**Package ‘polypharmacy’**

September 25, 2020

**Type** Package

**Version** 0.1.0.9000

**Title** Calculate indicators of polypharmacy

**Description** Analyse prescription drugs deliveries to calculate several indicators of polypharmacy cor- responding to the various definitions found in the literature.

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**BugReports** <https://github.com/guiboucher/polypharmacy/issues>

**License** GPL-3 + file LICENSE

**Imports** data.table (>= 1.13.0), lubridate (>= 1.7.9)

**Roxygen** list(markdown = TRUE)

**RoxygenNote** 7.1.1 **Encoding** UTF-8 **LazyData** true **Suggests** knitr,

rmarkdown

**VignetteBuilder** knitr

R **topics documented:**

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polypharmacy-package *Calculate indicators of polypharmacy*

## Description

This package analyse prescription drugs deliveries to calculate several indicators of polypharmacy corresponding to the various definitions found in the literature.

## Details

It is essential to know the concepts used to calculate the various polypharmacy indicators to ade- quately use this package.

The core of the package is the data\_process() function that creates the data.table of pharma-

cists drug deliveries by restructuring the drug delivery records (usually extracted from a pharmacy or a health insurance information system) into continuous periods of drug availability, applying user-defined arguments such as the grace periods between renewals or the longest treatment dura- tion that an individual may accumulate through the successive renewals.

Then, each polypharmacy indicator can be computed using the corresponding function (ind\_simult(), ind\_stdcumul(), ind\_wcumul(), ind\_stdcontinuous(), ind\_ucontinuous()) or using the over- all function indicators() and select all the desired indicator(s) to be calculated at once.

Prior to running data\_process() the user may need to pre-process the table of original drug de- livery records to break down combination drug into their individual components (drugs\_bkdn()) and/or to overwrite the treatment duration of specified drugs with constant time periods (cst\_trt\_dur()).

## Author(s)

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## See Also

Useful links:

* Report bugs at <https://github.com/guiboucher/polypharmacy/issues>

cst\_tx\_duration *Constant treatment duration drugs*

## Description

Overwrites the treatment duration with constant durations for each drug code included in a user- provided table.

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## Usage

cst\_tx\_duration(  
Rx\_deliv,  
Rx\_drug\_code,  
Rx\_duration, Cst\_Tx\_dur, cst\_drug\_code,  
cst\_duration

)

## Arguments

Rx\_deliv Name of the table listing all prescription drugs delivered. Rx\_drug\_code Column name of Rx\_deliv that contains the drug unique identifier. Rx\_duration Column name of the constant treatment duration in the Rx\_deliv table.

Cst\_Tx\_dur Name of the table that contains the constant treatment durations that will over- write that in the Rx\_deliv table for the specified drug codes.

cst\_drug\_code Column name of cst\_tx\_dur that contains the drug unique identifier (same format as Rx\_drug\_code).

cst\_duration Column name of the constant treatment duration in the cst\_tx\_dur table (same format as Rx\_duration).

## Value

data.table of the same structure than Rx\_deliv, sorted by Rx\_drug\_code, listing all drugs in which a constant treatment duration replaces the original treatment duration.

## Examples

Rx\_dt <- data.frame(id = c(rep(1, 3), rep(2, 2)),

code = c("A", "B", "C", "B", "D"),

duration = c(rep(15, 3), 15, 90)) cst\_dt <- data.frame(codes = c("A", "C", "D"),

dur = c(50, 100, 45))

Rx\_cst <- cst\_tx\_duration(Rx\_deliv = Rx\_dt,

Rx\_drug\_code = "code", Rx\_duration = "duration", cst\_tx\_dur = cst\_dt,

cst\_drug\_code = "codes", cst\_duration = "dur")

data\_process *Table required for the calculation of polypharmacy indicators*

## Description

Reads a table of successive drug delivery records (usually extracted from a pharmacy or a health insurance information system) and creates the data required for the calculation of the polyphar- macy indicators by applying various user-defined arguments, incorporating hospital stays into the treatment periods and reconstruct continuous treatment periods by merging quasi continuous and/or overlapping drugs deliveries.

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## Usage

data\_process( Rx\_deliv, Rx\_id, Rx\_drug\_code, Rx\_drug\_deliv, Rx\_duration, Cohort = NULL,

Cohort\_id = NULL, Hosp\_stays = NULL, Hosp\_id = NULL, Hosp\_admis = NULL, Hosp\_discharge = NULL, study\_start = NULL, study\_end = NULL, grace\_fctr = 0.5,

grace\_cst = 0,  
max\_reserve = NULL,

final\_date\_names = c("tx\_start", "tx\_end"), final\_as\_date = TRUE

)

## Arguments

Rx\_deliv Name of the table listing all prescription drugs delivered including a run-in pe- riod of 7 months prior to study\_start. See *Details*.

Rx\_id Column name of Rx\_deliv containing individuals’ unique identifiers (any for- mat).

Rx\_drug\_code Column name of Rx\_deliv that contains the drugs’ unique identifiers (any for- mat).

Rx\_drug\_deliv Column name of Rx\_deliv that contains the dates of the drug deliveries (Date format, see *Details*).

Rx\_duration Column name of Rx\_deliv that contains the delivered treatment duration (inte- ger number).

