Sanity_Check

December 4, 2020

1 Sanity Checks

Here we conduct some experiments to evaluate the basic functionality and assumptions of the code. Prior to reviewing these parts, you should take a look at Manual_Simulation.ipynb.

1.1 Import the Necessary Libs

In the beginning, we import some necessary simulation libraries from the code folder.

[3]:
```
import sys, os
sys.path.insert(1, os.path.join(os.pardir, 'src'))

from time_handle import Time
```

1.2 Run a Normal Simulation

This is the base simulation, with no commands, i.e., no policy situation. First, we initialize the parser and load population generator and disease properties from the respective json files.

[4]:
```
# Import Parser
from json_handle import Parser
parser = Parser('test')

# Load Population Generator from JSON file
population_generator = parser.parse_population_generator()

# Load Disease Properties from JSON file
disease_properties = parser.parse_disease_properties()
```

```
INFO - population_generator.py - 1295 - __init__ - 2020-12-04 14:24:25,453 -
Population Generator created
INFO - disease_manipulator.py - 61 - __init__ - 2020-12-04 14:24:25,454 -
Disease Properties generated
```

Test some features of population generator, to make sure about JSON files setting.

[5]:
```
print('Population size is', population_generator.population_size, '.')
print('There are', len(population_generator.family_pattern_probability_dict),␣
 ↪'family patterns.')
```

```
print('Distance function is', population_generator.distance_function.__name__,␣
 ↪'.')
print('There are', len(population_generator.community_types), 'and the first␣
 ↪one is named', population_generator.community_types[0].name, '.')
```

```
Population size is 500 .
There are 4 family patterns.
Distance function is euclidean_distance .
There are 1 and the first one is named School .
```

Then, simulator settings are parsed, and loaded into the simulator. This also includes the last two steps, so no need to add population generator and disease properties in the first place.

[6]:
```
# Load Simulator from JSON file
simulator = parser.parse_simulator()
simulator.generate_model(is_parallel=False)
```

```
INFO - population_generator.py - 1295 - __init__ - 2020-12-04 14:24:28,933 -
Population Generator created
INFO - disease_manipulator.py - 61 - __init__ - 2020-12-04 14:24:28,935 -
Disease Properties generated
INFO - population_generator.py - 1328 - generate_population - 2020-12-04
14:24:29,151 - Jobs required to generate the model: 1

INFO - time_simulator.py - 195 - generate_model - 2020-12-04 14:24:32,820 -
Simulation model generated
```

```
HBox(children=(HTML(value=''), FloatProgress(value=0.0, max=15.0),␣
 ↪HTML(value='')))
```

Now we load simulator data as well.

[7]:
```
# Load Simulator Data from JSON file
end_time, spread_period, initialized_infected_ids, _, observers = parser.
 ↪parse_simulator_data()
```

We set the commands to an empty list and run the simulation.

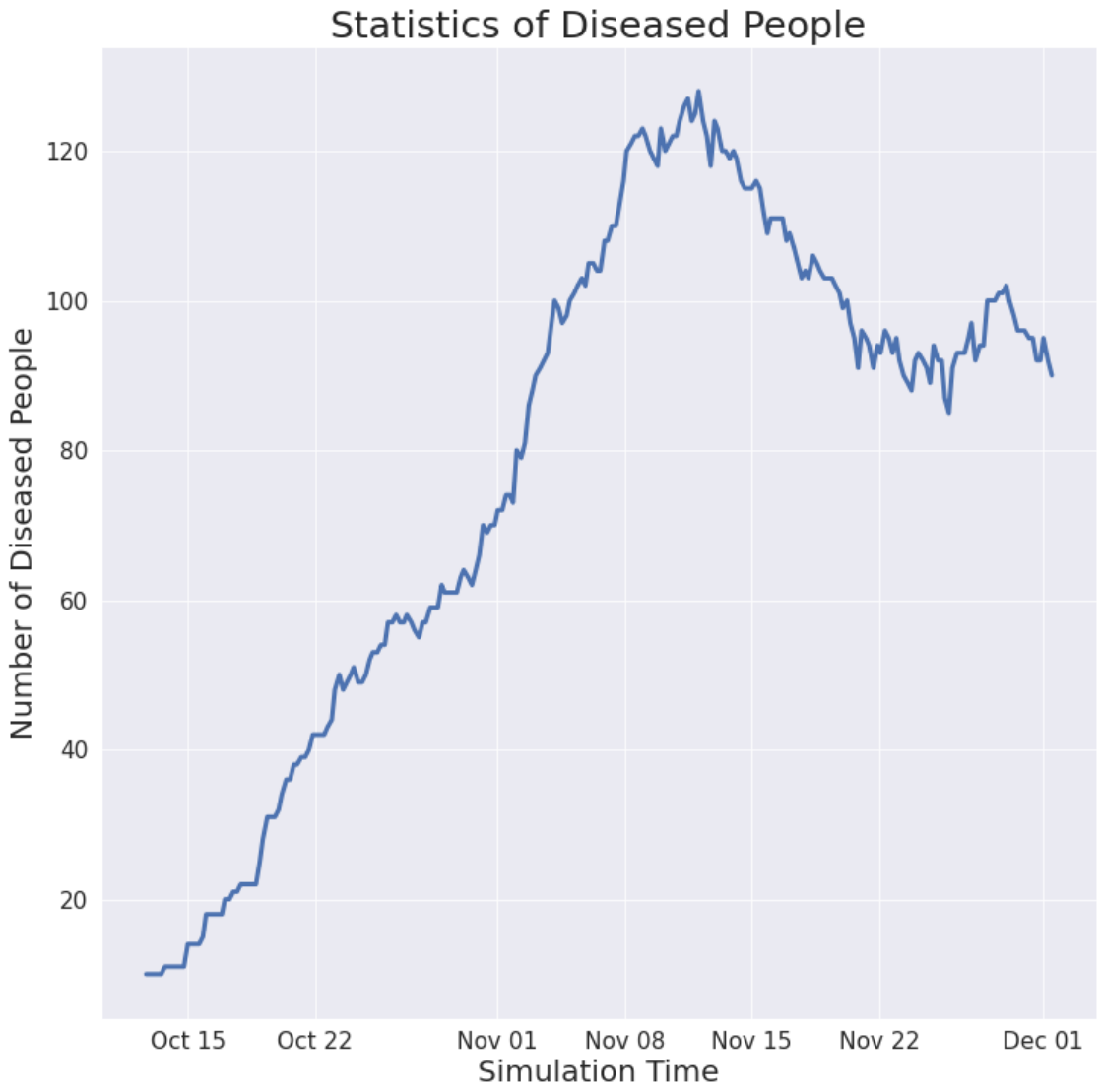
[8]:
```
commands = []
simulator.simulate(end_time=end_time,
                   spread_period=spread_period,
                   initialized_infected_ids=initialized_infected_ids,
                   commands=commands,
                   observers=observers)
```

```
INFO - time_simulator.py - 336 - simulate - 2020-12-04 14:24:51,863 -
Initializing the simulation
INFO - time_simulator.py - 343 - simulate - 2020-12-04 14:24:51,889 - Starting
the simulation
```

```
INFO - time_simulator.py - 365 - simulate - 2020-12-04 14:25:18,713 - Simulation
completed
INFO - utils.py - 303 - show_people_statistics - 2020-12-04 14:25:18,715 -
+----------------------------+-------+
|           People           | Count |
+============================+=======+
| Population Size            | 500   |
+----------------------------+-------+
| Confirmed (Active + Close) | 277   |
+----------------------------+-------+
| Total Death Cases          | 12    |
+----------------------------+-------+
| Total Recovered            | 488   |
+----------------------------+-------+
| Currently Active Cases     | 90    |
+----------------------------+-------+
INFO - utils.py - 280 - show_simulator_statistics - 2020-12-04 14:25:18,716 -
+--------------+--------------------+
|   Simulator  |        Data        |
+==============+====================+
| Start Time   | 2020-10-12 15:45:30 |
+--------------+--------------------+
| End Time     | 2020-12-01 15:45:30 |
+--------------+--------------------+
| Spread Period | 60                 |
+--------------+--------------------+
| Database     | simulator          |
+--------------+--------------------+

HBox(children=(HTML(value=''), FloatProgress(value=0.0, max=72000.0),␣
 ↪HTML(value='')))
```

