

# Package ‘epicR’

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**Title** Evaluation Platform in Chronic Obstructive Pulmonary Disease

**Version** 1.0.1

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**Description** Evaluation Platform in Chronic Obstructive Pulmonary Disease (EPIC) is a Discrete Event Simulation (DES) model that simulates health outcomes of patients with Chronic Obstructive Pulmonary Disease (COPD) based on demographics and individual-level risk factors, based on the model published in Sadatsafavi et al. (2019) <[doi:10.1177/0272989X18824098](https://doi.org/10.1177/0272989X18824098)>.

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epicR-package	<i>epicR package</i>
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## Description

Evaluation Platform in COPD (EPIC) R Package

## Details

See the README on [GitHub](#)

## Author(s)

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---

`calc_event_stack_size` *Calculate recommended event\_stack\_size for a given number of agents*

---

**Description**

Calculate recommended event\_stack\_size for a given number of agents

**Usage**

```
calc_event_stack_size(n_agents, time_horizon = 20)
```

**Arguments**

`n_agents`            number of agents to simulate  
`time_horizon`        simulation time horizon in years (default 20)

**Value**

recommended event\_stack\_size

---

`calibrate_COPD_inc`    *Solves stochastically for COPD incidence rate equation.*

---

**Description**

Solves stochastically for COPD incidence rate equation.

**Usage**

```
calibrate_COPD_inc(  
  nIterations = 100,  
  nPatients = 1e+05,  
  time_horizon = 20,  
  output_dir = tempdir()  
)
```

**Arguments**

`nIterations`        number of iterations for the numerical solution  
`nPatients`            number of simulated agents.  
`time_horizon`        in years  
`output_dir`          directory for output CSV files (default: tempdir())

**Value**

regression co-efficients as files

---

calibrate\_explicit\_mortality  
*Calibrates explicit mortality*

---

**Description**

Calibrates explicit mortality

**Usage**

calibrate\_explicit\_mortality(n\_sim = 10<sup>8</sup>)

**Arguments**

n\_sim            number of agents

**Value**

difference in mortality rates and life table

---

calibrate\_explicit\_mortality2  
*Calibrates explicit mortality by Amin*

---

**Description**

Calibrates explicit mortality by Amin

**Usage**

calibrate\_explicit\_mortality2(n\_sim = 10<sup>7</sup>)

**Arguments**

n\_sim            number of agents

**Value**

difference in mortality rates and life table

---

calibrate_smoking	<i>Calibrates smoking</i>
-------------------	---------------------------

---

**Description**

Calibrates smoking

**Usage**

```
calibrate_smoking()
```

**Value**

TODO

---

copy_configs_to_user	<i>Copy default configs to user directory</i>
----------------------	---

---

**Description**

Copy default configs to user directory

**Usage**

```
copy_configs_to_user(overwrite = FALSE)
```

**Arguments**

overwrite	Whether to overwrite existing user configs (default FALSE)
-----------	--

**Value**

TRUE if successful, FALSE otherwise

## Description

The epicR package now supports user-customizable configuration files. When the package is loaded for the first time, configuration files are automatically copied to a user-specific directory following CRAN policy. You can modify these files to customize model parameters for your specific region or research needs.

## Configuration Directory

User configuration files are stored in a platform-specific location determined by `tools::R_user_dir("epicR", "config")`. Use `get_user_config_dir()` to find the exact path on your system.

