Sweden's Societal Response to COVID-19

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INTRODUCTION:

From Ebola Virus and Influenza Virus to Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV) and the Middle East Respiratory Syndrome Coronavirus (MERS-CoV), the world has seen the tremendous social, political, and economic impact of viruses. Despite the fact that technology has improved drastically over the decades, it is far from being able to conquer biohazardous substances. COVID-19--a viral outbreak caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV2) that started in December of 2019--was declared a global pandemic, according to the World Health Organization (WHO) on March 11th of 2020.

SARS-CoV2 is a novel virus that can be transmitted through spillovers and is suspected to have originated from bats with pangolins being the intermediate host. However, studies have challenged this hypothesis with careful consideration over potential transmission through birds and other wild and domestic animals. Aside from researching the origin of the virus, people are more worried about the aftermath and treatment of the disease. COVID-19 has an incubation of 2-14 days, with symptoms including shortness of breath, fever, headache, diarrhea, fatigue, and more, although there are asymptomatic patients as well. The virus can commonly be transmitted through respiratory droplets and direct contact. The R value, or the number of secondary infections generated from one person, is around 1.0, varying in different regions. Because such symptoms parallel those of many other diseases, namely the common cold, specific viral or antibody tests are carried out to confirm the presence of SARS-CoV2 in one's blood. Although some patients successfully recover simply by resting, others require more intense care such as ventilator usage. Not surprisingly, drug and vaccine development are the ultimate goal for scientists to put an end to the pandemic, with many already demonstrating significant medical usages in patients.

Though suspected to have started in Wuhan, China, the outbreak is in fact much more out of control in many other countries outside of Asia. For example, several large countries in Europe such as Italy and Spain reported sudden increases in the total number of cases around mid-March. Along with that, the United States surpassed China in the number of cases on March 26th, around three months after the first diagnosed patient; as of April 24th, the United States had over 890 thousand confirmed cases in comparison to only 84 thousand in China, increasing over ten-fold in less than a month. Countries including South Korea, China, and Singapore have taken aggressive measures against the pandemic and therefore saw significant reductions in cases and death numbers within a short period of time. On the other side, the United States along with multiple European countries have demonstrated opposite results. This phenomenon along with the uncertainty in case numbers and mortality rates only further emphasize the importance of the strategies countries implement in response to COVID-19. A simple, yet effective strategy of social distancing has largely been hampered due to factors such as political tensions, national economies, and even ineffective news reports.

One of the countries with notable societal responses is Sweden, which has relatively relaxed social distancing restrictions, whether it's regarding travel bans, social gatherings, or quarantine measures. From their number of cases, fatality rates, and hospital resource usage to their mitigation efforts and vaccine developments, Sweden has achieved its intended results regarding COVID-19 to a minimal extent.

INFECTION AND FATALITY RATES:

With the previous knowledge of Sweden's response to the pandemic, here is a general breakdown of data collected from infections and fatality rates of Europe over time.

According to the widely used COVID-19 Map website made by the Johns Hopkins University and Medicine Coronavirus Resource Center, it currently indicates the following numbers in Cases and Deaths as of August 15th, 2020.

Johns Hopkins University and Medicine Coronavirus Resource Center Provided Data for Cases and Deaths for Most European Countries

Key:
Countries Worse than Sweden
Countries with Similar Rates as Sweden
Sweden

Countries in Sweden	**# of Cases**	**# of Deaths**
Aland Islands	N/A	N/A
Albania	7,117	219
Andorra	989	53
Austria	22,876	725
Belarus	69,308	603
Belgium	77,113	9,924
Bosnia and Herzegovina	15,535	469
Bulgaria	14,243	492
Croatia	6,258	163
Cyprus	1,318	20
Czechia	19,693	394
Denmark	15,758	621
Estonia	2,184	63

Faroe Islands	N/A	N/A
Finland	7,700	333
France	249,655	30,410
Germany	223,836	9,235
Gibraltar	N/A	N/A
Greece	6,632	223
Hungary	4,877	607
Iceland	1,983	10
Ireland	26,995	1,774
Isle of Man	N/A	N/A
Italy	252,809	35,234
Jersey	N/A	N/A
Kingdom of the Netherlands	N/A	N/A
Kosovo	11,130	381
Latvia	1,315	32
Liechtenstein	91	1
Lithuania	2,352	81
Luxembourg	7,405	122
Malta	1,276	9

Moldova	29,483	884
Monaco	146	4
Montenegro	3,930	73
Netherlands	63,127	6,189
North Macedonia	12,515	535
Norway	9,908	261
Poland	55,319	1,858
Romania	68,036	2,904
Slovakia	2,801	31
San Marino	699	42
Serbia	29,233	665
Slovenia	2,369	129
Svalbard and Jen Mayen	N/A	N/A
Sweden	84,294	5,783
Switzerland	37,671	1,991
Ukraine	91,795	2,076
United Kingdom	315,621	46,791
Vatican City	N/A	N/A

Some graphic comparisons from Our World in Data also provides the amount of cases that occurred in the highlighted countries (France, Germany, Italy, Ukraine, and the United Kingdom) for data comparison. Though the amount of residents are highly different, there are correlations of when the rates started to rise.

