Package: egfr (via r-universe)

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Type Package

Title Estimated Glomerular Filtration Rate (eGFR) Calculators

Version 1.1.0

Description A comprehensive, vectorised toolkit for estimating glomerular filtration rate (eGFR) and creatinine clearance from serum creatinine, cystatin C, or both. Implements 20 validated adult, paediatric, and neonatal equations, including CKD-EPI (2009, 2012, 2021), MDRD, Cockcroft-Gault, EKFC, FAS, Lund-Malmoe, the Berlin Initiative Study, Schwartz bedside, CKiD U25, CAPA, and a neonatal equation. Helpers for body surface area, CKD (KDIGO) staging, and unit conversions are included. Inspired by the 'kidney.epi' package.

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Contents

`bsa` *Body surface area (BSA)*

Description

Computes body surface area, used to convert between absolute (mL/min) and BSA-normalised (mL/min/1.73m^2) GFR.

Usage

```
bsa(weight, height, method = c("dubois", "haycock", "mosteller"))
```

Arguments

`weight`	Numeric vector of body weight in kilograms.
`height`	Numeric vector of height in centimetres.
`method`	One of `"dubois"` (Du Bois & Du Bois, default), `"haycock"`, or `"mosteller"`.

Value

Numeric vector of body surface area in m^2.

References

Du Bois D, Du Bois EF. Arch Intern Med. 1916;17:863-871. Haycock GB, et al. J Pediatr. 1978;93(1):62-66. Mosteller RD. N Engl J Med. 1987;317(17):1098.

Examples

```
bsa(weight = 80, height = 180)
bsa(weight = 20, height = 110, method = "haycock")
```

---

ckd_stage *KDIGO CKD stage from eGFR*

Description

Classifies eGFR values into KDIGO GFR categories (G1-G5).

Usage

```
ckd_stage(egfr)
```

Arguments

egfr	Numeric vector of eGFR in mL/min/1.73m^2.

Value

Character vector of GFR categories: "G1", "G2", "G3a", "G3b", "G4", or "G5".

References

Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO 2012 Clinical Practice Guideline. Kidney Int Suppl. 2013.

Examples

```
ckd_stage(c(95, 72, 50, 35, 20, 8))
```

convert_creatinine *Convert serum creatinine between mg/dL and umol/L*

Description

Convert serum creatinine between mg/dL and umol/L

Usage

```
convert_creatinine(creatinine, from = "mg/dl", to = "umol/l")
```

Arguments

creatinine	Numeric vector of serum creatinine.
from, to	Units, either "mg/dl" or "umol/l".

Value

Numeric vector of converted creatinine.

Examples

```
convert_creatinine(88.4, from = "umol/l", to = "mg/dl")
convert_creatinine(1.0, from = "mg/dl", to = "umol/l")
```

egfr_bis_cr *Berlin Initiative Study (BIS1) creatinine eGFR (2012)*

Description

Estimates GFR from serum creatinine using the BIS1 equation (Schaeffner et al., 2012), developed in an elderly (>= 70 years) German cohort.

Usage

```
egfr_bis_cr(
  creatinine,
  age,
  sex,
  creatinine_units = "mg/dl",
  label_sex_male = "male",
  label_sex_female = "female"
)
```

Arguments

`creatinine`	Numeric vector of serum creatinine.
`age`	Numeric vector of age in years.
`sex`	Vector of sex labels (see `label_sex_male`/`label_sex_female`).
`creatinine_units`	Units of `creatinine`: `"mg/dl"` (default) or `"umol/l"`.
`label_sex_male, label_sex_female`	Values in `sex` that denote male and female records. Defaults to `"male"`/`"female"`.

Value

Numeric vector of eGFR in mL/min/1.73m^2.

References

Schaeffner ES, Ebert N, Delanaye P, et al. Two novel equations to estimate kidney function in persons aged 70 years or older. Ann Intern Med. 2012;157(7):471-481. doi:10.7326/00034819157-720121002000003

Examples

```
egfr_bis_cr(creatinine = 1.1, age = 75, sex = "female")
```

`egfr_capa` *CAPA paediatric cystatin C eGFR (2014)*

Description

Estimates GFR from serum cystatin C using the Caucasian, Asian, paediatric, and adult (CAPA) equation (Grubb et al., 2014).