## Available Functions

- `get_user_config_dir`: Get the path to user config directory
- `user_config_exists`: Check if a user config exists
- `copy_configs_to_user`: Copy default configs to user directory
- `reset_user_configs`: Reset configs to package defaults
- `list_available_jurisdictions`: List available config jurisdictions
- `validate_config`: Validate a configuration file

## Usage

The package automatically uses user configs if they exist. When you call `get_input()`, it will:

1. First check for user config files in the user config directory
2. If found, use the user's customized configuration
3. If not found, fall back to package default configurations

## Customizing Configurations

To customize configurations for your region:

1. The config files are automatically copied on first package load
2. Edit the JSON files (e.g., `'config_canada.json'`, `'config_us.json'`)
3. Save your changes
4. The next time you use `get_input()`, your changes will be used

### Adding New Jurisdictions

To add a new jurisdiction:

1. Copy an existing config file (e.g., 'config\_canada.json')
2. Rename it to 'config\_yourcountry.json'
3. Update the "jurisdiction" field in the JSON to match
4. Modify all parameters as needed for your region
5. Use with: `get_input(jurisdiction = "yourcountry")`

### Resetting to Defaults

If you need to reset your configurations:

- Reset all configs: `reset_user_configs()`
- Reset specific jurisdiction: `reset_user_configs("canada")`

### Examples

```
# Check where user configs are stored
get_user_config_dir()

# List available jurisdictions
list_available_jurisdictions()

# Validate your custom config
validate_config("canada", user = TRUE)

# Reset to package defaults if needed
reset_user_configs("canada")

# Use your custom config
input <- get_input(jurisdiction = "canada")
```

---

estimate\_memory\_required

*Estimate memory required for simulation*

---

### Description

Estimate memory required for simulation

### Usage

```
estimate_memory_required(n_agents, record_mode = 0, time_horizon = 20)
```

**Arguments**

n\_agents            number of agents  
 record\_mode        recording mode (0=none, 1=agent, 2=event, 3=some\_event)  
 time\_horizon       simulation time horizon in years

**Value**

estimated memory in bytes

---

export\_figures        *Runs the model and exports an excel file with all output data*

---

**Description**

Runs the model and exports an excel file with all output data

**Usage**

```
export_figures(nPatients = 10000)
```

**Arguments**

nPatients            number of agents

**Value**

an excel file with all output

---

express\_matrix        *Express matrix.*

---

**Description**

Takes a named matrix and writes the R code to populate it; useful for generating input expressions from calibration results.

**Usage**

```
express_matrix(mtx)
```

**Arguments**

mtx                    a matrix

**Value**

Invisibly returns the generated R code as a character string, also outputs via message().

---

`get_agent_events`      *Returns all events of an agent.*

---

**Description**

Returns all events of an agent.

Returns events specific to an agent.

**Usage**

```
get_agent_events(id)
```

```
get_agent_events(id)
```

**Arguments**

`id`                      Agent number

**Value**

all events of agent `id`

dataframe consisting all events specific to agent `id`

---

`get_agent_size_bytes`      *Returns the size of agent struct in bytes*

---

**Description**

Returns the size of agent struct in bytes

Get size of agent struct in bytes (from C code)

**Usage**

```
get_agent_size_bytes()
```

```
get_agent_size_bytes()
```

**Value**

size of agent struct in bytes

size in bytes

---

<code>get_all_events</code>	<i>Returns all events.</i>
-----------------------------	----------------------------

---

**Description**

Returns all events.

Returns all events.

**Usage**

```
get_all_events()
```

```
get_all_events()
```

**Value**

all events

dataframe consisting all events.

---

<code>get_all_events_matrix</code>	<i>Returns a matrix containing all events</i>
------------------------------------	---

---

**Description**

Returns a matrix containing all events

**Usage**

```
get_all_events_matrix()
```

**Value**

a matrix containing all events

---

get\_available\_memory    *Get available system memory (platform-specific)*

---

**Description**

Get available system memory (platform-specific)

**Usage**

get\_available\_memory()

**Value**

available memory in bytes

---

get\_default\_settings    *Exports default settings*

---

**Description**

Exports default settings

**Usage**

get\_default\_settings()

**Value**

default settings

---

get\_errors                *Returns errors*

---

**Description**

Returns errors

**Usage**

get\_errors()

**Value**

a text with description of error messages

---

get_event	<i>Returns the events stack.</i>
-----------	----------------------------------

---

**Description**

Returns the events stack.

