Package ‘IncidencePrevalence’

December 11, 2023

**Title**  Estimate Incidence and Prevalence using the OMOP Common Data Model

**Version**  0.6.0

**Description**  Calculate incidence and prevalence using data mapped to the Observational Medical Outcomes Partnership (OMOP) common data model. Incidence and prevalence can be estimated for the total population in a database or for a stratification cohort.

**Encoding**  UTF-8

**RoxygenNote**  7.2.3

**Depends**  R (>= 4.0)

**Imports**  CDMConnector (>= 1.0.0), checkmate (>= 2.0.0), cli (>= 3.0.0), DBI (>= 1.0.0), dbplyr (>= 2.0.0), dplyr (>= 1.1.0), glue (>= 1.5.0), ggplot2 (>= 3.4.0), scales (>= 1.1.0), lubridate (>= 1.0.0), magrittr (>= 2.0.0), purrr (>= 0.3.5), rlang (>= 1.0.0), stringr (>= 1.5.0), tibble, tibble (>= 1.2.0), tidyselect (>= 1.2.0), zip (>= 2.2.0)

**Suggests**  knitr, rmarkdown, RPostgres, duckdb, odbc, here, Hmisc, epitools, tictoc, testthat (>= 0.3.1), spelling, PaRe

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**VignetteBuilder**  knitr

**Language**  en-US

**License**  Apache License (>= 2)

**URL**  https://darwin-eu.github.io/IncidencePrevalence/

**NeedsCompilation**  no

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benchmarkIncidencePrevalence

Run benchmark of incidence and prevalence analyses

Description

Run benchmark of incidence and prevalence analyses

Usage

benchmarkIncidencePrevalence(
  cdm,
  cohortDateRange = as.Date(c(NA, NA)),
  returnParticipants = FALSE,
  nOutcomes = 1,
  prevOutcomes = 0.25,
  analysisType = "all",
  outputFolder = NULL,
  fileName = NULL
)
bindIncidenceEstimates

Arguments

- **cdm**: A CDM reference object
- **cohortDateRange**: Two dates. The first indicating the earliest cohort start date and the second indicating the latest possible cohort end date. If NULL or the first date is set as missing, the earliest observation_start_date in the observation_period table will be used for the former. If NULL or the second date is set as missing, the latest observation_end_date in the observation_period table will be used for the latter.
- **returnParticipants**: Whether to return participants (requires temporary to be FALSE)
- **nOutcomes**: An integer specifying the number of outcomes to create in the denominator cohort
- **prevOutcomes**: An array of integers for the prevalence of the outcomes in the population (in %). If the user wants all the outcomes with the same prevalence, they can also provide a single integer
- **analysisType**: A string of the following: "all", "only incidence", "only prevalence"
- **outputFolder**: Folder to save results as CSV
- **fileName**: Name given to CSV with results

Value

- a tibble with time taken for different analyses

Examples

```r
cdm <- mockIncidencePrevalenceRef(
  sampleSize = 10000,
  earliestObservationStartDate = as.Date("2010-01-01"),
  latestObservationStartDate = as.Date("2018-01-01")
)
timings <- IncidencePrevalence::benchmarkIncidencePrevalence(cdm)
```

bindIncidenceEstimates

*Bind multiple incidence estimates into a single set of estimates*

Description

Bind multiple incidence estimates into a single set of estimates

Usage

`bindIncidenceEstimates(...)`
bindPrevalenceEstimates

Bind multiple prevalence estimates into a single set of estimates

Description

Bind multiple prevalence estimates into a single set of estimates

Usage

bindPrevalenceEstimates(...)

