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Examination of COVID-19 and the Spanish Flu of 1918

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Abstract

COVID-19, for many across the globe, has been a pandemic the likes of which has never been seen before. It has caused many aspects of life to change in order to adapt to the new limitations and cautions brought about by the global spread of a novel virus. However, almost exactly 100 years prior, a strain of the H1N1 influenza virus also known as the Spanish Flu of 1918, similarly uprooted life for millions of people around the globe. These two pandemics, while similarly leading to great disruption of global health, had many differences in the demographics impacted as well as their pathogenicity; the ability of the microbe to cause disruption and disease. The Spanish Flu also had wide reaching social implications and while the COVID-19 pandemic is still being analyzed, there is no doubt that the impact on healthcare and beyond will also be substantial. A lot can be learned from analyzing the last two global pandemics and in order to better understand and react to outbreaks like this, it is vital that all aspects of these two events are thoroughly examined.

Keywords: COVID-19, pandemic, Spanish Flu, pathogenicity

Introduction

In late December 2019, a string of cases of viral pneumonia of unknown cause were identified in the Hubei Province of China in the city of Wuhan by healthcare officials (Carvalho, 2021). This was the origin for what would become known as COVID-19 and this disease spread rapidly from China, to most of the Asian continent, and eventually worldwide. COVID-19 was named after genome sequencing was run on the virus and it was determined to be a coronavirus, a large family of viruses that are more commonly found in animals and when found in humans are rarely virulent (Liu, 2020). It was on March 11th, 2020 that the World Health Organization (WHO) officially declared COVID-19 a pandemic, or disease that had quickly spread to many continents and infected many (Carvalho, 2021). According to Carvalho's (2021) analysis:

Close to 100 million people have been infected and 2 million people have died worldwide from COVID-19 within the first 12 months of the pandemic according to official figures — with the true numbers likely to be significantly higher. (Concluding Remarks).

This virus was the first major outbreak of this proportion in over 100 years and though it decimated healthcare systems across the globe, this pandemic had implications far beyond that of healthcare.

In March of 1918, just over 100 years before the emergence of COVID-19, a man in the United States Army came down with a sickness characterized by coughing, a fever, and headaches (Martini, 2019). Though debated, according to Martini, (2019) this is thought to be the origin of the Influenza pandemic of 1918 a novel influenza strain that later was characterized as H1N1. This disease spread globally, aided greatly by the winding down of World War One and the great number of soldiers traveling between their own countries to the main front in Europe. This disease was caused by a strain of the influenza virus believed to have avian origins and was

characterized by extremely high fever, encephalitis, nasal hemorrhage, and coma (Martini, 2019). Unfortunately, the virulence of this disease was extreme and the mortality rate was very high as well as it is believed to have infected about a third of the world population and killed between 50-100 million people (Aassve, 2021). This was the first global pandemic of the modern global industrial world and the reaction to this outbreak set the stage for the development of the healthcare system as we know it.

There is little doubt that both of these pandemics had profound effects on the medical field, and as the Spanish Flu impacted society as a whole, COVID-19 is likely to do the same. As the pandemic winds down, there is a lot that can be learned from looking back at past pandemics for what can be expected moving forward. What better comparison than that of the Spanish Flu, the first modern pandemic and greatest pandemic in history, in which the pandemic defined an entire generation and had far reaching implications. In fact, Aassve (2021) theorizes that measures of public health implemented in the 1918 pandemic caused a profound national and global climate of suspicion and mistrust for that generation. With the handling of this current pandemic, could the same social mistrust result? Undoubtedly after 100 years a lot has been learned in regards to the response both medically, socially, and politically to an international crisis such as a global outbreak. However the question remains, though they are certainly different, can the history of the Spanish Flu pandemic help to guide the recovery from this recent COVID-19 pandemic?

History:

The first wave of the Spanish Flu of 1918 was believed to have started in the spring of 1918 as stated previously, however, the exact date cannot be officially declared. There are three separate waves of this disease that are recognized, the first wave, starting in March and lasting

through August with a mortality rate fairly low in this spring wave (Patterson, 1991). August of 1918 is when the much more deadly second fall wave struck, thought to have been the product of a mutated form of the much less virulent spring wave. This second wave was correlated with the movement of the troops during this World War One era, with the virus impacting much of the military, and was by far the deadliest of the three waves with a mortality rate predicted to be near 3% (Aassve, 2021). By December 1918 the majority of the world was once again free of the virus and the worst seemed to be over, but one last winter wave came in January through May of 1919, the pandemic was officially declared over in the northern hemisphere in the spring of 1919 (Martini, 2019). With the pandemic overall lasting less than a year, this disease was mysterious and didn't leave researchers at the time with many hints as the field of virology still had not been developed. Yet, with a death toll estimated between 50-100 million people claiming the title of second deadliest disease in human history, this disease had an undeniable impact on the world (Martini, 2019). However, along with this tragic pandemic came great reforms in the healthcare system and the scientific community in how disease was studied and thought of moving forward.

