Package 'CVrisk'

January 20, 2025

Title Compute Risk Scores for Cardiovascular Diseases

Version 1.1.1

Description Calculate various cardiovascular disease risk scores from the Framingham Heart Study (FHS), the American College of Cardiology (ACC), and the American Heart Association (AHA) as described in D'agostino, et al (2008) <doi:10.1161/circulationaha.107.699579>, Goff, et al (2013) <doi:10.1161/01.cir.0000437741.48606.98>, and Mclelland, et al (2015) <doi:10.1016/j.jacc.2015.08.035>.

License GPL-3

Depends R (>= 2.10)

Encoding UTF-8

LazyData true

RoxygenNote 7.2.3

URL https://github.com/vcastro/CVrisk

BugReports https://github.com/vcastro/CVrisk/issues

Imports utils

Suggests testthat (>= 2.1.0), covr, tibble

NeedsCompilation no

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Repository CRAN

Date/Publication 2023-08-19 22:12:31 UTC

Contents

`ascvd_10y_accaha` *ACC/AHA 2013 ASCVD risk score*

Description

Computes 10-year risk for hard ASCVD event (defined as first occurrence of non-fatal myocardial infarction (MI), congestive heart disease (CHD) death, or fatal or nonfatal stroke).

Usage

```
ascvd_10y_accaha(
  race = "white",
  gender = c("male", "female"),
  age,
  totchol,
  hdl,
  sbp,
  bp_med,
  smoker,
  diabetes,
  ...
)
```

Arguments

`race`	patient race (white, aa, other)
`gender`	patient gender (male, female)
`age`	patient age (years)
`totchol`	Total cholesterol (mg/dL)
`hdl`	HDL cholesterol (mg/dL)
`sbp`	Systolic blood pressure (mm Hg)
`bp_med`	Patient is on a blood pressure medication (1=Yes, 0=No)
`smoker`	Current smoker (1=Yes, 0=No)
`diabetes`	Diabetes (1=Yes, 0=No)
`...`	Additional predictors can be passed and will be ignored

Value

Estimated 10-Y Risk for hard ASCVD (percent)

References

Goff, David C., et al. "2013 ACC/AHA guideline on the assessment of cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines." Journal of the American College of Cardiology 63.25 Part B (2014): 2935-2959.

Examples

```
library(CVrisk)
ascvd_10y_accaha(
  race = "aa", gender = "male", age = 55,
  totchol = 213, hdl = 50, sbp = 140,
  bp_med = 0, smoker = 0, diabetes = 0
)
```

---

ascvd_10y_frs *Framingham 2008 ASCVD risk score (with lab measurement)*

Description

Computes 10-year risk for ASCVD event (coronary death, myocardial infarction (MI), coronary insufficiency, angina, ischemic stroke, hemorrhagic stroke, transient ischemic attack, peripheral artery disease, or heart failure).

Usage

```
ascvd_10y_frs(
  gender = c("male", "female"),
  age,
  hdl,
  totchol,
  sbp,
  bp_med,
  smoker,
  diabetes,
  ...
)
```

Arguments

gender	patient gender (male, female)
age	patient age (years), between 30 and 74
hdl	HDL cholesterol (mg/dL)
totchol	Total cholesterol (mg/dL)

sbp	Systolic blood pressure (mm Hg)
bp_med	Patient is on a blood pressure medication (1=Yes, 0=No)
smoker	Current smoker (1=Yes, 0=No)
diabetes	Diabetes (1=Yes, 0=No)
...	Additional predictors can be passed and will be ignored

Value

Estimated 10-Y Risk for hard ASCVD event (percent)

References

D'agostino, R.B., Vasan, R.S., Pencina, M.J., Wolf, P.A., Cobain, M., Massaro, J.M. and Kannel, W.B., 2008. General cardiovascular risk profile for use in primary care: the Framingham Heart Study. Circulation, 117(6), pp.743-753.

Examples

```
library(CVrisk)
ascvd_10y_frs(
  gender = "male", age = 55,
  hdl = 50, totchol = 213, sbp = 140,
  bp_med = 0, smoker = 0, diabetes = 0
)

# 16.7
```

---

ascvd_10y_frs_simple *Framingham 2008 ASCVD risk score (no lab measurement)*

Description

Computes 10-year risk for ASCVD event (coronary death, myocardial infarction (MI),coronary insufficiency, angina, ischemic stroke, hemorrhagic stroke, transient ischemic attack, peripheral artery disease, or heart failure).