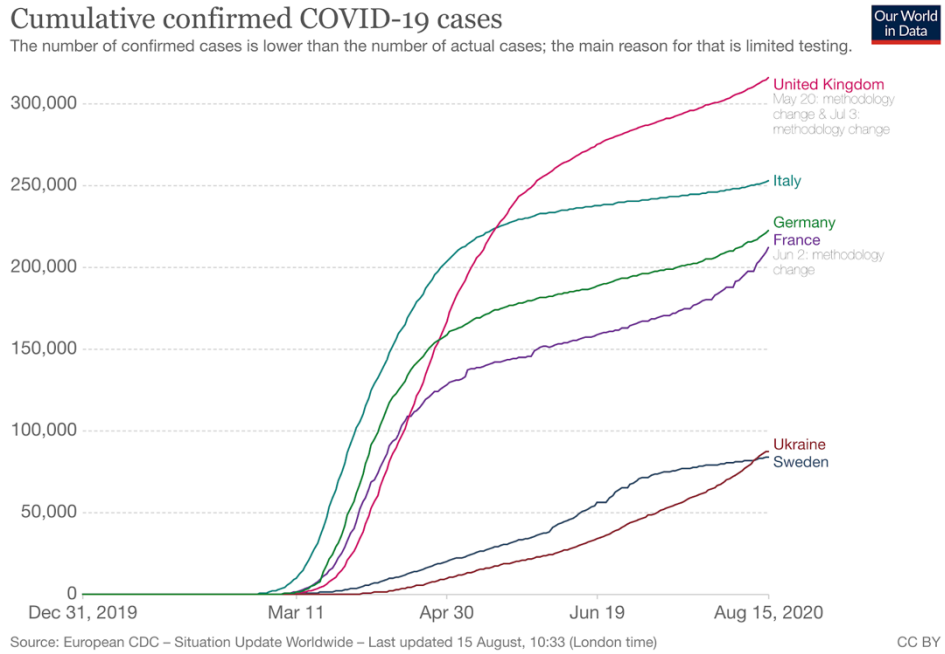

Figure 1. Number of Covid 19 Cases for countries United Kingdom, Italy, Germany, France, Ukraine, and Sweden as of August, 2020.

Country	# of Cases	Population
United Kingdom	315,621	66,650,000
Italy	252,809	60,360,000
Germany	223,836	83,020,000
France	249,655	66,990,000
Ukraine	91,795	41,980,000
Sweden	84,294	10,230,000

Table 1. Number of Covid 19 Cases for countries United Kingdom, Italy, Germany, France, Ukraine, and Sweden as of August, 2020.

The biggest reason why the other countries have higher spikes than Sweden is due to the size of each country's population. All of the countries that Sweden is being compared to have at least four or more times the amount of people, thus explaining why the curves are peaked.

Most accelerated rates occurred around March to April and started to stabilize around June and July.

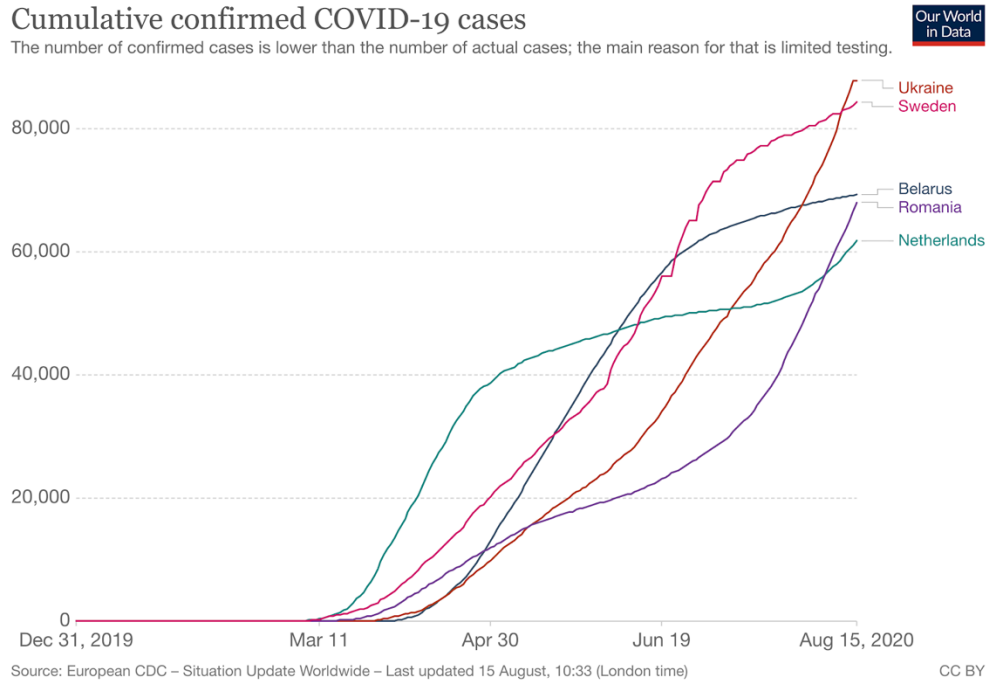

Figure 2. Number of Cases with similar Covid 19 rates as Sweden. Countries include Ukraine, Belarus, Romania, the Netherlands, and Sweden as of August, 2020.

Country	**Population**
Sweden	10,230,000
Ukraine	41,980,000
Belarus	9,485,000
Romania	19,410,000
Netherlands	17,280,000

Table 2. Number of Cases with similar Covid 19 rates as Sweden. Countries include Ukraine, Belarus, Romania, the Netherlands, and Sweden as of August, 2020.

Another comparison is made in **Figure 3** with countries having around the same average population and different case rates.