COVID-19 was first identified at the end December in 2019, with the WHO office in China initially being notified on December 31st of a cluster of viral pneumonia cases in Wuhan of unknown origin (Carvalho, 2021). All of the cases initially seemed to be connected to the Huanan Seafood and Wildlife Market in Wuhan, a wet market in which many live wild animals were sold, though there is speculation as to the true origin of this novel virus (Liu, 2020). The disease was interesting as the causative virus was not recognized by scientists and a complete genome analysis was run on a sample of the virus and this genome draft was made publicly available by the 10th of January 2020 (Carvalho, 2021). This virus typically presented with a cough, labored breathing, fever, and body aches, and by the end of January, the WHO declared

the COVID-19 outbreak a public health emergency of international concern (Liu, 2020). The virus reached the United States by late January, and according to the Centers for Disease Control (CDC), by May 28, the death toll in the United States passed 100,000 people as the virus spread rapidly. According to the WHO as of October 3, 2021 the global number of confirmed deaths due to COVID-19 was just over 4.8 million and the number of confirmed total cases was at 235 million. Though not nearly as deadly as the Spanish Flu, COVID-19 has still changed the lives of millions around the globe.

Origins of Disease:

Contrary to the very name of this disease, the Spanish Flu did not in fact originate in Spain, while the true origins of the disease are not fully agreed upon there are a few leading theories. One of the most widely held ideas of its origin lie in the heartland of the United States, when a man named Albert Gitchel came down with a bad fever accompanied by coughing and headaches on March 4 of 1918 (Martini, 2019). Albert Gitchel was a cook for the United States Army stationed at the time at a base called Camp Fuston in Kansas, and in less than 3 weeks over 1,100 service members had been hospitalized with similar symptoms as well as thousands more affected (Martini, 2019). While this cannot be fully agreed upon as the root of the outbreak, this is accepted as the first case of the Spanish Flu in the United States. After studying specimens of this virus using more modern techniques, the causal agent of infection was identified as a strain of the influenza virus known as H1N1. This pandemic is believed to have been a zoonotic disease, or a disease passed from animals to humans, with the animal host having most likely been a bird or pig and passed to humans directly (Kristensson, 2006). These inter-species jumps of disease are extremely rare, however when they do occur they tend to be more harmful as the

human body has minimal natural defenses or immunity against such infections (Kristensson, 2006).

In a similar fashion, COVID-19 is believed to be a zoonotic virus as well with the causative agent in this case not being influenza, rather a coronavirus (Liu, 2020). The causative animal in the case of COVID-19 is not as clear, however a lot of the earliest cases can be traced back to the Huanan Seafood and Wildlife Market in Wuhan. Yet, the earliest three documented cases of COVID-19 came from three individuals with no known exposure or connection to this wildlife market, further complicating the search for this disease's origins (Liu, 2020). A growing theory about the origin of this virus is the potential of a laboratory leak from the nearby Wuhan Institute of Virology, which was conducting gain of function research on viruses. This type of research takes viruses that are found in nature and modifies them to be more virulent, transmissible, or resistant in order to further study these properties. This theory is further perpetuated by the fact that this virus's spike protein seems to perfectly interact with the matching human receptor in a way that happened faster than has ever been seen, expediting the human-to-human transmission process (Liu, 2020). The likely reservoir for this disease in nature is a horseshoe bat or a pangolin, both wild species sold in the Huanan Seafood and Wildlife market as well as native to that region of Asia (Shereen, 2020). Bats were determined to be the causative agent of the very similar SARS outbreak in 2001 which was also due to a very similar coronavirus originating in China. Additionally, bats were found to be the key host for the 2012 MERS outbreak which was another similar coronavirus outbreak in the Middle East (Shereen, 2020). Unlike in the Spanish Flu, the original outbreak of COVID-19 can be undoubtedly traced to a specific source; the city of Wuhan in China. Yet, in a similar fashion this outbreak could have been caused by a virus potentially jumping from a natural animal host to humans and then

spreading throughout the region and eventually the world. Though with newfound knowledge of the gain of function research being conducted at Wuhan Institute of Virology, there is doubt being cast on this previously accepted theory.