Usage

```
ascvd_10y_frs_simple(
  gender = c("male", "female"),
  age,
  bmi,
  sbp,
  bp_med,
  smoker,
  diabetes,
  ...
)
```

Arguments

gender	patient gender (male, female)
age	patient age (years), between 30 and 74
bmi	Body mass index (kg/m2)
sbp	Systolic blood pressure (mm Hg)
bp_med	Patient is on a blood pressure medication (1=Yes, 0=No)
smoker	Current smoker (1=Yes, 0=No)
diabetes	Diabetes (1=Yes, 0=No)
...	Additional predictors can be passed and will be ignored

Value

Estimated 10-Y Risk for hard ASCVD (percent)

References

D'agostino, R.B., Vasan, R.S., Pencina, M.J., Wolf, P.A., Cobain, M., Massaro, J.M. and Kannel, W.B., 2008. General cardiovascular risk profile for use in primary care: the Framingham Heart Study. Circulation, 117(6), pp.743-753.

Examples

```
library(CVrisk)
ascvd_10y_frs_simple(
  gender = "male", age = 55,
  bmi = 30, sbp = 140,
  bp_med = 0, smoker = 0, diabetes = 0
)

# 16.7
```

---

ascvd_pooled_coef *Model coefficients for ASCVD 10y ACC/AHA model*

Description

A data set containing the 2013 ACC/AHA ASCVD 10-year risk pooled cohort coefficients

Usage

```
ascvd_pooled_coef
```

Format

A data frame with 4 obs. and 17 variables:

race Patient race, either white or aa

gender Patient gender, either female or male

ln_age Natural log of patient age

ln_age_squared Natural log of patient age in years, squared

ln_totchol Natural log of total cholesterol level

ln_age_totchol Natural log of combined age and total cholesterol

ln_hdl Natural log of HDL level

ln_age_hdl Natural log of HDL and age

ln_treated_sbp Natural log of treated systolic blood pressure

ln_age_treated_sbp Natural log of treated systolic blood pressure and age

ln_untreated_sbp Natural log of untreated systolic blood pressure

ln_age_untreated_sbp Natural log of untreated systolic blood pressure and age

smoker Smoking status

ln_age_smoker Natural log of smoking status and age

diabetes Diabetes status

group_mean Grouped mean

baseline_survival Baseline survival

References

Goff, David C., et al. "2013 ACC/AHA guideline on the assessment of cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines." Journal of the American College of Cardiology 63.25 Part B (2014): 2935-2959.

`chd_10y_mesa` *MESA 2015 CHD risk score*

Description

Computes 10-year risk for hard coronary heart disease (CHD) event (defined as first occurrence of myocardial infarction (MI), resuscitated cardiac arrest, CHD death, or revascularization with prior or concurrent adjudicated angina).

Usage

```
chd_10y_mesa(
  race = "white",
  gender = c("male", "female"),
  age,
  totchol = NA,
  hdl = NA,
  lipid_med = NA,
  sbp = NA,
  bp_med = NA,
  smoker = NA,
  diabetes = NA,
  fh_heartattack = NA,
  ...
)
```

Arguments

race	patient race/ethnicity (white, aa, chinese, or hispanic)
gender	patient gender (male, female)
age	patient age (years), risk computed for 45-85 year olds
totchol	Total cholesterol (mg/dL)
hdl	HDL cholesterol (mg/dL)
lipid_med	Patient is on a hyperlipidemic medication (1=Yes, 0=No)
sbp	Systolic blood pressure (mm Hg)
bp_med	Patient is on a blood pressure medication (1=Yes, 0=No)
smoker	Current smoker (1=Yes, 0=No)
diabetes	Diabetes (1=Yes, 0=No)
fh_heartattack	Family history of heart attacks (parents, siblings ,or children) (1=Yes, 0=No)
...	Additional predictors can be passed and will be ignored

Value

Estimated 10-Y Risk for hard CAD event (percent)

References

McClelland RL, Jorgensen NW, Budoff M, et al. 10-Year Coronary Heart Disease Risk Prediction Using Coronary Artery Calcium and Traditional Risk Factors: Derivation in the MESA (Multi-Ethnic Study of Atherosclerosis) With Validation in the HNR (Heinz Nixdorf Recall) Study and the DHS (Dallas Heart Study). J Am Coll Cardiol. 2015;66(15):1643-1653. doi:10.1016/j.jacc.2015.08.035

Examples

```
library(CVrisk)
chd_10y_mesa(
  race = "aa", gender = "male", age = 55,
  totchol = 213, hdl = 50, sbp = 140, lipid_med = 0,
  bp_med = 1, smoker = 0, diabetes = 0, fh_heartattack = 0
)
```

