Problem Statement

Write a code in R., that simulates the spread of COVID-19 within a society. The code should utilize vectorization and minimize the use of loops, ideally having only one loop to count the number of days. The simulation should consider factors such as population size, initial infections, interactions between citizens, the duration of illness, mortality rate, infection rate, partial immunity after recovery, and tracking daily statistics.

Visualization of the infection history should also be included.

Experimentation with different parameter values is encouraged to observe their impact on the spread of the virus.

1. The simulation models a population of "N_Population" citizens.

2. Each citizen has a health state: "healthy," "sick," or "dead" (represented as 0, 1, or 2).

3. A small number of citizens are randomly marked as "sick" to start the pandemic.

4. Each day, citizens can have a random number of interactions with other citizens (0-20).

5. Sick citizens remain infectious for 10 days before becoming healthy.

6. Dead citizens cannot become sick or infect others.

7. Sick citizens have a 0.2% probability of dying during a day.

8. If a sick citizen does not die, they can infect healthy citizens they meet with a 30% probability.

9. After recovering, citizens become partially immune with an immunity coefficient of 0.1.

10. The simulation runs for a specified number of days, storing daily results (sick citizens, deaths, new infections, etc.).

11. Data visualization is created to show the infection history.

12. Parameters should be adjustable at the beginning of the code for easy modification.

13. Experimentation with different parameter values is encouraged to observe their effects on infection growth.