

Package ‘BackToSchool’

December 15, 2020

Title What the Package Does (One Line, Title Case)

Version 0.0.0.9000

Description What the package does (one paragraph).

License `use_mit_license()`, `use_gpl3_license()` or friends to
pick a license

Encoding UTF-8

LazyData true

Roxygen list(markdown = TRUE)

RoxygenNote 7.1.1

R topics documented:

initialize_school	2
make_infected	3
make_quarantine	4
make_schedule	4
make_school	5
mult_runs	5
results	8
run_care	9
run_class	9
run_household	10
run_model	10
run_rand	12
run_specials	12
run_staff_rand	13
synthpop	13
synthpop_HS	14
Index	15

initialize_school	<i>Initialize school</i>
-------------------	--------------------------

Description

This function takes in a data frame exported by `make_school()`. It adds epidemiological attributes of the full school community.

Usage

```
initialize_school(
  n_contacts = 10,
  n_contacts_brief = 0,
  rel_trans_HH = 1,
  rel_trans = 1/8,
  rel_trans_brief = 1/50,
  p_asymp_adult = 0.35,
  p_asymp_child = 0.7,
  p_subclin_adult = 0,
  p_subclin_child = 0,
  attack = 0.01,
  child_trans = 1,
  child_susp = 0.5,
  teacher_trans = 1,
  teacher_susp = 1,
  disperse_transmission = T,
  isolate = T,
  dedens = T,
  run_specials = F,
  start
)
```

Arguments

<code>n_contacts</code>	Number of sustained contacts outside of the classroom; defaults to 10
<code>n_contacts_brief</code>	Number of brief contacts outside of the classroom; defaults to 0
<code>rel_trans_HH</code>	Relative attack rate of household contact (vs. classroom); defaults to 1
<code>rel_trans</code>	Relative attack rate of sustained contact (vs. classroom); defaults to 1/8
<code>rel_trans_brief</code>	Relative attack rate of brief contact (vs. classroom); defaults to 1/50
<code>p_asymp_adult</code>	Fraction of adults with asymptomatic disease; defaults to 0.4
<code>p_asymp_child</code>	Fraction of children with asymptomatic disease; defaults to 0.8
<code>p_subclin_adult</code>	Fraction of adults with subclinical but not technically asymptomatic disease; defaults to 0
<code>p_subclin_child</code>	Fraction of children with subclinical but not technically asymptomatic disease; defaults to 0

attack	Average daily attack rate in adults; defaults to 0.01
child_trans	Relative transmissibility of children (vs. adults); defaults to 1
child_susp	Relative transmissibility of children (vs. adults); defaults to .5
teacher_trans	Factor by which teacher transmissibility is reduced due to intervention; defaults to 1
teacher_susp	Factor by which teacher transmissibility is reduced due to intervention; defaults to 1
disperse_transmission	Whether transmission is overdispersed (vs. all have equal attack rate); default to T
isolate	Whether symptomatic individuals isolate when symptoms emerge; defaults to T
dedens	Whether dedensification measures reduce attack rate; defaults to F
run_specials	Whether special subjects are run; defaults to F
start	Data frame from make_class()

Value

out data frame of child and teacher attributes.

make_infected	<i>Set infection parameters</i>
---------------	---------------------------------

Description

Set infection parameters for individuals infected at a particular timestep

Usage

```
make_infected(df.u, days_inf, set = NA, mult_asymp = 1, seed_asymp = F)
```

Arguments

set	indication of seeding model vs. creating infections
mult_asymp	multiplier on asymptomatic infection; default is 1
seed_asymp	when making a seed, force to be asymptomatic; default is false
a	id of infected individual
df	school data frame from make_school()

Value

df.u with updated parameters

make_quarantine	<i>Update quarantine</i>
-----------------	--------------------------

Description

Mark classes for quarantine based on current symptomatic infections

Usage

```
make_quarantine(
  class_quarantine,
  df.u,
  quarantine.length = 10,
  quarantine.grace = 3,
  hs = F,
  hs.classes = NA
)
```

Arguments

class_quarantine	data frame of quarantine times
df.u	data frame of infections whose classes should be quarantined

