Package 'kidney.epi'

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Title Kidney Functions: Clinical and Epidemiological

Version 1.1.0

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Description Contains kidney care oriented functions.
Current version contains only function for calculation of Kidney Donor Risk Index and Kidney Donor Profile Index for kidney transplant donors by Rao et al. (2009) <doi:10.1097/TP.0b013e3181ac620b>.
Citation: Bikbov B. R open source programming code for calculation of the Kidney Donor Profile Index and Kidney Donor Risk Index. Kidney Diseases (2018) <doi:10.1159/000492427>.

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License LGPL (>= 2)

URL http://kidneyepidemiology.org/r/

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Suggests knitr, rmarkdown

VignetteBuilder knitr

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R topics documented:

`kidney.epi` *Kidney functions for R: clinical and epidemiological*

Description

Package contains different functions for use in the field of kidney disease and general epidemiology Current version contains only function for calculation of KDPI and KDRI for kidney transplant donors. However, more functions are coming soon.

`ktx` *Sample dataset with kidney transplant patients.*

Description

A dataset containing 10 records for kidney transplant patients, including information for deceased donors.

Usage

```
ktx
```

Format

A data frame with 10 rows and 12 variables:

ptid patient identifier

rec.age age of the recipient, in years

don.age age of the donor, in years

don.height height of the donor, in cm

don.weight weight of the donor, in kg

don.ethnicity ethnicity of the donor

don.hypertension history of hypertension for the donor

don.diabetes history of diabetes for the donor

don.causeofdeath cause of death for the donor

don.creatinine serum creatinine of the donor, in mg/dL

don.hcv hepatitis c virus status of the donor

don.dcdstatus donation after circulatory death status of the donor

Source

Generation from different patients' records

`ktx.kdpi.optn` *Calculate KDRI and KDPI for deceased kidney donor*

Description

Calculate KDRI and KDPI for deceased kidney donor

Usage

```
ktx.kdpi.optn(age, height_cm = 0, height_ft = 0, height_inch = 0,
  weight_kg = 0, weight_lb = 0, ethnicity, hypertension, diabetes,
  causeofdeath, creatinine, hcv, dcdstatus, creatinineunits = "micromol/l",
  return_output_type = "KDPI", mapping_values_year = "latest",
  label_afroamerican = c("Afroamerican"),
  label_hypertension_positive = c("yes"), label_hypertension_unknown = "NA",
  label_diabetes_positive = c("yes"), label_diabetes_unknown = "NA",
  label_causeofdeath = c("cva"), label_hcv_positive = c("positive"),
  label_hcv_unknown = "NA", label_dcdstatus = c("yes"))
```

Arguments

`age`	Numeric vector. Age, in years.
`height_cm`	Numeric vector. Could be defined either as height_cm if is measured in cm, or as height_ft and height_inch if is measured in feet and inches. If the parameter height_cm is greater than 0, the function uses cm, otherwise - feet and inches.
`height_ft`	see height_cm
`height_inch`	see height_cm
`weight_kg`	Numeric vector. Could be defined either as weight_kg if measured in kg, or as weight_lb if is measured in pounds. If the parameter weight_kg is greater than 0, the function uses kg, otherwise - pounds.
`weight_lb`	see weight_kg
`ethnicity`	Vector. Ethnicity, specify in case of African-American donors which have special coefficient in the regression equation. The value of variable refers to the parameter label_afroamerican.
`hypertension`	Vector. History of hypertension, specify in case of hypertensive donors which have special coefficient in the regression equation. The value of variable refers to the parameters label_hypertension_positive and label_hypertension_unknown.
`diabetes`	Vector. History of diabetes, specify in case of donors with diabetes which have special coefficient in the regression equation. The value of variable refers to the parameters label_diabetes_positive and label_diabetes_unknown.

`causeofdeath` Vector. Cause of death, specify whether death was due to cerebrovascular disease, or other reasons.

`creatinine` Numeric vector. Serum creatinine, could be expressed in "micromol/L", "mmol/L" or "mg/dL". Units of measurement should be defined in variable creatinineunits (if not defined explicitly by user, the default value is "micromol/L").

`hcv` Vector. Hepatitis C virus status. The value of variable refers to the parameters label_hcv_positive and label_hcv_unknown.

`dcdstatus` Vector. Donation after circulatory death status. Specify whether organ was from a donor after circulatory death or not. The value of variable refers to the parameter label_dcdstatus.

`creatinineunits`
Character string. Units in which serum creatinne is expressed. Could be one of the following: "micromol/L", "mmol/L" or "mg/dL".

`return_output_type`
Character string. Specify which calculated parameter to return from the function: "KDRI_Rao" - Raw Kidney Donor Risk Index, "KDRI_median" - scaled to the median Kidney Donor Risk Index, or "KDPI" - Kidney Donor Profile Index.

