Package 'BackToSchool'

February 22, 2021

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

Version 0.0.0.9000

Description What the package does (one paragraph).

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Encoding UTF-8

LazyData true

Roxygen list(markdown = TRUE)

RoxygenNote 7.1.1

R topics documented:

`initialize_school` *Initialize school*

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

`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 0
`rel_trans_HH`	Relative attack rate of household contact (vs. classrom); 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 disease; defaults to 0.4
`p_asymp_child`	Fraction of children with asymptomatic disease; defaults to 0.8
`p_subclin_adult`	Fraction of adults with subclinical but not techincally asymptomatic disease; defaults to 0
`p_subclin_child`	Fraction of children with subclinical but not techincally 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` *Set infection parameters*

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,
  turnaround.time = 1
)
```

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
turnaround.time	test turnaround time, default = 1 day
a	id of infected individual
df	school data frame from make_school()

Value

df.u with updated parameters

make_quarantine *Update quarantine*

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 *Make schedule*

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 *Make school*

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, 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 *Run model multiple times and summarize results*

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,
  turnaround.time = 1
)
```

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. classrom); 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 techincally asymptomatic disease; defaults to 0

p_subclin_child
: Fraction of children with subclinical but not techincally 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
turnaround.time	test turnaround time, default = 1 day
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 *Set care-based transmission*

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 *Set class transmission*

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 *Set household transmission*

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 *Run model*

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,
  turnaround.time = 1,
  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

turnaround.time
: test turnaround time, default = 1 day

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 *Set random transmission*

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 *Set specials transmission*

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 *Set random staff transmission*

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 *Synthetic Maryland elementary school population*

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.

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