# Package 'HOME'

June 2, 2026

**Title** Harmonized Orphanhood Mortality Estimation

**Version** 0.1.0

**Description** Implements indirect demographic methods for estimating adult mortality from orphanhood data. The package includes the standard Brass and Hill (1973) method <https://scholar.google.com/scholar_lookup?&title=Estimating%20Adult%20Mortality%20from%20Orphanhood&pages=111-23&publication_year=1973&author=Brass%2CW.&author=Hill.%2CK.>, the regression-based approach developed by Timaeus (1992) <https://pubmed.ncbi.nlm.nih.gov/12317481/>, and the adjustments proposed by Luy (2012) <doi:10.1007/s13524-012-0101-4> for low-mortality populations. A relational model is used to harmonize estimates into comparable adult mortality indicators. The package also provides diagnostic tools to assess the sensitivity of results to assumptions about the mean age of childbearing and the choice of model life table family.

**License** MIT + file LICENSE

**Encoding** UTF-8

**Depends** R (>= 3.5.0)

**Imports** ggplot2, gridExtra

**Suggests** shiny, testthat, DT, readxl, writexl, plotly, scales, bslib

**URL** https://github.com/tamaravaz/HOME

**BugReports** https://github.com/tamaravaz/HOME/issues

**NeedsCompilation** no

**Config/roxygen2/version** 8.0.0

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**Repository** CRAN

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# Contents



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`app_HOME` *Launch the HOME Shiny Application*

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## Description

Opens the interactive dashboard for indirect adult mortality estimation using the orphanhood-based methods implemented in the **HOME** package. The application provides a graphical interface to `om_estimate_index`, `om_plot_linearity`, `om_sensitivity`, and `om_sensitivity_family`.

## Usage

```
app_HOME()
```

## Details

The Shiny application is located in `inst/shiny/home_app/` and is launched via `shiny::runApp()`. An active R session with the **shiny**, **bslib**, **ggplot2**, **plotly**, **DT**, **readxl**, and **writexl** packages is required; these are listed under `Suggests` in the package `DESCRIPTION` file.

## Value

This function is called for its side effect of launching a Shiny application. It does not return a meaningful value; the return value of `shiny::runApp()` is returned invisibly.

## See Also

`om_estimate_index` for the underlying estimation function.

## Examples

```
if (interactive()) {
  app_HOME()
}
```

om_dashboard *Combined Diagnostic Dashboard*

## Description

Produces a three-panel diagnostic display combining the internal consistency check with sensitivity analyses for mean age of childbearing and model life table family.

## Usage

```
om_dashboard(
  object,
  index = "30q30",
  family_type = "UN",
  range_m = seq(-1.5, 1.5, 0.5)
)
```

## Arguments

| | |
|---|---|
| object | An object of class OrphanhoodEstimate. |
| index | Character. Mortality index to display in sensitivity panels. One of "30q30", "45q15", or "e30". Default: "30q30". |
| family_type | Character. Life table family system for the family sensitivity panel. One of "UN", "CD", or "All". Default: "UN". |
| range_m | Numeric vector. Offsets applied to the mean age of childbearing. Default: seq(-1.5, 1.5, 0.5). |

## Value

Invisibly returns the gtable object produced by gridExtra::grid.arrange().

## See Also

om_plot_linearity, om_sensitivity, om_sensitivity_family

## Examples

```
result <- om_estimate_index(
  method          = "luy",
  sex_parent      = "Female",
  age_respondent  = seq(20, 60, by = 5),
  p_surv          = c(0.987, 0.967, 0.934, 0.908, 0.882,
                      0.835, 0.769, 0.669, 0.565),
  mean_age_parent = rep(27, 9),
  surv_date       = 1998.5
)

om_dashboard(result, index = "30q30", family_type = "UN")
```

`om_estimate_index` *Estimate Adult Mortality Indices from Orphanhood Data*

## Description

Estimates conditional survivorship probabilities using orphanhood methods and harmonizes them into common adult mortality indices using a one-parameter relational logit model.

## Usage

```
om_estimate_index(
  method = c("luy", "timaeus", "brass"),
  sex_parent = c("Female", "Male"),
  age_respondent,
  p_surv,
  mean_age_parent,
  surv_date,
  num_respondents = NULL,
  model_family = "General"
)
```

## Arguments

| | |
|---|---|
| `method` | Character. Estimation method. One of `"luy"`, `"timaeus"`, or `"brass"`. |
| `sex_parent` | Character. Sex of the parent. One of `"Female"` or `"Male"`. |
| `age_respondent` | Numeric vector. Lower bound of respondent age groups (e.g., `c(15, 20, 25, 30)`). |
| `p_surv` | Numeric vector. Proportion of respondents reporting the parent alive, one value per age group. |
| `mean_age_parent` | Numeric scalar or vector. Mean age of parents at respondent's birth ($M$). A scalar is recycled across all age groups. |
| `surv_date` | Numeric. Survey reference date as a decimal year (e.g., `2015.5`). |
| `num_respondents` | Numeric vector. Optional. Number of respondents per age group. Reserved for future use; currently has no effect on estimates. |
| `model_family` | Character. Model life table family used as the relational logit standard. UN families: `"General"`, `"Latin"`, `"Chilean"`, `"South_Asian"`, `"Far_East_Asian"`. Coale-Demeny families: `"West"`, `"North"`, `"East"`, `"South"`. Default is `"General"`. |

## Details

Three orphanhood-based estimation methods are supported. Regardless of the method selected, estimates are harmonized into three comparable mortality indices:

- **30q30**: Probability of dying between ages 30 and 60.