1.2.1 Check infected people over time

[10]:
```
from utils import Health_Condition
observers[0].plot_disease_statistics_during_time(Health_Condition.IS_INFECTED)
```



1.3 Simulate with a Quarantine Everyone Policy

Now, we add a policy to quarantine all the people after 3 days, and see how the result changes.

[15]:
```
# Import Parser
from json_handle import Parser
parser = Parser('test')

# Load Simulator from JSON file
simulator = parser.parse_simulator()
simulator.generate_model()

# Load Simulator Data from JSON file
```

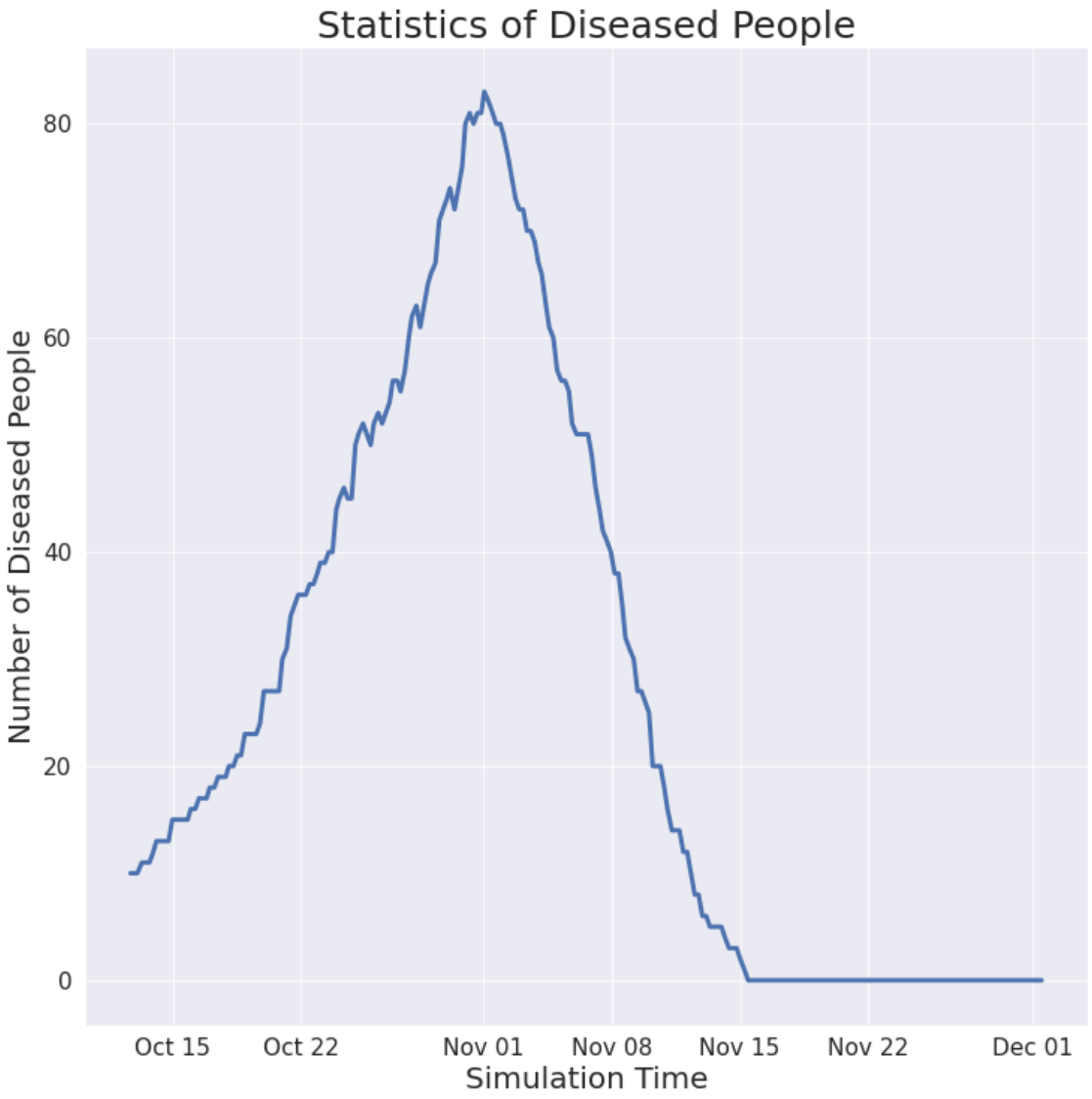
```
end_time, spread_period, initialized_infected_ids, _, observers = parser.
 ↪parse_simulator_data()

# Build a policy
from datetime import timedelta
from commands import Quarantine_Multiple_People
from conditions import Time_Point_Condition

commands =␣
 ↪[Quarantine_Multiple_People(condition=Time_Point_Condition(Time(timedelta(days=20))),␣
 ↪ids=[i for i in range(500)])]

simulator.simulate(end_time
                   , spread_period
                   , initialized_infected_ids
                   , commands
                   , observers
                   , report_statistics=2)
```

```
INFO - population_generator.py - 1295 - __init__ - 2020-12-04 14:27:03,962 -
Population Generator created
INFO - disease_manipulator.py - 61 - __init__ - 2020-12-04 14:27:03,968 -
Disease Properties generated
INFO - population_generator.py - 1328 - generate_population - 2020-12-04
14:27:04,161 - Jobs required to generate the model: 1

INFO - time_simulator.py - 195 - generate_model - 2020-12-04 14:27:07,969 -
Simulation model generated
INFO - time_simulator.py - 336 - simulate - 2020-12-04 14:27:07,971 -
Initializing the simulation
INFO - time_simulator.py - 343 - simulate - 2020-12-04 14:27:07,993 - Starting
the simulation
INFO - commands.py - 666 - take_action - 2020-12-04 14:27:19,127 - Command
executed: Quarantine_Multiple_People

INFO - time_simulator.py - 365 - simulate - 2020-12-04 14:27:28,562 - Simulation
completed
INFO - utils.py - 303 - show_people_statistics - 2020-12-04 14:27:28,563 -
+----------------------------+-------+
|           People           | Count |
+============================+=======+
| Population Size            | 500   |
+----------------------------+-------+
| Confirmed (Active + Close) | 105   |
+----------------------------+-------+
| Total Death Cases          | 8     |
+----------------------------+-------+
```

```
| Total Recovered            | 492   |
+----------------------------+-------+
| Currently Active Cases     | 0     |
+----------------------------+-------+
INFO - utils.py - 280 - show_simulator_statistics - 2020-12-04 14:27:28,565 -
+--------------+--------------------+
|   Simulator  |        Data        |
+==============+====================+
| Start Time   | 2020-10-12 15:45:30 |
+--------------+--------------------+
| End Time     | 2020-12-01 15:45:30 |
+--------------+--------------------+
| Spread Period | 60                 |
+--------------+--------------------+
| Database     | simulator          |
+--------------+--------------------+
INFO - utils.py - 326 - show_family_statistics - 2020-12-04 14:27:28,567 -
+----------------------------+-------+
|          Families          | Count |
+============================+=======+
| Number of Families         | 142   |
+----------------------------+-------+
| Confirmed (Active + Close) | 55    |
+----------------------------+-------+