Afflicted Demographics:

Perhaps one of the biggest abnormalities of the Spanish Flu was the demographic that was impacted. The Spanish Flu disproportionately affected those aged 15-34 years old, creating what was dubbed a W-shaped mortality curve, sparing the youngest and oldest, who are typically most vulnerable, and having the highest mortality rates in those who were young adults (Aassve, 2021). This goes against the typical U-shaped mortality patterns for most other recorded diseases, and to this day the exact mechanism behind why this disease impacted this demographic so much more than previous diseases is still a mystery. Some theorize that due to World War I, many young individuals were working or living in close quarters and often in less than ideal conditions as the war increased stress levels and food scarcity (Martini, 2019). However, this cannot be fully true as millions of people that were not even involved in World War I were still struck by this disease and it was as deadly in neutral countries as the countries at war (Assve, 2021). Another possible explanation for this unconventional mortality rate is that the elderly could have been protected by prior exposure to a strain of this disease and could have had some level of protection (Luk, 2001). Though, perhaps the most likely explanation is that the stronger immune systems of these young healthy individuals over-reacted to this virus and this unnecessary immune response is what actually harmed the body (Luk, 2001). Whatever the true mechanism, this demographic abnormality was the first of its kind to be documented as has yet to be seen again.

The demographic most impacted by COVID-19 was much more traditional in the sense that the oldest in the population were those most adversely impacted in both mortality and severity. This virus, unlike many before it, also seemed to spare the youngest population relative to the normal U shaped mortality curve seen in many other diseases, with the very youngest and oldest experiencing the highest mortality. (Caramelo, 2020). Unlike the Spanish Flu pandemic which disproportionately killed those aged 15-34, COVID-19 has disproportionately killed those aged 65 and older. This is more traditional in the study of past diseases, and this is thought to be due to more limited immune responses in older individuals, in COVID-19 age is the best predictor of mortality and those over 60 years of age have the highest mortality rate (Caramelo, 2020). Cardiovascular disease was the riskiest comorbidity, or compounding condition that led to the highest mortality rate other than age, with chronic respiratory disease being the third most important predictor of an individual's mortality rate (Caramelo, 2020).

Unlike in the case of the Spanish Flu where it was harder to record certain discrepancies in mortality on the basis of race and ethnicity, in COVID-19 these factors were studied in depth in the United States. The data undoubtedly points to minority racial groups in the United States being irregularly impacted by COVID-19. For example in the state of Wisconsin, African-Americans make up 6% of the state's population but accounted for over 50% of the COVID-19 deaths in that state (Mahajan, 2020). This incredible divide extends beyond that of just one state, using data from over 2,886 counties in the United States, Mahajan (2020) found that African-Americans are more likely to both contract as well as die from COVID-19 than White Americans through a thorough data analysis. While this difference in mortality due to race in the United States cannot be pinned down to a single cause as there are many factors at play, it is certainly worth considering with a difference in mortality this extensive.

Mitigation Methods:

The Spanish Flu of 1918 ushered in a new era for pandemic response, while much of the severity of this pandemic was downplayed by the media at the time, there were still various mitigation measures implemented for the first time in response to this disease. The very name of this disease, the ‘Spanish Flu’ came during this media blackout, during the first world war, Spain remained neutral and because of this, they were one of the only countries that reported on the reality of this pandemic (Martini, 2019). The other countries feared that reporting on this disease and the casualties that it caused would make them appear weak and therefore, much of the press either neglected to cover the pandemic, or was censored. (Martini, 2019). Though much of the press did not report on the fatalities, the press was still a crucial part of informing the general public of the health measures necessary to help curb the spread of this virus. This happened in the United States mostly through the help of local news sources that reported on the closings of large public places, the distribution of soap, and the canceling of events in order to stop the spread of this disease (Martini, 2019).

COVID-19 on the other hand was very largely covered by the media as it was seemingly impossible to escape any news of this pandemic in stark contrast to that of the Spanish Flu. While the spread of information was rapid in the case of COVID-19, some of the mitigation techniques remained similar, this was largely seen in the biggest non-pharmaceutical strategy used in both the COVID-19 pandemic as well as the pandemic of 1918; social mitigation behaviors (Markel, 2007). In 1918, the most effective forms of non-pharmaceutical intervention took the form of school cancellations, masking, isolation of infected individuals, and public gathering bans (Markel, 2007). For COVID-19 the main strategies were masking, social distancing, hand washing, and avoidance of public gatherings (Hutchins, 2020). These strategies,

though over 100 years apart, look eerily similar and though technology has come a long way since 1918, when dealing with a viral pandemic, the mitigation techniques are limited. Luckily, these mitigation behaviors alone are not the only method that we have for combating viral disease such as COVID-19 and the Spanish Flu.

