

# Base ABM model

Interface Info Code

Edit Delete Add

abc Button

slower  
days: 3

view updates

continuous

Settings...

### ABSTRACT Model Toy model of infectious disease with treatment

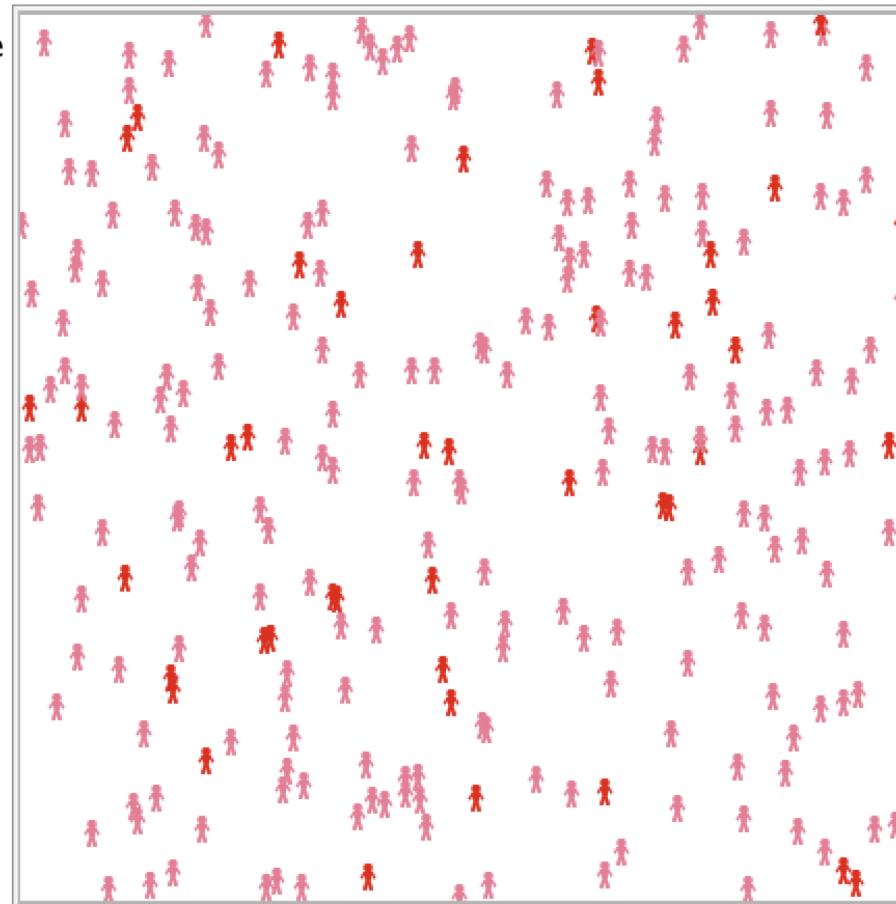
1. setup    2. draw

|                     |            |
|---------------------|------------|
| pop-size            | 423        |
| st_infected         | 40 percent |
| chance-of-infection | 50 %       |
| chance-of-death     | 50 %       |

4. load-pop    5. infect

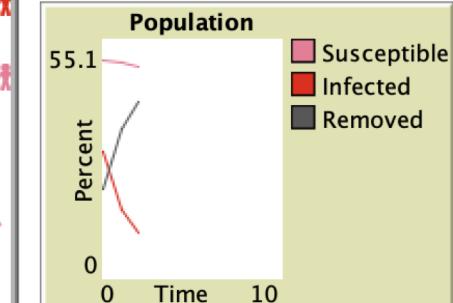
6. Start/Stop Model

NOTE: To run the model  
over, adjust the settings on  
sliders etc, and then just  
click on buttons 4, 5, and 6



days: 3  
initial population: 423  
percent ok: 49

percent infected: 10  
percent died: 41



travel-goal:  
random

count people with [status = "S"]  
206

count people with [status = "I"]  
44

count people with [status = "R"]  
173

Command Center

Clear

observer>

```
breed [people person]
people-own [status time-infected]
```

```
to setup
  clear-all
  reset-ticks
end
```

```
to draw
  clear-drawing
  reset-ticks
```

```
ask patches [set pcolor white]
end
```