| Total Death Cases          | 7     |
+----------------------------+-------+
| Currently Active Cases     | 0     |
+----------------------------+-------+
INFO - utils.py - 382 - show_disease_statistics - 2020-12-04 14:27:28,569 -
+-------------------+-----------------------------+---------------------------+
| Disease Property  |      Distribution Type      |         Parameters        |
+===================+=============================+===========================+
| Infectious Rate   | Uniform_Disease_Property_Di | {'lower_bound': 0.05,     |
|                   | stribution                  | 'upper_bound': 0.6}       |
+-------------------+-----------------------------+---------------------------+
| Immunity Rate     | Immunity_Distribution       | {'lower_bound': 0.02,     |
|                   |                             | 'upper_bound': 0.1}       |
+-------------------+-----------------------------+---------------------------+
| Disease Period    | Uniform_Disease_Property_Di | {'lower_bound': 11520,    |
|                   | stribution                  | 'upper_bound': 23040}     |
+-------------------+-----------------------------+---------------------------+
| Death Probability | Uniform_Disease_Property_Di | {'lower_bound': 0.05,     |
|                   | stribution                  | 'upper_bound': 0.15}      |
+-------------------+-----------------------------+---------------------------+
INFO - utils.py - 344 - show_population_statistics - 2020-12-04 14:27:28,570 -
+---------------------------+------------------+---------------------------+
| Family Pattern Probability | Number of Members |          Genders          |
+===========================+==================+===========================+
```

```
| 0.210                      | 2                | ['Female', 'Male']          |
+----------------------------+------------------+-----------------------------+
| 0.300                      | 3                | ['Female', 'Male', 'Male']  |
+----------------------------+------------------+-----------------------------+
| 0.290                      | 4                | ['Female', 'Male', 'Male',  |
|                            |                  | 'Female']                   |
+----------------------------+------------------+-----------------------------+
| 0.200                      | 6                | ['Female', 'Female',        |
|                            |                  | 'Male', 'Male', 'Male',     |
|                            |                  | 'Female']                   |
+----------------------------+------------------+-----------------------------+
INFO - utils.py - 356 - show_population_statistics - 2020-12-04 14:27:28,572 -
+----------------+----------------------+------------------------+
| Community Type | Number of Communities |  Sub-community Types   |
+================+======================+========================+
| School         | 15                   | ['Teacher', 'Student'] |
+----------------+----------------------+------------------------+

HBox(children=(HTML(value=''), FloatProgress(value=0.0, max=15.0),␣
 ↪HTML(value='')))

HBox(children=(HTML(value=''), FloatProgress(value=0.0, max=72000.0),␣
 ↪HTML(value='')))
```

[16]:
```
observers[0].plot_disease_statistics_during_time(Health_Condition.IS_INFECTED)
```



1.4 Simulate with Quarantine Diseased People

Now we start quarantine only infected people at some point, and the results should be the same.