**Usage**

```
get_event(i)
```

**Arguments**

i                    number of event

**Value**

events

---

get_events_by_type	<i>Returns all events of a certain type.</i>
--------------------	--

---

**Description**

Returns all events of a certain type.

Returns certain events by type

**Usage**

```
get_events_by_type(event_type)
```

```
get_events_by_type(event_type)
```

**Arguments**

event\_type          event\_type number

**Value**

all events of the type event\_type

dataframe consisting all events of the type event\_type

---

get_input	Returns a list of default model input values
-----------	--

---

### Description

Returns a list of default model input values

### Usage

```
get_input(  
  age0 = 40,  
  time_horizon = 20,  
  discount_cost = 0,  
  discount_qaly = 0.03,  
  closed_cohort = 0,  
  jurisdiction = "canada"  
)
```

### Arguments

age0	Starting age in the model
time_horizon	Model time horizon
discount_cost	Discounting for cost outcomes
discount_qaly	Discounting for QALY outcomes
closed_cohort	Whether the model should run as closed_cohort, open-population by default.
jurisdiction	Jurisdiction for model parameters ("canada" or "us")

### Value

A list with four components:

**values** A nested list of model input parameter values

**help** A nested list of help text descriptions for each parameter

**ref** A nested list of reference information for each parameter

**config** The raw configuration object loaded from the JSON file

---

get_inputs	<i>Returns inputs</i>
------------	-----------------------

---

**Description**

Returns inputs

**Usage**

```
get_inputs()
```

**Value**

all inputs

---

get_list_elements	<i>Get list elements</i>
-------------------	--------------------------

---

**Description**

Recursively extracts element names from a nested list structure.

**Usage**

```
get_list_elements(ls, running_name = "")
```

**Arguments**

ls	A list to extract element names from
running_name	Internal parameter for recursion (default: "")

**Value**

A character vector of element names, with nested elements separated by "\$" (e.g., "parent\$child\$grandchild").

---

get_n_events	<i>Returns total number of events.</i>
--------------	--

---

**Description**

Returns total number of events.

**Usage**

```
get_n_events()
```

**Value**

number of events

---

get_output	<i>Main outputs of the current run.</i>
------------	---

---

**Description**

Main outputs of the current run.

**Usage**

```
get_output()
```

**Value**

number of agents, cumulative time, number of deaths, number of COPD cases, as well as exacerbation statistics and QALYs.

---

get_output_ex	<i>Extra outputs from the model</i>
---------------	-------------------------------------

---

**Description**

Extra outputs from the model

**Usage**

```
get_output_ex()
```

**Value**

Extra outputs from the model.

---

get_progress	Returns current simulation progress.
--------------	--------------------------------------

---

**Description**

Returns current simulation progress.

**Usage**

```
get_progress()
```

**Value**

Number of agents processed so far (last\_id).

---

get_runtime_stats	Returns run time stats.
-------------------	-------------------------

---

**Description**

Returns run time stats.

**Usage**

```
get_runtime_stats()
```

**Value**

agent size as well as memory and random variable fill stats.

---

get_sample_output	Returns a sample output for a given year and gender.
-------------------	--

---

**Description**

Returns a sample output for a given year and gender.

**Usage**

```
get_sample_output(year, sex)
```

**Arguments**

year	a number
sex	a number, 0 for male and 1 for female

**Value**

that specific output

---

get_settings	<i>Returns current settings.</i>
--------------	----------------------------------

---

**Description**

Returns current settings.

**Usage**

```
get_settings()
```

**Value**

current settings.

---

get_smith	<i>Returns agent Smith.</i>
-----------	-----------------------------

---

**Description**

Returns agent Smith.

**Usage**

```
get_smith()
```

**Value**

agent smith.

---

get_user_config_dir	<i>Get user config directory path</i>
---------------------	---------------------------------------

---

**Description**

Returns the path to the user configuration directory following CRAN policy using `tools::R_user_dir()`.