ABSTRACT Model  
Toy model of infectious disease  
with treatment

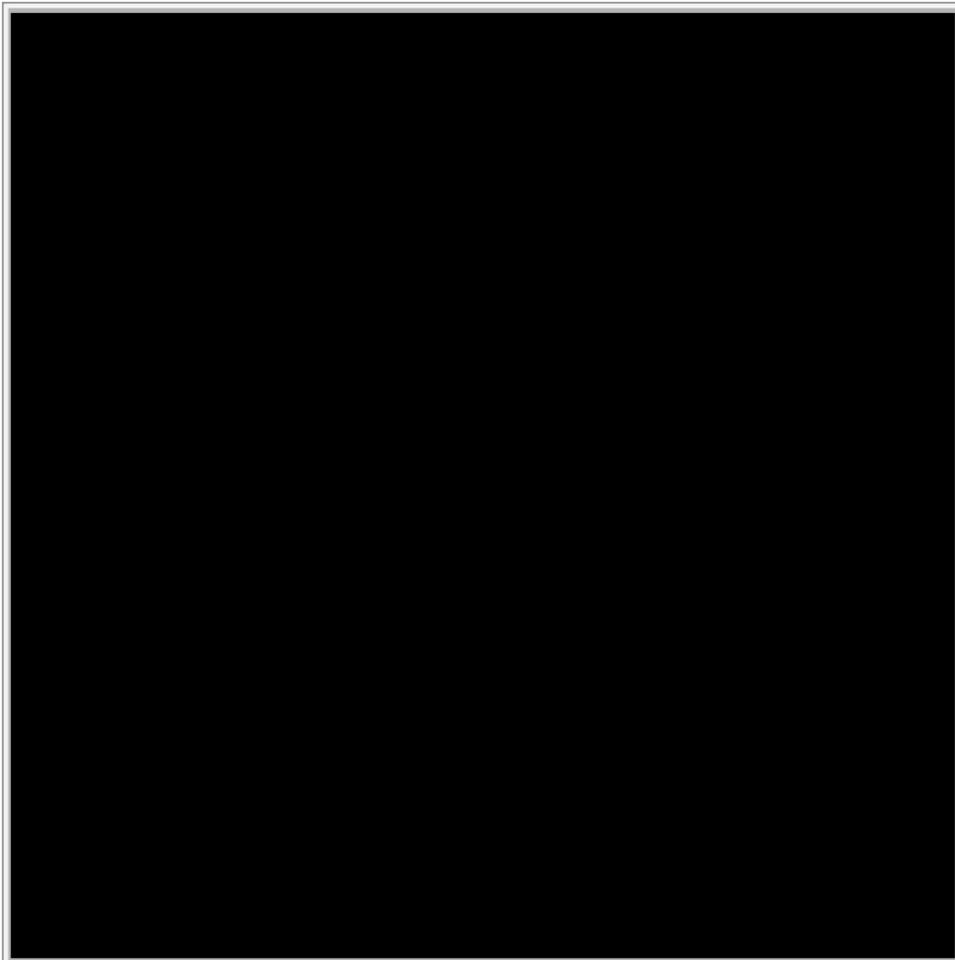
1. setup    2. draw

|                     |            |
|---------------------|------------|
| pop-size            | 423        |
| st_infected         | 40 percent |
| chance-of-infection | 50 %       |
| chance-of-death     | 50 %       |

4. load-pop    5. infect

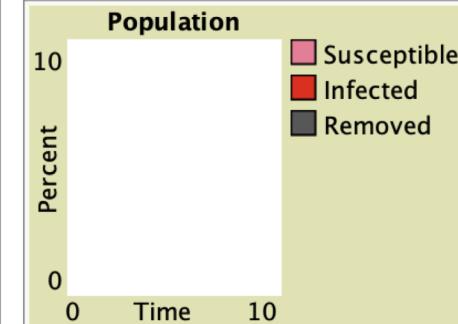
6. Start/Stop Model

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sliders etc, and then just  
click on buttons 4, 5, and 6



days    initial population    percent ok  
0                    0                    N/A

percent infected    percent died  
N/A                    N/A



count people with [status = "S"]  
0

count people with [status = "I"]  
0

count people with [status = "R"]  
0

travel-goal  
random

```
to load-pop
  clear-plot
  reset-ticks
  ask turtles with [breed = people][die]
  reset-ticks
  create-people pop-size
    [set shape "person"
     set size 2
     set label ""
     set status "S"
     set color pink
     move-to one-of patches]
  end
```

to go  
travel

end

to travel

if travel-goal = "random"  
[ask people with [status != "R"] [rt random  
360 fd 1]]

end

```
to infect
  ask n-of round((st_infected / 100) * count people) people
    [set status "I" set color red ]
end
```

to infect-others

```
let victims (turtle-set people-here with [status != "R"] people-
on neighbors)
```

```
ask victims
  [if status != "R"
    [let chance random 101
      if chance > (100 - chance-of-infection)
        [set status "I"
          set color red]
    ]]
end
```

to go  
travel

; expose others and possibly infect them  
; also chance to die (change status to "R" for remove  
ask people with [status = "I"]