[18]:
```
# Import Parser
from json_handle import Parser
parser = Parser('test')

# Load Simulator from JSON file
simulator = parser.parse_simulator()
simulator.generate_model()

# Load Simulator Data from JSON file
```

```
end_time, spread_period, initialized_infected_ids, _, observers = parser.
 ↪parse_simulator_data()

# Build a policy
from datetime import timedelta
from commands import Quarantine_Diseased_People
from conditions import Time_Point_Condition

commands =␣
 ↪[Quarantine_Diseased_People(condition=Time_Point_Condition(Time(timedelta(days=15))))]

simulator.simulate(end_time
                   , spread_period
                   , initialized_infected_ids
                   , commands
                   , observers)
```

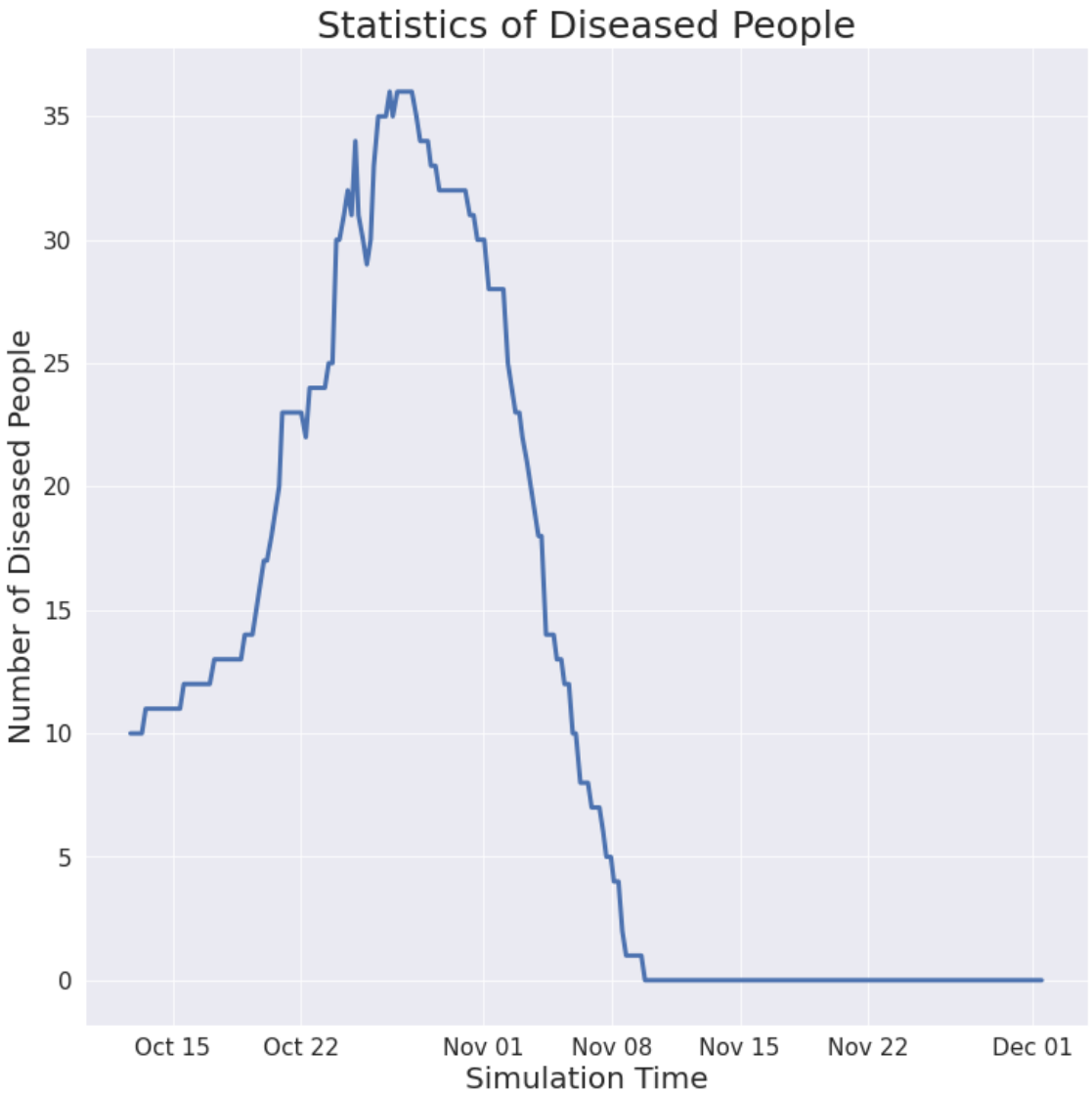
```
INFO - population_generator.py - 1295 - __init__ - 2020-12-04 14:27:55,378 -
Population Generator created
INFO - disease_manipulator.py - 61 - __init__ - 2020-12-04 14:27:55,384 -
Disease Properties generated
INFO - population_generator.py - 1328 - generate_population - 2020-12-04
14:27:55,732 - Jobs required to generate the model: 1

INFO - time_simulator.py - 195 - generate_model - 2020-12-04 14:27:59,464 -
Simulation model generated
INFO - time_simulator.py - 336 - simulate - 2020-12-04 14:27:59,468 -
Initializing the simulation
INFO - time_simulator.py - 343 - simulate - 2020-12-04 14:27:59,496 - Starting
the simulation
INFO - commands.py - 915 - take_action - 2020-12-04 14:28:08,374 - Command
executed: Quarantine_Diseased_People

INFO - time_simulator.py - 365 - simulate - 2020-12-04 14:28:22,837 - Simulation
completed
INFO - utils.py - 303 - show_people_statistics - 2020-12-04 14:28:22,838 -
+----------------------------+-------+
|           People           | Count |
+============================+=======+
| Population Size            | 500   |
+----------------------------+-------+
| Confirmed (Active + Close) | 48    |
+----------------------------+-------+
| Total Death Cases          | 3     |
+----------------------------+-------+
| Total Recovered            | 497   |
+----------------------------+-------+
```

```
| Currently Active Cases     | 0     |
+----------------------------+-------+
INFO - utils.py - 280 - show_simulator_statistics - 2020-12-04 14:28:22,839 -
+---------------+---------------------+
|   Simulator   |        Data         |
+===============+=====================+
| Start Time    | 2020-10-12 15:45:30 |
+---------------+---------------------+
| End Time      | 2020-12-01 15:45:30 |
+---------------+---------------------+
| Spread Period | 60                  |
+---------------+---------------------+
| Database      | simulator           |
+---------------+---------------------+

HBox(children=(HTML(value=''), FloatProgress(value=0.0, max=15.0),␣
 ↪HTML(value='')))

HBox(children=(HTML(value=''), FloatProgress(value=0.0, max=72000.0),␣
 ↪HTML(value='')))
```

1.4.1 Check the Result

Now, we plot the infected people statistics, it most be the same as the last section.