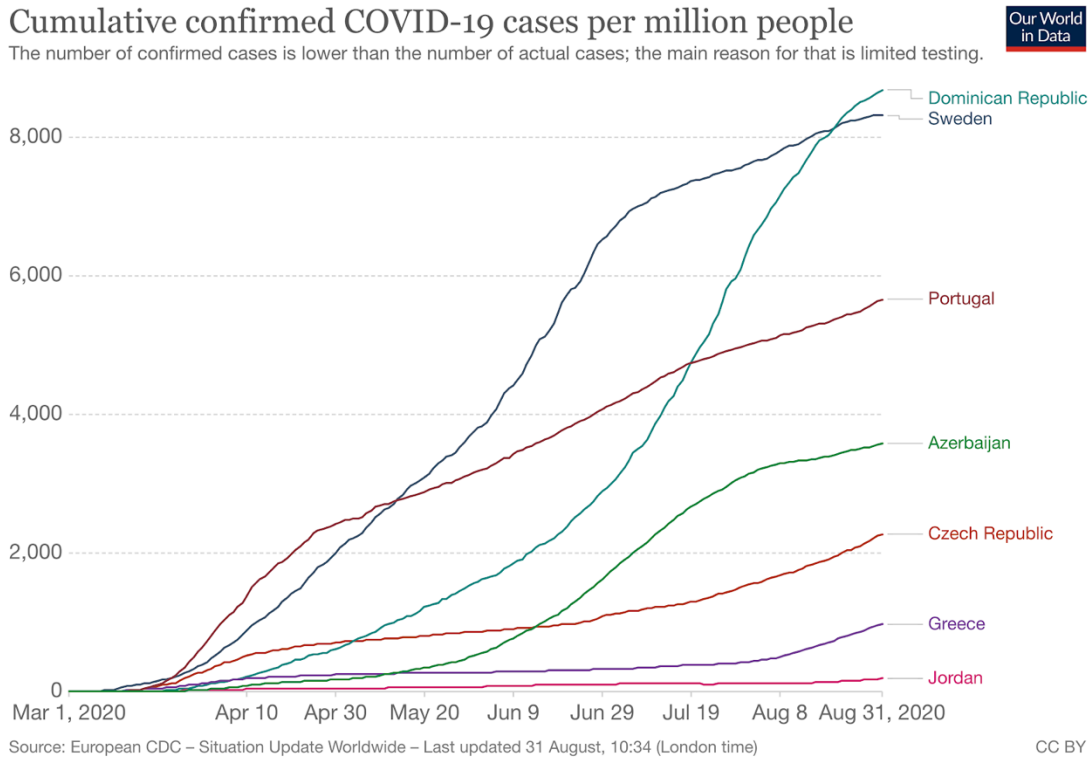

Figure 3. Covid 19 rates with countries that have similar population rates as Sweden as of August, 2020. Countries are Dominican Republic, Sweden, Portugal, Azerbaijan, Czech Republic, Greece, and Jordan.

Countries	Population	Cases
Dominican Republic	10,847,910	94,421
Czech Republic	10,708,981	24,367
Greece	10,423,054	10,134
Jordan	10,203,134	1,966
Portugal	10,196,709	57,768
Azerbaijan	10,139,177	36,309
Sweden	10,099,265	83,958

Table 3. Covid 19 rates with countries that have similar population rates as Sweden as of August, 2020. Countries are Dominican Republic, Sweden, Portugal, Azerbaijan, Czech Republic, Greece, and Jordan.

Sweden Cities	Cases	Deaths
Stockholm County	23,101	2,384
Västra Götaland County	17,850	828
Jonkoping County	4,644	179
Skåne County	3,569	262
Uppsala County	3,534	239
Östergötland County	3,488	239
Gavleborg County	3,119	160
Västmanland County	2,600	178
Örebro County	2,479	171
Södermanland County	2,381	254
Dalarna County	1,945	171
Västernorrland County	1,744	128
Halland County	1,714	78
Norrbotten County	1,575	81
Kronoberg County	1,138	103
Jamtland County	1,124	59
Varmland County	1,024	73
Västerbotten County	895	31
Kalmar County	764	62
Blekinge County	482	14
Gotland County	230	6

Table 4. The breakdowns of the amount of cases of infection and deaths from the cities of Sweden.

A brief history of the infections and fatality rates in Sweden began around February the 1st, where the first case was identified on the Our World in Data chart. According to the Public Health Agency of Sweden, the first test that came back as positive was performed on January the 30th.

At the end of February, the cases started to spread rapidly. Near the end of March, there were a little more than 4,000 cases in Sweden. On March 4th, the Public Health Agency distributed more tests to various other parts of Sweden, which accounted for the spike in infection rates.

According to the Public Health Agency of Sweden, the number of tests that were carried out totaled around 10,000 every week near the end of March. Mid April the tests grew to be around 20,000 carried out every week. One of the main causes for this were due to Sweden officials who, "haven't enforced business shutterings," and allowing, "Shops, restaurants and gyms (to) … stay(ed) open…" According to The New York Daily News.

The rates grew steadily around May and started to peak even higher in June while the tests carried out grew to 30,000 each week. At the end of May, there were already a total of 275,819 samples that have been tested since the start of the Coronavirus outbreak.

By the end of June there were around 68,000 cases. The beginning of July continued that rate but then started to slow down as new implementations and strategies were enforced in Sweden. By August, the curve started slowing down and resumed the same growth rate as March, rising steadily but not spiking anymore.

Sweden's actual response did not achieve their intended response as seen from March to June and still has not yet fully arrived at their goal to keep the curve flattened. Yet, the data of the rates in August shows that Sweden is slowly achieving their goal at a slow yet steady pace.