Value

class_quarantine updated

make_schedule	<i>Make schedule</i>
---------------	----------------------

Description

Make a schedule of when individuals in the school community are present/absent

Usage

```
make_schedule(time = 30, type = "base", total_days = 5, df)
```

Arguments

time	number of days; defaults to 30
type	"base", "On/off", "A/B", "Remote"; defaults to "base"
total_days	number of days in school; defaults to 5
df	data frame from make_school()

Value

d Returns a n x time data frame that indicates whether an individual is in the school building at a particular time

make_school	<i>Make school</i>
-------------	--------------------

Description

This function allows you to sort a synthetic population into classes. It also assigns children to groups for alternating schedules and ensures that children are in the same group as siblings. It adds non-primary teacher staff, and if families are included, includes two adult family members per child and one per adult staff member.

Usage

```
make_school(
  synthpop = synthpop,
  n_other_adults = 30,
  includeFamily = F,
  n_class = 4
)
```

Arguments

synthpop	synthetic population; defaults to synthMaryland stored in file
n_other_adults	Number of adults in the school other than primary teachers; defaults to 30
includeFamily	whether to include family and adult family members of teachers, default = FALSE
n_class	number of classes per grade

Value

out data frame of child and teacher attributes

mult_runs	<i>Run model multiple times and summarize results</i>
-----------	---

Description

Run model multiple times and summarize results

Usage

```
mult_runs(
  N = 500,
  n_other_adults = 30,
  n_contacts = 10,
  n_contacts_brief = 0,
  rel_trans_HH = 1,
  rel_trans = 1/8,
  rel_trans_brief = 1/50,
  rel_trans_CC = 2,
```

```

rel_trans_adult = 2,
p_asymp_adult = 0.4,
child_prob = 0.05,
adult_prob = 0.01,
p_asymp_child = 0.8,
attack = 0.01,
child_trans = 1,
child_susp = 0.5,
p_subclin_adult = 0,
p_subclin_child = 0,
teacher_trans = 1,
teacher_susp = 1,
disperse_transmission = T,
n_staff_contact = 0,
n_HH = 0,
num_adults = 2,
n_start = 1,
time_seed_inf = NA,
days_inf = 6,
mult_asymp = 1,
seed_asymp = F,
isolate = T,
dedens = 0,
run_specials_now = F,
time = 30,
notify = F,
test = F,
test_sens = 0.7,
test_frac = 0.9,
test_days = "week",
test_type = "all",
quarantine.length = 10,
quarantine.grace = 3,
type = "base",
total_days = 5,
includeFamily = T,
synthpop = synthpop,
class = NA,
n_class = 4,
high_school = F,
nper = 8,
start_mult = 1,
start_type = "mix",
bubble = F,
include_weekends = T
)

```

Arguments

N	number of runs
n_other_adults	Number of adults in the school other than primary teachers; defaults to 30
n_contacts	Number of sustained contacts outside of the classroom; defaults to 10

n_contacts_brief	Number of brief contacts outside of the classroom; defaults to 20
rel_trans_HH	Relative attack rate of household contact (vs. classroom); defaults to 1
rel_trans	Relative attack rate of sustained contact (vs. classroom); defaults to 1/8
rel_trans_brief	Relative attack rate of brief contact (vs. classroom); defaults to 1/50
p_asymp_adult	Fraction of adults with asymptomatic (unsuspected) disease; defaults to 0.2
child_prob	if start_type = "cont", set daily probability of infectious entry for children, defaults to .05
adult_prob	if start_type = "cont", set daily probability of infectious entry for adults, defaults to .01
p_asymp_child	Fraction of children with asymptomatic (unsuspected) disease; defaults to 0.8
attack	Average daily attack rate in adults; defaults to 0.01
child_trans	Relative transmissibility of children (vs. adults); defaults to 1
child_susp	Relative transmissibility of children (vs. adults); defaults to .5
p_subclin_adult	Fraction of adults with subclinical but not technically asymptomatic disease; defaults to 0
p_subclin_child	Fraction of children with subclinical but not technically asymptomatic disease; defaults to 0
teacher_trans	Factor by which teacher transmissibility is reduced due to intervention; defaults to 1
teacher_susp	Factor by which teacher transmissibility is reduced due to intervention; defaults to 1
disperse_transmission	Whether transmission is overdispersed (vs. all have equal attack rate); default to T
n_staff_contact	number of contacts a teacher/staff member has with other teachers/staff members; defaults to 1
n_HH	number of households a household interacts with when not attending school; defaults to 0
num_adults	number of adults interacting with children, defaults to 2
n_start	number of infections to seed model; defaults to 1
time_seed_inf	time(s) at which to introduce new infectious individuals; defaults to NA and randomly selects one time
days_inf	length of infectious period (assuming mild case or quarantined on symptoms)
mult_asymp	multiplier on asymptomatic infection; default is 1
seed_asymp	whether to seed with an asymptomatic case
isolate	Whether symptomatic individuals isolate when symptoms emerge; defaults to T
dedens	Whether dedensification measures reduce attack rate; defaults to F
time	length of time to run model; defaults to 30
notify	whether classrooms are notified and quarantined; defaults to F
test	whether there is weekly testing; defaults to F