Treatment and Vaccine Development:

The race to develop an effective treatment or cure for the Spanish Flu was greatly limited by the available technology as well as knowledge of the time. In 1918, the knowledge of viruses and other microbes was not very well understood and in fact the pandemic was not even attributed to a virus until 1930 and the first human influenza virus was not isolated until even later in 1933 (Martini, 2019). Because of this lack of fundamental understanding of virology, it made treatment protocol ineffective and limited, the most common forms for treatment were fluids, sanitation, and helping to make patients as comfortable as possible (Jester, 2019). Though there was an effort to develop a vaccine for this strain of influenza, most of these efforts were aimed incorrectly at the treatment of bacillus, which was actually a secondary infection, rendering them unsuccessful (Martini, 2019). This was the unfortunate reality for those that came down with this sickness; the best course of action was really no action at all. This lack of effective treatment or cure made the importance of mitigation strategies paramount in combating this particular virus.

The technology of resources that are in the arsenal of modern medicine today is profound and because of this, the response to the recent COVID-19 pandemic looked very different than that of the Spanish Flu. One of the first major breakthroughs for understanding and possibly treating this virus came just days after the initial cases, on January 10th 2020, when the first draft of the virus's genome was published publicly (Carvalho, 2021). This information allowed

researchers to immediately identify the causative agent of COVID-19 as a virus and then really start the initial steps of vaccine development. In fact, by March 16th, the first vaccine was not only developed but started in a phase one clinical trial (Carvalho, 2021). Finally in December of 2020, the first vaccines for treatment of COVID-19 were given emergency use authorization in the United States (Carvalho, 2021). This was record speed for vaccine development, and though this gave a hopeful outlook to the COVID-19 pandemic, the issue of treatment was still not solved for this virus. For viruses in general, the treatment options even with today's exceptional resources, are slim, and Covid was no exception.

Though there were some treatments that were studied in the treatment of COVID-19, with some having fairly significant efficacy. Right after it was discovered that the causative agent of COVID-19 was a virus, antiviral treatments commonly used for the seasonal flu such as Tamiflu, however after clinical studies concluded this was not effective against this particular coronavirus, this was discontinued. Though many antiviral drugs did not seem to be effective against COVID-19, Remdesivir, an antiviral that acts by blocking viral replication, thus decreasing the viral load in patients was found to be effective in clinical studies (Shereen, 2020). Though one of the most effective therapeutics for COVID-19 was initially convalescent plasma, in which a patient that has had COVID-19 and since recovered donates their plasma that contains antibodies to the virus and this can be administered to those that become sick with this same virus. Though through use of monoclonal antibodies, antibody therapy has become even more effective, this is because in monoclonal antibody treatment, a lab synthesizes the same antibodies that the body naturally produces after a COVID-19 infection to help combat the virus (Shereen, 2020). Very recently, there have been promising studies on the development of an antiviral treatment specific for the treatment of COVID-19 by both Pfizer and Merck companies that is

showing great clinical promise and may offer the closest thing to a cure that has yet been seen (Ledford,, 2021). It is important to keep in mind that these treatments, while effective, are not nearly as effective as the vaccine (save for the new antivirals) and though there are more treatment options when it comes to COVID-19 when compared to the Spanish Flu, there currently is no 'cure' for either illness.

Social Ramifications:

These diseases both came with their respective challenges, and while the diseases themselves posed a threat, so did the divisive nature of society's response. The Spanish Flu of 1918, came on the scene in a time of war, in which much of the world was in the middle of what would be one of the deadliest conflicts on record. Though today, after examining the data, World War I is believed to have killed around 20 million total, in the same time frame, the 1918 pandemic killed at least 50 million (Martini, 2019). The general trust of society in the government and media was very low due to the media blackouts that were happening due to the war. In fact, in almost all countries that were actively involved in World War I, the media was either silenced or simply did not report on the status of the pandemic, this was mainly due to these countries trying to hide any sign of weakness (Aassve, 2021). This disease also more uniquely had the long term ramifications of shifting the demographics of many countries due to the excess mortality rates of healthy adults, creating social upheaval (Martini, 2019). Though in time, the demographics would switch back, the combination of wartime strife, general distrust, and this silent killer left its mark on this generation.