**Usage**

```
get_user_config_dir()
```

**Value**

Path to user config directory

---

init_session	<i>Initializes a model. Allocates memory to the C engine.</i>
--------------	---

---

**Description**

Initializes a model. Allocates memory to the C engine.

**Usage**

```
init_session(settings = get_default_settings(), jurisdiction = "canada")
```

**Arguments**

settings	customized settings.
jurisdiction	The jurisdiction for which to load input parameters (default: "canada").

**Value**

0 if successful.

---

list_available_jurisdictions	<i>List available config jurisdictions</i>
------------------------------	--

---

**Description**

List available config jurisdictions

**Usage**

```
list_available_jurisdictions()
```

**Value**

Character vector of available jurisdictions

---

`mvrnormArma`*Samples from a multivariate normal*

---

**Description**

Samples from a multivariate normal

**Usage**

```
mvrnormArma(n, mu, sigma)
```

**Arguments**

<code>n</code>	number of samples to be taken
<code>mu</code>	the mean
<code>sigma</code>	the covariance matrix

**Value**

the multivariate normal sample

---

`report_COPD_by_ctime` *Reports COPD related stats.*

---

**Description**

Reports COPD related stats.

**Usage**

```
report_COPD_by_ctime(n_sim = 10^6)
```

**Arguments**

<code>n_sim</code>	number of simulated agents.
--------------------	-----------------------------

**Value**

COPD-related stats

---

report\_exacerbation\_by\_time  
*Reports exacerbation-related stats.*

---

**Description**

Reports exacerbation-related stats.

**Usage**

report\_exacerbation\_by\_time(n\_sim = 10<sup>5</sup>)

**Arguments**

n\_sim            number of simulated agents.

**Value**

exacerbation-related stats

---

reset\_model\_input      *Reset the cached model input*

---

**Description**

Forces the default model\_input to be reloaded on next access. Useful after modifying config files.

**Usage**

reset\_model\_input()

**Value**

No return value, called for side effects (clears the model input cache).

---

reset_user_configs	<i>Reset user configs to package defaults</i>
--------------------	---

---

**Description**

Reset user configs to package defaults

**Usage**

```
reset_user_configs(jurisdiction = NULL)
```

**Arguments**

jurisdiction    Specific jurisdiction to reset, or NULL for all (default NULL)

**Value**

TRUE if successful, FALSE otherwise

---

resume	<i>Resumes running of model.</i>
--------	----------------------------------

---

**Description**

Resumes running of model.

**Usage**

```
resume(max_n_agents = NULL)
```

**Arguments**

max\_n\_agents    maximum number of agents

**Value**

0 if successful.

---

sanity_check	<i>Basic tests of model functionality. Serious issues if the test does not pass.</i>
--------------	--

---

**Description**

Basic tests of model functionality. Serious issues if the test does not pass.

**Usage**

```
sanity_check()
```

**Value**

tests results

---

sanity_COPD	<i>Basic COPD test.</i>
-------------	-------------------------

---

**Description**

Basic COPD test.

**Usage**

```
sanity_COPD()
```

**Value**

validation test results

---

set_input_var	<i>Sets input variables.</i>
---------------	------------------------------

---

**Description**

Sets input variables.

**Usage**

```
set_input_var(name, value)
```

**Arguments**

name	a string
value	a number

**Value**

0 if successful

---

set_settings_var	<i>Sets model settings.</i>
------------------	-----------------------------

---

**Description**

Sets model settings.

**Usage**

```
set_settings_var(name, value)
```

**Arguments**

name	a name
value	a value

**Value**

0 if successful.

