

# Package ‘HOME’

June 17, 2026

**Title** Harmonized Orphanhood Mortality Estimation

**Version** 0.1.1

**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.>](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/>](https://pubmed.ncbi.nlm.nih.gov/12317481/), and the adjustments proposed by Luy (2012) [doi:10.1007/s13524-012-0101-4](https://doi.org/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.

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**Encoding** UTF-8

**Depends** R (>= 3.5.0)

**Imports** ggplot2, gridExtra

**Suggests** shiny, bslib, plotly, DT, readxl, writexl, scales, testthat (>= 3.0.0), knitr, rmarkdown

**VignetteBuilder** knitr

**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

**Date/Publication** 2026-06-17 11:00:02 UTC

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app\_HOME

*Launch the HOME Shiny Application*

---

### 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 "A11". 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	<i>Estimate Adult Mortality Indices from Orphanhood Data</i>
-------------------	--

---

**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 ( $b + \text{duration}$ ). 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  $l(n_b)/l(b) = \text{lx\_ratio}$  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	<i>Sensitivity Analysis: Mean Age of Childbearing</i>
----------------	---

---

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

**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 <code>OrphanhoodEstimate</code> .
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 <code>om_estimate_index</code> .

**Value**

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

data	A data frame of estimates for each family, with columns matching <code>om_estimate_index()\$estimates</code> 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

<code>x</code>	An object of class <code>OrphanhoodSensitivityFamily</code> .
<code>index</code>	Character. Mortality index to plot. One of "30q30", "45q15", or "e30". Default: "30q30".
<code>...</code>	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

<code>x</code>	An object of class <code>OrphanhoodEstimate</code> .
<code>...</code>	Further arguments passed to <a href="#">print.data.frame</a> .

**Value**

Invisibly returns x.

---

```
print.OrphanhoodSensitivity
```

*Print Method for OrphanhoodSensitivity Objects*

---

**Description**

Prints a concise summary of a mean-age-of-childbearing sensitivity analysis.

**Usage**

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

**Arguments**

x                    An object of class OrphanhoodSensitivity.  
...                   Further arguments (currently unused).

**Value**

Invisibly returns x.

---

```
print.OrphanhoodSensitivityFamily
```

*Print Method for OrphanhoodSensitivityFamily Objects*

---

**Description**

Prints a concise summary of a model life table family sensitivity analysis.

**Usage**

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

**Arguments**

x                    An object of class OrphanhoodSensitivityFamily.  
...                   Further arguments (currently unused).

**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.

---

```
summary.OrphanhoodSensitivity
```

*Summary Method for OrphanhoodSensitivity Objects*

---

### Description

Summarises the range of estimated mortality indices across all mean-age-of-childbearing offsets.

### Usage

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

### Arguments

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

### Value

Invisibly returns object.

---

summary.OrphanhoodSensitivityFamily  
*Summary Method for OrphanhoodSensitivityFamily Objects*

---

**Description**

Summarises the range of estimated mortality indices across all model life table families tested.

**Usage**

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

**Arguments**

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

**Value**

Invisibly returns object.

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