

**The Benefits of South Korea's COVID-19 Response: A Governmental Approach**  
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**Introduction: Nathan**

On January 20, 2020, South Korea announced the first case of COVID-19 in their country. Now, only 19,000 people in the whole country have been infected. An incredibly small amount compared to other countries. This paper focuses on the spread of the epidemic in Korea and the government's role in controlling its effect on the country. This is done through analysis of infection and death statistics, hospital management and resource use, their strategies in mitigating the virus, and their development of treatments and vaccines. Through our findings, we found that the Korean government was effective in its response to the virus because of its efficient usage of hospitals and its many programs to minimize the spread of the virus resulting in a low fatality and infection rate.

**Infections and Fatality Rates: Sarah**

As of August 18th, 2020, South Korea has a total documented case count of 15,761, with 1,521 active cases. At that time, there were only 306 deaths due to COVID-19 in South Korea. While the global case-fatality rate fluctuates anywhere from approximately 3.5% to 7% throughout the spread of the pandemic, South Korea maintains a significantly lower rate of barely 2%. The Korean government's effective response to COVID-19 outbreak is the key to South Korea's low infection and fatality rate.

South Korea government's quick reaction to the pandemic likely correlates with the effects of a different coronavirus which appeared in the summer of 2015. To explain, Middle East Respiratory Syndrome coronavirus (MERS-CoV) is a virus transmitted through respiratory droplets, first reported in Saudi Arabia. On May 20th of 2015, the first case of MERS in South Korea was diagnosed. In the two months following, the virus would continue to spread in South Korea, resulting in 186 infected cases and 38 deaths. According to the article "Middle East respiratory syndrome: what we learned from the 2015 outbreak in the Republic of Korea", the MERS-CoV outbreak in South Korea "is the largest outside the Arabian Peninsula"(Oh et al). However, the experience of this disease that panicked Koreans five years ago actually plays a positive role in the South Korean government's reaction to COVID-19- "the government was criticized for a slow response [to MERS-CoV outbreak] and that outcry has been widely seen as the cause for regulations and actions that allowed for such a rapid response to this new coronavirus" (Berger). For one, having this prior experience allows the Korean government to make decisions regarding implementing quarantine and other safety precautions early on, limiting the spread of COVID-19. On top of that, after the incident with the MERS-CoV, a system that allows for quick approval of testing kits was created. Having this preparation allows the Korean government to identify infected patients faster, and arrange for treatments before it's too late.

Since COVID-19 spreads through close contact with respiratory droplets of infected individuals, the most straightforward method to prevent such interaction is through social distancing and quarantine. In order to oversee this guideline, the Korean government "developed a phone app where those in quarantine can report the status of their health twice daily... The app also uses GPS to keep track of their location to ensure they are not breaking the quarantine rules" (Park). For those that refuse to install this app or don't have access to devices that allow them to

do so, phone calls and sometimes sudden visits to their residences are made to check up on them. Although controversy over mandatory quarantine and the monitoring method exists, its effectiveness can not be denied. To some extent, it takes away privacy and freedom for residents in South Korea, but overall, it is successful in the greater goal of limiting COVID-19 transmission.

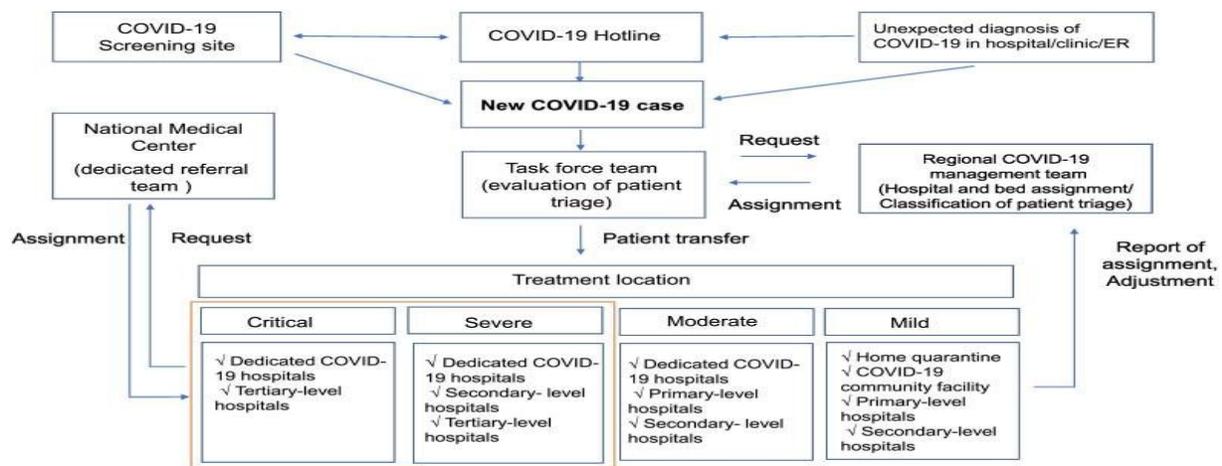
## Hospital Management and Resource Use: Faith