---

simulate	<i>Convenience function: run simulation and return results</i>
----------	--

---

**Description**

This is a simplified interface that handles session management automatically and returns the results directly. Ideal for most users. Progress information is displayed including: configuration summary, a real-time progress bar showing percentage completion (10

**Usage**

```
simulate(
  input = NULL,
  settings = NULL,
  jurisdiction = "canada",
  time_horizon = NULL,
  n_agents = NULL,
  extended_results = TRUE,
  return_events = FALSE,
  seed = NULL
)
```

**Arguments**

input	customized input criteria (optional)
settings	customized settings (optional)
jurisdiction	Jurisdiction for model parameters ("canada" or "us")
time_horizon	Model time horizon in years (default: uses config file value)
n_agents	Number of agents to simulate (default: 60,000)
extended_results	whether to return extended results in addition to basic (default: TRUE)
return_events	whether to return event matrix (default: FALSE). If TRUE, automatically sets record_mode=2
seed	Random seed for reproducibility (optional). If provided, ensures identical results across runs

**Value**

list with simulation results (always includes 'basic', includes 'extended' by default, optionally 'events')

**Examples**

```
# Simplest usage - includes both basic and extended results
results <- simulate()
print(results$basic)
print(results$extended)

# With custom parameters
results <- simulate(jurisdiction = "us", time_horizon = 10, n_agents = 100000)

# Quick test with fewer agents
results <- simulate(n_agents = 10000)

# Basic output only (faster, less memory)
results <- simulate(extended_results = FALSE)
print(results$basic)
```

```
# With event history
results <- simulate(return_events = TRUE)
print(results$events) # Event matrix

# With reproducible results
results1 <- simulate(seed = 123)
results2 <- simulate(seed = 123)
# results1 and results2 will be identical
```

---

terminate\_session      *Terminates a session and releases allocated memory.*

---

### Description

Terminates a session and releases allocated memory.

### Usage

```
terminate_session()
```

### Value

0 if successful.

---

test\_case\_detection      *Returns results of Case Detection strategies*

---

### Description

Returns results of Case Detection strategies

### Usage

```
test_case_detection(
  n_sim = 10000,
  p_of_CD = 0.1,
  min_age = 40,
  min_pack_years = 0,
  only_smokers = 0,
  CD_method = "CDQ195"
)
```

**Arguments**

n_sim	number of agents
p_of_CD	probability of receiving case detection given that an agent meets the selection criteria
min_age	minimum age that can receive case detection
min_pack_years	minimum pack years that can receive case detection
only_smokers	set to 1 if only smokers should receive case detection
CD_method	Choose one case detection method: CDQ195", "CDQ165", "FlowMeter", "FlowMeter_CDQ"

**Value**

results of case detection strategy compared to no case detection

---

user\_config\_exists      *Check if user config exists*

---

**Description**

Check if user config exists

**Usage**

```
user_config_exists(jurisdiction = "canada")
```

**Arguments**

jurisdiction	Jurisdiction name (e.g., "canada", "us")
--------------	--

**Value**

TRUE if user config exists, FALSE otherwise

---

validate_config	<i>Validate a config file</i>
-----------------	-------------------------------

---

**Description**

Validate a config file

**Usage**

```
validate_config(jurisdiction = "canada", user = TRUE)
```

**Arguments**

jurisdiction	Jurisdiction to validate
user	Whether to validate user config (TRUE) or package config (FALSE)

**Value**

TRUE if valid, FALSE otherwise (with warnings about issues)

---

validate_COPD	<i>Returns results of validation tests for COPD</i>
---------------	---

---

**Description**

This function runs validation tests for COPD model outputs. It estimates the baseline prevalence and incidence of COPD, along with sex-specific baseline COPD prevalence. Additionally, it calculates the baseline prevalence of COPD by age groups and smoking pack-years. It also estimates the coefficients for the relationships between age, pack-years, smoking status, and the prevalence of COPD.

**Usage**

```
validate_COPD(incident_COPD_k = 1, return_CI = FALSE, jurisdiction = "canada")
```

**Arguments**

incident_COPD_k	a number (default=1) by which the incidence rate of COPD will be multiplied.
return_CI	if TRUE, returns 95 percent confidence intervals for the "Year" coefficient
jurisdiction	character string specifying the jurisdiction for validation ("canada" or "us"). Default is "canada".