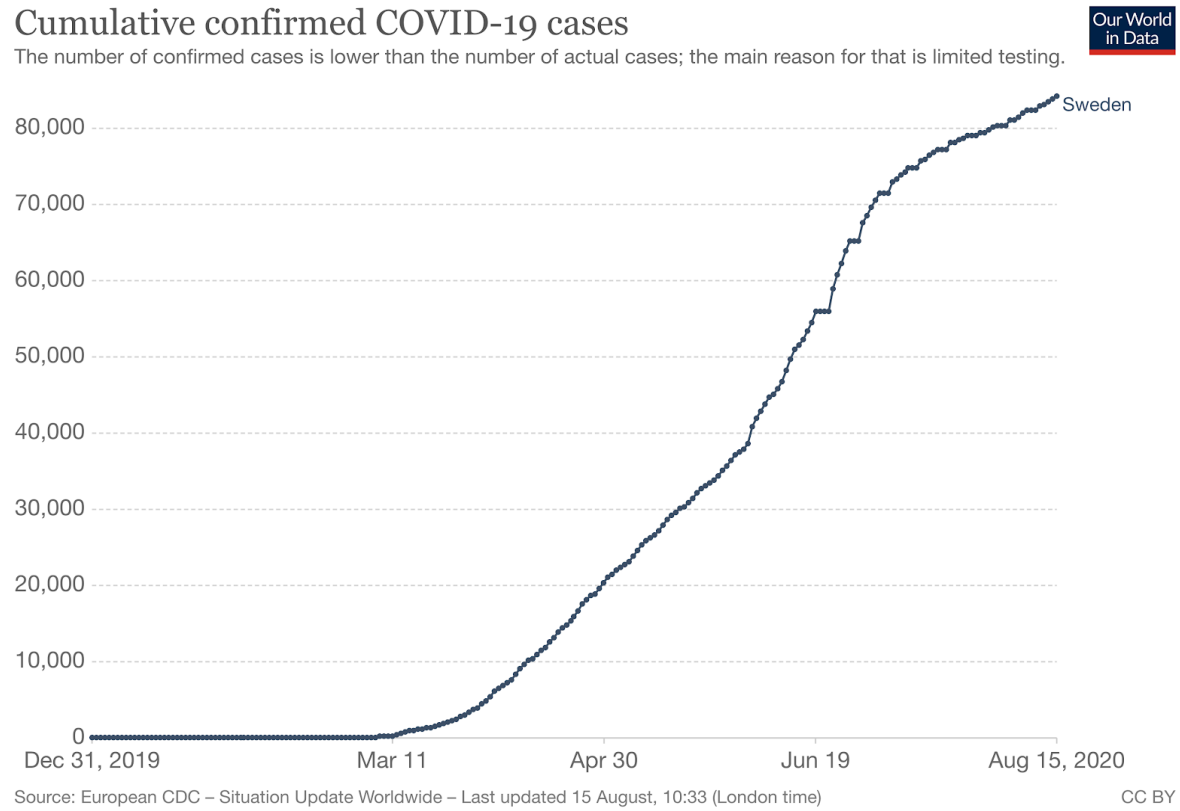

Figure 4. COVID-19 rates for Sweden as of August, 2020.

HOSPITAL RESOURCE USE:

On January 29th, two days before Sweden reported its first case, Björn Persson, the head of intensive care at Karolinska University Hospital in Stockholm, the largest hospital in Sweden, held a meeting with the hospital managers in regards to the Coronavirus. Persson tells The Local, \That they initially belived the virus would just stay in China, but was prepared to implement policies in the case that it would become a global issue. Initially, hospital chiefs expected to receive around 10 more intensive care patients than usual at Karolinska University Hospital. However, after the virus intensely hit Italy, the hospital team realized they would have to quickly reevaluate and make major changes to their original plan.

On February 7th, Stockholm health officials assembled their extraordinary regional crisis management response team, and on February 27th, the Stockholm region confirmed its first Covid-19 infection. In the last week of February, thousands of Stockholm residents went abroad for the spring holiday, simultaneously while the virus was quickly spreading throughout Europe. Due to the increase in travel concurrent to the increase in cases throughout Europe, Stockholm healthcare director Björn Eriksson tells The Local, “The need for hospital care started increasing in early March. By mid-March, we started getting deaths, and after that, it was like an explosion.”

According to figures by the Swedish news site, Aftonbladet, before the start of the coronavirus pandemic, Sweden had 526 intensive care beds in total or 5.8 per 100,000 people, according to a recent study, Sweden's amount of intensive care beds per capita is the second-lowest in Europe, with Germany being the highest at 29.2 beds per capita. However, in a matter of weeks, the number of intensive care beds ready to accept patients nearly doubled, increasing to 1,100 available beds in Sweden. As for the country as a whole, Sweden's National Board of Health and Welfare states that it was able to increase the number of ICU beds so that there was always around 20-30 percent spare capacity in intensive care. Karolinska University Hospital, the biggest hospital in Sweden's Stockholm region, increased the number of available intensive care beds fivefold, from 38 to 200. Swedish Minister for Health and Social Affairs Lena Hallengren states, “Flattening the curve of infections has been an important goal to make the healthcare system cope and not be overwhelmed.” By dramatically increasing the number of ICU beds before the peak of the crisis, the potential pressure that hospitals in Sweden would have faced if there were limited number of beds was mitigated. At Karolinska University Hospital in Stockholm, they had 140 patients in the ICU at the peak of the virus, and 60 beds extra available to take in more patients if needed.

Moving forward, Karolinska University Hospital was one of the first hospitals in Sweden to increase the number of ICU beds to prepare for an influx of coronavirus patients. To increase the number of available Intensive care unit beds, the hospital first opened up post-operative wards, areas where patients who just get out of surgery usually recover, to Covid-19 patients. Postoperative wards are generically larger than the standard ICU room, so more staff can look over a greater amount of patients in one room. Secondly, the hospital increased the amount of ICU equipment by ordering more equipment, taking old ventilators from the hospital basement, using the National Board of Health and Welfare's emergency reserves, converting anesthesia machines to acceptable ventilators for coronavirus patients, and borrowing ventilators from private caregivers. Lastly, in an attempt to increase the number of available staff, Karolinska University Hospital took in volunteers from other regions in Sweden and staff from private caregivers where the outbreak was less prominent.

All non-essential surgeries were canceled so that the staff who conducted those surgeries could be transferred to intensive care.