test_sens	test sensitivity; defaults to 0.7
test_frac	fraction of school tested; defaults to 0.9
test_days	vector indicating days on which students are tested; defaults to Sundays
test_type	group tested; defaults to "all", also allows "staff" and "students"
quarantine.length	length of quarantine when someone is infectious; defaults to 10
quarantine.grace	length of grace period after which a quarantined class returns not to be "re-quarantined"
type	"base", "On/off", "A/B", "Remote"; defaults to "base"
total_days	number of days in school; defaults to 5
includeFamily	whether to include family, default = FALSE
synthpop	synthetic population; defaults to synthMaryland
high_school	whether to use a high school schedule of random period mixing; defaults to F
nper	number of school periods; defaults to 8
start_mult	value to indicate relative frequency of adult/child infections; defaults to 1 (adults 2x as likely as kids)
bubble	whether out-of-school interactions occur with a 'bubble'; defaults to F
run_specials	Whether special subjects are run; defaults to F
@start_type	type of seed; default is "mix" (also "adult", "child")

 results

Summarize multiple runs

Description

Summarize multiple runs

Usage

```
results(out)
```

Arguments

out output from mult_runs

Value

calc summarizes results from multiple runsf

run_care	<i>Set care-based transmission</i>
----------	------------------------------------

Description

Determine who is infected at a timestep from contact with an infected individual out of school

Usage

```
run_care(a, df, care_contacts, rel_trans_CC = 2, num_adults = 2)
```

Arguments

a	id of infected individual
df	school data frame from make_school()
num_adults	number of adults interacting with children, defaults to 2
contacts	graph of random contacts at time t

Value

infs id of infected individuals

run_class	<i>Set class transmission</i>
-----------	-------------------------------

Description

Determine who is infected at a timestep in the same classroom as an infected individual

Usage

```
run_class(a, df, high_school = F, hs.classes = NA)
```

Arguments

a	id of infected individual
df	school data frame from make_school()

Value

infs id of infected individuals

run_household	<i>Set household transmission</i>
---------------	-----------------------------------

Description

Determine who is infected at a timestep in the same household as an infected individual

Usage

```
run_household(a, df)
```

Arguments

a	id of infected individual
df	school data frame from make_school()

Value

infs id of infected individuals

run_model	<i>Run model</i>
-----------	------------------

Description

Perform a single model run

Usage

```
run_model(
  time = 30,
  notify = F,
  test = F,
  test_days = "week",
  test_sens = 0.7,
  test_frac = 0.9,
  n_staff_contact = 0,
  n_HH = 0,
  n_start = 1,
  days_inf = 6,
  mult_asymp = 1,
  seed_asymp = F,
  time_seed_inf = NA,
  high_school = F,
  nper = 8,
  start_mult = 1,
  start_type = "mix",
  test_type = "all",
  adult_prob = 0.013,
```

```

    child_prob = 0.056,
    quarantine.length = 10,
    quarantine.grace = 3,
    rel_trans_CC = 2,
    rel_trans_adult = 2,
    num_adults = 2,
    bubble = F,
    include_weekends = T,
    df,
    sched
)

