```
from numpy import random
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from scipy.stats import uniform, logistic
```

```
np.random.seed(50)
population_size=15000
population_data=pd.DataFrame({
    'Person_ID':np.arange(1,population_size+1,1),
    'Age':np.random.randint(18,60,population_size),
    'Health_score':np.random.uniform(50,100,population_size)
})
print('Population Data Sample',population_data)
print('population_data.head()',population_data.head())
```

```
Population Data Sample        Person_ID  Age  Health_score
0                1   50     58.493400
1                2   29     96.870697
2                3   51     93.757733
3                4   48     90.194093
4                5   22     97.252761
...            ...  ...           ...
14995        14996   21     85.675709
14996        14997   28     70.045560
14997        14998   33     72.936087
14998        14999   56     63.380566
14999        15000   37     85.233796

[15000 rows x 3 columns]
population_data.head()    Person_ID  Age  Health_score
0          1   50     58.493400
1          2   29     96.870697
2          3   51     93.757733
3          4   48     90.194093
4          5   22     97.252761
```

```
sample_size=1000
sample_indices=(uniform.rvs(size=sample_size) * population_size).astype(int)
sample_data=population_data.iloc[sample_indices]
print('Sample Data',sample_data)
print('Sample Data Head',sample_data.head())
```

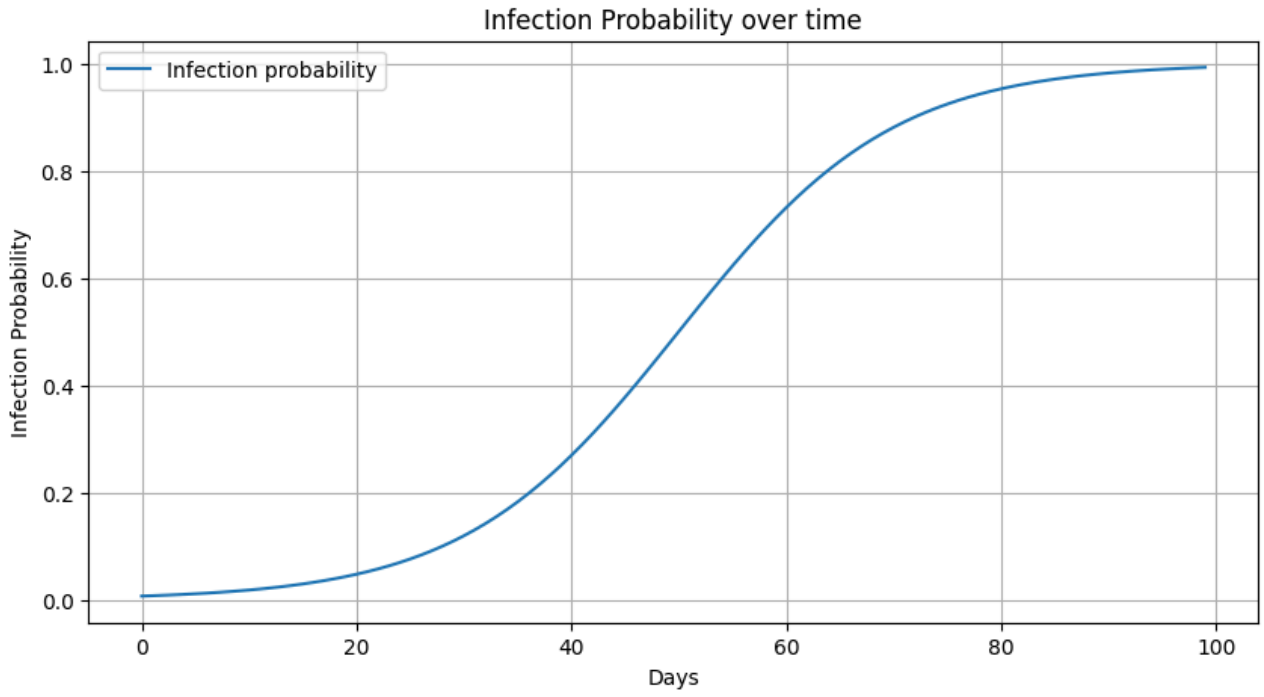
```
Sample Data       Person_ID  Age  Health_Score
4333       4334   48      0.939840
9629       9630    8      0.753339
3907       3908   59      0.871650
4006       4007   24      0.640027
6657       6658   38      0.593660
...         ...  ...           ...
9637       9638   62      0.587026
9666       9667   77      0.546795
3777       3778   77      0.952938
5898       5899   49      0.753344
1413       1414   40      0.509323

[1000 rows x 3 columns]
Sample Data Head       Person_ID  Age  Health_Score
4333       4334   48      0.939840
9629       9630    8      0.753339
3907       3908   59      0.871650
4006       4007   24      0.640027
6657       6658   38      0.593660
```

```
days=np.arange(0,100,1)
loc=50
scale=10
infection_prob=logistic.cdf(days,loc=loc,scale=scale)
infected_population=infection_prob*sample_size
print('Infected Population',infected_population)
```

```
Infected Population [  3.34642546   3.69577067   4.08128558   4.50664933   4.97590093
   5.49347132   6.06421749   6.69345891   7.38701585   8.15124969
   8.99310498   9.92015287  10.94063547  12.06351071  13.29849679
  14.65611538  16.14773235  17.78559464  19.5828614   21.55362747
  23.71293659  26.07678154  28.66208795  31.48667803  34.56921017
  37.92909001  41.58634825  45.56148051  49.87524456  54.5484106
  59.60146101  65.05423718  70.92553245  77.23263254  83.99080743
  91.2127619   98.90805572 107.08250848 115.73760825 124.8699472
 134.47071068 144.52524869 155.01275944 165.90611392 177.17184689
 188.7703344  200.65616994 212.77874159 225.08300134 237.51040626
 250.         262.48959374 274.91699866 287.22125841 299.34383006
 311.2296656  322.82815311 334.09388608 344.98724056 355.47475131
 365.52928932 375.1300528  384.26239175 392.91749152 401.09194428
 408.7872381  416.00919257 422.76736746 429.07446755 434.94576282
 440.39853899 445.4515894  450.12475544 454.43851949 458.41365175
 462.07090999 465.43078983 468.51332197 471.33791205 473.92321846
 476.28706341 478.44637253 480.4171386  482.21440536 483.85226765
 485.34388462 486.70150321 487.93648929 489.05936453 490.07984713
 491.00689502 491.84875031 492.61298415 493.30654109 493.93578251
 494.50652868 495.02409907 495.49335067 495.91871442 496.30422933]
```

```
plt.figure(figsize=(10,5))
plt.plot(days,infection_prob)
plt.xlabel('Days')
plt.ylabel('Infection Probability')
plt.title('Infection Probability over time')
plt.legend(['Infection probability'])
plt.grid(True)
plt.show()
```




```
infection_data=pd.DataFrame({
    'Day':days,
    'Infection_Probability':infection_prob,
    'Estimated_Infected':infected_population.astype(int)
})
print("\n Infection Data")
print(infection_data.head())
```

```
 Infection Data
   Day  Infection_Probability  Estimated_Infected
0    0               0.006693                   3
1    1               0.007392                   3
2    2               0.008163                   4
3    3               0.009013                   4
4    4               0.009952                   4
```