---

chd_10y_mesa_cac *MESA 2015 CHD risk score with CAC*

Description

Computes 10-year risk for hard coronary heart disease (CHD) event (defined as first occurrence of myocardial infarction (MI), resuscitated cardiac arrest, CHD death, or revascularization with prior or concurrent adjudicated angina). Includes coronary artery calcification score for more precise estimate of risk

Usage

```
chd_10y_mesa_cac(
  race = "white",
  gender = c("male", "female"),
  age,
  totchol = NA,
  hdl = NA,
  lipid_med = NA,
  sbp = NA,
  bp_med = NA,
  smoker = NA,
  diabetes = NA,
  fh_heartattack = NA,
  cac = NA,
  ...
)
```

Arguments

race	patient race/ethnicity (white, aa, chinese, or hispanic)
gender	patient gender (male, female)
age	patient age (years), risk computed for 45-85 year olds
totchol	Total cholesterol (mg/dL)
hdl	HDL cholesterol (mg/dL)
lipid_med	Patient is on a hyperlipidemic medication (1=Yes, 0=No)
sbp	Systolic blood pressure (mm Hg)

bp_med	Patient is on a blood pressure medication (1=Yes, 0=No)
smoker	Current smoker (1=Yes, 0=No)
diabetes	Diabetes (1=Yes, 0=No)
fh_heartattack	Family history of heart attacks (parents, siblings ,or children) (1=Yes, 0=No)
cac	Coronary artery calcification (Agatston units)
...	Additional predictors can be passed and will be ignored

Value

Estimated 10-Y Risk for hard CAD event (percent)

References

McClelland RL, Jorgensen NW, Budoff M, et al. 10-Year Coronary Heart Disease Risk Prediction Using Coronary Artery Calcium and Traditional Risk Factors: Derivation in the MESA (Multi-Ethnic Study of Atherosclerosis) With Validation in the HNR (Heinz Nixdorf Recall) Study and the DHS (Dallas Heart Study). J Am Coll Cardiol. 2015;66(15):1643-1653. doi:10.1016/j.jacc.2015.08.035

Examples

```
library(CVrisk)
chd_10y_mesa_cac(
  race = "aa", gender = "male", age = 55,
  totchol = 213, hdl = 50, sbp = 140, lipid_med = 0,
  bp_med = 1, smoker = 0, diabetes = 0, fh_heartattack = 0, cac = 0
)
```

---

compute_CVrisk *Compute multiple CV risk scores*

Description

Compute multiple CV risk scores

Usage

```
compute_CVrisk(
  df,
  scores = c("ascvd_10y_accaha", "ascvd_10y_frs", "ascvd_10y_frs_simple", "chd_10y_mesa",
    "chd_10y_mesa_cac"),
  age,
  gender,
  race,
  sbp = NULL,
  bmi = NULL,
  hdl = NULL,
  totchol = NULL,
```

```
  bp_med = NULL,
  smoker = NULL,
  diabetes = NULL,
  lipid_med = NULL,
  fh_heartattack = NULL,
  cac = NULL
)
```

Arguments

df	input dataframe
scores	scores to compute, default is all scores
age	patient age in years (required for all scores)
gender	patient gender (male or female)
race	character string for patient race (white, aa, other) column
sbp	character string of systolic blood pressure (in mm Hg) column
bmi	character string of Body mass index (kg/m2) column
hdl	character string of HDL column
totchol	character string of total cholesterol column
bp_med	character string of blood pressure medication column
smoker	character string of smoking status column
diabetes	character string of diabetes status column
lipid_med	character string of lipid medication column
fh_heartattack	character string of fh of heart attack status column
cac	character string of cac column

Value

input data frame with risk score results appended as columns

Examples

```
library(CVrisk)
compute_CVrisk(sample_data,
  age = "age", race = "race", gender = "gender", bmi = "BMI", sbp = "sbp",
  hdl = "hdl", totchol = "totchol", bp_med = "bp_med", smoker = "smoker",
  diabetes = "diabetes", lipid_med = "lipid_med",
  fh_heartattack = "fh_heartattack", cac = "cac"
)
```

frs_coef *Model coefficients for ASCVD 10y FRS model*

Description

A data set containing the Framingham risk score coefficients (full model with lab features)