**Value**

For Canada: list with validation test results. For US: data frame with COPD prevalence by age group over time.

---

validate\_diagnosis      *Returns results of validation tests for diagnosis*

---

### Description

This function returns a table showing the proportion of COPD patients diagnosed over the model's runtime. It also provides a second table that breaks down the proportion of diagnosed patients by COPD severity. Additionally, the function generates a plot to visualize the distribution of diagnoses over time.

### Usage

```
validate_diagnosis(n_sim = 10000, jurisdiction = "canada")
```

### Arguments

n\_sim                    number of agents  
 jurisdiction            character string specifying the jurisdiction ("canada" or "us"). Default is "canada"

### Value

validation test results

---

validate\_exacerbation      *Returns results of validation tests for exacerbation rates*

---

### Description

This function runs validation tests for COPD exacerbation rates by GOLD stage and compares them with reference values from studies such as CanCOLD, CIHI, and Hoogendoorn. It simulates exacerbation events, and returns key metrics, including overall exacerbation rates, rates by GOLD stage, and rates in diagnosed vs. undiagnosed patients.

### Usage

```
validate_exacerbation(  
  base_agents = 10000,  
  input = NULL,  
  jurisdiction = "canada"  
)
```

### Arguments

base\_agents            Number of agents in the simulation. Default is 1e4.  
 input                    EPIC inputs  
 jurisdiction            character string specifying the jurisdiction for validation ("canada" or "us"). Default is "canada".

**Value**

For Canada: validation test results (invisible). For US: invisible NULL (results displayed via messages and plots).

---

validate\_gpvisits      *Returns results of validation tests for GP visits*

---

**Description**

This function returns Average number of GP visits by sex, COPD severity and COPD diagnosis status along with their plots.

**Usage**

```
validate_gpvisits(n_sim = 10000, jurisdiction = "canada")
```

**Arguments**

n\_sim                  number of agents  
 jurisdiction      character string specifying the jurisdiction ("canada" or "us"). Default is "canada"

**Value**

validation test results

---

validate\_lung\_function      *Returns results of validation tests for lung function*

---

**Description**

This function evaluates FEV1 (Forced Expiratory Volume in 1 second) values and GOLD stage distributions to assess lung function in simulated patients.

**Usage**

```
validate_lung_function(jurisdiction = "canada")
```

**Arguments**

jurisdiction      character string specifying the jurisdiction ("canada" or "us"). Default is "canada"

**Value**

validation test results

---

validate\_medication     *Returns results of validation tests for medication module.*

---

**Description**

This function returns plots showing medication usage over time

**Usage**

```
validate_medication(n_sim = 50000, jurisdiction = "canada")
```

**Arguments**

n\_sim                    number of agents  
 jurisdiction            character string specifying the jurisdiction ("canada" or "us"). Default is "canada"

**Value**

validation test results for medication

---

validate\_mortality     *Returns results of validation tests for mortality rate*

---

**Description**

This function returns a table and a plot of the difference between simulated and expected (life table) mortality, by sex and age.

**Usage**

```
validate_mortality(  
  n_sim = 5e+05,  
  bgd = 1,  
  bgd_h = 1,  
  manual = 1,  
  exacerbation = 1,  
  jurisdiction = "canada"  
)
```

**Arguments**

n\_sim                    number of simulated agents  
 bgd                     a number  
 bgd\_h                   a number  
 manual                  a number  
 exacerbation            a number  
 jurisdiction            character string specifying the jurisdiction ("canada" or "us"). Default is "canada"

**Value**

validation test results

---

validate\_overdiagnosis

*Returns results of validation tests for overdiagnosis*

---

**Description**

This function returns the proportion of non-COPD subjects overdiagnosed over model time.