Usage

```
egfr_capa(cystatin, age)
```

Arguments

`cystatin`	Numeric vector of serum cystatin C in mg/L.
`age`	Numeric vector of age in years.

Value

Numeric vector of eGFR in mL/min/1.73m^2.

References

Grubb A, Horio M, Hansson LO, et al. Generation of a new cystatin C-based estimating equation for GFR by use of 7 assays standardized to the international calibrator. Clin Chem. 2014;60(7):974-986. doi:10.1373/clinchem.2013.220707

Examples

```
egfr_capa(cystatin = 1.0, age = 12)
```

`egfr_ckdepi_cr_2009` *CKD-EPI 2009 creatinine eGFR (with race coefficient)*

Description

Estimates GFR from serum creatinine using the original CKD-EPI 2009 creatinine equation (Levey et al., 2009), which includes a race coefficient. Retained for historical comparison; the race-free `egfr_ckdepi_cr_2021()` is now recommended.

Usage

```
egfr_ckdepi_cr_2009(
  creatinine,
  age,
  sex,
  ethnicity = NULL,
  creatinine_units = "mg/dl",
  label_sex_male = "male",
  label_sex_female = "female",
  label_afroamerican = c("black", "Black")
)
```

Arguments

`creatinine`	Numeric vector of serum creatinine.
`age`	Numeric vector of age in years.
`sex`	Vector of sex labels (see `label_sex_male`/`label_sex_female`).
`ethnicity`	Optional vector of ethnicity labels. Records matching `label_afroamerican` receive the Black race coefficient (1.159); all others receive 1.0. If `NULL` (default) no race coefficient is applied.
`creatinine_units`	Units of `creatinine`: `"mg/dl"` (default) or `"umol/l"`.
`label_sex_male, label_sex_female`	Values in `sex` that denote male and female records. Defaults to `"male"`/`"female"`.
`label_afroamerican`	Values in `ethnicity` denoting Black/African American race. Defaults to `c("black", "Black")`.

Value

Numeric vector of eGFR in mL/min/1.73m^2.

References

Levey AS, Stevens LA, Schmid CH, et al. A new equation to estimate glomerular filtration rate. Ann Intern Med. 2009;150(9):604-612. doi:10.7326/0003481915092009050500006

Examples

```
egfr_ckdepi_cr_2009(creatinine = 1.0, age = 50, sex = "female")
egfr_ckdepi_cr_2009(1.0, 50, "female",
  ethnicity = "black", label_afroamerican = "black"
)
```

---

egfr_ckdepi_cr_2021 *CKD-EPI 2021 creatinine eGFR (race-free)*

Description

Estimates GFR from serum creatinine using the race-free CKD-EPI 2021 creatinine equation (Inker et al., 2021). This is the equation recommended for adults (>= 18 years) by current US guidelines.

Usage

```
egfr_ckdepi_cr_2021(
  creatinine,
  age,
  sex,
  creatinine_units = "mg/dl",
  label_sex_male = "male",
  label_sex_female = "female"
)
```

Arguments

creatinine	Numeric vector of serum creatinine.
age	Numeric vector of age in years.
sex	Vector of sex labels (see label_sex_male/label_sex_female).
creatinine_units	Units of creatinine: "mg/dl" (default) or "umol/l".
label_sex_male, label_sex_female	Values in sex that denote male and female records. Defaults to "male"/"female".

Value

Numeric vector of eGFR in mL/min/1.73m^2.

References

Inker LA, Eneanya ND, Coresh J, et al. New creatinine- and cystatin C-based equations to estimate GFR without race. N Engl J Med. 2021;385(19):1737-1749. doi:10.1056/NEJMoa2102953

Examples

```
egfr_ckdepi_cr_2021(creatinine = 1.0, age = 50, sex = "female")
egfr_ckdepi_cr_2021(c(0.8, 1.2), c(40, 65), c("female", "male"))
```

`egfr_ckdepi_cr_cys_2021`

CKD-EPI 2021 combined creatinine + cystatin C eGFR (race-free)

Description

Estimates GFR using both serum creatinine and cystatin C with the race-free CKD-EPI 2021 combined equation (Inker et al., 2021). This is the most accurate of the CKD-EPI equations when both biomarkers are available.