Arguments

... Multiple prevalence estimates, generated from estimatePeriodPrevalence() or estimatePointPrevalence()

Value

Bound prevalence estimates
**estimateIncidence**

**Examples**

```r
cdm <- mockIncidencePrevalenceRef(sampleSize = 10000)
cdm <- generateDenominatorCohortSet(
  cdm = cdm, name = "denominator"
)
prev1 <- estimatePeriodPrevalence(
  cdm = cdm,
  denominatorTable = "denominator",
  outcomeTable = "outcome"
)
prev2 <- estimatePointPrevalence(
  cdm = cdm,
  denominatorTable = "denominator",
  outcomeTable = "outcome"
)
prevCombined <- bindPrevalenceEstimates(prev1, prev2)
```

**Description**

Collect population incidence estimates

**Usage**

```r
estimateIncidence(
  cdm,
  denominatorTable,
  outcomeTable,
  denominatorCohortId = NULL,
  outcomeCohortId = NULL,
  interval = "years",
  completeDatabaseIntervals = TRUE,
  outcomeWashout = Inf,
  repeatedEvents = FALSE,
  minCellCount = 5,
  strata = list(),
  includeOverallStrata = TRUE,
  temporary = TRUE,
  returnParticipants = FALSE
)
```
estimateIncidence

Arguments

cdm A CDM reference object
denominatorTable A cohort table with a set of denominator cohorts (for example, created using the 
generateDenominatorCohortSet() function).
outcometable A cohort table in the cdm reference containing a set of outcome cohorts.
denominatorCohortId The cohort definition ids of the denominator cohorts of interest. If NULL all 
cohorts will be considered in the analysis.
outcomeCohortId The cohort definition ids of the outcome cohorts of interest. If NULL all cohorts 
will be considered in the analysis.
interval Time intervals over which incidence is estimated. Can be "weeks", "months", 
"quarters", "years", or "overall". ISO weeks will be used for weeks. Calendar 
months, quarters, or years can be used, or an overall estimate for the entire 
time period observed (from earliest cohort start to last cohort end) can also be 
estimated. If more than one option is chosen then results will be estimated for 
each chosen interval.
completeDatabaseIntervals TRUE/ FALSE. Where TRUE, incidence will only be estimated for those inter-
vals where the denominator cohort captures all the interval.
outcomeWashout The number of days used for a 'washout' period between the end of one out-
come and an individual starting to contribute time at risk. If Inf, no time can be 
contributed after an event has occurred (whether during the study period or if 
occurring beforehand).
repeatedEvents TRUE/ FALSE. If TRUE, an individual will be able to contribute multiple events 
during the study period (time while they are present in an outcome cohort and 
y any subsequent washout will be excluded). If FALSE, an individual will only 
contribute time up to their first event during the study period.
minCellCount The minimum number of events to reported, below which results will be ob-
scured. If 0, all results will be reported.
strata Variables added to the denominator cohort table for which to stratify estimates.
includeOverallStrata Whether to include an overall result as well as strata specific results (when strata 
has been specified).
temporary If TRUE, temporary tables will be used throughout. If FALSE, permanent tables 
will be created in the write_schema of the cdm.
returnParticipants Either TRUE or FALSE. If TRUE references to participants from the analysis 
will be returned allowing for further analysis. Note, if using permanent tables 
and returnParticipants is TRUE, one table per analysis will be kept in the cdm 
write schema.

Value

Incidence estimates
estimatePeriodPrevalence

Examples

```r
cdm <- mockIncidencePrevalenceRef(sampleSize = 10000)
cdm <- generateDenominatorCohortSet(
    cdm = cdm, name = "denominator",
    cohortDateRange = c(as.Date("2008-01-01"), as.Date("2018-01-01")))
inc <- estimateIncidence(
    cdm = cdm,
    denominatorTable = "denominator",
    outcomeTable = "outcome"
)
```

estimatePeriodPrevalence

*Estimate period prevalence*

Description

Estimate period prevalence

Usage

```r
estimatePeriodPrevalence(
    cdm,
    denominatorTable, 
    outcomeTable, 
    denominatorCohortId = NULL, 
    outcomeCohortId = NULL, 
    interval = "years", 
    completeDatabaseIntervals = TRUE, 
    fullContribution = FALSE, 
    strata = list(), 
    includeOverallStrata = TRUE, 
    minCellCount = 5, 
    temporary = TRUE, 
    returnParticipants = FALSE
)
```

Arguments

- **cdm**: A CDM reference object
- **denominatorTable**: A cohort table with a set of denominator cohorts (for example, created using the `generateDenominatorCohortSet()` function).
- **outcomeTable**: A cohort table in the cdm reference containing a set of outcome cohorts.
estimatePeriodPrevalence

denominatorCohortId
The cohort definition ids of the denominator cohorts of interest. If NULL all
cohorts will be considered in the analysis.

