vector of $q_x$ in the lifetable to be used to obtain the best-fit parameters of the Gompertz-Makeham model.
mode	Which of lifetable functions should be used to calculate the RMSE: 1 $q_x$ , 2 $dx$ , otherwise $lx$ . Default is 1.
Method	The method to be used in <code>optim()</code> function. Default is "Nelder-Mead".
...	Other options to be passed to <code>optim()</code> .

**Value**

Siler() returns model  $q_x$  for the same length with t. fitSiler() returns the numeric vector of fitted parameters a1, b1, a2, a3 and b3, RMSE for those values, and the flag of convergence.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**See Also**

[Jlife](#)

**Examples**

```
res <- fitSiler(,Jlife$qx2005M)
FLAG <- res[7]
while (FLAG>0) {
  res <- fitSiler(res[1:5], Jlife$qx2005M)
  FLAG <- res[7]
}
print(res)
```

---

**SIQR***Calculate semi-interquartile range*

---

**Description**

Calculate semi-interquartile range, using IQR or fivenum.

**Usage**

```
SIQR(X, mode)
```

**Arguments**

**X** a numeric vector.  
**mode** If 1, using fivenum, otherwise using IQR function. Default is 1.

**Value**

A numeric vector of length 1, giving the semi-interquartile range.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**Examples**

```
data <- rnorm(100, 10, 1)
SIQR(data)
SIQR(data, 2)
sd(data)
idata <- sample(50:80, 100, replace=TRUE)
SIQR(idata)
SIQR(idata, 2)
sd(idata)
```



---

spearman.ci.sas	<i>Calculate Spearman's rank correlation with its confidence intervals by SAS method</i>
-----------------	--

---

**Description**

Calculate Spearman's rank correlation with its confidence intervals by the same method as SAS.

**Usage**

```
spearman.ci.sas(x, y, adj.bias=TRUE, conf.level=0.95)
```

**Arguments**

x	A numeric vector.
y	A numeric vector.
adj.bias	Logical. If TRUE, adjustment for bias is taken. Default TRUE.
conf.level	Probability for confidence intervals. Default is 0.95.

**Value**

rho	Calculated point estimate of Spearman's rank correlation coefficient.
rho.ll	The lower limit of given confidence intervals.
rho.ul	The upper limit of given confidence intervals.
adj.bias	The option for bias adjustment taken.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

[http://support.sas.com/documentation/cdl/en/procstat/63104/HTML/default/corr\\_toc.htm](http://support.sas.com/documentation/cdl/en/procstat/63104/HTML/default/corr_toc.htm)

**Examples**

```
data(airquality)
spearman.ci.sas(airquality$Ozone, airquality$Wind)
```

---

truemedian	<i>Calculate true median for data with ties.</i>
------------	--

---

### Description

Usually median for data with ties, tied values are treated as exactly same. For example, median of 3, 3, 4, 4, 4 will be 4. However, the measured values are usually rounded, so that we can assume evenly distributed true values for tied values. For example, the previous data can be treated as rounded values of 2.75, 3.25, 11/3, 4, 13/3. From this viewpoint, true median of 3, 3, 4, 4, 4 could be 11/3 (=3.66...). This function calculates this.

### Usage

```
truemedian(X, h)
```

### Arguments

X	A numeric vector. Usually integer.
h	Width of measurement unit. Default is 1.

### Value

A numeric vector of length 1, giving "true" median estimate.

### Author(s)

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

### References

Grimm LG (1993) Statistical Applications for the Behavioral Sciences. John Wiley and Sons.

### Examples

```
median(c(3, 3, 4, 4, 4))  
truemedian(c(3, 3, 4, 4, 4))
```

---

**VIF***Calculate variance inflation factor (VIF) from the result of lm.*

---

**Description**

To evaluate multicollinearity of multiple regression model, calculating the variance inflation factor (VIF) from the result of `lm()`. If VIF is more than 10, multicollinearity is strongly suggested.

**Usage**`VIF(X)`**Arguments**

`X` The object with class "lm", which would be generated by `lm()`.

**Value**

A variance inflation factor is returned.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**Examples**

```
# the target multiple regression model
res <- lm(Ozone ~ Wind+Temp+Solar.R, data=airquality)
summary(res)
# checking multicollinearity for independent variables.
VIF(lm(Wind ~ Temp+Solar.R, data=airquality))
VIF(lm(Temp ~ Wind+Solar.R, data=airquality))
VIF(lm(Solar.R ~ Wind+Temp, data=airquality))
```

---

**WhipplesIndex***Whipple's Index*

---

**Description**

Whipple's Index for age-heaping

**Usage**`WhipplesIndex(X)`

**Arguments**

X                    The integer vector to give age-specific population from age 0 to more than 63 for each age.

**Value**

WI                    The Whipple's Index.

JUDGE                Based on Whipple's Index, accuracy of age-reporting is judged.

**Author(s)**

Minato Nakazawa <minato-nakazawa@umin.net> <http://minato.sip21c.org/>

**References**

Preston SH, Heuveline P, Guillot M (2001) Demography: Measuring and Modeling Population Processes. Blackwell Publishing, Oxford.

Newell C (1988) Methods and Models in Demography. The Guilford Press, New York.

Rowland DT (2003) Demographic methods and concepts. Oxford Univ. Press, Oxford.

**Examples**

```
WhipplesIndex(Jpop$M2000)
```

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