[infect-others

let chance random 101

if chance >= (100 - chance-of-death) ; die

[set status "R" set size 0]

if chance < 10 ; get better

[set status "S" set color pink]

]

tick

if not any? people with [status = "S"] [stop] ; everyone is sick  
or dead

if not any? people with [status = "I"] [stop] ; everyone is either  
okay or dead

end

Add treatment sites

ABSTRACT Model  
Toy model of infectious disease  
with treatment

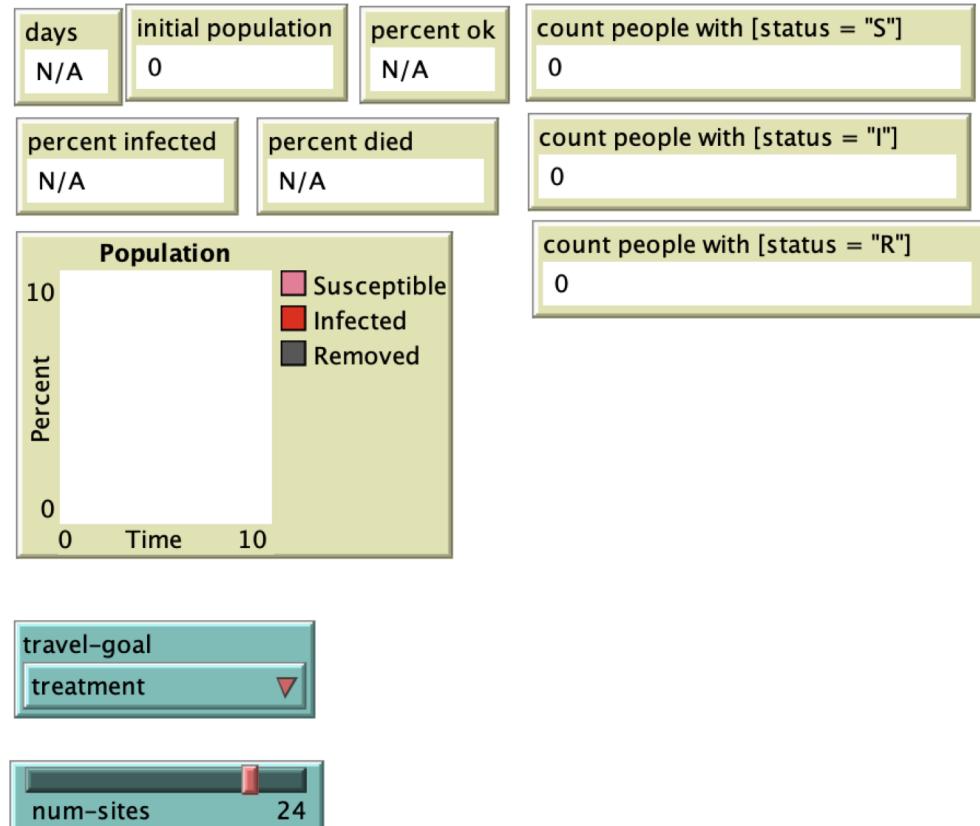
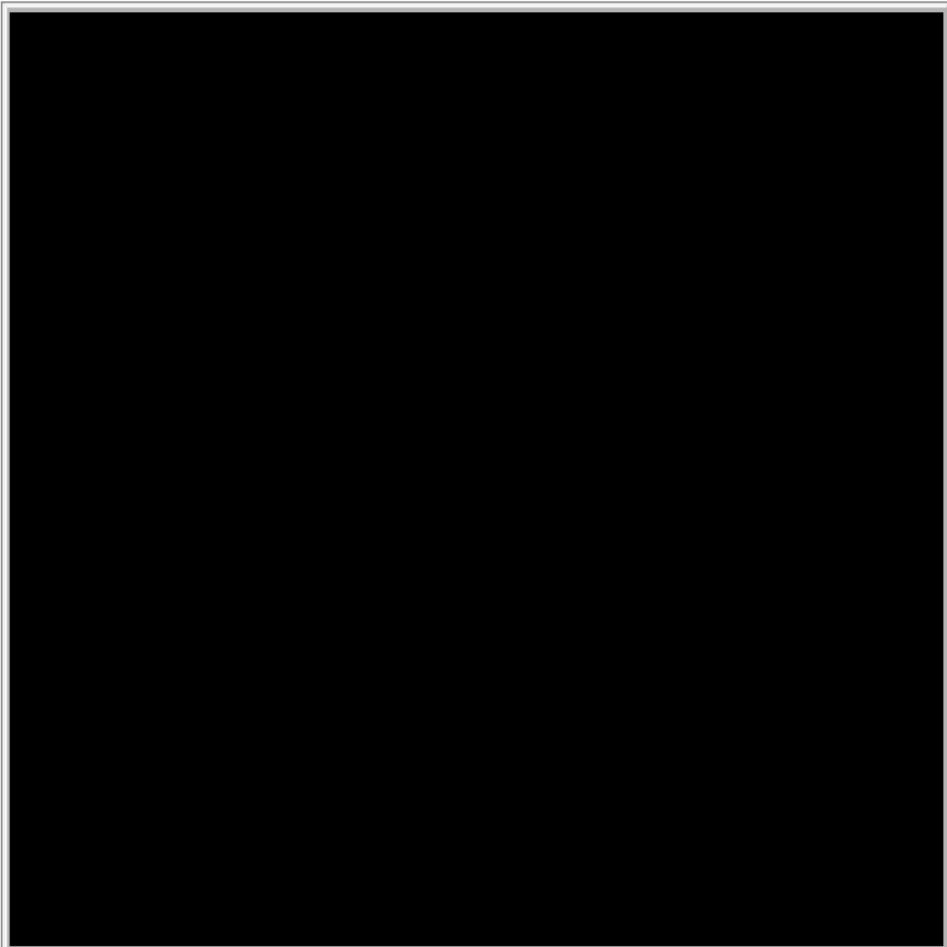
1. setup    2. draw