outcomeCohortId
The cohort definition ids of the outcome cohorts of interest. If NULL all cohorts
will be considered in the analysis.

interval
Time intervals over which period prevalence is estimated. This can be "weeks",
"months", "quarters", "years", or "overall". ISO weeks will be used for weeks.
Calendar months, quarters, or years can be used as the period. If more than one
option is chosen then results will be estimated for each chosen interval.

completeDatabaseIntervals
TRUE/ FALSE. Where TRUE, prevalence will only be estimated for those inter-
vals where the database captures all the interval (based on the earliest and latest
observation period start dates, respectively).

fullContribution
TRUE/ FALSE. Where TRUE, individuals will only be included if they in the
database for the entire interval of interest. If FALSE they are only required to
present for one day of the interval in order to contribute.

strata
Variables added to the denominator cohort table for which to stratify estimates.

includeOverallStrata
Whether to include an overall result as well as strata specific results (when strata
has been specified).

minCellCount
Minimum number of events to report- results lower than this will be obscured.
If NULL all results will be reported.

temporary
If TRUE, temporary tables will be used throughout. If FALSE, permanent tables
will be created in the write_schema of the cdm.

returnParticipants
Either TRUE or FALSE. If TRUE references to participants from the analysis
will be returned allowing for further analysis. Note, if using permanent tables
and returnParticipants is TRUE, one table per analysis will be kept in the cdm
write schema.

Value
Period prevalence estimates

Examples

cdm <- mockIncidencePrevalenceRef(sampleSize = 10000)
cdm <- generateDenominatorCohortSet(
  cdm = cdm, name = "denominator",
  cohortDateRange = c(as.Date("2008-01-01"), as.Date("2018-01-01")))
estimatePeriodPrevalence(
  cdm = cdm,
  denominatorTable = "denominator",
  outcomeTable = "outcome",
)
estimatePointPrevalence

interval = "months"
)

estimatePointPrevalence

Estimate point prevalence

Description
Estimate point prevalence

Usage

estimatePointPrevalence(
  cdm,
  denominatorTable,
  outcomeTable,
  denominatorCohortId = NULL,
  outcomeCohortId = NULL,
  interval = "years",
  timePoint = "start",
  strata = list(),
  includeOverallStrata = TRUE,
  minCellCount = 5,
  temporary = TRUE,
  returnParticipants = FALSE
)

Arguments

  cdm
  A CDM reference object

denominatorTable
  A cohort table with a set of denominator cohorts (for example, created using the
generateDenominatorCohortSet() function).

outcomeTable
  A cohort table in the cdm reference containing a set of outcome cohorts.

denominatorCohortId
  The cohort definition ids of the denominator cohorts of interest. If NULL all
cohorts will be considered in the analysis.

outcomeCohortId
  The cohort definition ids of the outcome cohorts of interest. If NULL all cohorts
will be considered in the analysis.

interval
  Time intervals over which period prevalence is estimated. Can be "weeks",
"months", "quarters", or "years". ISO weeks will be used for weeks. Calendar
months, quarters, or years can be used as the period. If more than one option
is chosen then results will be estimated for each chosen interval.
timePoint where to compute the point prevalence
strata Variables added to the denominator cohort table for which to stratify estimates.
includeOverallStrata Whether to include an overall result as well as strata specific results (when strata has been specified).
minCellCount Minimum number of events to report - results lower than this will be obscured. If NULL all results will be reported.
temporary If TRUE, temporary tables will be used throughout. If FALSE, permanent tables will be created in the write_schema of the cdm.
returnParticipants Either TRUE or FALSE. If TRUE references to participants from the analysis will be returned allowing for further analysis. Note, if using permanent tables and returnParticipants is TRUE, one table per analysis will be kept in the cdm write schema.