[19]:
```
from utils import Health_Condition
observers[0].plot_disease_statistics_during_time(Health_Condition.IS_INFECTED)
```



1.5 Simulate with a lower Infectious Rate

Here, we set infectious rate to a very low amount and check the test result.

[21]:
```
# Import Parser (default constructor is the 'test' folder)
from json_handle import Parser
parser = Parser('test')

# Load Simulator from JSON file
simulator = parser.parse_simulator()

# Change the infectious rate here (or just change in the respective JSON file␣
↪and then parse the simulator)
```

```
from distributions import Uniform_Disease_Property_Distribution
simulator.disease_properties.infectious_rate_distribution = \
    Uniform_Disease_Property_Distribution(parameters_dict={"upper_bound":0.2,␣
 ↪"lower_bound":0.1})

# Generate the simulation model
simulator.generate_model()

# Load Simulator Data from JSON file
end_time, spread_period, initialized_infected_ids, _, observers = parser.
 ↪parse_simulator_data()

# No policy is required
commands = []

simulator.simulate(end_time
                   , spread_period
                   , initialized_infected_ids
                   , commands
                   , observers)
```

```
INFO - population_generator.py - 1295 - __init__ - 2020-12-04 14:30:13,607 -
Population Generator created
INFO - disease_manipulator.py - 61 - __init__ - 2020-12-04 14:30:13,617 -
Disease Properties generated
INFO - population_generator.py - 1328 - generate_population - 2020-12-04
14:30:13,881 - Jobs required to generate the model: 1

INFO - time_simulator.py - 195 - generate_model - 2020-12-04 14:30:17,505 -
Simulation model generated
INFO - time_simulator.py - 336 - simulate - 2020-12-04 14:30:17,510 -
Initializing the simulation
INFO - time_simulator.py - 343 - simulate - 2020-12-04 14:30:17,532 - Starting
the simulation

INFO - time_simulator.py - 365 - simulate - 2020-12-04 14:30:42,831 - Simulation
completed
INFO - utils.py - 303 - show_people_statistics - 2020-12-04 14:30:42,833 -
+----------------------------+-------+
|           People           | Count |
+============================+=======+
| Population Size            | 500   |
+----------------------------+-------+
| Confirmed (Active + Close) | 10    |
+----------------------------+-------+
| Total Death Cases          | 0     |
+----------------------------+-------+
```

```
| Total Recovered            | 500   |
+----------------------------+-------+
| Currently Active Cases     | 0     |
+----------------------------+-------+
INFO - utils.py - 280 - show_simulator_statistics - 2020-12-04 14:30:42,835 -
+--------------+---------------------+
|   Simulator  |        Data         |
+==============+=====================+
| Start Time   | 2020-10-12 15:45:30 |
+--------------+---------------------+
| End Time     | 2020-12-01 15:45:30 |
+--------------+---------------------+
| Spread Period | 60                 |
+--------------+---------------------+
| Database     | simulator           |
+--------------+---------------------+

HBox(children=(HTML(value=''), FloatProgress(value=0.0, max=15.0),␣
 ↪HTML(value='')))

HBox(children=(HTML(value=''), FloatProgress(value=0.0, max=72000.0),␣
 ↪HTML(value='')))
```

1.5.1 Plot the results

The infected people are plotted over time. We compare this with another simulation, with higher infectious rates.

[22]:
```
from utils import Health_Condition
data_1 = observers[0].get_disease_statistics_during_time(Health_Condition.
 ↪IS_INFECTED)
```

1.5.2 Increase Infectious Rate

[23]:
```
# Load Simulator from JSON file
simulator = parser.parse_simulator()

# Change the infectious rate here (or just change in the respective JSON file␣
 ↪and then parse the simulator)
from distributions import Uniform_Disease_Property_Distribution
simulator.disease_properties.infectious_rate_distribution = \
    Uniform_Disease_Property_Distribution(parameters_dict={"upper_bound":0.95,␣
 ↪"lower_bound":0.9})

# Generate the simulation model
simulator.generate_model()

# Load Simulator Data from JSON file
```

```
end_time, spread_period, initialized_infected_ids, _, observers = parser.
 ↪parse_simulator_data()

# No policy is required
commands = []

simulator.simulate(end_time
                   , spread_period
                   , initialized_infected_ids
                   , commands
                   , observers)
```

```
INFO - population_generator.py - 1295 - __init__ - 2020-12-04 14:34:02,864 -
Population Generator created
INFO - disease_manipulator.py - 61 - __init__ - 2020-12-04 14:34:02,870 -
Disease Properties generated
INFO - population_generator.py - 1328 - generate_population - 2020-12-04
14:34:03,274 - Jobs required to generate the model: 1

INFO - time_simulator.py - 195 - generate_model - 2020-12-04 14:34:06,690 -
Simulation model generated
INFO - time_simulator.py - 336 - simulate - 2020-12-04 14:34:06,695 -
Initializing the simulation
INFO - time_simulator.py - 343 - simulate - 2020-12-04 14:34:06,720 - Starting
the simulation

INFO - time_simulator.py - 365 - simulate - 2020-12-04 14:34:37,332 - Simulation
completed
INFO - utils.py - 303 - show_people_statistics - 2020-12-04 14:34:37,335 -
+----------------------------+-------+
|           People           | Count |
+============================+=======+
| Population Size            | 500   |
+----------------------------+-------+
| Confirmed (Active + Close) | 481   |
+----------------------------+-------+
| Total Death Cases          | 84    |
+----------------------------+-------+
| Total Recovered            | 416   |
+----------------------------+-------+
| Currently Active Cases     | 369   |
+----------------------------+-------+
INFO - utils.py - 280 - show_simulator_statistics - 2020-12-04 14:34:37,336 -
+---------------+---------------------+
|   Simulator   |        Data         |
+===============+=====================+
| Start Time    | 2020-10-12 15:45:30 |
```

```
+--------------+--------------------+
| End Time     | 2020-12-01 15:45:30 |
+--------------+--------------------+
| Spread Period | 60                 |
+--------------+--------------------+
| Database     | simulator          |
+--------------+--------------------+
```