Usage

```
egfr_ckdepi_cr_cys_2021(
  creatinine,
  cystatin,
  age,
  sex,
  creatinine_units = "mg/dl",
  label_sex_male = "male",
  label_sex_female = "female"
)
```

Arguments

`creatinine`	Numeric vector of serum creatinine.
`cystatin`	Numeric vector of serum cystatin C in mg/L.
`age`	Numeric vector of age in years.
`sex`	Vector of sex labels (see `label_sex_male`/`label_sex_female`).
`creatinine_units`	Units of `creatinine`: `"mg/dl"` (default) or `"umol/l"`.
`label_sex_male, label_sex_female`	Values in `sex` that denote male and female records. Defaults to `"male"`/`"female"`.

Value

Numeric vector of eGFR in mL/min/1.73m^2.

References

Inker LA, Eneanya ND, Coresh J, et al. N Engl J Med. 2021;385(19):1737-1749. doi:10.1056/NEJMoa2102953

Examples

```
egfr_ckdepi_cr_cys_2021(
  creatinine = 1.0, cystatin = 0.9,
  age = 50, sex = "female"
)
```

`egfr_ckdepi_cys_2012` *CKD-EPI 2012 cystatin C eGFR*

Description

Estimates GFR from serum cystatin C using the CKD-EPI 2012 cystatin C equation (Inker et al., 2012). The formula is identical to the race-free 2021 cystatin C equation and is retained for backward compatibility.

Usage

```
egfr_ckdepi_cys_2012(
  cystatin,
  age,
  sex,
  label_sex_male = "male",
  label_sex_female = "female"
)
```

Arguments

`cystatin`	Numeric vector of serum cystatin C in mg/L.
`age`	Numeric vector of age in years.
`sex`	Vector of sex labels (see `label_sex_male`/`label_sex_female`).
`label_sex_male, label_sex_female`	Values in `sex` that denote male and female records. Defaults to `"male"`/`"female"`.

Value

Numeric vector of eGFR in mL/min/1.73m^2.

References

Inker LA, Schmid CH, Tighiouart H, et al. Estimating GFR from serum creatinine and cystatin C. N Engl J Med. 2012;367(1):20-29. doi:10.1056/NEJMoa1114248

Examples

```
egfr_ckdepi_cys_2012(cystatin = 0.9, age = 55, sex = "male")
```

`egfr_ckdepi_cys_2021` *CKD-EPI 2021 cystatin C eGFR (race-free)*

Description

Estimates GFR from serum cystatin C using the race-free CKD-EPI 2021 cystatin C equation (Inker et al., 2021). The identical formula was first published in 2012; see `egfr_ckdepi_cys_2012()`.

Usage

```
egfr_ckdepi_cys_2021(
  cystatin,
  age,
  sex,
  label_sex_male = "male",
  label_sex_female = "female"
)
```

Arguments

`cystatin`	Numeric vector of serum cystatin C in mg/L.
`age`	Numeric vector of age in years.
`sex`	Vector of sex labels (see `label_sex_male`/`label_sex_female`).
`label_sex_male, label_sex_female`	Values in `sex` that denote male and female records. Defaults to `"male"`/`"female"`.

Value

Numeric vector of eGFR in mL/min/1.73m^2.

References

Inker LA, Eneanya ND, Coresh J, et al. N Engl J Med. 2021;385(19):1737-1749. doi:10.1056/NEJMoa2102953

Examples

```
egfr_ckdepi_cys_2021(cystatin = 0.9, age = 55, sex = "male")
```

egfr_ckid_u25_cr *CKiD U25 creatinine eGFR*

Description

Estimates GFR in children and young adults (ages 1-25) using the CKiD U25 creatinine equation (Pierce et al., 2021). This is the first-choice paediatric equation.

Usage

```
egfr_ckid_u25_cr(
  creatinine,
  age,
  sex,
  height,
  creatinine_units = "mg/dl",
  height_units = "cm",
  label_sex_male = "male",
  label_sex_female = "female"
)
```

Arguments

creatinine	Numeric vector of serum creatinine.
age	Numeric vector of age in years.
sex	Vector of sex labels (see label_sex_male/label_sex_female).
height	Numeric vector of height.
creatinine_units	Units of creatinine: "mg/dl" (default) or "umol/l".
height_units	Units of height: "cm" (default) or "m".
label_sex_male, label_sex_female	Values in sex that denote male and female records. Defaults to "male"/"female".

