The SIRD model is a mathematical way to chart how a disease spreads through a population. For each period, a calculation is performed to determine the next iteration of Susceptible, Infected, Recovered, and Dead populations. By changing the parameters of the model, one can impact how much populations can sway for each period. A typical SIRD model starts with a completely healthy population that has a disease introduced, along with the conditions that Susceptible people fall ill, infected either die or recover, and the dead and recovered stay where they are. While this is usually the case for many SIRD models, this is not a requirement. In our case, we created a model that reflects a typical SIRD case, and another with an added condition that recovered people have a chance to become Susceptible again. In our testing of both models, the typical case only ran for about fifty iterations before most of the population recovered and became immune to the simulated disease, while the modified case ran for over three-hundred iterations until nearly all the population was deceased.

Going into specifics, we saw that in our base case, the number of infected individuals reached a peak early on, and gradually decreased until reaching less than 1% of the population at the end of the simulation. Our susceptible population saw nothing but a decrease with time, with their population loss slowing down as their numbers became fewer and fewer. Our recovered and dead population saw a similar case, seeing significant growth early on that tapered off as the infected population declined. This is very similar to how a normal disease spread would happen in real life over a period of time. Individuals become infected, and then they recover or die. Once all possible hosts have been removed from the population, the infection rate plummets, and the world is left with a recovered immune population.

Meanwhile, in our modified case we see much of the same case, except for the number of recovered individuals having a similar curve to the infected. This is due to the additional possibility of returning to the susceptible population for the recovered. In this modified chart, all populations, excluding the dead, fell to nearly non-existent numbers by the end of the simulation. The behavior in this model represents a sort of unstable disease, such as one with many variants or the potential of creating many variants. In the presence of a new variant, immunity may not be perfect, and reinfection could be possible.