### Introduction

Although a majority of COVID-19 cases are not severe, the percentage that are likely require hospitalization. Thus, in order for hospitals to function efficiently and safely during the pandemic, to further reduce the spread of infection, implementing a management system amongst patients and hospitals will be beneficial. Upon seeing a rise of cases early March, South Korea’s government quickly reacted; by reorganizing hospitals to accommodate COVID-19 patients. The government formed a COVID-19 task force involving all main government ministries, as well as regional and city governments for precise efforts. One focus of South Korea’s coronavirus task force includes hospital reorganization. This section discusses the importance of hospital management and resource use during the COVID-19 outbreak in Korea, with a focus on governmental influence.

### Hospital Classifications and Resources

The South Korean government created a system that assesses and relocates COVID-19 patients based on safety and needs. Firstly, when a new case of COVID-19 appears, both the national COVID-19 task force team and regional COVID-19 management team are alerted. The COVID task force evaluates the patient’s symptoms, followed by classification. At the regional level, the management team then moves patients to different facilities depending on their severity and space availability. Cases are classified as mild, moderate, severe, and extremely severe. This process is conducted via triage centers at hospitals or larger district health centers.



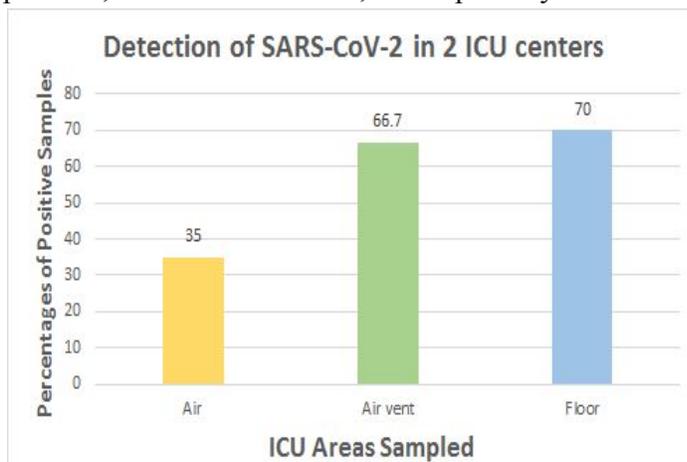
For example, if a patient contracts a mild case that requires monitoring, they would be transferred to a COVID-19 community facility. These individuals are primarily under the age of 65, free of underlying conditions, and do not require ventilators. A majority of these centers were

converted from training centers, dormitories, and resorts; most being freestanding buildings with ideal ventilation. Here health care professionals record patients' overall conditions twice daily, because new symptoms and changes would call for relocation to hospitals. COVID-19 community facilities were established to allow more resources for severe patients as well as non-COVID cases. As of March 30th 2020, when the highest spike of cases began to decrease, 16 community facilities were operating in South Korea.

For moderate to extremely severe cases, patients are transferred to dedicated COVID-19 hospitals and emergency centers. Most facilities in this department are government run, with the exception of a few private hospitals. Hospitals are guaranteed a negative-pressure transport chamber, negative pressure isolation rooms, an anteroom, dividing walls, and properly distanced beds. Some are university hospitals hosting negative-intensive care units in patient rooms and admission rooms, in addition to specialized professionals in infectious and respiratory disease. These experts were appointed by the Ministry of Health and Welfare, a branch of the government. As of March 30th, 2020, 67 dedicated COVID-19 hospitals with over 7000 beds were established. Emergency centers cater to patients in need of immediate treatment. They do not diagnose patients, which is done by screening sites to avoid sudden influxes of possible COVID patients. In South Korea, all hospitalization fees for confirmed patients were covered by government funds or the National Health Insurance. The creation of dedicated COVID-19 facilities also alleviates the risk of infection for non-COVID patients.