While the Karolinska University Hospital and the Stockholm region were prepared in advance for the spike in ICU patients due to the outbreak, other regions in Sweden were not able to prepare as well. In the Sörmland region, the number of extra ICU patients was considerably higher than expected. Karin Frisell, chief physician for intensive care at the Mälarsjukhuset hospital in the Sörmland region, south-west of Stockholm states, "The Public Health Agency had a prognosis for how many intensive care patients each region could expect, and we were told in the early days that Sörmland should prepare for around 30 patients in total, and our infectious disease clinic thought we'd have around three patients at a time in intensive care." The Mälarsjukhuset hospital treated a total of 87 coronavirus patients in intensive care. Even while at maximum capacity, however, Frisell stated, "... we have not turned anyone down because of a lack of resources, everyone we thought would benefit from intensive care received it," To accommodate for this unexpected amount of ICU patients, Mälarsjukhuset hospital opened new intensive care units in other parts of the hospital, 14 beds in the postoperative room, six beds in cardiology, and six beds in the surgical ward, compared to the usual 1-2 beds in the standard ICU room. Similar to the Karolinska University Hospital, the Mälarsjukhuset hospital received old ventilators from the National Board of Health and Welfare's reserves and uses anesthetic machines. The hospital mostly relied on current ICU staff to treat the influx of patients, however, retired staff, staff from other hospital units, and healthcare staff from regions such as Blekinge and Örebro were also brought in to help care for and treat ICU patients.

MITIGATION EFFORTS:

In terms of mitigation efforts, Sweden took a very lax approach towards the COVID-19 pandemic with a strategy that did not include a mandatory lockdown. The Swedish government opted for a “controlled” spread of the virus in hopes of minimizing stress on the Swedish healthcare system, alleviating the economic impacts of the pandemic, and while not explicitly stated, achieving herd immunity. Of the measures implemented in the controlled spread, only two were mandatory, the rest were voluntary.

One of the mandatory measures was the banning of public gatherings with more than 50 people. Through restricting the size of public gatherings, the Swedish government hoped to slow the spread of the virus. Despite this ban, schools for children under the age of 16 and businesses remained open. According to Science Magazine journalist Gretchen Vogel, “What is even more worrying is that Swedish officials have not tracked infections among school children-even when large outbreaks led to the closure of individual schools or staff members died of the disease.” Interestingly, the decision to resume school in Sweden for children under 16 had no statistically significant effect on the rate of infection among schoolchildren as compared to neighbouring country, Finland. Unlike Sweden, Finland chose to temporarily close schools of all ages. The Public Health Agency of Sweden found that between February 24 to June 14, in both countries, roughly 0.05% of people infected with COVID-19 were aged 1-19. In conclusion, it seems the decision to or not to close down schools had no statistically significant effect on the rate of infection.

The second mandatory measure implemented by the Swedish government, was the banning of visits to elderly homes. However, this measure was only implemented on March 31st, nearly two months after the first case of coronavirus was reported in Sweden. As of

August 12th, Statistics show that around 90% of deaths due to coronavirus were over the age of 70. At first sight, this statistic may seem worrying, but it is also important to remember the elderly are at higher risk for severe illness when contracting the virus, hence patterns of increased mortality rate among the elderly worldwide. However, reports have been surfacing lately regarding neglect and lack of protocol in elderly homes during the pandemic. Residents and family members claim that the nursing home staff “lacked protective gear and were spreading the virus around the home”, and some personnel have even admitted going to work despite showing symptoms of the virus. Furthermore, reports of residents testing positive after returning from hospitals for other treatments prior to testing negative have surfaced, prompting residents and family members to question authority’s choices. “We failed to protect our elderly. That’s really serious, and a failure for society as a whole,” says Health and Social Affairs Minister Lena Hallengren. As of now, whether reforms to policies regarding elderly homes will be put into place remains to be seen.

Finally, the majority of measures implemented by the Swedish government has been voluntary. These voluntary measures include staying home if you feel ill or test positive, maintaining good hygiene, and maintaining social distancing. These measures are non-binding, meaning those infected with the coronavirus are not legally obliged to quarantine. Sweden’s significantly higher rate of infection compared to its Nordic neighbours who have implemented far stricter policies and have led many to push for stricter measures. Karin Olofsdotter, Swedish Ambassador to the United States defends the strategy, stating, “This trust is a fundamental element of Swedish Society. That’s why we can work with recommendations, because most people actually follow them.” A survey released by Sweden’s Civil Contingencies Agency reports that 87% of the population are following social distancing guidelines, and are having 30% of social interactions they’ve had prior to the pandemic. Whether or not citizens did in fact adhere to the voluntary guidelines, the question remains: did the guidelines allow for a controlled spread of the virus, minimize stress on the Swedish healthcare system, alleviate the economic impacts of the pandemic, and achieve herd immunity?

From a statistical standpoint, Sweden's mitigation efforts and guidelines did not produce its intended results, infact, far from it. As of August 13, 2020, the number of people infected with SARS-COV-2 had reached over 84,000, far exceeding the number of cases of it Nordic neighbors. Furthermore ,the death toll in Sweden reached around 5,800 over the past week. Although it is important to acknowledge that Sweden has a far greater population than its neighbors, Sweden also has among the highest death rates relative to the population in European countries, and over 5 times the amount of Covid related deaths of Finland, Denmark, and Norway combined. This is significant as Sweden was the only Nordic nation that did not opt for a lockdown approach against the coronavirus pandemic. Overall, it is unknown whether or not the situation has always been the intentions and expected results of Swedish health officials, it is clear that in comparison to other Nordic countries, Sweden’s guidelines did not allow for a controlled spread of the virus.

