Package 'vaccinationimpact'

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Title Impact Study of Vaccination Campaigns

Version 0.1.0

Description Tools to estimate the impact of vaccination campaigns at population level (number of events averted, number of avertable events, number needed to vaccinate). Inspired by the methodology proposed by Foppa et al. (2015) <doi:10.1016/j.vaccine.2015.02.042> and Machado et al. (2019) <doi:10.2807/1560-7917.ES.2019.24.45.1900268> for influenza vaccination impact.

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URL https://github.com/Epiconcept-Paris/vaccinationimpact/, https://epiconcept-paris.github.io/vaccinationimpact/

Encoding UTF-8

RoxygenNote 7.3.3

Depends R (>= 3.5)

LazyData true

Suggests knitr, rmarkdown, testthat (>= 3.0.0)

VignetteBuilder knitr

NeedsCompilation no

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Contents

`compute_events_avertable_by_increasing_coverage` *Compute events averted by increasing the final vaccine coverage*

Description

Compute events averted by increasing the final vaccine coverage

Usage

```
compute_events_avertable_by_increasing_coverage(
  number_of_events,
  cumulative_coverage,
  vaccine_coverage_increase,
  vaccine_effectiveness
)
```

Arguments

`number_of_events`	number of events
`cumulative_coverage`	cumulative vaccination coverage
`vaccine_coverage_increase`	percentage increase in final vaccine coverage (between 0 and 1)
`vaccine_effectiveness`	vaccine effectiveness

Value

a list with the new vaccine coverage ("new_vaccine_coverage") and the estimated number of events averted ("nabe")

Examples

```
data(coverage_and_incidence_mock_data)
data(ve_mock_data)
coverage <- coverage_and_incidence_mock_data$coverage_data
incidence <- coverage_and_incidence_mock_data$incidence_data
vaccine_effectiveness <- ve_mock_data$ve
nabe <- compute_events_avertable_by_increasing_coverage(
  number_of_events = incidence$events,
  cumulative_coverage = coverage$cumulative_coverage,
```

```
  vaccine_coverage_increase = 0.1, # 10% increase in final coverage
  vaccine_effectiveness = vaccine_effectiveness
)
plot(nabe$new_vaccine_coverage, type = "l",
xlab = "Time", ylab = "Vaccine coverage with 10% increase")
plot(nabe$nabe, type = "l", xlab = "Time", ylab = "Events averted")
```

`compute_events_averted_by_vaccination` *Compute events averted by vaccination*

Description

Compute events averted by vaccination

Usage

```
compute_events_averted_by_vaccination(
  number_of_events,
  cumulative_coverage,
  vaccine_effectiveness
)
```

Arguments

`number_of_events`	number of events
`cumulative_coverage`	cumulative vaccination coverage
`vaccine_effectiveness`	vaccine effectiveness

Details

The number of events averted by vaccination is calculated as described by Machado et al. (2019) doi:10.2807/1560-7917.ES.2019.24.45.1900268.

Value

estimated number of events averted

Examples

```
data(coverage_and_incidence_mock_data)
data(ve_mock_data)
coverage <- coverage_and_incidence_mock_data$coverage_data
incidence <- coverage_and_incidence_mock_data$incidence_data
vaccine_effectiveness <- ve_mock_data$ve
```

```
nae <- compute_events_averted_by_vaccination(
  number_of_events = incidence$events,
  cumulative_coverage = coverage$cumulative_coverage,
  vaccine_effectiveness = vaccine_effectiveness
)
plot(nae, type = "l", xlab = "Time", ylab = "Events averted")
```

`compute_number_needed_to_vaccinate_machado` *Compute the number of individuals needed to vaccinate to prevent one event according to Machado et al. method*

Description

Compute the number of individuals needed to vaccinate to prevent one event according to Machado et al. method

Usage

```
compute_number_needed_to_vaccinate_machado(
  number_of_events,
  number_of_events_averted,
  population_size,
  vaccine_effectiveness
)
```

Arguments

`number_of_events`	number of events
`number_of_events_averted`	number of events averted
`population_size`	population size
`vaccine_effectiveness`	vaccine effectiveness

Details

The number of individuals needed to vaccinate to prevent one event is calculated as described by Machado et al. (2019) doi:10.2807/1560-7917.ES.2019.24.45.1900268.

Value

The number of individuals needed to vaccinate to avert one event

Examples

```
data(coverage_and_incidence_mock_data)
data(ve_mock_data)
coverage <- coverage_and_incidence_mock_data$coverage_data
incidence <- coverage_and_incidence_mock_data$incidence_data
vaccine_effectiveness <- ve_mock_data$ve
nae <- compute_events_averted_by_vaccination(
  number_of_events = incidence$events,
  cumulative_coverage = coverage$cumulative_coverage,
  vaccine_effectiveness = vaccine_effectiveness
)
nnv_machado <- compute_number_needed_to_vaccinate_machado(
  number_of_events = incidence$events,
  number_of_events_averted = nae,
  population_size = 1234,
  vaccine_effectiveness = vaccine_effectiveness
)
nnv_machado
```

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compute_number_needed_to_vaccinate_tuite_fisman

Compute the number of individuals needed to vaccinate to prevent one event according to Tuite and Fisman method

---

Description

Compute the number of individuals needed to vaccinate to prevent one event according to Tuite and Fisman method

Usage

```
compute_number_needed_to_vaccinate_tuite_fisman(
  number_of_vaccinated,
  number_of_events_averted
)
```

Arguments

number_of_vaccinated	number of vaccinated individuals
number_of_events_averted	number of events averted

Details

The number of individuals needed to vaccinate to prevent one event is calculated as described by Tuite and Fisman (2013) doi:10.1016/j.vaccine.2012.11.097.

Value

The number of individuals needed to vaccinate to avert one event

Examples

```
data(coverage_and_incidence_mock_data)
data(ve_mock_data)
coverage <- coverage_and_incidence_mock_data$coverage_data
incidence <- coverage_and_incidence_mock_data$incidence_data
vaccine_effectiveness <- ve_mock_data$ve
nae <- compute_events_averted_by_vaccination(
  number_of_events = incidence$events,
  cumulative_coverage = coverage$cumulative_coverage,
  vaccine_effectiveness = vaccine_effectiveness
)
nnv_tuite_fisman <- compute_number_needed_to_vaccinate_tuite_fisman(
  number_of_vaccinated = coverage$number_of_vaccinated,
  number_of_events_averted = nae
)
nnv_tuite_fisman
```

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coverage_and_incidence_mock_data

coverage_and_incidence_mock_data

Description

Coverage and incidence mock data. Coverage values are computed considering a sample size of 1234 individuals.

Usage

```
coverage_and_incidence_mock_data
```

Format

A list with two data frames:

incidence_data data.frame with weekly incidence data

coverage_data data.frame with weekly coverage data

Source

Simulated coverage and incidence data

ve_mock_data *ve_mock_data*

Description

Vaccine effectiveness data.

Usage

```
ve_mock_data
```

Format

A data frame with 52 rows and 2 variables:

week Date

ve numeric: weekly vaccine effectiveness

Source

Simulated vaccine effectiveness data

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