Usage

```
frs_coef
```

Format

A data frame with 2 obs. and 10 variables:

gender Patient gender, either female or male

ln_age Natural log of patient age

ln_totchol Natural log of total cholesterol level

ln_hdl Natural log of HDL level

ln_untreated_sbp Natural log of untreated systolic blood pressure

ln_treated_sbp Natural log of treated systolic blood pressure

smoker Smoking status

diabetes Diabetes status

group_mean Grouped mean

baseline_survival Baseline survival

References

D'agostino, R.B., Vasan, R.S., Pencina, M.J., Wolf, P.A., Cobain, M., Massaro, J.M. and Kannel, W.B., 2008. General cardiovascular risk profile for use in primary care. Circulation, 117(6), pp.743-753.

frs_simple_coef *Model coefficients for ASCVD 10y FRS simple model*

Description

A data set containing the Framingham risk score coefficients (simple model without lab features)

Usage

```
frs_simple_coef
```

Format

A data frame with 2 obs. and 10 variables:

gender Patient gender, either female or male

ln_age Natural log of patient age (years)

ln_bmi Natural log of body mass index kg/m2

ln_untreated_sbp Natural log of untreated systolic blood pressure

ln_treated_sbp Natural log of treated systolic blood pressure

smoker Smoking status

diabetes Diabetes status

group_mean Grouped mean

baseline_survival Baseline survival

References

D'agostino, R.B., Vasan, R.S., Pencina, M.J., Wolf, P.A., Cobain, M., Massaro, J.M. and Kannel, W.B., 2008. General cardiovascular risk profile for use in primary care. Circulation, 117(6), pp.743-753.

`mesa_cac_coef` *mesa_cac_coef*

Description

A data set containing the MESA risk score coefficients (model with CAC)

Usage

```
mesa_cac_coef
```

Format

A data frame with 1 obs. and 15 variables:

age Coefficient for age

gender_male Coefficient for male gender

race_chinese Coefficient for Chinese race

race_aa Coefficient for African American race

race_hispanic Coefficient for Hispanic race

diabetes Coefficient for diabetes status

smoker Coefficient for current smoker

totchol Coefficient for total cholesterol level

hdl Coefficient for HDL level

hld_med Coefficient for antihyperlipidemic medication

sbp Coefficient for systolic blood pressure

bp_med Coefficient for antihypertensive medication

fh_heartattack Coefficient for family history of heart attacks

log1p_cac Coefficient for ln(coronary artery calcification (units)+1)

baseline_survival Baseline survival

References

McClelland RL, Jorgensen NW, Budoff M, et al. 10-Year Coronary Heart Disease Risk Prediction Using Coronary Artery Calcium and Traditional Risk Factors: Derivation in the MESA (Multi-Ethnic Study of Atherosclerosis) With Validation in the HNR (Heinz Nixdorf Recall) Study and the DHS (Dallas Heart Study). J Am Coll Cardiol. 2015;66(15):1643-1653. doi:10.1016/j.jacc.2015.08.035

`mesa_coef` *mesa_coef*

Description

A data set containing the MESA risk score coefficients (model without CAC)

Usage

```
mesa_coef
```

Format

A data frame with 1 obs. and 14 variables:

age Coefficient for age

gender_male Coefficient for male gender

race_chinese Coefficient for Chinese race

race_aa Coefficient for African American race

race_hispanic Coefficient for Hispanic race

diabetes Coefficient for diabetes status

smoker Coefficient for current smoker

totchol Coefficient for total cholesterol level

hdl Coefficient for HDL level

hld_med Coefficient for antihyperlipidemic medication

sbp Coefficient for systolic blood pressure

bp_med Coefficient for antihypertensive medication

fh_heartattack Coefficient for family history of heart attacks

baseline_survival Baseline survival

References

McClelland RL, Jorgensen NW, Budoff M, et al. 10-Year Coronary Heart Disease Risk Prediction Using Coronary Artery Calcium and Traditional Risk Factors: Derivation in the MESA (Multi-Ethnic Study of Atherosclerosis) With Validation in the HNR (Heinz Nixdorf Recall) Study and the DHS (Dallas Heart Study). J Am Coll Cardiol. 2015;66(15):1643-1653. doi:10.1016/j.jacc.2015.08.035

`sample_data` *Sample patient data*

Description

A data set containing sample patient data

Usage

```
sample_data
```

Format

A data frame with 3 obs. and 10 variables:

age age in years

gender Patient gender

race race

BMI Body mass index (kg/m2)

sbp systolic blood pressure

hdl HDL

totchol Total cholesterol

bp_med Patient is on blood pressure medication

smoker Smoking status

diabetes Diabetes status

lipid_med Patient is on hyperlipidemic medication

fh_heartattack Family history of heart attack

cac Coronary artery calcification score

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