|                     |            |
|---------------------|------------|
| pop-size            | 423        |
| st_infected         | 17 percent |
| chance-of-infection | 50 %       |
| chance-of-death     | 33 %       |

4. load-pop    5. infect

6. Start/Stop Model

NOTE: To run the model  
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click on buttons 4, 5, and 6



```
breed [people person]
people-own [status time-infected]
```

```
breed [sites site]
sites-own [capacity]
```

```
to setup
  clear-all
  reset-ticks
end
```

```
to draw
  clear-drawing
  reset-ticks
```

```
ask patches [set pcolor white]
```

```
; add treatment sites
ask n-of num-sites patches [sprout-sites 1]
ask sites [set shape "house" set size 1 set color blue ]
end
```

to travel

```
if travel-goal = "random"
  [ask people with [status != "R"] [rt random
  360 fd 1]]
```

```
if travel-goal = "treatment"
  [
    ask people with [status = "S"]
    [rt random 360 fd 1]
    ask people with [status = "I"]
      [let nearest-treatment min-one-of sites
      [distance myself]
        face nearest-treatment fd 1]
  ]
end
```

ABSTRACT Model  
Toy model of infectious disease  
with treatment

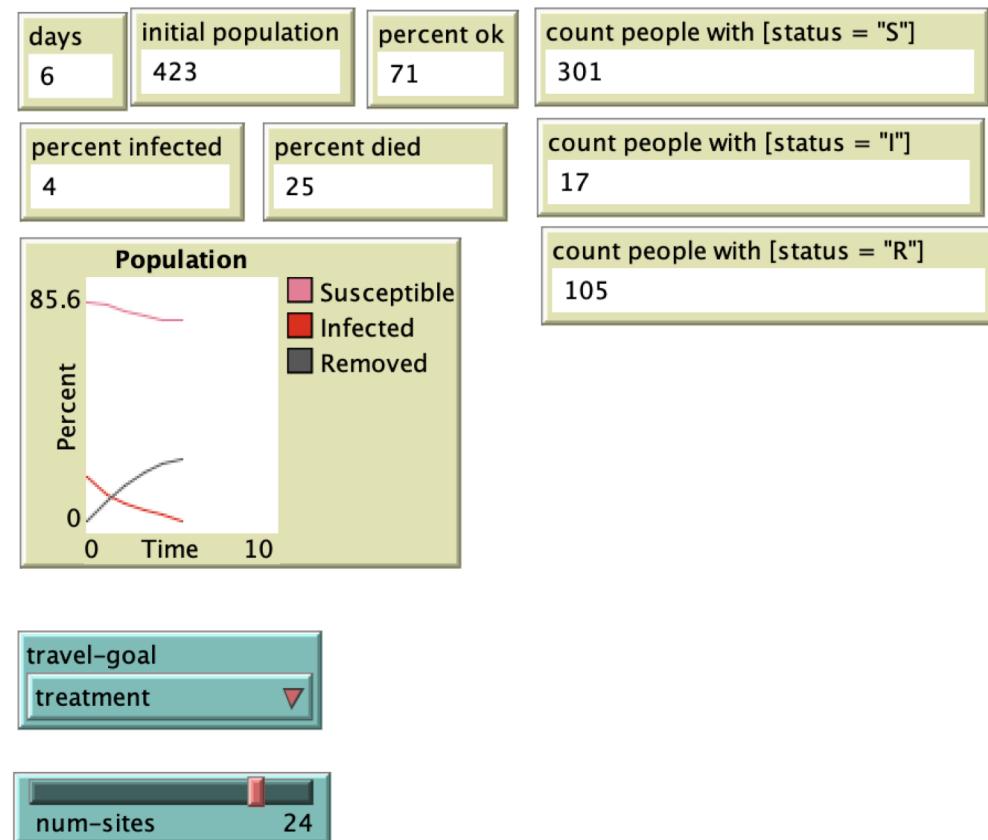
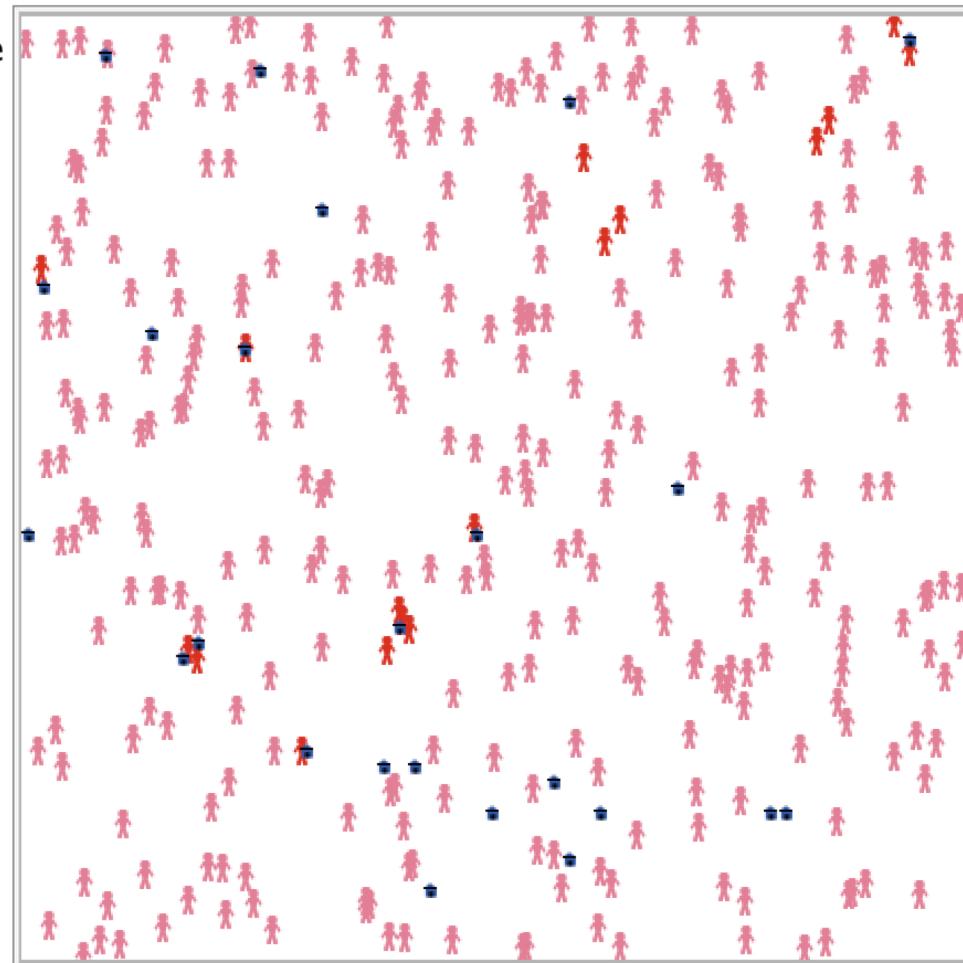
1. setup    2. draw

|                     |            |
|---------------------|------------|
| pop-size            | 423        |
| st_infected         | 17 percent |
| chance-of-infection | 50 %       |
| chance-of-death     | 33 %       |