Value
Point prevalence estimates

Examples

cdm <- mockIncidencePrevalenceRef(sampleSize = 10000)
cdm <- generateDenominatorCohortSet(
  cdm = cdm, name = "denominator",
  cohortDateRange = c(as.Date("2008-01-01"), as.Date("2018-01-01"))
)
estimatePointPrevalence(
  cdm = cdm,
  denominatorTable = "denominator",
  outcomeTable = "outcome",
  interval = "months"
)

declaration

exportIncidencePrevalenceResults
Export IncidencePrevalence results

Description
Export IncidencePrevalence results

Usage
exportIncidencePrevalenceResults(resultList, zipName, outputFolder)
generateDenominatorCohortSet

Arguments

resultList  
Named list with results from estimateIncidence, estimatePointPrevalence, or estimatePeriodPrevalence

zipName  
name to give zip folder

outputFolder  
directory to save zip folder containing results as a set of CSV files

Value

zip folder of results saved in the outputFolder

Examples

```r
  cdm <- mockIncidencePrevalenceRef(sampleSize = 10000)
  cdm <- generateDenominatorCohortSet(cdm, name = "denominator")
  prev <- estimatePointPrevalence(cdm = cdm, denominatorTable = "denominator", outcomeTable = "outcome")
  exportIncidencePrevalenceResults(resultList = list("prevalence" = prev), zipName = "test", outputFolder = tempdir())
```

generateDenominatorCohortSet

*Identify a set of denominator populations*

Description

generateDenominatorCohortSet() creates a set of cohorts that can be used for the denominator population in analyses of incidence, using estimateIncidence(), or prevalence, using estimatePointPrevalence() or estimatePeriodPrevalence().

Usage

```r
  generateDenominatorCohortSet(cdm, name, cohortDateRange = as.Date(c(NA, NA)), ageGroup = list(c(0, 150)), sex = "Both",)
```
```r
daysPriorObservation = 0,
requirementInteractions = TRUE,
overwrite = TRUE
)

Arguments

- **cdm**: A CDM reference object
- **name**: Name of the cohort table to be created.
- **cohortDateRange**: Two dates. The first indicating the earliest cohort start date and the second indicating the latest possible cohort end date. If NULL or the first date is set as missing, the earliest observation_start_date in the observation_period table will be used for the former. If NULL or the second date is set as missing, the latest observation_end_date in the observation_period table will be used for the latter.
- **ageGroup**: A list of age groups for which cohorts will be generated. A value of `list(c(0,17), c(18,30))` would, for example, lead to the creation of cohorts for those aged from 0 to 17, and from 18 to 30. In this example an individual turning 18 during the time period would appear in both cohorts (leaving the first cohort the day before their 18th birthday and entering the second from the day of their 18th birthday).
- **sex**: Sex of the cohorts. This can be one or more of: "Male", "Female", or "Both".
- **daysPriorObservation**: The number of days of prior observation observed in the database required for an individual to start contributing time in a cohort.
- **requirementInteractions**: If TRUE, cohorts will be created for all combinations of ageGroup, sex, and daysPriorObservation. If FALSE, only the first value specified for the other factors will be used. Consequently, order of values matters when requirementInteractions is FALSE.
- **overwrite**: Whether to overwrite any existing table with the same name

Value

A cohort reference

Examples

```r
cdm <- mockIncidencePrevalenceRef(sampleSize = 10000)
cdm <- generateDenominatorCohortSet(
  cdm = cdm,
  name = "denominator",
  cohortDateRange = as.Date(c("2008-01-01", "2020-01-01"))
)
cdm$denominator
generateTargetDenominatorCohortSet

Identify a set of denominator populations using a target cohort

Description

generateTargetDenominatorCohortSet() creates a set of cohorts that can be used for the denominator population in analyses of incidence, using estimateIncidence(), or prevalence, using estimatePointPrevalence() or estimatePeriodPrevalence().

