Life Course of COVID-19 in NYC

By Nicki Mohammadi

As the world processes the COVID-19 crisis, we are most concerned with what it may look like for those of us living in New York City, the global epicenter of the pandemic. Below I discuss the potential evolution of the COVID-19 crisis and the likelihood of each escalation in severity. It's important to remember that at this point, there are limitations on the available data. The COVID-19 pandemic is a constantly developing and dynamic situation. All available data are preliminary and subject to over or underestimations.

What are your chances of acquiring COVID-19 in the first place?

We're interested in the prevalence rate of COVID-19. Prevalence of a disease describes the proportion of a population who have the disease during a certain time. As of April 20th, there are 136,806 confirmed COVID-19 cases in NYC, which has a population of 8.3 million, putting the prevalence of COVID-19 at 1.6%.

To the best of our understanding, the mode of spread and transmissibility is via respiratory droplets. A high level of transmissibility combined with minimal immunity in our population has resulted in an overwhelming number of cases. The crowded, urban environment of New York City has facilitated a local outbreak to occur. Given the mode of transmissibility, this makes NYC subject to a higher prevalence of the disease than most of the country. Again, these numbers are susceptible to change due to the rapid evolution of the disease. At the beginning of an outbreak, while testing capacity is low, surveillance is biased toward detecting severe cases. Thus, mild to moderate cases may go undetected and are likely underrepresented in our calculations. Additionally, many of these patients who were tested may be those with risk factors or underlying conditions.

There is some evidence that some or even a majority of infected individuals are asymptomatic carriers. These people are infected with the virus and can transmit it but never have any symptoms related to the infection. A study from New York Presbyterian Hospital published on April 13th presented the results of pan-screening all pregnant women giving childbirth in the hospital. This population might be a good representation of the prevalence of the virus in the

general population and the rate of asymptomatic disease among infected individuals. The authors found that the prevalence of active viral infection within this group was 15.4% and the rate of asymptomatic disease was 13.5% overall or 88% of infected individuals. To state these findings in another way, only 12% of infected individuals were displaying symptoms in this group of pregnant women.

Hospitalization

For most COVID-19 victims, symptoms are mild to moderate and they are able to adequately recover at home. According to the World Health organization (WHO), roughly 80% of the population with COVID-19 recover without needing hospital treatment. Fortunately, that means that many of you will not reach this step. In NYC, the hospitalization rate has hovered around 26%. The rate of hospitalization increases with age, and the rate is highest among adults ≥ 65 years. Additionally, approximately 12% of hospitalized patients have an underlying condition. This includes chronic lung disease, asthma, obesity, diabetes and people who are immunocompromised. The median hospital stay is 10 days.

ICU Admission

Hospitals have been preparing for a surge of critically ill patients in the ICU as soon as COVID-19 began spreading in the country. ICU's around the country braced themselves to take care of the sickest of the sick, with admission contingent upon severity of the illness as well as capacity. A majority of ICU admission patients had at least one underlying health condition or risk factor. While ICU admission rates in different parts of the US are still to be determined, rates in China hovered around 7% and went up to 12% in Italy.

What is a Ventilator and Who Needs It?

Clinical guidelines on ventilating COVID-19 patients are evolving. In simple terms, a ventilator takes over the body's breathing process when our lungs are too weak to do so. This gives our bodies a break to continue fighting. In severe cases of COVID-19 the virus damages the lungs, making it harder to breath and get oxygen to our bodies.

The lung damage that COVID-19 causes is not well understood and can be mistaken for acute respiratory distress syndrome (ARDS). While mortality rates of patients on ventilators may be

terrifying, it is important to consider the characteristics of the population that is being ventilated. Many patients who are sick enough to require this invasive procedure may be older and have more underlying conditions. For instance, obesity was found to be a risk factor for respiratory failure and can contribute to the need of mechanical ventilation. Because of the evolving nature of the situation, it is hard to give a percentage of patients under mechanical ventilation. However, the current literature says that 20-35% of patients needed ventilation support.

Recovery & Mortality

While the quarantine period is a long 14 days for COVID-19 exposure, recovery is no longer a distant prospect. In fact, over 18,000 patients in NYC have already recovered and that number is steadily growing. Patients who spend time in the ICU will undergo a longer recovery period.

A case fatality ratio of an infectious disease is a measure of the proportion of individuals diagnosed with a disease who will die from it. This number is still in the works for COVID-19 but for reference SARS in 2003 had a case fatality rate of 14-15% and MERS was 35%. A case report out of China suggested a preliminary case fatality ratio of 1.4-2.3% for COVID-19.

The course of a disease is never straightforward or easily predictable. This makes it challenging to provide definitive answers. Nevertheless, a worldwide collaboration of healthcare workers and scientists is working tirelessly to find concrete answers.