4. load-pop    5. infect

6. Start/Stop Model

NOTE: To run the model over, adjust the settings on sliders etc, and then just click on buttons 4, 5, and 6



Add GIS

and CSV

## Toy model of infectious disease

1. setup    2. draw    3. label-districts

Set up experiment for travel

travel-restriction

none

On  Off travel-by-road-only

chance-of-infection

50 %

chance-of-death

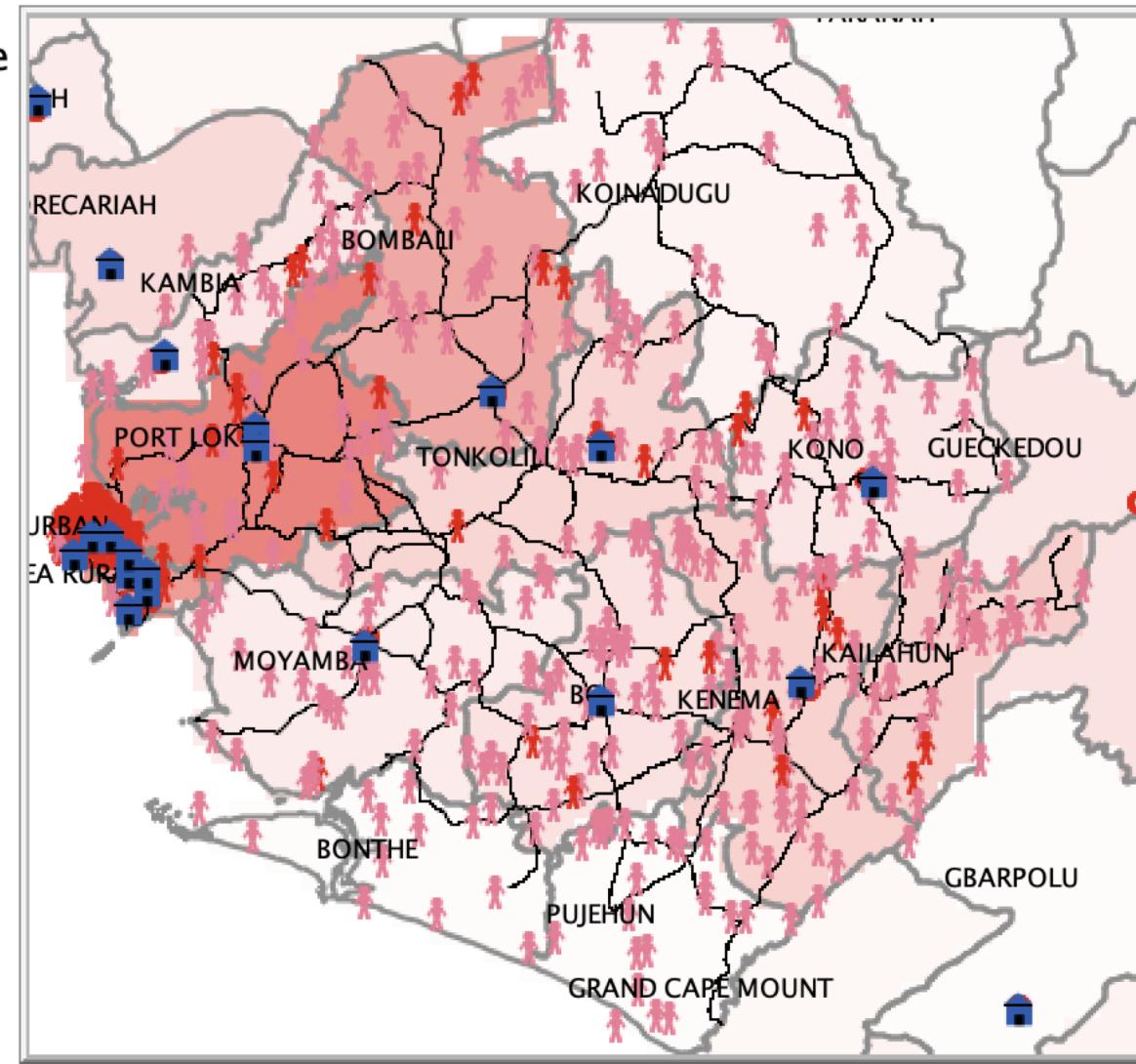
75 %

4. load-pop

5. infect

6. Start/Stop Model

NOTE: To run the model over, adjust the settings on sliders etc, and then just click on buttons 4, 5, and 6