Around the time of May 1st, when the SARS-COV-2 pandemic reached its worst in Sweden, the Swedish healthcare system had already withstood the onslaught of the virus amidst Sweden’s less restrictive approach against the pandemic. Many public health experts were concerned at the time, that hospitals could not hold out much longer unless the cases subsided. Maria Fuberg, an infectious disease expert at Umea University Hospital in northeastern Sweden, said the system "had been under heavy pressure for several weeks now but I do not [believe] that it has been overwhelmed as of yet ... though it has been close."

Mozhu Ding, PhD, an epidemiologist at the Karolinska Institute, said that while the system isn't overwhelmed and there's excess capacity due to a field hospital set up in the Stockholm Exhibition Center, "the situation is not improving and there are concerns of not enough personal protective equipment and health professionals."

Fortunately, recent figures have shown that Sweden has improved at containing the spread of the virus. With the number of daily deaths falling within single digits for most of July, in sharp contrast with the peak of the pandemic in April. There has also been a drop in the number of serious cases, with only a handful of new intensive care admissions each day. Although the numbers are still not as low compared to other Scandinavian countries, it is a clear improvement. In conclusion, it seems that the Swedish healthcare system faced much more stress than Swedish health officials originally intended, and were on the verge of being overwhelmed. Thankfully the pandemic seemed to have begun to decline, alleviating the stress put on hospitals and health professionals.

Although Swedish healthcare officials never said achieving herd immunity was their goal, they argued that by keeping society open, people would be more likely to develop resistance against COVID-19. Scientists are still trying to figure out whether or not herd immunity can even be achieved for the new coronavirus. Data published by the Swedish public health agency in June showed about 10 percent of the population in Stockholm had developed antibodies to COVID-19, more than anywhere else in the country. A recent study from the Karolinska Institute also showed that individuals that tested negative for COVD-19 antibodies may still have some resistance to the virus through specific T-Cells. Even though the number of cases in Sweden have far exceeded its neighboring countries, whether or not Sweden is on track to achieve greater immunity in its populace is still unknown. Experts are still uncertain on how many actually develop antibodies and immune responses after getting SARS-COV-2, and how many will be required in order to achieve herd immunity. As of right now, it is still fairly reasonable to assume that Sweden is far from herd immunity.

ECONOMIC IMPACT:

On January 11, 2020, Sweden reported its first case of coronavirus. This was a time when the COVID-19 hadn’t even been given a name, and details of the disease were still shrouded in mystery. It wouldn’t be for another 2 months before Sweden would be hit by their first COVID-19 death. It was then on that same day, that the WHO officially declared this novel coronavirus disease a world-wide pandemic. However, at this point in time, accounts of this virus as well as deaths due to it were not unseen in other places, having already settled-in in many other countries - including those neighboring Sweden. China, for example, where the virus supposedly originated, had already reported thousands of infections as well as hundreds of fatalities. Some speculate that it was because of this precedence that Sweden perceived the initial few infections and deaths relatively lightly. While countries like the United States, the People’s Republic of China, and Spain had begun imposing lockdowns, Sweden took a different approach. Sweden knew that by locking down, the economy of the country would inevitably tank, likely leading the country into an economic recession. If lockdowns were implemented, businesses like restaurants, bars, and gyms would not be able to operate properly and generate enough revenue. This would then lead to a slippery slope of detriments, going first from a degrading consumerism culture and failing businesses, to unemployment rates rising, stock withdrawal, a stock market crash, etc. And so, Anders Tegnell, the chief state epidemiologist of Sweden as well as head pandemic response strategist, devised a semi-lock down plan in hopes of keeping Sweden’s economy from

collapsing during the pandemic period. Instead of locking everyone at home and halting the economy entirely like many other nations, he decided against it and enforced almost no federal regulations on gatherings at businesses like restaurants and gyms. Despite this, shops were still expected to engage business with safety protocols in place in order to minimize the infection rates by as much as possible.

Sweden's laissez-faire approach has allowed the world to observe what happens to the economy of a country during a pandemic when a government allows life to carry on as usual, and the results of this approach are critical for other countries. Governments prioritize both saving lives and keeping economic prosperity, and at an initial glance, Sweden failed at doing both. Just three months into the pandemic, 5,420 people have died out of Sweden's population of 10 million people [WHO], meaning that per 1 million people, Sweden's death toll is seven times more than Finland, 12 times more than Norway, six times more than Denmark, and 40% greater than the US [NYT]. A lack of government restrictions has resulted in several times more deaths than its neighboring Scandinavian countries who implemented stricter regulations. In addition, Sweden has captured worldwide criticism for their lack of care for saving lives with no apparent advantages. Not only did their methods result in a higher death per capita but also did not appear to have any economic benefits. In allowing business to remain open and people to freely have public gatherings, it seems likely that Sweden's economy would fare much better than its neighboring countries. However, by April 30th, Sweden's central bank, the Riksbank, predicted its economy to contract anywhere between 6.9% and 9.7% for 2020. At the same time, The National Institute for Economic Research (NIER) predicted Sweden's economy would contract by 7% [FEE]. Sweden's unemployment rate rose from 7.1% in March to 9% in May [NYT]. Sweden's economy wouldn't be saved despite their relaxed approach, furthering criticisms that Sweden's government was incompetent.

Sweden was viewed as a failure in containing the coronavirus and in keeping their economy intact. Although they did fail to save lives and the latter seemed true at first, recent evidence actually suggests that Sweden's plan has worked to some extent. Sweden is a country heavily dependent on exports and international trade, and its economy would have suffered regardless of the method they chose. The question was how much it would have suffered. While the rest of Europe is now undergoing an economic recession, Sweden's economy is faring just fine. In contrast with a Reuters poll of economists expecting a 0.6% contraction in the first quarter, Sweden's GDP instead increased by 0.1% [CNBC]. The second quarter resulted in an 8.6% economic contraction, but was less than half of Spain's and the United Kingdom's, with an 18.5% and 19.1% decline respectively. Even compared to Germany's decline in the second quarter -- who has been one of the most successful European countries to contain the virus and keep their economy going -- Sweden faced a lower decline by 1.5% [FEE]. In contrast with the predictions and harsh critique, it would seem that a laissez-faire approach actually is most effective for preventing economic recession and decline, albeit at the cost of prioritizing saving lives.