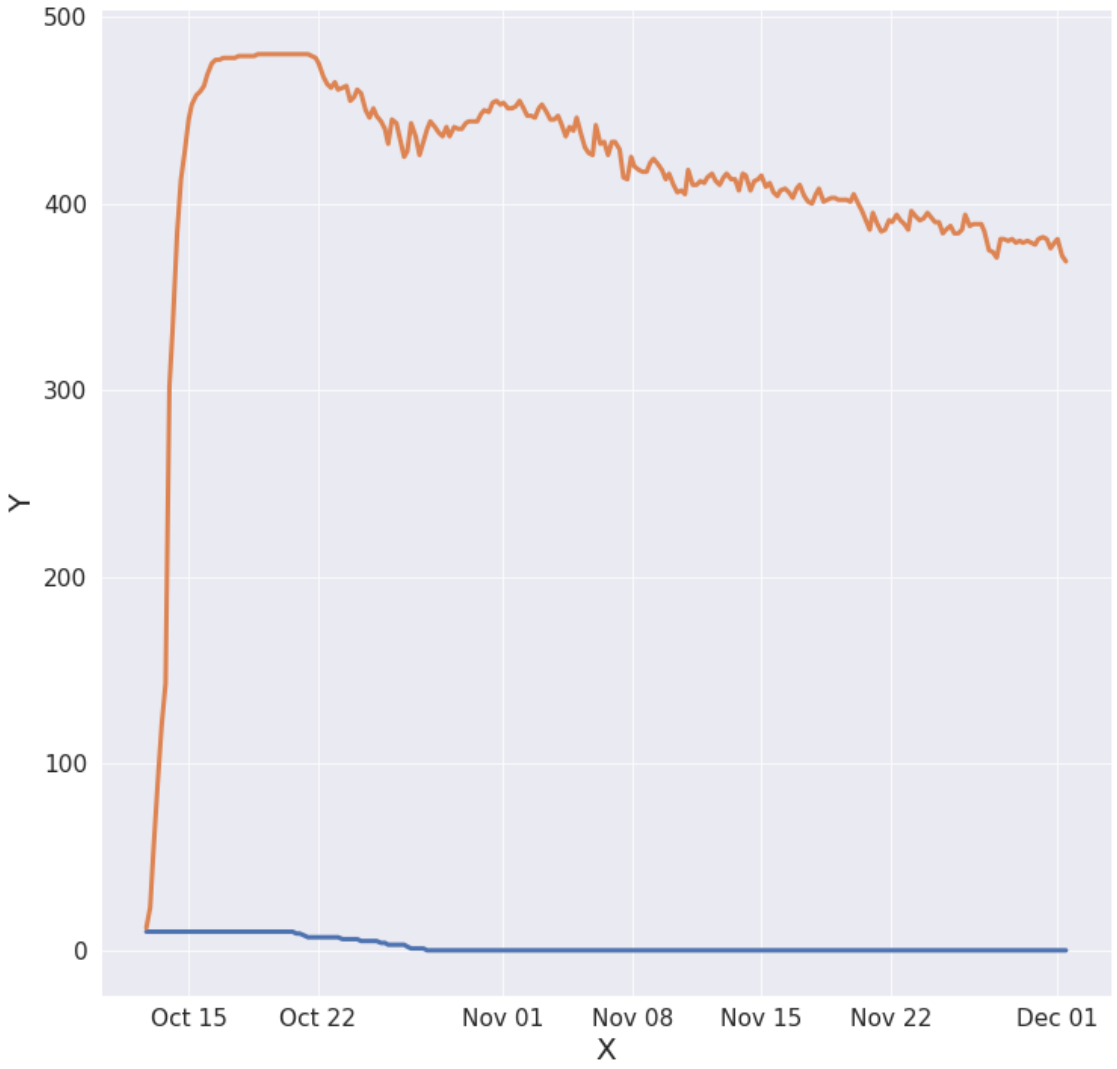
```
HBox(children=(HTML(value=''), FloatProgress(value=0.0, max=15.0),␣
 ↪HTML(value='')))
```

```
HBox(children=(HTML(value=''), FloatProgress(value=0.0, max=72000.0),␣
 ↪HTML(value='')))
```

1.5.3 Plot and Compare

The results of low infectious rate simulation are shown in the following figure. A significant displacement in the peak of the

[25]:
```
from utils import Health_Condition
data_2 = observers[0].get_disease_statistics_during_time(Health_Condition.
 ↪IS_INFECTED)

from plot_utils import Plot
Plot.plot_multiple_lines(data_1[1], [data_1[0], data_2[0]])
```



[25]:
```
<module 'matplotlib.pyplot' from '/home/amin/.local/lib/python3.8/site-
packages/matplotlib/pyplot.py'>
```

1.6 Decrease Immunity

In this section, the immunity is decreased, and the results of the simulation are shown in the following figure. With this amount of immunity, almost every person should get infected. Also, the pandemic curve will not become flat since there is a small generated immunity after catching the infectious disease for the first time.

[32]:
```
# Import Parser
from json_handle import Parser
parser = Parser('test')
```