Value

Numeric vector of eGFR in mL/min/1.73m^2.

References

Pierce CB, Munoz A, Ng DK, Warady BA, Furth SL, Schwartz GJ. Age- and sex-dependent clinical equations to estimate GFR in children and young adults with CKD. Kidney Int. 2021;99(4):948-956. doi:10.1016/j.kint.2020.10.047

Examples

```
egfr_ckid_u25_cr(creatinine = 0.6, age = 10, sex = "male", height = 140)
```

`egfr_ckid_u25_cr_cys` *CKiD U25 combined creatinine + cystatin C eGFR*

Description

Arithmetic mean of the CKiD U25 creatinine (`egfr_ckid_u25_cr()`) and cystatin C (`egfr_ckid_u25_cys()`) estimates.

Usage

```
egfr_ckid_u25_cr_cys(
  creatinine,
  cystatin,
  age,
  sex,
  height,
  creatinine_units = "mg/dl",
  height_units = "cm",
  label_sex_male = "male",
  label_sex_female = "female"
)
```

Arguments

`creatinine`	Numeric vector of serum creatinine.
`cystatin`	Numeric vector of serum cystatin C in mg/L.
`age`	Numeric vector of age in years.
`sex`	Vector of sex labels (see `label_sex_male`/`label_sex_female`).
`height`	Numeric vector of height.
`creatinine_units`	Units of `creatinine`: `"mg/dl"` (default) or `"umol/l"`.
`height_units`	Units of `height`: `"cm"` (default) or `"m"`.
`label_sex_male, label_sex_female`	Values in `sex` that denote male and female records. Defaults to `"male"`/`"female"`.

Value

Numeric vector of eGFR in mL/min/1.73m^2.

References

Pierce CB, et al. Kidney Int. 2021;99(4):948-956. doi:10.1016/j.kint.2020.10.047

Examples

```
egfr_ckid_u25_cr_cys(
  creatinine = 0.6, cystatin = 0.8, age = 10,
  sex = "male", height = 140
)
```

`egfr_ckid_u25_cr_extended` *CKiD U25 extended creatinine eGFR (to age 30)*

Description

Research extension of `egfr_ckid_u25_cr()` with kappa values that continue to age 30.

Usage

```
egfr_ckid_u25_cr_extended(
  creatinine,
  age,
  sex,
  height,
  creatinine_units = "mg/dl",
  height_units = "cm",
  label_sex_male = "male",
  label_sex_female = "female"
)
```

Arguments

`creatinine`	Numeric vector of serum creatinine.
`age`	Numeric vector of age in years.
`sex`	Vector of sex labels (see `label_sex_male`/`label_sex_female`).
`height`	Numeric vector of height.
`creatinine_units`	Units of `creatinine`: `"mg/dl"` (default) or `"umol/l"`.
`height_units`	Units of `height`: `"cm"` (default) or `"m"`.
`label_sex_male, label_sex_female`	Values in `sex` that denote male and female records. Defaults to `"male"`/`"female"`.

Value

Numeric vector of eGFR in mL/min/1.73m^2.

References

Pierce CB, et al. Kidney Int. 2021;99(4):948-956. doi:10.1016/j.kint.2020.10.047

Examples

```
egfr_ckid_u25_cr_extended(
  creatinine = 1.0, age = 28, sex = "female",
  height = 165
)
```

`egfr_ckid_u25_cys` *CKiD U25 cystatin C eGFR*

Description

Estimates GFR in children and young adults (ages 1-25) using the CKiD U25 cystatin C equation (Pierce et al., 2021).

Usage

```
egfr_ckid_u25_cys(
  cystatin,
  age,
  sex,
  label_sex_male = "male",
  label_sex_female = "female"
)
```

Arguments

`cystatin`	Numeric vector of serum cystatin C in mg/L.
`age`	Numeric vector of age in years.
`sex`	Vector of sex labels (see `label_sex_male`/`label_sex_female`).
`label_sex_male, label_sex_female`	Values in `sex` that denote male and female records. Defaults to `"male"`/`"female"`.

Value

Numeric vector of eGFR in mL/min/1.73m^2.

