# Analysis of SEIRD Epidemic Model Graph

The graph depicts a classic SEIRD (Susceptible-Exposed-Infected-Recovered-Death) epidemic model showing the progression of disease through a population over approximately 300 days.

## Key Components of the Graph:

* **Black line**: Susceptible population (initially ~100,000 people)
* **Red line**: Exposed population (individuals infected but not yet infectious)
* **Green line**: Infected/Infectious population
* **Gray line**: Recovered population
* **Blue line**: Deaths from the disease

## Dynamics and Progression:

1. **Initial Phase (0-40 days)**:
   * The population starts almost entirely susceptible (~100,000 people)
   * Very few exposed, infected, recovered, or deaths are visible
2. **Growth Phase (40-80 days)**:
   * Susceptible population begins declining rapidly
   * Exposed and infected populations rise simultaneously, with the exposed curve slightly preceding the infected curve
   * This represents the incubation period between exposure and becoming infectious
3. **Peak Infection (80-100 days)**:
   * Infected population reaches its peak (~20,000 people)
   * Exposed population peaks slightly earlier than infected (~15,000 people at peak)
   * Susceptible population continues decreasing
4. **Recovery Phase (100-160 days)**:
   * Infected and exposed populations decline
   * Recovered population rises significantly
   * Susceptible population continues decreasing but at a slower rate
5. **Equilibrium Phase (160-300 days)**:
   * System reaches a new equilibrium
   * Susceptible population stabilizes at a low level
   * Recovered population stabilizes at ~90,000 people
   * Deaths plateau at ~3,000-4,000 people
   * Very few new infections occur

## Causal Relationships and Feedback Loops:

1. **Negative Feedback Loop (Balancing)**: As susceptible population decreases, fewer new infections occur, reducing the rate of new exposures and eventually slowing the epidemic.
2. **Transmission Chain**: Susceptible → Exposed → Infected → (Recovered or Death)
   * Contact between susceptible and infected individuals causes new exposures
   * Exposed individuals become infectious after incubation period
   * Infected individuals either recover or die
3. **Herd Immunity Effect**: As recovered population grows, the effective reproduction number falls below 1, causing the epidemic to die out naturally.
4. **Case Fatality Rate**: The ratio of deaths to total infections appears to be approximately 3-4% based on final death toll compared to initial population.

This model illustrates the classic epidemic curve showing how infectious diseases spread through a population and eventually subside once sufficient immunity has been developed or susceptible individuals are no longer available in large numbers.