### Analysis

SARS-CoV-2 is an extremely mobile and resilient virus. For example, extensive research shows that SARS-CoV-2 can aerosolize and suspend in air for up to 3 hours. A study from hospitals in Wuhan, China provides evidence that SARS-CoV-2 remains in the air, vents, and floors of hospitals. Of the two facilities sampled, 35% of ICU air samples, 66.7% of ICU air vent samples, and 70% of ICU floor samples tested positive. Furthermore, 100% of samples from a pharmacy floor that did not house patients detected SARS-CoV-2. This implies that SARS-CoV-2 may linger on the soles of healthcare workers. Therefore, given the mobility and resilience of the virus, hospitals must enforce stricter guidelines to avoid transmission between patients, healthcare workers, and especially non-COVID patients.



The Korean government's precise hospital management measures and resource use may be a reason behind their overall low COVID-19 incidence rate and especially, case fatality rate. Non-COVID hospital inpatients may include the severely ill, individuals with underlying conditions, or elders. People with these conditions are at greater risk for serious symptoms or death from COVID-19. For instance, in one nosocomial outbreak in London, of 66 confirmed cases, 36% had

died. Only 55% of hospital-acquired cases noted sharing a bay with a confirmed patient, further implying that the virus can travel throughout facilities. Moreover, research shows evidence that

these susceptible COVID-19 patients have high rates for viral RNA shedding. Therefore, susceptible patients may not only have increased risk of death for themselves, but also increased risk of transmitting the virus to others. Given the dangers of nosocomial transmission, South Korea's sophisticated hospital management system may have alleviated a majority of such issues. They prepared enough resources to separate COVID patients from regular patients, which potentially contributed to the country's overall low incidence and case fatality rate.

### **Mitigation Efforts: Nathan**

Before COVID-19, there was MERS or Middle East respiratory syndrome. This virus acted as a wakeup call to the South Korean government, prompting them to put more funding into epidemic prevention programs to prevent another pandemic from ravaging their country again. Only five years later, COVID-19 had begun to spread throughout the globe, including Korea. However, they were prepared this time and implemented multiple strategies they learned through the MERS outbreak. Through the usage of contact tracing, implementation of widespread testing, and self-quarantine, the Korean government was able to effectively minimize the spread of COVID-19 while also minimizing its damage to the economy.

One lesson they learned from MERS was the importance of contact tracing. This tracing allowed officials to link cases into clusters (where one person infects many people simultaneously), the largest one stemming from a megachurch in Daegu. It allowed for early detection and isolation of cases, slowing down the rate of infection compared to other countries. The usage of contact tracing instead of population-wide lockdowns also softened the impact that COVID-19 had on the economy since most people could still go to work, avoiding the recession that many other countries faced. This is seen when comparing Korea's 2020 Q2 GDP shift with the USA, -3.3% and -32.9%, respectively, showing a vast difference between the effect of the coronavirus in each country (however, this doesn't account for the magnitude of the pandemics between each country). Mandatory lockdowns in the US have caused significant disruptions in both consumer spending and employment. Something Korea is not experiencing.

Another primary reason why the Korean government was successful in mitigating the effects of coronavirus was its ability to quickly obtain widespread testing. This is due to the government's collaboration on research towards RT-PCR by working with private companies, expedition towards approval by the Korean CDC, and rapid deployment. Being able to fast track the creation of tests allowed the Korean government to perform an aggressive testing strategy, testing anyone with the suspicion of having COVID instead of only foreigners and people traced to a previous case. The liberal usage of testing is seen when comparing the percentage of positive to negative tests between Korea and the US, where Korea has 2.9% to the US's 17.4% 119 days after each country's first case. A large number of tests allowed the Korean government to contain viral spread more effectively compared to other countries by identifying cases and isolating them before they can spread COVID to others.