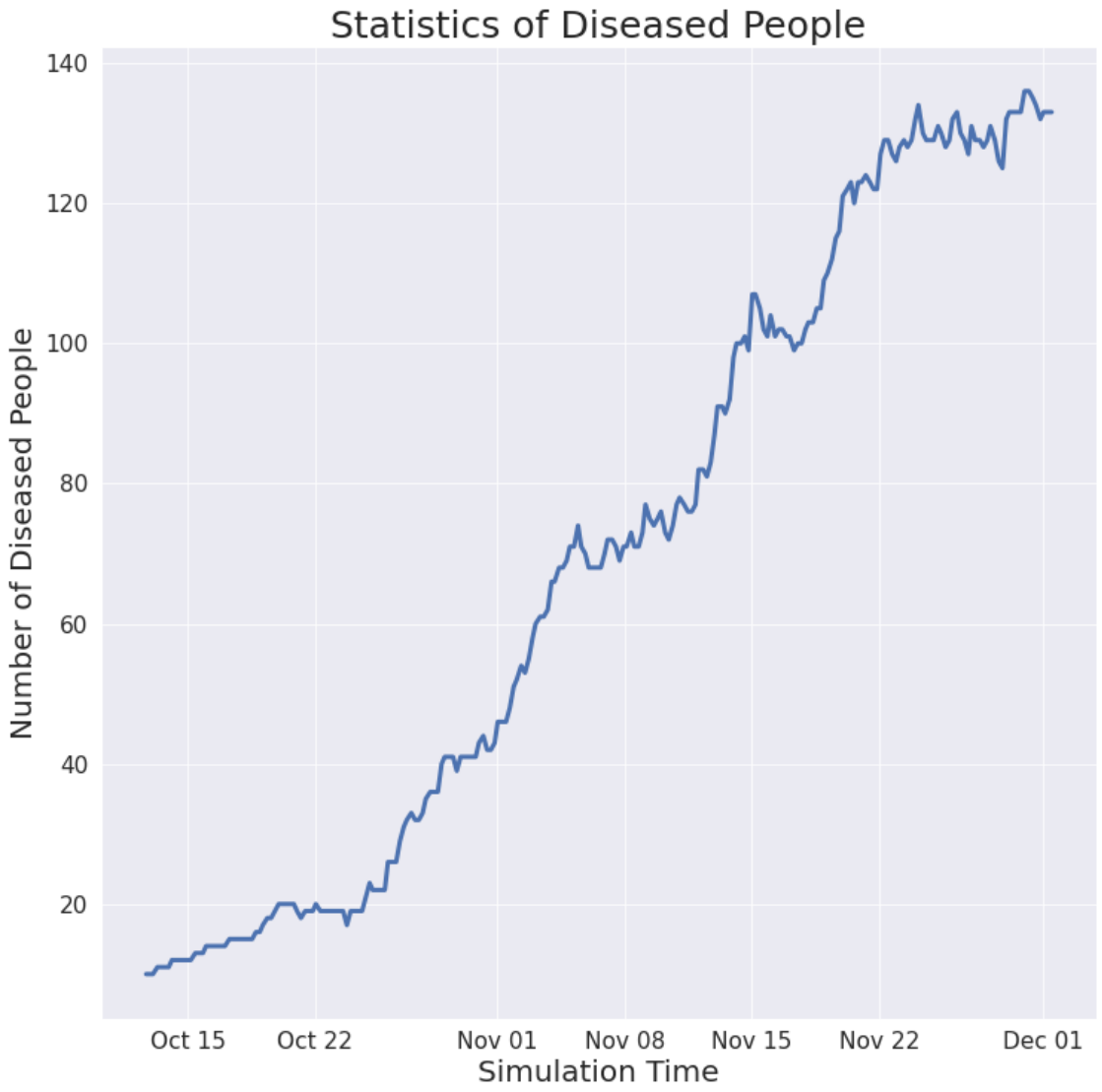
```
# Load Simulator from JSON file
simulator = parser.parse_simulator()

# Change the infectious rate here (or just change in the respective JSON file␣
 ↪and then parse the simulator)
from distributions import Uniform_Disease_Property_Distribution
simulator.disease_properties.immunity_distribution = \
    Uniform_Disease_Property_Distribution(parameters_dict={"upper_bound":0.03,␣
 ↪"lower_bound":0.02})

# Generate the simulation model
simulator.generate_model()

# Load Simulator Data from JSON file
end_time, spread_period, initialized_infected_ids, _, observers = parser.
 ↪parse_simulator_data()

# No policy is required
commands = []

simulator.simulate(end_time
                   , spread_period
                   , initialized_infected_ids
                   , commands
                   , observers)
```

```
INFO - population_generator.py - 1295 - __init__ - 2020-12-04 17:21:49,932 -
Population Generator created
INFO - disease_manipulator.py - 61 - __init__ - 2020-12-04 17:21:49,935 -
Disease Properties generated
INFO - population_generator.py - 1328 - generate_population - 2020-12-04
17:21:50,111 - Jobs required to generate the model: 1

INFO - time_simulator.py - 195 - generate_model - 2020-12-04 17:21:54,009 -
Simulation model generated
INFO - time_simulator.py - 336 - simulate - 2020-12-04 17:21:54,035 -
Initializing the simulation
INFO - time_simulator.py - 343 - simulate - 2020-12-04 17:21:54,055 - Starting
the simulation

INFO - time_simulator.py - 365 - simulate - 2020-12-04 17:22:23,519 - Simulation
completed
INFO - utils.py - 303 - show_people_statistics - 2020-12-04 17:22:23,521 -
+----------------------------+-------+
|           People           | Count |
+============================+=======+
| Population Size            | 500   |
```

```
+----------------------------+-------+
| Confirmed (Active + Close) | 264   |
+----------------------------+-------+
| Total Death Cases          | 17    |
+----------------------------+-------+
| Total Recovered            | 483   |
+----------------------------+-------+
| Currently Active Cases     | 134   |
+----------------------------+-------+
INFO - utils.py - 280 - show_simulator_statistics - 2020-12-04 17:22:23,522 -
+--------------+--------------------+
|   Simulator  |        Data        |
+==============+====================+
| Start Time   | 2020-10-12 15:45:30 |
+--------------+--------------------+
| End Time     | 2020-12-01 15:45:30 |
+--------------+--------------------+
| Spread Period | 60                 |
+--------------+--------------------+
| Database     | simulator          |
+--------------+--------------------+

HBox(children=(HTML(value=''), FloatProgress(value=0.0, max=15.0),␣
 ↪HTML(value='')))

HBox(children=(HTML(value=''), FloatProgress(value=0.0, max=72000.0),␣
 ↪HTML(value='')))
```

1.6.1 Plot the results

[33]:
```
from utils import Health_Condition
observers[0].plot_disease_statistics_during_time(Health_Condition.IS_INFECTED)
```



1.7 Quarantine All the Families

This should have the same effect as quarantining all the people.