days

1

initial population

490

percent ok

66

percent infected

21

percent died

13

Population

72.7

Percent

0

Time

10

Susceptible  
Infected  
Removed

travel-goal

treatment

## Toy model of infectious disease

1. setup    2. draw    3. label-districts

Set up experiment for travel

travel-restriction

none

On  Off travel-by-road-only

chance-of-infection

50 %

chance-of-death

75 %

4. load-pop

5. infect

6. Start/Stop Model 

NOTE: To run the model over, adjust the settings on sliders etc, and then just click on buttons 4. 5. and 6



days  
0

initial population

0

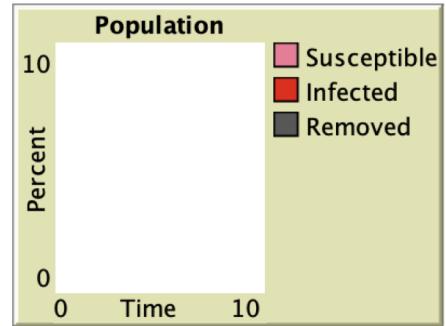
percent ok

N/A

percent infected  
N/A

percent died

N/A



travel-goal  
treatment

count people with [status = "S"]  
0

count people with [status = "I"]  
0

count people with [status = "R"]  
0

```
extensions [ gis csv ]
globals [ site-locations roads districts SL]

patches-own [district-name confirmed population road-here]
turtles-own []

breed [people person]
people-own [district status time-infected]

breed [admin-labels admin-label]
admin-labels-own [name]
breed [sites site]

to setup
  clear-all
  reset-ticks
  gis:load-coordinate-system (word "data/projection.prj")
  set site-locations gis:load-dataset
  "data/disease_Treatment_Centers.shp"
  set roads gis:load-dataset "data/Sierra Leone_Roads.shp"
  set districts gis:load-dataset
  "data/Cases_at_Admin2_Level.shp"
  set SL gis:load-dataset "data/SL_Admin01.shp"
end
```

```
to draw
clear-drawing
reset-ticks
gis:set-world-envelope (gis:envelope-union-of ;(gis:envelope-of
sites) (gis:envelope-of SL))
ask patches [set pcolor white]
```