References

Pierce CB, et al. Kidney Int. 2021;99(4):948-956. doi:10.1016/j.kint.2020.10.047

Examples

```
egfr_ckid_u25_cys(cystatin = 0.8, age = 10, sex = "male")
```

`egfr_cockcroft_gault` *Cockcroft-Gault creatinine clearance*

Description

Estimates creatinine clearance (not BSA-normalised eGFR) using the Cockcroft-Gault equation (Cockcroft & Gault, 1976). Commonly used for drug dosing.

Usage

```
egfr_cockcroft_gault(
  creatinine,
  age,
  sex,
  weight,
  creatinine_units = "mg/dl",
  label_sex_male = "male",
  label_sex_female = "female"
)
```

Arguments

`creatinine`	Numeric vector of serum creatinine.
`age`	Numeric vector of age in years.
`sex`	Vector of sex labels (see `label_sex_male`/`label_sex_female`).
`weight`	Numeric vector of body weight in kilograms.
`creatinine_units`	Units of `creatinine`: `"mg/dl"` (default) or `"umol/l"`.
`label_sex_male, label_sex_female`	Values in `sex` that denote male and female records. Defaults to `"male"`/`"female"`.

Value

Numeric vector of creatinine clearance in mL/min.

References

Cockcroft DW, Gault MH. Prediction of creatinine clearance from serum creatinine. Nephron. 1976;16(1):31-41. doi:10.1159/000180580

Examples

```
egfr_cockcroft_gault(creatinine = 1.0, age = 50, sex = "male", weight = 80)
```

`egfr_ekfc_cr` *EKFC creatinine eGFR (2021)*

Description

Estimates GFR from serum creatinine using the European Kidney Function Consortium (EKFC) creatinine equation (Pottel et al., 2021). Valid across the full age spectrum (2-120 years).

Usage

```
egfr_ekfc_cr(
  creatinine,
  age,
  sex,
  creatinine_units = "mg/dl",
  label_sex_male = "male",
  label_sex_female = "female",
  q = NULL
)
```

Arguments

`creatinine`	Numeric vector of serum creatinine.
`age`	Numeric vector of age in years.
`sex`	Vector of sex labels (see `label_sex_male`/`label_sex_female`).
`creatinine_units`	Units of `creatinine`: `"mg/dl"` (default) or `"umol/l"`.
`label_sex_male, label_sex_female`	Values in `sex` that denote male and female records. Defaults to `"male"`/`"female"`.
`q`	Optional numeric vector of the reference creatinine Q value (median creatinine for the age/sex, in mg/dL). When `NULL` (the default) the built-in EKFC reference Q is used; supply a value to use a population-, assay-, or individual-specific Q. Recycled to the length of the other inputs.

Value

Numeric vector of eGFR in mL/min/1.73m^2.

References

Pottel H, Bjork J, Courbebaisse M, et al. Development and validation of a modified full age spectrum creatinine-based equation to estimate glomerular filtration rate. Ann Intern Med. 2021;174(2):183-191. doi:10.7326/M204366

Examples

```
egfr_ekfc_cr(creatinine = 1.0, age = 50, sex = "female")
egfr_ekfc_cr(0.5, 8, "male")
egfr_ekfc_cr(1.0, 50, "female", q = 0.72)
```

`egfr_ekfc_cr_cys` *EKFC combined creatinine + cystatin C eGFR (2023)*

Description

Arithmetic mean of the EKFC creatinine (`egfr_ekfc_cr()`) and EKFC cystatin C (`egfr_ekfc_cys()`) estimates.

Usage

```
egfr_ekfc_cr_cys(
  creatinine,
  cystatin,
  age,
  sex,
  creatinine_units = "mg/dl",
  label_sex_male = "male",
  label_sex_female = "female",
  q_cr = NULL,
  q_cys = NULL
)
```

Arguments

`creatinine`	Numeric vector of serum creatinine.
`cystatin`	Numeric vector of serum cystatin C in mg/L.
`age`	Numeric vector of age in years.
`sex`	Vector of sex labels (see `label_sex_male`/`label_sex_female`).
`creatinine_units`	Units of `creatinine`: `"mg/dl"` (default) or `"umol/l"`.
`label_sex_male, label_sex_female`	Values in `sex` that denote male and female records. Defaults to `"male"`/`"female"`.
`q_cr`	Optional numeric vector of the reference creatinine Q value (median creatinine, in mg/dL) passed to `egfr_ekfc_cr()`. `NULL` (default) uses the built-in EKFC reference Q.
`q_cys`	Optional numeric vector of the reference cystatin C Q value (median cystatin C, in mg/L) passed to `egfr_ekfc_cys()`. `NULL` (default) uses the built-in EKFC reference Q.