In 2019, the world and particularly the United States, was already in a state of political and social unrest, and the emergence of COVID-19 simply seemed to add fuel to the fire. It is hard to assess the extent to which COVID-19 has impacted the greater social structure, given that

the pandemic is still ongoing, however there are some major takeaways. Through this pandemic, one of the main strategies early on that was consistent almost worldwide was that of isolation and social distancing, this has well known disadvantages in the long term and this can already be seen by the marked increase in suicide, generalized anxiety, and substance abuse prompted by the pandemic (Czeisler, 2020). This poses a great threat when one of the best strategies that we have for disease mitigation also has these negative unintended impacts on mental health, and creates a very difficult tradeoff. Another factor that cannot be overlooked is the impact that this pandemic had on gatherings for purposes such as education, work, and commerce; all halted because of the threat of this virus (Ali, 2020). Not to mention the loss the worldwide economy experienced due to the COVID-19 pandemic, estimated at over 2.7 trillion U.S. dollars lost (Ali, 2020).

These social changes in response to the COVID-19 pandemic are novel in nature and really haven't been seen before in the modern age in which people are used to being more connected than ever before in history. Politics also became a battleground for the pandemic, with division in the United States about all issues relating to the pandemic, ranging from mask wearing, to vaccination, to social distancing, and beyond. This political division added to the unease and general anxiety that many in the United States experienced surrounding this pandemic. Unlike the blackouts of the 1918 Spanish Flu, the media coverage of the COVID-19 pandemic was extensive and relentless, creating an atmosphere in which it was difficult to distance oneself from the news of this disease. These factors made COVID-19 a pandemic unlike any other, with information (and misinformation) at everyone's fingertips, and many divisive opinions, there are sure to be far reaching social implications.

Long Term Outlook:

While the post Spanish Flu world is history, life after COVID-19 is still unfolding in real time, and just as there were changes resulting from the 1918 pandemic, there is sure to be substantial changes driven by the recent pandemic. The Spanish Flu was largely over by 1919 and the pandemic was undoubtedly declared over by 1920, just as the world was coming out of the first world war (Martini, 2019). Though the most impacted group of people in the United States and globally was the age group of 15-34 year olds, which made up a good portion of workers, the impact to the economy was not what many would assume (Aassve, 2021). The war and post-war industry actually drove the economy forwards despite the Spanish Flu, and the United States that had an economy mainly based on natural resources extraction, manufacturing, and transportation surged (Cohen-Kristiansen, 2020).

Socially, life also looked different after the 1918 pandemic had ended. In fact, many attribute what we today call the roaring twenties to the wartime and pandemic stresses finally being lifted in the 1920s leading to a marked increase in spending and national wealth (Cohen-Kristiansen, 2020). Along with this injection of wealth came a social revolution as well bringing lavish parties that may in many ways be attributed to the end of the pandemic, and therefore the end of social distancing and anxiety surrounding public gatherings. When examining the similar mitigation methods used in the treatment of the Spanish Flu and COVID-19, it is hard to ignore the possibility of a similar economic and social boost following the end of the current pandemic. Though today's global economy and that of 1918 are far from similar, the isolation driven by the COVID-19 pandemic has at least two potential outcomes; the potential to cripple the global economy for years to come due to long term restriction of global trade networks, or the potential to spur on what could be the new roaring twenties of the 21st century.

The Spanish Flu pandemic did not have nearly the economic impact that COVID-19 had, at over 2.7 trillion U.S. dollars lost globally, this pandemic is likely to have long term ramifications (Ali, 2020). With the most afflicted demographic of COVID-19 being those aged 70 years and over, the direct impact on the current workforce is unlikely to really change long term. While the overall productivity is down due to the pandemic, because of technology it is still possible for people in many areas of employment to continue to work remotely despite sweeping social distancing guidelines and stay at home mandates (Cohen-Kristiansen, 2020). While this has helped with productivity and continued to drive the global economy, it has certainly not been a substitute for traditional work, and this remote style of working unfortunately does not work for many types of essential jobs. This is why the outlook is uncertain as many were forced to socially isolate at home and not work for months on end leading to the rising rates of substance abuse, depression, and suicide (Czeisler, 2020). Only time will tell what exactly the true long term impact of this most recent global pandemic will be, though it certainly will have an impact.

Conclusion:

There is little question that both of these diseases have had and will have major implications for society in the United States and the world as a whole. Though each of these viruses brought their own unique set of challenges, innovation and technological advancements has helped exponentially with this most recent pandemic. The development of a vaccine and effective treatment for COVID-19 was much faster than that of the Spanish Flu of 1918, helping to prevent infections and reduce overall mortality. Yet, it is almost guaranteed that with a growing population, more human-animal contact, and a multitude of other environmental factors, there will indeed be another viral pandemic in the future. However, examining the different

aspects of the origin and response to these two historic pandemics, gives a good idea of how far science has come in just over 100 years. This leaves little doubt that in another 100 years the preparedness for another global outbreak will be vastly ahead of where it is today.

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