Package 'DepMod'

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Title Decision-Analytic Modelling for Depression Prevention and Treatment

Version 0.1.0

Description Provides functions and example datasets to run a decision-analytic model for prevention and treatment strategies across depression severity states (sub-clinical, mild, moderate, severe, and recurrent). The package supports scenario analyses (base and alternative inputs) and summarises outcomes such as coverage, adherence, effect sizes, and healthcare costs.

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Imports shiny, stats, utils, DT, DiagrammeR, tidyverse, bslib, here

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Contents

`data_prev_rec_alt` *Intervention: prevention of recurrent depression (alternative)*

Description

Alternative scenario intervention parameters for the prevention of recurrent depression. Structure matches the base dataset. Values can be adjusted to reflect alternative modelling assumptions. In this dataset, the same numbers are provided as in the base case.

Usage

```
data(data_prev_rec_alt)
```

Format

Same structure as `data_prev_rec_alt`.

`data_prev_rec_base` *Intervention: prevention of recurrent depression (base)*

Description

Baseline intervention parameters for the prevention of recurrent depression among individuals with prior depressive episodes. Includes coverage, adherence, effect size, sample size, and healthcare costs.

Usage

```
data(data_prev_rec_base)
```

Format

Same structure as `data_prev_sub_base`.

data_prev_sub_alt *Intervention: prevention of sub-clinical depression (alternative)*

Description

This dataset contains alternative scenario intervention parameters for the prevention of sub-clinical depression in the DepMod model. The structure is identical to the base dataset but can represent alternative modelling assumptions. In this dataset, the same numbers are provided as in the base case.

Usage

```
data(data_prev_sub_alt)
```

Format

A data frame with the same columns as `data_prev_sub_alt`.

data_prev_sub_base *Intervention: prevention of sub-clinical depression (base)*

Description

This dataset contains baseline intervention parameters for the prevention of sub-clinical depression in the DepMod model. It includes coverage, adherence, effectiveness, sample size, and healthcare costs.

Usage

```
data(data_prev_sub_base)
```

Format

A data frame with one row per intervention strategy and columns:

cov Coverage of the intervention (proportion of target population).

adh Adherence to the intervention (proportion).

1-RR Effect size or relative risk reduction (numeric).

n Sample size or study population used for the parameter estimate.

healthcare costs Estimated healthcare costs per person.

Details

Used to compute the overall preventive effect for sub-clinical depression in the simulation model.

data_tr_mild_alt *Intervention: treatment of mild depression (alternative)*

Description

Alternative scenario parameters for the treatment of mild depression. The structure matches the base dataset but values can be adjusted to reflect alternative modelling assumptions. In this dataset, the same numbers are provided as in the base case.

Usage

```
data(data_tr_mild_alt)
```

Format

Same structure as `data_tr_mild_base`.

data_tr_mild_base *Intervention: treatment of mild depression (base)*

Description

Baseline intervention parameters for the treatment of mild depression episodes. Includes coverage, adherence, effectiveness, sample size, and healthcare costs.

Usage

```
data(data_tr_mild_base)
```

Format

A data frame with one row per intervention strategy and columns:

cov Coverage of the intervention (proportion of mild cases).

adh Adherence to the intervention (proportion).

d Effect size or relative risk reduction (numeric).

n Sample size or study population used for the estimate.

healthcare costs Estimated healthcare costs per person.

data_tr_mod_alt *Intervention: treatment of moderate depression (alternative)*

Description

Alternative scenario parameters for the treatment of moderate depression, structurally identical to the base dataset. Values can be adjusted to reflect alternative modelling assumptions. In this dataset, the same numbers are provided as in the base case.

Usage

```
data(data_tr_mod_alt)
```

Format

Same structure as `data_tr_mod_base`.

data_tr_mod_base *Intervention: treatment of moderate depression (base)*

Description

Baseline intervention parameters for the treatment of moderate depression episodes. Includes coverage, adherence, effect size, sample size, and healthcare costs.