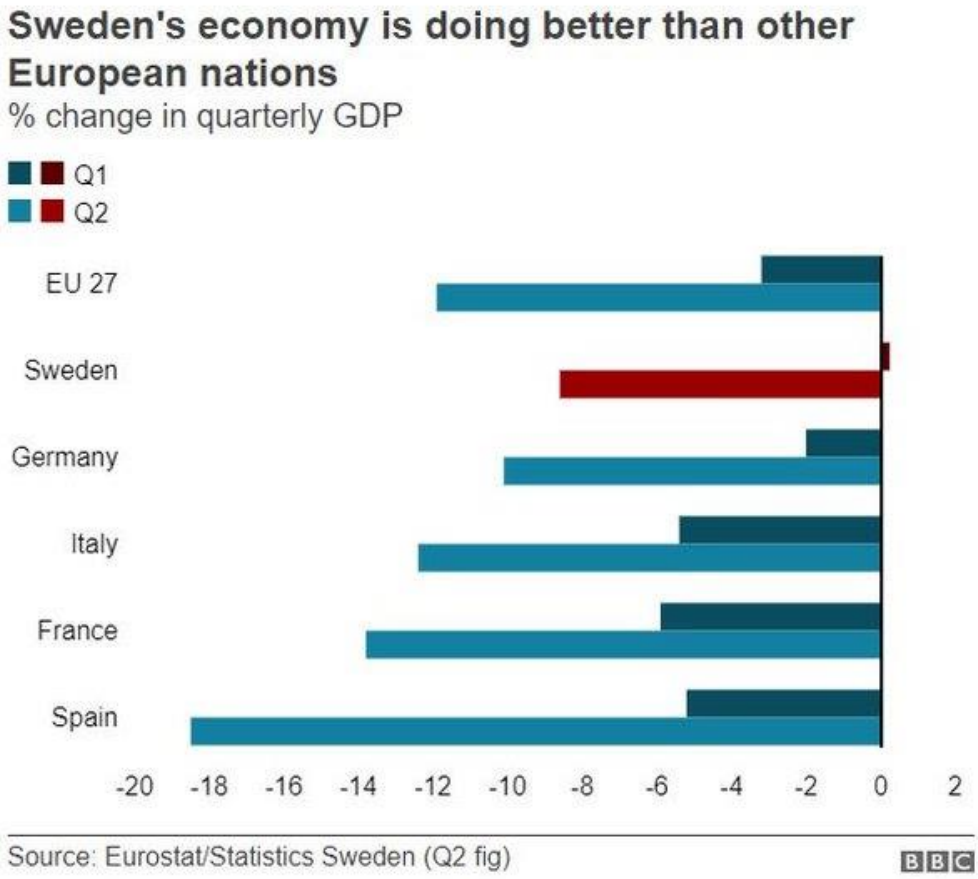

Figure 4. % change in quarterly GDP of several EU nations.

In summary, Anders Tegnell and Sweden sought out an unorthodox and extremely risky approach when tackled with the now-famous COVID-19 virus. The goal was to mitigate as much economic degradation as possible, and so Sweden didn't impose a full-lockdown like many other countries. The plan was met with a wave of critical speculation and doubtful conjectures, with even huge news sources like the CNN and the NYT conveying their suspicions on the feasibility and moral legitimacy of the approach. In the end, critics weren't right nor wrong. As expected, the case fatality rate as well as deaths per million people in Sweden was among the highest in the world, but to everyone's surprise, the 'mitigation of economic degradation' part of the plan worked out. So in conclusion, to answer the question 'to what extent did Sweden's pandemic response achieve its intended results', the extent was absolute because in terms of economic impact, Sweden's laissez-faire approach achieved exactly what it sought out to do - minimize economic damage.

FUTURE MODELS:

Moving forward, while Sweden has managed to "flatten the curve" of both daily infections and daily deaths from the Coronavirus, models predict that they will both begin to increase exponentially in the upcoming months. According to covid19.healthdata.org, Sweden last observed 322 confirmed coronavirus cases on July 31st, 2020. With current mandates, that number is projected to rise to 670 cases on September 1st, 1,044 cases on October 1st, 2,964 on November 1st, and 13,995 on December 1st. To provide a comparison, Portugal has a population of 10.28 million people (compared to Sweden's population of 10.23

million) and adopted a lockdown response to try and combat the spread of Coronavirus, opposite of Sweden's herd immunity approach, by imposing a stay at home order, placing restrictions on social and religious gatherings, ordering commercial establishments to shut down unless they were deemed essential, closing all schools, and only allowing restaurants to offer to take out and delivery services. According to covid19.healthdata.org, Portugal last reported 106 cases on August 3rd, 2020. This number is also predicted to rise at an exponential rate, but not at the same rate as cases in Sweden. Models predict that the number will rise to 271 cases in Portugal on September 1st, 472 cases on October 1st, 1,644 cases on November 1st, and 10, 924 cases on December 1st.

Continuing, According to covid19.healthdata.org, Sweden last reported 0 deaths on August 25th, 2020. In concurrence with the future model that predicts that cases will begin to exponentially rise in the coming months, the number of deaths per day will also rise. Models project that there will be approximately 7 deaths a day up to September 1st, then slowly rise to approximately 8 deaths a day on October 1st, then rise to approximately 16 deaths per day on November 1st, and then 57 deaths per day on December 1st. The total amount of confirmed deaths due to the Coronavirus in Sweden as of August 3rd, 2020 is 5,754, and models predict that this number will rise to 7,493 deaths by December 1st, 2020.

