

Assignment 5: Modeling COVID-19

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Exercise 1

```
days_range <- 1:250
```

Exercise 2

```
susceptible <- 300000000  
infectious  <- 1  
recovered   <- 0
```

Exercise 3

```
beta <- 0.25  
gamma <- 0.125  
N <- 300000001  
  
for(day in 2:250){  
  susceptible[day] <- susceptible[day - 1] - (beta * susceptible[day - 1] * infectious[day - 1])  
  infectious[day] <- infectious[day - 1] + (beta * susceptible[day - 1] * infectious[day - 1])  
  recovered[day] <- recovered[day - 1] + (gamma * infectious[day - 1])  
}
```

Exercise 4

```
library(tibble)  
  
covid_sim <- tibble(  
  day = days_range,  
  susceptible = susceptible,  
  infectious = infectious,
```

```

    recovered = recovered
  )

```

Exercise 5

```

library(ggplot2)
library(tidyr)

covid_long <- covid_sim %>%
  pivot_longer(cols = c(susceptible, infectious, recovered),
               names_to = "category",
               values_to = "count")

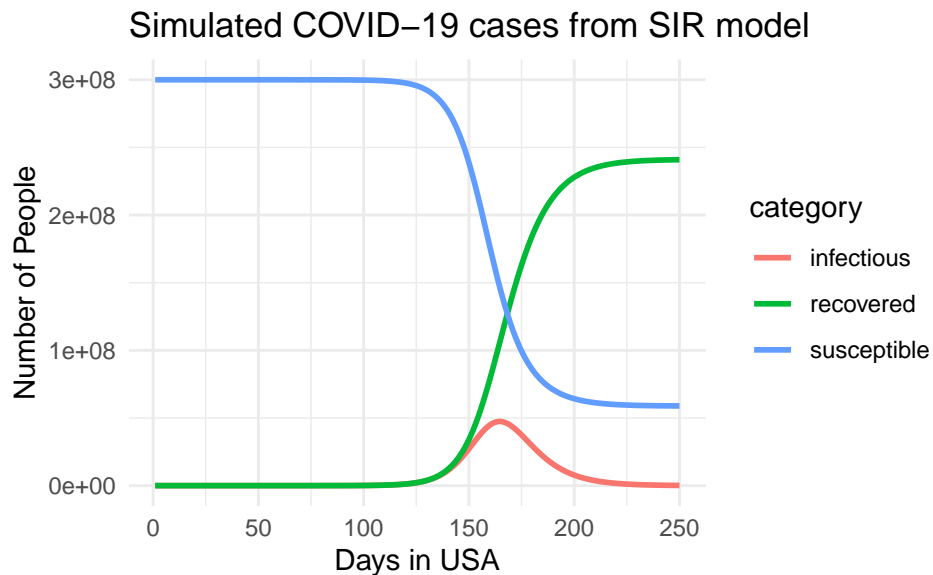
ggplot(covid_long, aes(x = day, y = count, color = category)) +
  geom_line(size = 1) +
  labs(
    title = "Simulated COVID-19 cases from SIR model",
    x = "Days in USA",
    y = "Number of People"
  ) +
  theme_minimal()

```

```

## Warning: Using 'size' aesthetic for lines was deprecated in ggplot2 3.4.0.
## i Please use 'linewidth' instead.
## This warning is displayed once every 8 hours.
## Call 'lifecycle::last_lifecycle_warnings()' to see where this warning was
## generated.

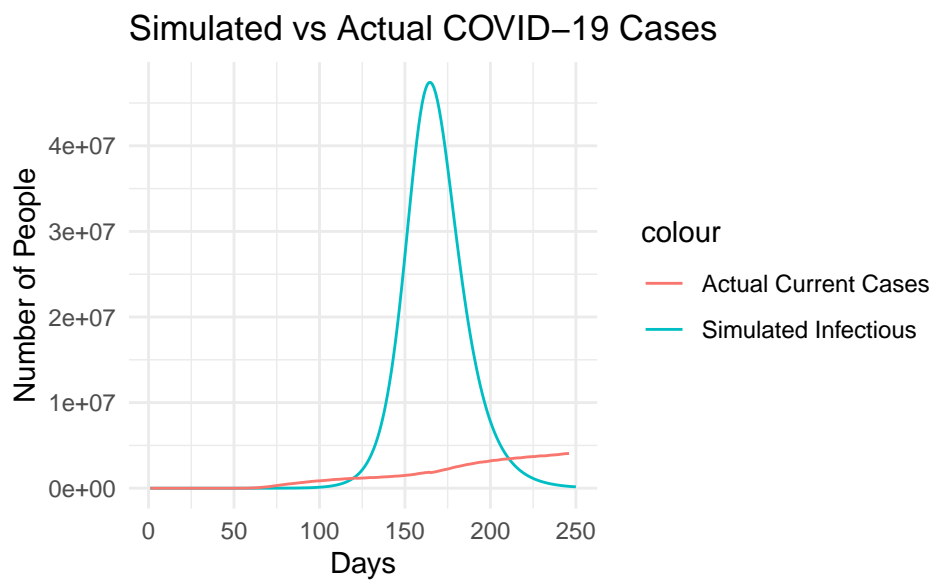
```



Exercise 6

```
library(ggplot2)

ggplot() +
  geom_line(data = covid_sim, aes(x = day, y = infectious, color = "Simulated Infectious")) +
  geom_line(data = covid_real, aes(x = days_in_country, y = current_cases, color = "Actual Current Cases")) +
  labs(
    title = "Simulated vs Actual COVID-19 Cases",
    x = "Days",
    y = "Number of People"
  ) +
  theme_minimal()
```



Exercise 7

Exercise 8

Academic Integrity statement