`mapping_values_year`
Numeric value or character string. Specify which year to take for the OPTN mapping table, as well as KDRI scaling factor and chances of hypertension and diabetes in case if they were unknown for donor.

By default the value is "latest", and the function takes the latest available OPTN mapping table and coefficients from the internal dataframes ktx.kdpi_mapping_table and ktx.kdpi_coefficients_table.

But if necessary, a user could define the exact year (i.e. mapping_values_year = 2015).

For a list of available years run the following: ktx.kdpi.optn.show.years().

`label_afroamerican`
List. Label(s) for Afroamerican ethnicity.

`label_hypertension_positive`
List. Label(s) for a positive history of hypertension.

`label_hypertension_unknown`
List. Label(s) for donors with unknown history of hypertension.

`label_diabetes_positive`
List. Label(s) for a positive history of diabetes.

`label_diabetes_unknown`
List. Label(s) for donors with unknown history of diabetes.

`label_causeofdeath`
List. Label(s) for a cause of death due to cerebrovascular/stroke.

`label_hcv_positive`
List. Label(s) for a positive HCV status.

`label_hcv_unknown`
List. Label(s) for an unknown, not done, indeterminate, or pending HCV status.

`label_dcdstatus`
List. Label(s) for a donor after circulatory death status.

Details

Calculate Kidney Donor Risk Index (KDRI) and Kidney Donor Profile Index (KDPI) based on the algorithm of US Organ Procurement and Transplantation Network. The Kidney Donor Profile Index (KDPI) is a numerical measure that combines ten donor factors to summarize into a single number the quality of deceased donor kidneys relative to other recovered kidneys. *KDRI could be calculated only for a deceased donor*!

More reading:

- OPTN web-based calculator
- Guide to calculating and interpreting KDPI
- Latest data for mapping table, scaling factor, etc

Programming: Boris Bikbov <boris@bikbov.ru>.

Citation: Bikbov B. R open source programming code for calculation of the Kidney Donor Profile Index and Kidney Donor Risk Index. Kidney Diseases, 2018. DOI: 10.1159/000492427

Value

numeric One of the following values based on the return_output_type argument: Raw Kidney Donor Risk Index (KDRI), Scaled to the median Kidney Donor Risk Index (KDRI), or Kidney Donor Profile Index (KDPI).

Examples

```
ktx.kdpi.optn (age = 60, height_cm = 168, weight_kg = 93, ethnicity = "White",
  hypertension = "yes", diabetes = "no", causeofdeath = "roadinjury",
  creatinine = 1.4, hcv = "negative", dcdstatus = "no",
  creatinineunits = "mg/dl", return_output_type = "KDRI_Rao")
ktx.kdpi.optn (age = 30, height_cm = 176, weight_kg = 82, ethnicity = "White",
  hypertension = "NA", diabetes = "no", causeofdeath = "roadinjury",
  creatinine = 150, hcv = "negative", dcdstatus = "no", return_output_type = "KDPI")
```

---

ktx.kdpi.optn.show.years

Shows which years are available in the R package for the OPTN mapping table, KDRI scaling factor, etc.

Description

Shows which years are available in the R package for the OPTN mapping table, KDRI scaling factor, etc.

Usage

```
ktx.kdpi.optn.show.years()
```

Details

Service function which shows for user for which year(s) the OPTN mapping table, as well as KDRI scaling factor and chances of hypertension and diabetes in case if they were unknown for donor in the ktx.kdpi_mapping_table and ktx.kdpi_coefficients_table. This years could be used for the argument *mapping_values_year* of the ktx.kdpi.optn function.

This function has no arguments.

Value

numeric List of years which could be used for the argument mapping_values_year of the ktx.kdpi.optn function.

---

service.count_greater_threshhold

Count how many values are greater than the defined threshhold.

Description

Count how many values are greater than the defined threshhold.

Usage

```
service.count_greater_threshhold(x, threshhold)
```

Arguments

x	the vector to be checked.
threshhold	numeric the threshhold to compare with.

Details

Count how many values are greater than the defined threshhold.

Programming: Boris Bikbov <boris@bikbov.ru>.

Value

numeric returns number of numeric values greater or equal to the threshhold.

Examples

```
myvals <- c(1, 8, -5, "oggi", NA)
myvals2 <- service.count_greater_threshhold(myvals, 0)
myvals2 # 2
```

service.count_lowerequal_threshhold

Count how many values are less or equal than the defined threshhold.

Description

Count how many values are less or equal than the defined threshhold.

Usage

```
service.count_lowerequal_threshhold(x, threshhold)
```

Arguments

x	the vector to be checked.
threshhold	numeric the threshhold to compare with.