- **45q15**: Probability of dying between ages 15 and 60.
- **e30**: Life expectancy at age 30.

For the Brass method, adjacent orphanhood proportions are paired across successive age groups. The first observation yields NA by construction because no preceding adjacent proportion exists.

## Value

An object of class `OrphanhoodEstimate`, a named list with:

`estimates` Data frame of estimated adult mortality indices by respondent age group. Columns:

- `Method` Citation label of the estimation method used.
- `RefYear` Estimated reference year of the mortality estimate, expressed as a decimal year.
- `Age` Lower bound of the respondent age group ($n$) used to derive the orphanhood estimate.
- `b` Initial exact age of the conditional survivorship interval. Equals 30 for Luy (2012); 25 for Timaeus (1992) females, 35 for males; 25 for Brass and Hill (1973) females, 32.5 or 37.5 for males depending on $\bar{M}$.
- `n_b` Terminal exact age of the survivorship interval ($b +$ duration). For Luy (2012) this equals $33 + n$.
- `l(b)` Estimated survivorship at exact age $b$, derived from the relational logit model.
- `l(n_b)` Estimated survivorship at exact age $n\_b$, derived from the relational logit model.
- `lx_ratio` Conditional survivorship probability $l(n\_b)/l(b)$, i.e.\ the probability of surviving from exact age $b$ to exact age $n\_b$. This is the key observable quantity derived from the orphanhood method and used to estimate `Alpha`.
- `Alpha` Relational logit level parameter $\alpha$ estimated by solving $l(n\_b)/l(b) =$ lx_ratio against the standard life table. Higher values indicate lower mortality.
- `30q30` Probability of dying between exact ages 30 and 60.
- `45q15` Probability of dying between exact ages 15 and 60.
- `e30` Life expectancy at exact age 30.

`meta` Named list of metadata: sex of the parent, model life table family, family system type (`"UN"` or `"CD"`), method identifier, and primary index name.

`inputs` Named list of the original input arguments, retained for reproducibility and use by `om_sensitivity` and `om_sensitivity_family`.

## See Also

`om_sensitivity`, `om_sensitivity_family`, `om_plot_linearity`

## Examples

```
result <- om_estimate_index(
  method          = "brass",
  sex_parent      = "Female",
  age_respondent  = c(20, 25, 30, 35, 40, 45),
  p_surv          = c(0.906, 0.840, 0.747, 0.631, 0.518, 0.400),
  mean_age_parent = 28.8,
  surv_date       = 1975.64,
  model_family    = "General"
```

```
)
print(result)
```

---

`om_plot_linearity` *Diagnostic Plot: Internal Consistency Check*

---

## Description

Displays the estimated Brass logit $\alpha$ parameter across respondent age groups. A roughly constant $\alpha$ indicates internal consistency of the orphanhood-based estimates; a systematic trend suggests age-reporting errors, adoption effects, or structural changes in mortality.

## Usage

```
om_plot_linearity(object)
```

## Arguments

| | |
|---|---|
| `object` | An object of class `OrphanhoodEstimate`. |

## Value

A `ggplot` object with respondent age group (`Age`) on the x-axis and the relational logit level parameter $\alpha$ (`Alpha`) on the y-axis. A dashed horizontal line marks the median $\alpha$ across age groups.

## See Also

`om_estimate_index`, `om_dashboard`

## Examples

```
result <- om_estimate_index(
  method          = "luy",
  sex_parent      = "Female",
  age_respondent  = seq(20, 60, by = 5),
  p_surv          = c(0.987, 0.967, 0.934, 0.908, 0.882,
                      0.835, 0.769, 0.669, 0.565),
  mean_age_parent = rep(27, 9),
  surv_date       = 1998.5
)
om_plot_linearity(result)
```

om_sensitivity *Sensitivity Analysis: Mean Age of Childbearing*

## Description

Evaluates the sensitivity of orphanhood-based mortality estimates to assumptions about the mean age of childbearing ($M_n$) by re-estimating indices across a grid of additive offsets.