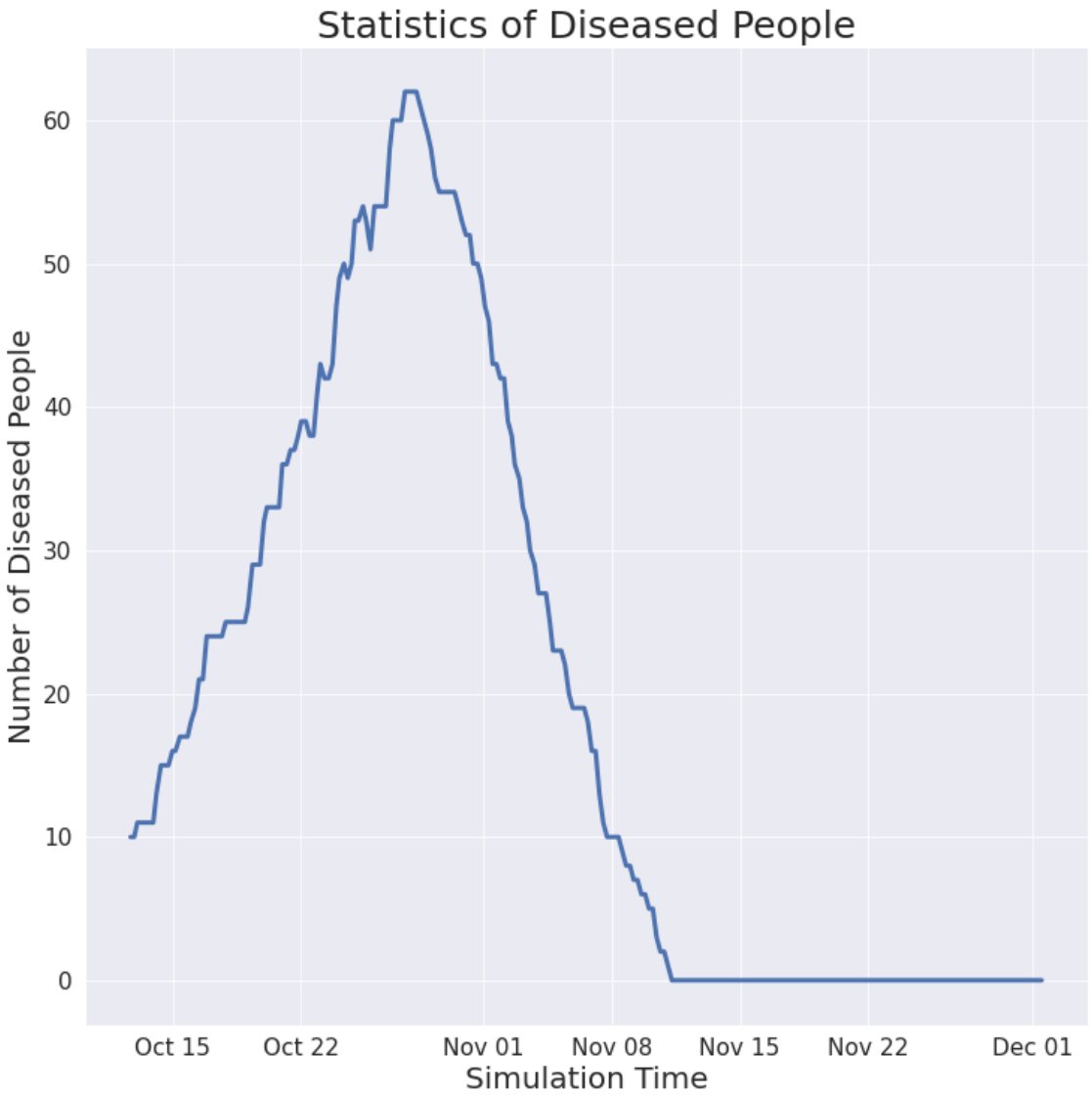
[29]:
```
# Import Parser
from json_handle import Parser
parser = Parser('test')

# Load Simulator from JSON file
simulator = parser.parse_simulator()
simulator.generate_model(is_parallel=False)

# Load Simulator Data from JSON file
```

```
end_time, spread_period, initialized_infected_ids, _, observers = parser.
 ↪parse_simulator_data()

# Build a policy
from datetime import timedelta
from commands import Quarantine_Multiple_Families
from conditions import Time_Point_Condition

commands =␣
 ↪[Quarantine_Multiple_Families(condition=Time_Point_Condition(Time(timedelta(days=15))),␣
 ↪ids=[i for i in range(len(simulator.families))])]

simulator.simulate(end_time
                   , spread_period
                   , initialized_infected_ids
                   , commands
                   , observers)
```

```
INFO - population_generator.py - 1295 - __init__ - 2020-12-04 14:36:32,620 -
Population Generator created
INFO - disease_manipulator.py - 61 - __init__ - 2020-12-04 14:36:32,622 -
Disease Properties generated
INFO - population_generator.py - 1328 - generate_population - 2020-12-04
14:36:32,809 - Jobs required to generate the model: 1

INFO - time_simulator.py - 195 - generate_model - 2020-12-04 14:36:36,354 -
Simulation model generated
INFO - time_simulator.py - 336 - simulate - 2020-12-04 14:36:36,357 -
Initializing the simulation
INFO - time_simulator.py - 343 - simulate - 2020-12-04 14:36:36,385 - Starting
the simulation
INFO - commands.py - 450 - take_action - 2020-12-04 14:36:45,230 - Command
executed: Quarantine_Multiple_Families

INFO - time_simulator.py - 365 - simulate - 2020-12-04 14:36:58,569 - Simulation
completed
INFO - utils.py - 303 - show_people_statistics - 2020-12-04 14:36:58,570 -
+----------------------------+-------+
|           People           | Count |
+============================+=======+
| Population Size            | 500   |
+----------------------------+-------+
| Confirmed (Active + Close) | 79    |
+----------------------------+-------+
| Total Death Cases          | 5     |
+----------------------------+-------+
| Total Recovered            | 495   |
```

```
+---------------------------+-------+
| Currently Active Cases    | 0     |
+---------------------------+-------+
INFO - utils.py - 280 - show_simulator_statistics - 2020-12-04 14:36:58,572 -
+---------------+---------------------+
|   Simulator   |        Data         |
+===============+=====================+
| Start Time    | 2020-10-12 15:45:30 |
+---------------+---------------------+
| End Time      | 2020-12-01 15:45:30 |
+---------------+---------------------+
| Spread Period | 60                  |
+---------------+---------------------+
| Database      | simulator           |
+---------------+---------------------+

HBox(children=(HTML(value=''), FloatProgress(value=0.0, max=15.0),␣
 ↪HTML(value='')))

HBox(children=(HTML(value=''), FloatProgress(value=0.0, max=72000.0),␣
 ↪HTML(value='')))
```

[30]:
```
from utils import Health_Condition
observers[0].plot_disease_statistics_during_time(Health_Condition.IS_INFECTED)
```


Statistics of Diseased People
Number of Diseased People
0
10
20
30
40
50
60
Oct 15
Oct 22
Nov 01
Nov 08
Nov 15
Nov 22
Dec 01
Simulation Time