Usage

```
data(data_tr_mod_base)
```

Format

Same structure as `data_tr_mild_base`.

data_tr_sev_alt *Intervention: treatment of severe depression (alternative)*

Description

Alternative intervention parameters for the treatment of severe depression episodes. Structure matches the base dataset. Values can be adjusted to reflect alternative modelling assumptions. In this dataset, the same numbers are provided as in the base case.

Usage

```
data(data_tr_sev_alt)
```

Format

Same structure as `data_tr_sev_alt`.

data_tr_sev_base *Intervention: treatment of severe depression (base)*

Description

Baseline intervention parameters for the treatment of severe depression episodes. Includes coverage, adherence, effectiveness, sample size, and healthcare costs.

Usage

```
data(data_tr_sev_base)
```

Format

Same structure as `data_tr_sev_base`.

`parameter_list` *Model parameters list*

Description

A named list of scalar parameters used in the disease progression and cost-effectiveness model. Each element is a single numeric value.

Usage

```
data(parameter_list)
```

Format

A named list with 40 elements:

excess mortality Excess mortality multiplier.

retirement rate Annual retirement rate.

death rate Baseline annual death rate.

mean duration of chronicity (year) Mean duration of chronic disease (years).

increased relapse 1 Relapse multiplier for category 1.

increased relapse 2 Relapse multiplier for category 2.

increased relapse 3 Relapse multiplier for category 3.

increased relapse 4 Relapse multiplier for category 4.

increased relapse 5 Relapse multiplier for category 5.

discount rate daly averted Annual discount rate applied to DALYs averted.

discount rate costs Annual discount rate applied to costs.

dw conversion factor Disability weight conversion factor.

Lower range dw conversion factor Lower bound of the disability weight conversion factor.

Upper range dw conversion factor Upper bound of the disability weight conversion factor.

Scale/shape Gamma cost distribution Scale/shape parameter for a Gamma cost distribution.

Incidence no history Incidence among individuals with no prior history.

pmild Proportion of incident cases that are mild.

pmoderate Proportion of incident cases that are moderate.

psevere Proportion of incident cases that are severe.

mildrecovery Probability of full recovery from mild disease.

mildpartial Probability of partial recovery from mild disease.

mildchronic Probability of chronic course after mild disease.

moderaterecovery Probability of full recovery from moderate disease.

moderatepartial Probability of partial recovery from moderate disease.

moderatechronic Probability of chronic course after moderate disease.

severerecovery Probability of full recovery from severe disease.

severepartial Probability of partial recovery from severe disease.

severechronic Probability of chronic course after severe disease.

mildrecoverycured Among mild recoveries, probability of being cured.

mildrecoveryrelapse Among mild recoveries, probability of relapse.

mildpartialcured Among mild partial recoveries, probability of being cured.

mildpartialrelapse Among mild partial recoveries, probability of relapse.

moderaterecoverycured Among moderate recoveries, probability of being cured.

moderaterecoveryrelapse Among moderate recoveries, probability of relapse.

moderatepartialcured Among moderate partial recoveries, probability of being cured.

moderatepartialrelapse Among moderate partial recoveries, probability of relapse.

severerecoverycured Among severe recoveries, probability of being cured.

severerecoveryrelapse Among severe recoveries, probability of relapse.

severepartialcured Among severe partial recoveries, probability of being cured.

severepartialrelapse Among severe partial recoveries, probability of relapse.

Examples

```
data(parameter_list)
names(parameter_list)
parameter_list[["excess mortality"]]
```

`run_app` *Run the Shiny app*

Description

Launches the Shiny app included in this package.

Usage

```
run_app()
```

Value

No return value; called for its side effect of launching the Shiny application.

Examples

```
if (interactive()) {
  run_app()
}
```

run_model *Run base and alternative simulation models*

Description

Wrapper for running the DepMod decision-analytic model under both base and alternative scenarios. The function first builds the transition matrix using `func_first_part_model()` and then runs `fun_sim_model()` for each scenario.