Value

Numeric vector of eGFR in mL/min/1.73m^2.

References

Pottel H, Bjork J, Rule AD, et al. N Engl J Med. 2023;388(4):333-343. doi:10.1056/NEJMoa2203769

Examples

```
egfr_ekfc_cr_cys(creatinine = 1.0, cystatin = 0.9, age = 50, sex = "female")
```

---

egfr_ekfc_cys *EKFC cystatin C eGFR (2023)*

Description

Estimates GFR from serum cystatin C using the sex- and race-free EKFC cystatin C equation (Pottel et al., 2023).

Usage

```
egfr_ekfc_cys(cystatin, age, q = NULL)
```

Arguments

`cystatin`	Numeric vector of serum cystatin C in mg/L.
`age`	Numeric vector of age in years.
`q`	Optional numeric vector of the reference cystatin C Q value (median cystatin C, in mg/L). When `NULL` (the default) the built-in age-based EKFC reference Q is used; supply a value to use a population- or individual-specific Q. Recycled to the length of the other inputs.

Value

Numeric vector of eGFR in mL/min/1.73m^2.

References

Pottel H, Bjork J, Rule AD, et al. Cystatin C-based equation to estimate GFR without the inclusion of race and sex. N Engl J Med. 2023;388(4):333-343. doi:10.1056/NEJMoa2203769

Examples

```
egfr_ekfc_cys(cystatin = 0.9, age = 50)
egfr_ekfc_cys(0.9, 50, q = 0.85)
```

`egfr_fas_cr` *Full Age Spectrum (FAS) creatinine eGFR*

Description

Estimates GFR from serum creatinine using the Full Age Spectrum equation (Pottel et al., 2016). Uses adult reference Q values (male 0.90, female 0.70 mg/dL) across all ages.

Usage

```
egfr_fas_cr(
  creatinine,
  age,
  sex,
  creatinine_units = "mg/dl",
  label_sex_male = "male",
  label_sex_female = "female"
)
```

Arguments

`creatinine`	Numeric vector of serum creatinine.
`age`	Numeric vector of age in years.
`sex`	Vector of sex labels (see `label_sex_male`/`label_sex_female`).
`creatinine_units`	Units of `creatinine`: `"mg/dl"` (default) or `"umol/l"`.
`label_sex_male, label_sex_female`	Values in `sex` that denote male and female records. Defaults to `"male"`/`"female"`.

Value

Numeric vector of eGFR in mL/min/1.73m^2.

References

Pottel H, Hoste L, Dubourg L, et al. An estimated glomerular filtration rate equation for the full age spectrum. Nephrol Dial Transplant. 2016;31(5):798-806. doi:10.1093/ndt/gfv454

Examples

```
egfr_fas_cr(creatinine = 1.0, age = 50, sex = "female")
```

egfr_lund_malmo *Lund-Malmoe Revised creatinine eGFR (2011)*

Description

Estimates GFR from serum creatinine using the revised Lund-Malmoe equation (Bjork et al., 2011). Piecewise-linear in plasma creatinine (umol/L) with sex-specific knots.

Usage

```
egfr_lund_malmo(
  creatinine,
  age,
  sex,
  creatinine_units = "mg/dl",
  label_sex_male = "male",
  label_sex_female = "female"
)
```

Arguments

creatinine	Numeric vector of serum creatinine.
age	Numeric vector of age in years.
sex	Vector of sex labels (see label_sex_male/label_sex_female).
creatinine_units	Units of creatinine: "mg/dl" (default) or "umol/l".
label_sex_male, label_sex_female	Values in sex that denote male and female records. Defaults to "male"/"female".

Value

Numeric vector of eGFR in mL/min/1.73m^2.

References

Bjork J, Grubb A, Sterner G, Nyman U. Revised equations for estimating glomerular filtration rate based on the Lund-Malmo Study cohort. Scand J Clin Lab Invest. 2011;71(3):232-239. doi:10.3109/00365513.2011.557086

Examples

```
egfr_lund_malmo(creatinine = 1.0, age = 50, sex = "female")
```

egfr_mdrd *MDRD 4-variable eGFR (IDMS-standardised)*

Description

Estimates GFR from serum creatinine using the IDMS-traceable 4-variable MDRD Study equation (Levey et al., 2006). Historical; superseded by CKD-EPI for clinical use.