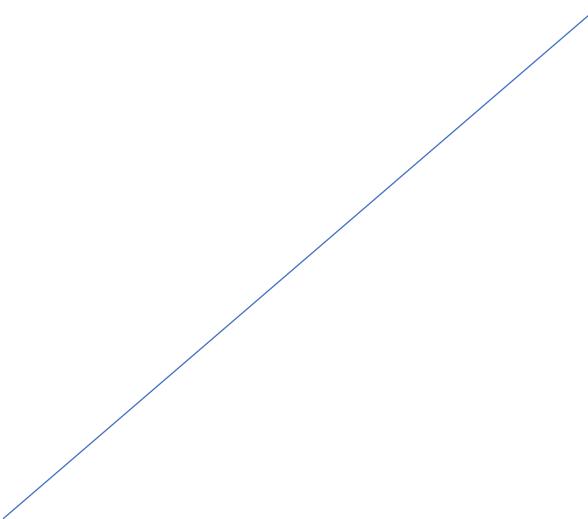
```
gis:apply-coverage districts "GLOBAL_A_1" district-name
gis:apply-coverage districts "V ADM2 C 3" confirmed
```

```
ask patches
[ifelse (confirmed > 0)
 [set pcolor scale-color red confirmed 5000 0]
 [set pcolor white]
]
```

```
gis:set-drawing-color gray
gis:draw districts 2
```

```
gis:set-drawing-color red
gis:draw site-locations 3
```

```
gis:set-drawing-color black
gis:draw roads 1
```



```
ask patches
[if gis:intersects? roads self
 [set road-here 1 ] ]

ask patches
[ if gis:intersects? site-locations self
 [sprout-sites 1
 [set shape "house" set color blue set size 2]
 ]
end
```

```
to label-districts
  ask admin-labels [die]
  foreach gis:feature-list-of districts
    [ ?1 -> let centroid gis:location-of gis:centerid-of ?1
      if not empty? centroid
        [create-admin-labels 1
          [set xcor item 0 centroid
            set ycor item 1 centroid
            set size 0
            set shape "circle"
            set color gray
            set name gis:property-value ?1 "GLOBAL_A_1"
            set label name
            set label-color black ]
        ]
    ]
  end
```

```
to load-pop  
clear-plot  
reset-ticks
```

```
ask turtles with [breed = people][die]  
reset-ticks
```

```
file-open "data/SL_pop.csv"  
  if not file-at-end? [let header csv:from-row file-read-line]  
    while [not file-at-end?]  
      [let row csv:from-row file-read-line  
       ;let district_name item 0 row  
       let d_name item 0 row  
       let district_name upper-case-string d_name ;convert text to  
       uppercase  
       if district_name = "WESTERN RURAL" [set district_name  
       "WESTERN AREA RURAL"]  
       if district_name = "WESTERN URBAN" [set district_name  
       "WESTERN AREA URBAN"]  
       let district_pop item 4 row  
       let small_pop (district_pop / 10000)  
       create-people small_pop  
       [set district district_name  
        set shape "person"  
        set size 2  
        set label ""  
        set status "S"  
        set color pink  
        move-to one-of patches with [district-name = [district] of  
        myself]]]  
      file-close  
    end
```

```
to-report upper-case-string [s]
  ifelse empty? s
    [report ""]
    [ report word (upper-case-char first s)
      (upper-case-string butfirst s) ]
  end
```

```
to-report upper-case-char [c]
  let pos position c "abcdefghijklmnopqrstuvwxyz"
  ifelse pos = false
    [ report c ]
    [ report item pos "ABCDEFGHIJKLMNOPQRSTUVWXYZ" ]
  end
```

to infect

foreach gis:feature-list-of districts

[ ?1 -> let d\_name gis:property-value ?1 "GLOBAL\_A\_1"

let infected gis:property-value ?1 "V ADM2\_C\_3"

let st\_infected round infected / 100 ;for visualization

if st\_infected < 0 [set st\_infected 1]

if any? people with [district = d\_name]

[ask n-of st\_infected people with [district = d\_name]

[set status "I" set color red ]

]

]

end

to infect-others

let victims (turtle-set people-here with [status != "R"] people-on neighbors)

ask victims

[if status != "R"

[let chance random 101

if chance > (100 - chance-of-infection)

[set status "I"

set color red]

]]

end

to go  
travel

; expose others and possibly infect them  
; also chance to die (change status to "R" for remove  
ask people with [status = "I"]

[infect-others  
let chance random 101  
if chance >= (100 - chance-of-death) ; die  
[set status "R" set size 0]  
if chance < 10 ; get better  
[set status "S" set color pink]  
]

tick  
if not any? people with [status = "S"] [stop] ; everyone is sick  
or dead  
if not any? people with [status = "I"] [stop] ; everyone is either  
okay or dead

end

to travel

```
if travel-goal = "random"
  [ask people with [status != "R"] [check-travel-restriction]];[rt
  random 360 fd 1]]
```

```
if travel-goal = "treatment"
  [
    ask people with [status = "S"]
      [check-travel-restriction]
    ask people with [status = "I"]
      [let nearest-treatment min-one-of sites [distance myself]
        face nearest-treatment fd .5
        check-travel-restriction]
  ]
end
```

```
to check-travel-restriction
if travel-restriction = "none" and travel-by-road-only = true
[rt random 360
 ifelse not any? neighbors with [road-here = 1]
 [move-to min-one-of patches with [road-here = 1]
 [distance myself]
 [ move-to one-of neighbors with [road-here = 1]]
 ]
if travel-restriction = "none" and travel-by-road-only = false
[rt random 360
 fd 1]
if travel-restriction = "within-districts" and travel-by-road-only = false
[rt random 360
 ifelse patch-ahead 1 = nobody
 []
 [if [district-name] of patch-ahead 1 = district
 [fd 1 ] ]]
if travel-restriction = "within-districts" and travel-by-road-only = true
[rt random 360
 ifelse patch-ahead 1 = nobody
 []
 [if [district-name] of patch-ahead 1 = district and [road-here] of patch-ahead 1 = 1
 [fd 1 ] ]]
end
```