Usage

```
run_model(
  parameters = parameter_list,
  sim_runs = 1000,
  total_population = 10518000,
  df_prev_sub_base = data_prev_sub_base,
  df_tr_mild_base = data_tr_mild_base,
  df_tr_mod_base = data_tr_mod_base,
  df_tr_sev_base = data_tr_sev_base,
  df_prev_rec_base = data_prev_rec_base,
  df_prev_sub_alt = data_prev_sub_alt,
  df_tr_mild_alt = data_tr_mild_alt,
  df_tr_mod_alt = data_tr_mod_alt,
  df_tr_sev_alt = data_tr_sev_alt,
  df_prev_rec_alt = data_prev_rec_alt
)
```

Arguments

`parameters`	Named list of model parameters (see Details).
`sim_runs`	Integer. Number of simulation runs. Default is 1000.
`total_population`	Integer. Total population size used in the simulation. Default is 10518000.
`df_prev_sub_base`	Data frame for base scenario prevention (sub-clinical depression).
`df_tr_mild_base`	Data frame for base scenario treatment (mild depression).
`df_tr_mod_base`	Data frame for base scenario treatment (moderate depression).
`df_tr_sev_base`	Data frame for base scenario treatment (severe depression).
`df_prev_rec_base`	Data frame for base scenario prevention (recurrent depression).
`df_prev_sub_alt`	Data frame for alternative scenario prevention (sub-clinical depression).
`df_tr_mild_alt`	Data frame for alternative scenario treatment (mild depression).

`df_tr_mod_alt` Data frame for alternative scenario treatment (moderate depression).

`df_tr_sev_alt` Data frame for alternative scenario treatment (severe depression).

`df_prev_rec_alt`
Data frame for alternative scenario prevention (recurrent depression).

Details

The `parameters` list must contain numeric values controlling disease progression, recovery, relapse, disability weights, discounting, and cost accumulation. Required elements include:

General simulation parameters

dw_conversion_fact Disability-weight conversion factor.

discount_rate_daly Discount rate for DALYs.

scale_shape_gamma_cost Gamma distribution scale/shape cost factor.

disc_rate_cost Discount rate for economic costs.

leavemodel Probability of leaving the model.

mean_dur_chron Mean duration of chronic phase.

Population incidence inputs

incidence_no_history Incidence among individuals without prior disease.

pmild Proportion of incident mild cases.

pmoderate Proportion of incident moderate cases.

psevere Proportion of incident severe cases.

Stage-progression probabilities

mildrecovery Recovery probability from mild depression.

mildpartial Partial remission probability (mild).

mildchronic Chronic transition probability (mild).

moderaterecovery Recovery probability (moderate).

moderatepartial Partial remission probability (moderate).

moderatechronic Chronic transition probability (moderate).

severerecovery Recovery probability (severe).

severepartial Partial remission probability (severe).

severechronic Chronic transition probability (severe).

Recovery-state outcomes

mildrecoverycured Cure probability from mild–recovery.

mildrecoveryrelapse Relapse probability from mild–recovery.

mildpartialcured Cure probability from mild–partial.

mildpartialrelapse Relapse probability from mild–partial.

moderaterecoverycured Cure probability from moderate–recovery.

moderaterecoveryrelapse Relapse probability from moderate–recovery.

moderatepartialcured Cure probability from moderate–partial.

moderatepartialrelapse Relapse probability from moderate–partial.

severerecoverycured Cure probability from severe–recovery.

severerecoveryrelapse Relapse probability from severe–recovery.

severepartialcured Cure probability from severe–partial.

severepartialrelapse Relapse probability from severe–partial.

Relapse multipliers

increased_relapse_1 Relapse multiplier (category 1).

increased_relapse_2 Relapse multiplier (category 2).

increased_relapse_3 Relapse multiplier (category 3).

increased_relapse_4 Relapse multiplier (category 4).

increased_relapse_5 Relapse multiplier (category 5).

Value

A list with two elements:

base Model output using the base scenario.

alt Model output using the alternative scenario.

#' @examples res <- run_model()

Index