Details

Count how many values are less or equal than the defined threshhold.

Programming: Boris Bikbov <boris@bikbov.ru>.

Value

numeric returns number of numeric values less or equal to the threshhold.

Examples

```
myvals <- c(1, 8, -5, "oggi", NA)
myvals2 <- service.count_lowerequal_threshhold(myvals, 0)
myvals2 # 1
```

service.is.param_possible

Service functions for data check which could be applied in any function of the package or externally

Description

Service functions for data check which could be applied in any function of the package or externally

Usage

```
service.is.param_possible(param2check, possible_params)
```

Arguments

param2check	Numeric value or character string. The single value to be verified.
possible_params	Vector. The vector of values which contains all possible values.

Details

Verifies whether the single value is among the values of the vector. Function is useful to check whether the argument of the function defined by the user is among the possible arguments recognized inside the function.

Programming: Boris Bikbov <boris@bikbov.ru>.

Value

logic returns TRUE if argument param2check is foundin possible values possible_params, and FALSE if it is not.

Examples

```
possible_params = c("KDPI", " KDRI_Rao", "KDRI_median")
service.is.param_possible("KDZO", possible_params) # return FALSE
service.is.param_possible("KDPI", possible_params) # return TRUE
```

---

service.is_numeric *Check whether a vector is numeric.*

Description

Check whether a vector is numeric.

Usage

```
service.is_numeric(x)
```

Arguments

x	the vector to be checked.

Details

Check whether a vector is numeric.

Programming: Boris Bikbov <boris@bikbov.ru>.

Value

logic whether vector x is numeric or not.

service.kdpi.optn.output_message
Produce message for warning or cat

Description

Produce message for warning or cat

Usage

```
service.kdpi.optn.output_message(x, custom_phrase, warning_type)
```

Arguments

x	Numeric. The value to be checked (usualy a counter of some variable).
custom_phrase	Character string. Custom message to be inserted in the middle of standard message.
warning_type	Character string. The type of message: warning (with substitution to NA) or cat (with leave as is).

Details

Produce message that is used by warning or cat in the ktx.kdpi.optn function. Service function that will not be exported to user, and used only in the ktx.kdpi.optn function.

Programming: Boris Bikbov <boris@bikbov.ru>.

Value

Character string. Returns a phrase.

service.singular_or_plural
Form output message in singular or plural.

Description

Form output message in singular or plural.

Usage

```
service.singular_or_plural(x, singular, plural)
```

Arguments

x	Numeric. The value to be checked (usualy a counter of some variable).
singular	Character string. The value to be returned in case of singular form (usualy a string, but could be any type).
plural	Character string. The value to be returned in case of plural form (usualy a string, but could be any type).

Details

Provide different output for constructing messages in singular or plural.

Programming: Boris Bikbov <boris@bikbov.ru>.

Value

Character string. Returns a value for constructing messages in singular or plural form.

Examples

```
service.singular_or_plural(1, "This value was", "These values were") # "This value was"
service.singular_or_plural(99, "This value was", "These values were") # "These values were"
```

---

service.strict_to_numeric_threshhold_greater

Select only numeric values lower than defined threshhold

Description

Select only numeric values lower than defined threshhold

Usage

```
service.strict_to_numeric_threshhold_greater(x, threshhold)
```

Arguments

x	the vector to be checked.
threshhold	numeric the threshhold to compare with.

Details

Select only numeric values lower than defined threshhold, and substitute other values with NA.

Programming: Boris Bikbov <boris@bikbov.ru>.

Value

numeric returns only numeric values lower than threshhold.

Examples

```
myvals <- c(1, 8, -5, "oggi", NA)
# ruturn to myvals2 only numeric values lower than threshhold  (3 in this case)
#   susbstitute non-numeric or negative values with NA
myvals2 <- service.strict_to_numeric_threshhold_greater(myvals, 3)
myvals2 # 1, NA, -5, NA, NA
```

---

service.strict_to_numeric_threshhold_lower

Select only numeric values greater than defined threshhold.

Description

Select only numeric values greater than defined threshhold.

Usage

```
service.strict_to_numeric_threshhold_lower(x, threshhold)
```

Arguments

x	the vector to be checked.
threshhold	numeric the threshhold to compare with.

Details

Select only numeric values greater than defined threshhold, and substitute other values with NA.

Programming: Boris Bikbov <boris@bikbov.ru>.

Value

numeric returns only numeric values greater than threshhold.

Examples

```
myvals <- c(1, 8, -5, "oggi", NA)
# ruturn to myvals2 only numeric values greater than defined threshhold (0 in this case)
#    and susbstitute non-numeric or negative values with NA
myvals2 <- service.strict_to_numeric_threshhold_lower(myvals, 0)
myvals2 # 1, 8, NA, NA, NA
```

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