Cohort Name of the table providing the unique identifiers of the study cohort. Only the ids listed in both the Cohort and the Rx\_deliv tables will be returned. if Cohort

= NULL, all ids of the Rx\_deliv table will be returned.

Cohort\_id Column name of Cohort containing individuals’ unique identifiers (same format as Rx\_id). If Cohort is not NULL and Cohort\_id is NULL, Cohort\_id will have the same value as Rx\_id.

Hosp\_stays Name of the table listing all hospital stays. (see *Details* for possible format).

Hosp\_id Column name of Hosp\_stays containing individuals’ unique identifiers (same format as Rx\_id). If Hosp\_stays is not NULL and Hosp\_id is NULL, Hosp\_id will have the same value as Rx\_id

Hosp\_admis Column name of Hosp\_stays that contains the date of admission in hospital (Date format, see *Details*).

Hosp\_discharge Column name of Hosp\_stays that contains the date of discharge from hospital (Date format, see *Details*).

study\_start, study\_end

Defines the first and last day of the study period for which the polypharmacy indicator(s) need to be calculated. All treatment periods prior to study\_start

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and past study\_end are not transcribed into the result table (Date format, see

*Details*).

grace\_fctr, grace\_cst

Number 0. Two types of grace periods can be applied. One is proportional to the treatment duration of the previous delivery (grace\_fctr) and the other is a constant number of days (grace\_cst).

*≥*

max\_reserve An integer number 0 or NULL. Longest treatment duration, in days, that can be stored from successive overlapping deliveries. When max\_reserve = NULL no limit is applied. When max\_reserve = 0 no accumulation of extra treatment duration is accounted for.

*≥*

final\_date\_names

Vector of two (2) values indicating the name of the first and last date of continued drug use. See *Value*.

final\_as\_date Return final\_date\_names columns in date format (TRUE). Else, columns are returned as integer (FALSE, memory efficient). TRUE by default.

## Details

**Variables**:

* Rx\_id, Cohort\_id and Hosp\_id columns must be of the same class (integer, numeric, charac- ter, ).
* Rx\_drug\_deliv, Hosp\_admis and Hosp\_discharge can be 1) as.Date('yyyy-mm-dd'), 2)

as.character('yyyy-mm-dd') or 3) as.integer() where 0 is January 1*st*, 1970.

## Arguments:

* study\_start and study\_end can be 1) as.Date("yyyy-mm-dd"), 2) as.character("yyyy-mm-dd") or 3) as.integer() where 0 is January 1*st*, 1970.

## Hospital stays:

Drug availability is considered to continue during the hospital stay as it is on the day prior ad- mission. The patient is assumed to resume the consumption of the drugs delivered by community pharmacists (as recorded in Rx\_deliv) prior admission the day after hosp\_discharge.

## Run-in period:

A run-in period is necessary to account for the medications that are available to the individuals on the day of study\_start.

## Grace period:

The grace period is used to determine if two successive deliveries can be considered as a continuous treatment even if there is a gap of a few days for which no treatment is apparently available. Two successive deliveries of an identical drug are considered part of a single continuous treatment if the next delivery doesn’t occur more than grace\_cst + (grace\_fctr × Rx\_duration) days after the end of the previous treatment duration. The availability of extra drugs accumulated over the successive deliveries is accounted for prior to evaluating the duration of the gap between deliveries.

## Performance

For better performance, date columns are converted to integer numbers.

## Value

data.table with four (4) variables:

* The individual unique identifier which name is defined by Rx\_id.

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* The drug unique identifier which name is defined by Rx\_drug\_code.
* The date of initiation of the reconstructed continued treatment. The name of the variable is defined by final\_date\_names[1] (default: 'tx\_start').
* The date of the last day of the reconstructed continued treatment. The name of the variable is defined by final\_date\_names[2] (default: 'tx\_end').

drug\_bkdn *Translate combination drug deliveries into single active ingredients*

## Description

Replaces each combination drug into several deliveries of elementary active ingredients according to a user-provided correspondence table.

## Usage

drug\_bkdn(Rx\_deliv, Rx\_drug\_code, Combn\_drugs, Combn\_drug\_code, Combn\_act\_code)

## Arguments

Rx\_deliv Name of the table listing all prescription drugs delivered.

Rx\_drug\_code Column name of Rx\_deliv that contains the combination drugs’ unique identi- fiers (any format).

Combn\_drugs Name of the correspondence table listing all elementary active ingredients that make up each combination drug.

Combn\_drug\_code

Column name of Combn\_drugs that contains the combination drugs’ unique identifiers (same format as Rx\_drug\_code).

Combn\_act\_code Column name of elementary active ingredients that is present in Combn\_drugs

(same format as Rx\_drug\_code).

## Value

data.table of the same structure than Rx\_deliv.

## Examples

Rx\_dt <- data.frame(

id = c(1, 1, 2, 2, 2),

codeDrug = c(159, 753, 123, 456, 789)

)

SplitCode <- data.frame(

code = c(159, 159, 456, 456, 456),

split\_code = c(1591, 1592, 4567, 4568, 4569)

)

Rx\_split <- drug\_bkdn(Rx\_deliv = Rx\_dt, Rx\_drug\_code = "codeDrug",

Combn\_drugs = SplitCode, Combn\_drug\_code = "code", Combn\_act\_code = "split\_code")

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