Finally, the Korean government's usage of targeted isolation allowed the economy to run as normal while also protecting people from becoming infected. The most important part of this targeted isolation is that Korea never closed its borders. Instead, they implemented a strict self-quarantine program where all incoming travelers had to isolate themselves for 14 days. In February, 22 per 10,000 travelers that were quarantined were identified as cases, showing the effectiveness of this program at preventing cases from infecting others while still allowing people in and out of the country. Travelers were not the only ones that were self-quarantined. As

previously mentioned, individuals found to have recently contacted someone suspected or confirmed to be infected were also quarantined, preventing future infections before an individual started to show symptoms. People unable to self-isolate in their own homes were allowed the free stay to support centers, allowing people without housing or with vulnerable family members a place to stay. This self-quarantine program, compounded with the programs previously mentioned are the reason for Korea's exceptional drop in R-value (a value measuring the average amount of people someone with a virus infects), which reached a value of 0.4 by March. Comparing this to the US, which currently has an R-value between 0.8 to 1.2, exemplifies the effectiveness of the Korean response to the coronavirus since, even with the conservative estimate, each Korean spreads the virus to half the people that an American does. This is thanks to the actions the government has taken in preventing the spread of COVID-19, including contact tracing, widespread testing, and isolation.

### **Treatment and Vaccine Development: Liana**

Ever since the beginning of the spread of SARS-CoV-2, drugmakers worldwide have been rushing to develop treatments for this flu-like illness. According to The Korean Herald, "the Ministry of Health is giving 45 billion won [approximately 37.5 million US Dollars] to support all phases of clinical trials for COVID-19 treatment development and 49 billion won [approximately 45.1 million US Dollars] to promote development of vaccines." Although it may seem strange that vaccine development is receiving a larger budget compared to treatment development, the Health Ministry explained that these budget amounts were carefully considered and calculated. The budget for treatment development was set based upon track records of other drug developments, and how much each of their clinical trial phases had roughly cost. As for vaccine development, it was decided that vaccines require a larger pool of healthy participants for clinical trials, so therefore was assigned a larger budget.

One of the drugs developed in South Korea that is furthest into testing is CT-P59, developed by South Korean pharmaceutical firm Celltrion. An antibody treatment that is directed against the surface of the virus, it is designed to block it from locking onto human cells. According to its pre-clinical study, this treatment showed "improved recovery in runny nose, cough and body aches after the first day of treatment, and clearing of lung inflammation within six days." This treatment successfully tested on animals in early June, and has begun Phase I clinical trials on 32 healthy patients in the Chungnam National University Hospital, testing for its safety and any potential side effects. Additionally, Celltrion is currently working closely with the UK to begin global Phase I trials. They hope to test on a total of 50 mild COVID patients, testing the safety, tolerability, and virology of CT-P59. As for Phases II and III, Celltrion is looking into conducting tests on patients with mild to moderate symptoms in other countries, such as Europe and possibly Brazil. If all phases of this treatment CT-P59 succeed, Celltrion hopes to begin mass production of this drug in the first half of 2021.

Similarly, South Korean based Genexine Inc has developed a deoxyribonucleic COVID-19 vaccine that utilizes a jet injector method. As it is injected without needles, children and other patients who fear needles can comfortably and safely receive the vaccine. The development of this vaccine began in March, when Genexine formed an institution with other institutes, and since then, it has been the first domestic vaccine to be approved by South Korea's Ministry of Food and Drug Safety. GX-19 has already begun undergoing clinical trials, and preliminary data of the drug's safety and tolerance are expected to be gathered in September's

initial trials. Genexine's Phase I trials will consist of 40 healthy participants from South Korea, taking place over three months. This will soon be followed by Phase IIa, which will be conducted with 150 participants in the second half of 2020 across multiple nations, such as Thailand and Indonesia, as well as other countries where the spread of COVID-19 is severe. As shared by a Genexine official, "if everything goes as planned, [Genexine aims] to complete all stages of [their] human clinical trial by the end of 2021."

### **Conclusion: Liana**

In conclusion, South Korea's government played a major role in minimizing the effects of COVID-19 in Korea. Based on our research, the key points that contributed towards this effective response were the country's efficient hospital system, quick mitigation efforts, and ongoing development of treatments and vaccines. They had enforced quarantine rules much earlier on, back when the pandemic was not as serious, which led to lower fatality and infection rates. As for those who had gotten infected, the country had an effective hospital management system that was careful to quarantine the sick and prevent them from infecting others. Additionally, they had also begun developing and testing treatments early on. These actions all contributed to their successful mitigation efforts. All in all, South Korea's government did an excellent job of flattening the curve of COVID-19, and their efforts should be acknowledged and emulated.

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