TREATMENT AND VACCINE DEVELOPMENT:

As the situation of COVID-19 continues to intensify, more hospitals globally are struggling with the issue of insufficient bed numbers. In order to solve this urgent issue, many hospitals are taking their chances with clinical trials of specific treatments for COVID-19, in hopes that patients will recover faster with the treatments, freeing up beds for other patients.

One treatment which has been proven by scientists and medical centers to be effective is a drug called Remdesivir, a investigational nucleotide prodrug which functions as an inhibitor to the viral RNA-dependent RNA polymerase. Remdesivir, which was developed by Gilead, was first introduced to the public during late January, when it was used to treat the very first patient in the United States. According to an article published by the New England Journal of Medicine (NEJM), the treatment was “effective”, but whether the result was due to the drug could not be concluded. After 3 more months of clinical trials in several countries around the world under different circumstances, Remdesivir was proven to be an effective drug for the treatment of SARS COVID-19 by speeding up the recovery process. Currently, Remdesivir is known to be the most effective drug for the treatment of COVID-19. Many governments around the world – including Australia, Sweden, and the United States – have publicly allowed its usage in regular hospital treatments.

However, Remdesivir has its drawbacks such as its unaffordable price and the shortage of supplies. Many hospitals are willing to pay for this drug in order to shorten the period for treatment, thus solving the problem of bed shortage, but many individuals can not afford the price charged by Gilead. According to NPR, the treatment of Remdesivir is charged up to 520$ per vial for people with health insurance. The typical treatment is a five-day course of Remdesivir, leaving the total charge to be around 2600$.

Due to these reasons, scientists and governments are still finding other possible treatments for the coronavirus. Another treatment candidate is hydroxychloroquine, a drug

that is much cheaper (37 dollars for 100 tablets) than remdesivir. Hydroxychloroquine is a drug that is normally used to treat rheumatism and malaria and was never proven effective in any virus treatments. The testing of hydroxychloroquine had continued until later in May, when a group of scientists published a study, and the result shows the negative impacts such as the increase of death rate and more severe symptoms caused by this drug. Despite this study having proven bias and deemed not credible by many other scientists, this event still led to public distrust. The drug is still not widely accepted nowadays, even though many recent clinical experiments have proved that it is effective against COVID-19.

Information and research regarding treatment for COVID-19 has increased substantially since the initial outbreak, as more and more researchers have joined the hunt to find effective treatment against the disease. However, treatments of COVID-19, such as Remdesivir, are only a 'temporary' solution. Treatments are effective in helping patients who already have COVID-19 recover, whereas vaccines can prevent the spread of the SARS-CoV2 virus which causes COVID-19. Vaccines work by using a patient's own immune system to give the patient an immunity to a certain type of disease. By giving a person immunity to the SARS-CoV2 virus through a vaccine, they will not be able to be infected by the virus, meaning that they will not be able to spread the virus to others. If enough of the population is able to be vaccinated, the population will then gain 'herd immunity', which protects the vulnerable group of people who cannot be vaccinated from getting infected. However, as for the current COVID-19 pandemic, it is unlikely that herd immunity will be reached in a short span of time, as vaccine development and distribution could possibly take years.

There are several institutions and organizations all across the globe that are working on developing a vaccine for COVID-19. One of the most promising SARS-CoV2 vaccine candidates is the AZD1222 (formerly ChAdOx1 nCoV-19) vaccine, which is being developed by the British-Swedish company AstraZeneca and the University of Oxford. The AZD1222 vaccine is a viral-vector vaccine that is based off of the ChAdOx1 adenovirus found in chimpanzees. On May 21st 2020, the U.S. Department of Health and Human Services announced a grant for AstraZeneca, stating that it would provide "up to $1.2 billion" in funding for research. The AZD1222 vaccine was shown to be safe and have no severe side effects in phase 1/2 clinical trials through a paper that was published in *The Lancet*, one of the world's most renowned scientific journals, on July 20th 2020. The study consisted of 1077 patients ranging from 18 to 55 years of age. The journal states: "ChAdOx1 nCoV-19(AZD1222) showed an acceptable safety profile, and homologous boosting increased antibody responses." (Homologous boosts refer to the patients being treated several times with the vaccine.) Another study published in *Nature* on July 30th 2020 showed that the AZD1222 vaccine was able to prevent SARS-Cov2 pneumonia in rhesus macaques, a species of monkeys. The study states: "We observed a significantly reduced viral load in bronchoalveolar lavage fluid and lower respiratory tract tissue of vaccinated rhesus macaques challenged with SARS-CoV-2 compared with control animals, and no pneumonia was observed in vaccinated animals." The ChAdOx1 nCoV-19 vaccine is currently in combined phase 2 and 3 clinical trials which are taking place in England, India, Brazil, and South Africa. If these clinical trials generate positive results, then emergency vaccines could be delivered by October according to AstraZeneca.

As a result of faster development, AstraZeneca along with many other organizations have combined different phases of human clinical trials. This means that SARS-Cov2 vaccines developed during the pandemic may not have as much time for inspection and

safety-testing as other vaccines in the past, which could lead to the failure to detect potential flaws in the vaccines such as negative long-term effects.

CONCLUSION:

Despite the extensive efforts put into alleviating the devastating impacts of the unexpected viral outbreak, Sweden has only reached its intended results to a minimal extent. As shown by the comparison of infection and fatality rates of all the European countries, there are very few experiencing more severe consequences. With the advancement of SAR-CoV2 in the country, research of efficient resource use as well as vaccine development is being carried out at rapid paces. While the efforts are well respected, they are leveled by the inefficacious methods taken by the Swedish government in an attempt to mitigate COVID-19's intensity. This proves to show that simply reaching for long term success brings far too little benefits to compromise the short term costs.

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