```

Arguments

time	length of time to run model; defaults to 30
notify	whether classrooms are notified and quarantined; defaults to F
test	whether there is weekly testing; defaults to F
test_sens	test sensitivity; defaults to 0.7
test_frac	fraction of school tested; defaults to 0.9
n_staff_contact	number of contacts a teacher/staff member has with other teachers/staff members; defaults to 1
n_HH	number of households a household interacts with when not attending school; defaults to 0
n_start	number of infections to seed model; defaults to 1
days_inf	length of infectious period (assuming mild case or quarantined on symptoms)
mult_asymp	multiplier on asymptomatic infection; default is 1
seed_asymp	whether to seed with an asymptomatic case
time_seed_inf	time(s) at which to introduce new infectious individuals; defaults to NA and randomly selects one time
high_school	whether to use a high school schedule of random period mixing; defaults to F
nper	number of school periods; defaults to 8
start_mult	value to indicate relative frequency of adult/child infections; defaults to 1 (adults 2x as likely as kids)
start_type	type of seed; default is "mix" (also "adult", "child", "cont")
test_type	group tested; defaults to "all", also allows "staff" and "students"
quarantine.length	length of quarantine when someone is infectious; defaults to 10
quarantine.grace	length of grace period after which a quarantined class returns not to be "re-quarantined"
num_adults	number of adults interacting with children, defaults to 2
bubble	whether out-of-school interactions occur with a 'bubble'; defaults to F
include_weekends	if TRUE excludes weekends from additional out-of-school mixing, defaults to F
df	school data frame from make_school()
sched	schedule data frame from make_schedule()

Value

df updated df with transmission results
 time_seed_inf when the first individual was dropped in
 class_quarantine a matrix of class quarantine times
 mat a check on if the people who you think are present are actually the ones present

run_rand	<i>Set random transmission</i>
----------	--------------------------------

Description

Determine who is infected at a timestep from random contact with an infected individual

Usage

```
run_rand(a, df, random_contacts)
```

Arguments

a	id of infected individual
df	school data frame from make_school()
random_contacts	graph of random contacts at time t

Value

infs id of infected individuals

run_specials	<i>Set specials transmission</i>
--------------	----------------------------------

Description

Determine who is infected at a timestep from specials

Usage

```
run_specials(a, df, specials)
```

Arguments

a	id of infected individual
df	school data frame from make_school()
specials	classroom and teacher ids of specials at time t

Value

infs id of infected individuals

run_staff_rand	<i>Set random staff transmission</i>
----------------	--------------------------------------

Description

Determine who is infected at a timestep from random contact between in-school adults

Usage

```
run_staff_rand(a, df, n_contact, rel_trans_adult = 2)
```

Arguments

a	id of infected individual
df	school data frame from make_school()
random_contacts	graph of random contacts at time t

Value

infs id of infected individuals

synthpop	<i>Synthetic Maryland elementary school population</i>
----------	--

Description

A data frame containing a synthetic population of children ages 5-10, representative of the state of Maryland. This is used by make_class() to sort children into classes.

Usage

```
data(synthMaryland)
```

Format

A data frame with

HH_id household ID

age age

flag_mult true if more than one child in the household, not used

id individual id #

Source

Wheaton, W.D., U.S. Synthetic Population 2010 Version 1.0 Quick Start Guide, RTI International, May 2014. ([website](#)). Created with script demographic_data2.R.

`synthpop_HS`*Synthetic Maryland high school population*

Description

A data frame containing a synthetic population of children ages 14-17, representative of the state of Maryland. This is used by `make_class()` to sort children into classes.

Usage

```
data(synthMaryland_HS)
```

Format

A data frame with

HH_id household ID

age age

flag_mult true if more than one child in the household, not used

id individual id #

Source

Wheaton, W.D., U.S. Synthetic Population 2010 Version 1.0 Quick Start Guide, RTI International, May 2014. ([website](#)). Created with script `demographic_data2.R`.

Index

* datasets

- synthpop, [13](#)
- synthpop_HS, [14](#)

initialize_school, [2](#)

make_infected, [3](#)
make_quarantine, [4](#)
make_schedule, [4](#)
make_school, [5](#)
mult_runs, [5](#)

results, [8](#)
run_care, [9](#)
run_class, [9](#)
run_household, [10](#)
run_model, [10](#)
run_rand, [12](#)
run_specials, [12](#)
run_staff_rand, [13](#)

synthpop, [13](#)
synthpop_HS, [14](#)