Usage

generateTargetDenominatorCohortSet(
  cdm,  
  name,  
  targetCohortTable,  
  targetCohortId = NULL,  
  cohortDateRange = as.Date(c(NA, NA)),  
  ageGroup = list(c(0, 150)),  
  sex = "Both",  
  daysPriorObservation = 0,  
  requirementInteractions = TRUE,  
  overwrite = TRUE
)

Arguments

cdm A CDM reference object
name Name of the cohort table to be created.
targetCohortTable A cohort table in the cdm reference to use to limit cohort entry and exit (with individuals only contributing to a cohort when they are contributing to the cohort in the target table).
targetCohortId The cohort definition id for the cohort of interest in the target table. If targetCohortTable is specified, a single targetCohortId must also be specified.
cohortDateRange Two dates. The first indicating the earliest cohort start date and the second indicating the latest possible cohort end date. If NULL or the first date is set as missing, the earliest observation_start_date in the observation_period table will be used for the former. If NULL or the second date is set as missing, the latest observation_end_date in the observation_period table will be used for the latter.
ageGroup A list of age groups for which cohorts will be generated. A value of list(c(0, 17), c(18, 30)) would, for example, lead to the creation of cohorts for those aged from 0 to 17, and from 18 to 30. In this example an individual turning 18 during the time period would appear in both cohorts (leaving the first cohort the day before their 18th birthday and entering the second from the day of their 18th birthday).
incidenceAttrition

sex
Sex of the cohorts. This can be one or more of: "Male", "Female", or "Both".

daysPriorObservation
The number of days of prior observation observed in the database required for an individual to start contributing time in a cohort.

requirementInteractions
If TRUE, cohorts will be created for all combinations of ageGroup, sex, and daysPriorObservation. If FALSE, only the first value specified for the other factors will be used. Consequently, order of values matters when requirementInteractions is FALSE.

overwrite
Whether to overwrite any existing table with the same name

Value
A cohort reference

Examples

cdm <- mockIncidencePrevalenceRef(sampleSize = 10000)
cdm <- generateTargetDenominatorCohortSet(
  cdm = cdm,
  name = "denominator",
  targetCohortTable = "target",
  cohortDateRange = as.Date(c("2008-01-01", "2020-01-01"))
)
cdm$denominator

---

incidenceAttrition  Attrition associated with an incidence analysis

Description
Attrition associated with an incidence analysis

Usage
incidenceAttrition(result)

Arguments
result  Result for which to get attrition

Value
tibble with counts and reasons for attrition.
incidenceSet

**Examples**

```r
cdm <- mockIncidencePrevalenceRef(sampleSize = 200)
cdm <- generateDenominatorCohortSet(cdm, name = "denominator")
inc <- estimateIncidence(
  cdm = cdm,
  denominatorTable = "denominator",
  outcomeTable = "outcome",
  interval = "overall"
)
incidenceAttrition(inc)
```

---

**Description**

Settings associated with an incidence analysis

**Usage**

```r
incidenceSet(result)
```

**Arguments**

- `result` Result for which to get settings

**Value**

tibble with settings used when estimating incidence

**Examples**

```r
cdm <- mockIncidencePrevalenceRef(sampleSize = 200)
cdm <- generateDenominatorCohortSet(cdm, name = "denominator")
inc <- estimateIncidence(
  cdm = cdm,
  denominatorTable = "denominator",
  outcomeTable = "outcome",
  interval = "overall"
)
incidenceSet(inc)
```
mockIncidencePrevalenceRef

Generate example subset of the OMOP CDM for estimating incidence and prevalence

Description

Generate example subset of the OMOP CDM for estimating incidence and prevalence

Usage

mockIncidencePrevalenceRef(
  personTable = NULL,
  observationPeriodTable = NULL,
  targetCohortTable = NULL,
  outcomeTable = NULL,
  sampleSize = 1,
  outPre = 1,
  seed = 444,
  ageBeta = NULL,
  genderBeta = NULL,
  intercept = NULL,
  earliestDateOfBirth = NULL,
  latestDateOfBirth = NULL,
  earliestObservationStartDate = NULL,
  latestObservationStartDate = NULL,
  minDaysToObservationEnd = NULL,
  maxDaysToObservationEnd = NULL,
  minOutcomeDays = 1,
  maxOutcomeDays = 10,
  maxOutcomes = 1
)

Arguments

personTable         A tibble in the format of the person table.
observationPeriodTable         A tibble in the format of the observation period table.
targetCohortTable         A tibble in the format of a cohort table which can be used for stratification
outcomeTable         A tibble in the format of a cohort table which can be used for outcomes
sampleSize         The number of unique patients.
outPre         The fraction of patients with an event.
seed         The seed for simulating the data set. Use the same seed to get same data set.
ageBeta         The beta for the standardised age in a logistic regression outcome model.
participants

participants(result, analysisId)