Usage

```
egfr_mdrd(
  creatinine,
  age,
  sex,
  ethnicity = NULL,
  creatinine_units = "mg/dl",
  label_sex_male = "male",
  label_sex_female = "female",
  label_afroamerican = c("black", "Black")
)
```

Arguments

creatinine	Numeric vector of serum creatinine.
age	Numeric vector of age in years.
sex	Vector of sex labels (see label_sex_male/label_sex_female).
ethnicity	Optional vector of ethnicity labels. Records matching label_afroamerican receive the Black race coefficient (1.159); all others receive 1.0. If NULL (default) no race coefficient is applied.
creatinine_units	Units of creatinine: "mg/dl" (default) or "umol/l".
label_sex_male, label_sex_female	Values in sex that denote male and female records. Defaults to "male"/"female".
label_afroamerican	Values in ethnicity denoting Black/African American race. Defaults to c("black", "Black").

Value

Numeric vector of eGFR in mL/min/1.73m^2.

References

Levey AS, Coresh J, Greene T, et al. Using standardized serum creatinine values in the MDRD study equation. Ann Intern Med. 2006;145(4):247-254. doi:10.7326/0003481914542006081500004

Examples

```
egfr_mdrd(creatinine = 1.2, age = 60, sex = "male")
```

`egfr_neonatal` *Neonatal creatinine eGFR (2022)*

Description

Estimates GFR in term-born neonates using the equation of Smeets et al. (2022). Requires IDMS-standardised creatinine.

Usage

```
egfr_neonatal(
  creatinine,
  height,
  creatinine_units = "mg/dl",
  height_units = "cm"
)
```

Arguments

`creatinine`	Numeric vector of serum creatinine.
`height`	Numeric vector of height.
`creatinine_units`	Units of `creatinine`: `"mg/dl"` (default) or `"umol/l"`.
`height_units`	Units of `height`: `"cm"` (default) or `"m"`.

Value

Numeric vector of eGFR in mL/min/1.73m^2.

References

Smeets NJL, IntHout J, van der Burgh MJP, et al. SCr- and cystatin C-based equations to estimate GFR in term-born neonates. J Am Soc Nephrol. 2022;33(7):1277-1292. doi:10.1681/ASN.2021111453

Examples

```
egfr_neonatal(creatinine = 0.5, height = 50)
```

`egfr_schwartz` *Schwartz bedside paediatric eGFR (2009)*

Description

Estimates GFR in children using the bedside Schwartz equation (Schwartz et al., 2009). Requires IDMS-standardised creatinine.

Usage

```
egfr_schwartz(
  creatinine,
  height,
  creatinine_units = "mg/dl",
  height_units = "cm"
)
```

Arguments

`creatinine`	Numeric vector of serum creatinine.
`height`	Numeric vector of height.
`creatinine_units`	Units of `creatinine`: `"mg/dl"` (default) or `"umol/l"`.
`height_units`	Units of `height`: `"cm"` (default) or `"m"`.

Value

Numeric vector of eGFR in mL/min/1.73m^2.

References

Schwartz GJ, Munoz A, Schneider MF, et al. New equations to estimate GFR in children with CKD. J Am Soc Nephrol. 2009;20(3):629-637. doi:10.1681/ASN.2008030287

Examples

```
egfr_schwartz(creatinine = 0.5, height = 120)
```

`gfr_bsa_adjust` *Normalise or de-normalise GFR using body surface area*

Description

Converts between absolute creatinine clearance (mL/min) and BSA-normalised GFR (mL/min/1.73m^2).

Usage

```
gfr_bsa_adjust(gfr, bsa, to = c("normalized", "absolute"))
```

Arguments

`gfr`	Numeric vector of GFR values.
`bsa`	Numeric vector of body surface area in m^2 (e.g. from `bsa()`).
`to`	Either `"normalized"` (absolute -> per 1.73m^2, the default) or `"absolute"` (per 1.73m^2 -> absolute).

Value

Numeric vector of converted GFR.

Examples

```
gfr_bsa_adjust(100, bsa = 2.0, to = "normalized")
gfr_bsa_adjust(90, bsa = 2.0, to = "absolute")
```

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