## Usage

```
om_sensitivity(object = NULL, range_m = seq(-1.5, 1.5, 0.5), ...)
```

## Arguments

| | |
|---|---|
| object | Optional. An object of class OrphanhoodEstimate. When supplied, all estimation arguments are taken from object$inputs and may be overridden via .... |
| range_m | Numeric vector of offsets (in years) applied to the baseline mean age of childbearing. Default: seq(-1.5, 1.5, 0.5). |
| ... | Additional arguments passed to om_estimate_index, overriding values stored in object. |

## Value

An object of class OrphanhoodSensitivity, a named list with:

data A data frame of estimates for each offset value, with columns matching om_estimate_index()$estimates plus an additional column Offset_M identifying the applied offset in years.

meta A named list of metadata: variable name, offset range, standard level, and estimation method.

## See Also

plot.OrphanhoodSensitivity, om_sensitivity_family, om_estimate_index

## Examples

```
result <- om_estimate_index(
  method          = "luy",
  sex_parent      = "Female",
  age_respondent  = seq(20, 60, by = 5),
  p_surv          = c(0.987, 0.967, 0.934, 0.908, 0.882,
                      0.835, 0.769, 0.669, 0.565),
  mean_age_parent = rep(27, 9),
  surv_date       = 1998.5
)
sens <- om_sensitivity(result, range_m = seq(-2, 2, by = 0.5))
plot(sens, index = "30q30")
```

`om_sensitivity_family` *Sensitivity Analysis: Model Life Table Family*

## Description

Evaluates the sensitivity of orphanhood-based mortality estimates to the assumed age pattern of mortality by re-estimating indices across multiple model life table families.

## Usage

```
om_sensitivity_family(
  object = NULL,
  type = c("UN", "CD", "All"),
  families = NULL,
  ...
)
```

## Arguments

| | |
|---|---|
| `object` | Optional. An object of class `OrphanhoodEstimate`. |
| `type` | Character. Family system to evaluate. One of `"UN"`, `"CD"`, or `"All"` (default). Ignored when `families` is supplied. |
| `families` | Optional character vector of specific family names to test, overriding `type`. |
| `...` | Additional arguments passed to `om_estimate_index`. |

## Value

An object of class `OrphanhoodSensitivityFamily`, a named list with:

`data` A data frame of estimates for each family, with columns matching `om_estimate_index()$estimates` plus an additional column `Family` identifying the model life table family.

`meta` A named list of metadata: variable name, families tested, standard level, family system name, and estimation method.

## See Also

`plot.OrphanhoodSensitivityFamily`, `om_sensitivity`, `om_estimate_index`

## Examples

```
result <- om_estimate_index(
  method          = "luy",
  sex_parent      = "Female",
  age_respondent  = seq(20, 60, by = 5),
  p_surv          = c(0.987, 0.967, 0.934, 0.908, 0.882,
                      0.835, 0.769, 0.669, 0.565),
  mean_age_parent = rep(27, 9),
```

```
  surv_date       = 1998.5
)
sens_fam <- om_sensitivity_family(result, type = "UN")
plot(sens_fam, index = "30q30")
```

---

`plot.OrphanhoodSensitivity` *Plot Method for* `OrphanhoodSensitivity` *Objects*

---

## Description

Displays estimated mortality indices across reference years for each mean-age-of-childbearing offset, coloured from light (low offset) to dark (high offset).

## Usage

```
## S3 method for class 'OrphanhoodSensitivity'
plot(x, index = "30q30", ...)
```

## Arguments

| | |
|---|---|
| `x` | An object of class `OrphanhoodSensitivity`. |
| `index` | Character. Mortality index to plot. One of `"30q30"`, `"45q15"`, or `"e30"`. Default: `"30q30"`. |
| `...` | Further arguments (currently unused). |

## Value

A `ggplot` object.

## See Also

`om_sensitivity`

---

`plot.OrphanhoodSensitivityFamily` *Plot Method for* `OrphanhoodSensitivityFamily` *Objects*

---

## Description

Displays estimated mortality indices across reference years for each model life table family, distinguished by line type.

### Usage

```
## S3 method for class 'OrphanhoodSensitivityFamily'
plot(x, index = "30q30", ...)
```

### Arguments

| | |
|---|---|
| x | An object of class OrphanhoodSensitivityFamily. |
| index | Character. Mortality index to plot. One of "30q30", "45q15", or "e30". Default: "30q30". |
| ... | Further arguments (currently unused). |

### Value

A ggplot object.

### See Also

om_sensitivity_family

---

## print.OrphanhoodEstimate

*Print method for* OrphanhoodEstimate *objects*

---

### Description

Print method for OrphanhoodEstimate objects

### Usage

```
## S3 method for class 'OrphanhoodEstimate'
print(x, ...)
```

### Arguments

| | |
|---|---|
| x | An object of class OrphanhoodEstimate. |
| ... | Further arguments passed to print.data.frame. |

### Value

Invisibly returns x.

summary.OrphanhoodEstimate *Summary method for* OrphanhoodEstimate *objects*

## Description

Summary method for OrphanhoodEstimate objects

## Usage

```
## S3 method for class 'OrphanhoodEstimate'
summary(object, ...)
```

## Arguments

| | |
|---|---|
| object | An object of class OrphanhoodEstimate. |
| ... | Further arguments (currently unused). |

## Value

Invisibly returns object.

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