Arguments

result:

Result object

analysisId:

ID of a specific analysis to return participants for
plotIncidence

Value

References to tables with the study participants contributing to a given analysis

Examples

```r
cdm <- mockIncidencePrevalenceRef(sampleSize = 200)
cdm <- generateDenominatorCohortSet(cdm, name = "denominator")
incidence <- estimateIncidence(
  cdm = cdm,
  denominatorTable = "denominator",
  outcomeTable = "outcome",
  interval = "overall"
)
participants(result = incidence, analysisId = 1)
```

---

**plotIncidence**  
*Plot incidence results*

**Description**

Plot incidence results

**Usage**

```r
plotIncidence(
  result,
  x = "incidence_start_date",
  ylim = c(0, NA),
  ribbon = FALSE,
  facet = NULL,
  colour = NULL,
  colour_name = NULL
)
```

**Arguments**

- `result`  
  Incidence results
- `x`  
  Variable to plot on x axis
- `ylim`  
  Limits for the Y axis
- `ribbon`  
  If TRUE, the plot will join points using a ribbon
- `facet`  
  Variables to use for facets
- `colour`  
  Variables to use for colours
- `colour_name`  
  Colour legend name
Value

A ggplot with the incidence results plotted

Examples

cdm <- mockIncidencePrevalenceRef(sampleSize = 10000)
cdm <- generateDenominatorCohortSet(
  cdm = cdm, name = "denominator",
  cohortDateRange = c(as.Date("2008-01-01"), as.Date("2018-01-01"))
)
inc <- estimateIncidence(
  cdm = cdm,
  denominatorTable = "denominator",
  outcomeTable = "outcome"
)
plotIncidence(inc)

plotPrevalence

Plot prevalence results

Description

Plot prevalence results

Usage

plotPrevalence(
  result, 
  x = "prevalence_start_date",
  ylim = c(0, NA),
  ribbon = FALSE,
  facet = NULL,
  colour = NULL,
  colour_name = NULL
)

Arguments

result  Prevalence results
x       Variable to plot on x axis
ylim    Limits for the Y axis
ribbon  If TRUE, the plot will join points using a ribbon
facet   Variables to use for facets
colour  Variables to use for colours
colour_name  Colour legend name
Value

A ggplot with the prevalence results plotted

Examples

cdm <- mockIncidencePrevalenceRef(sampleSize = 10000)
cdm <- generateDenominatorCohortSet(
  cdm = cdm, name = "denominator",
  cohortDateRange = c(as.Date("2014-01-01"), as.Date("2018-01-01")))
prev <- estimatePointPrevalence(
  cdm = cdm,
  denominatorTable = "denominator",
  outcomeTable = "outcome"
)
plotPrevalence(prev)

prevalenceAttrition

Attrition associated with an prevalence analysis

Description

Attrition associated with an prevalence analysis

Usage

prevalenceAttrition(result)

Arguments

result Result for which to get attrition

Value

tibble with counts and reasons for attrition.

Examples

cdm <- mockIncidencePrevalenceRef(sampleSize = 200)
cdm <- generateDenominatorCohortSet(cdm, name = "denominator")
prev <- estimatePointPrevalence(
  cdm = cdm,
  denominatorTable = "denominator",
  outcomeTable = "outcome"
)
prevalenceAttrition(prev)
**prevalenceSet**

*Settings associated with a prevalence analysis*

**Description**

Settings associated with a prevalence analysis

**Usage**

`prevalenceSet(result)`

**Arguments**

- **result** Result for which to get settings

**Value**

tibble with settings used when estimating prevalence

**Examples**

```r
cdm <- mockIncidencePrevalenceRef(sampleSize = 200)
cdm <- generateDenominatorCohortSet(cdm, name = "denominator")
prev <- estimatePointPrevalence(
  cdm = cdm,
  denominatorTable = "denominator",
  outcomeTable = "outcome"
)
prevalenceSet(prev)
```
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