**Usage**

```
validate_overdiagnosis(n_sim = 10000, jurisdiction = "canada")
```

**Arguments**

n\_sim            number of agents

jurisdiction    character string specifying the jurisdiction ("canada" or "us"). Default is "canada"

**Value**

validation test results

---

validate\_payoffs

*Returns results of validation tests for payoffs, costs and QALYs*

---

**Description**

Returns results of validation tests for payoffs, costs and QALYs

**Usage**

```
validate_payoffs(
  nPatient = 1e+06,
  disableDiscounting = TRUE,
  disableExacMortality = TRUE,
  jurisdiction = "canada"
)
```

**Arguments**

nPatient	number of simulated patients. Default is 1e6.
disableDiscounting	if TRUE, discounting will be disabled for cost and QALY calculations. Default: TRUE
disableExacMortality	if TRUE, mortality due to exacerbations will be disabled for cost and QALY calculations. Default: TRUE
jurisdiction	character string specifying the jurisdiction for validation ("canada" or "us"). Default is "canada". Currently only "canada" is implemented.

**Value**

validation test results

---

validate\_population     *Returns simulated vs. predicted population table and a plot*

---

**Description**

Returns simulated vs. predicted population table and a plot

**Usage**

```
validate_population(
  remove_COPD = 0,
  incidence_k = 1,
  savePlots = 0,
  jurisdiction = "canada"
)
```

**Arguments**

remove_COPD	0 or 1, indicating whether COPD-caused mortality should be removed
incidence_k	a number (default=1) by which the incidence rate of population will be multiplied.
savePlots	0 or 1, exports 300 DPI population growth and pyramid plots comparing simulated vs. predicted population
jurisdiction	character string specifying the jurisdiction for validation ("canada" or "us"). Default is "canada".

**Value**

For Canada: returns a table showing predicted (StatsCan) and simulated population values. For US: returns a data frame with population comparisons by age group and year.

---

validate_smoking	<i>Returns results of validation tests for smoking module.</i>
------------------	--

---

### Description

It compares simulated smoking prevalence and trends against observed data to assess the model's accuracy.

### Usage

```
validate_smoking(remove_COPD = 1, intercept_k = NULL, jurisdiction = "canada")
```

### Arguments

remove_COPD	0 or 1. whether to remove COPD-related mortality.
intercept_k	a number
jurisdiction	character string specifying the jurisdiction for validation ("canada" or "us"). Default is "canada".

### Value

For Canada: validation test results (invisible). For US: data frame with smoking status rates by year.

---

validate_survival	<i>Returns the Kaplan Meier curve comparing COPD and non-COPD</i>
-------------------	---

---

### Description

Returns the Kaplan Meier curve comparing COPD and non-COPD

### Usage

```
validate_survival(
  savePlots = FALSE,
  base_agents = 10000,
  jurisdiction = "canada"
)
```

### Arguments

savePlots	TRUE or FALSE (default), exports 300 DPI population growth and pyramid plots comparing simulated vs. predicted population
base_agents	Number of agents in the simulation. Default is 1e4.
jurisdiction	character string specifying the jurisdiction ("canada" or "us"). Default is "canada"

**Value**

validation test results

---

validate\_symptoms      *Returns results of validation tests for Symptoms*

---

**Description**

This function plots the prevalence of cough, dyspnea, phlegm and wheeze over time and by GOLD stage.

**Usage**

```
validate_symptoms(n_sim = 10000, jurisdiction = "canada")
```

**Arguments**

n\_sim                  number of agents  
jurisdiction          character string specifying the jurisdiction ("canada" or "us"). Default is "canada"

**Value**

validation test results

---

validate\_treatment      *Returns results of validation tests for Treatment*

---

**Description**

This function runs validation tests to examine how treatment initiated at diagnosis influences exacerbation rates in COPD patients. It compares exacerbation rates between diagnosed and undiagnosed patients and assesses the impact of treatment.

**Usage**

```
validate_treatment(n_sim = 10000, jurisdiction = "canada")
```

**Arguments**

n\_sim                  number of agents  
jurisdiction          character string specifying the jurisdiction ("canada" or "us"). Default is "canada"

**Value**

validation test results

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