

Examination of Aspects Involved in Multiple Pandemics/Outbreaks

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Abstract

The examination of multiple pandemics/outbreaks will provide information regarding both proper and improper ways to curtail outbreaks. In this report, a variety of aspects of the individual epidemic will be examined. First, information regarding the origin, spread, and response will be analyzed. This will include information regarding regional, national, and world response to these specific outbreaks. More specifically, information regarding media and public information dissemination will assist in understanding public health policy and its effectiveness in warning the public/health workers to the dangers of the disease. Finally, this report will examine subtopics of interests regarding both bioterrorism and the use/development of personal protective equipment. These specific subtopics provide an examination of major issues being examined in the world of public health policy.

SARS: Overview of the Outbreak

Severe Acute Respiratory Syndrome (SARS) provides an interesting modern-day case study that shows how a health crisis is handled in the 21st century. First identified in 2002, SARS was seen as a possible Avian Influenza variant; however, it became apparent that this was a new type of virus that would become known worldwide during the next two years. When looking at SARS, it must be mentioned that the Chinese government was reluctant at first to share information regarding the outbreak in their Guandong province, and the subsequent world effort to combat the disease was hampered by their inability to cooperate and or share information regarding the characteristics of their specific epidemic (1).

SARS also brought up the possibility of a "super spread event" or SSE. The Metropole hotel in Hong Kong would act as ground zero for the spread of the SARS virus to countries around the world. Canada, Singapore, Vietnam, Ireland, and the United States would all experience cases that were traced back to the hotel's own ninth floor (2). Dr. Liu Jianlun was a physician that resided in the Guangdong province. At the time, Guangdong was experiencing a large scale SARS outbreak that had many scientists/health officials wondering what exactly was the virus they were dealing with at the time. After contracting SARS, Dr. Jianlun travelled to Hong Kong to attend a wedding. It was here that he checked into the Metropole Hotel (Room 911 to be specific). From

this point forward, the SARS virus reached a point of globalization via a previously explained SSE. By affecting multiple countries across the globe, SARS would soon become known as the first modern day outbreak of the 21st century (2).

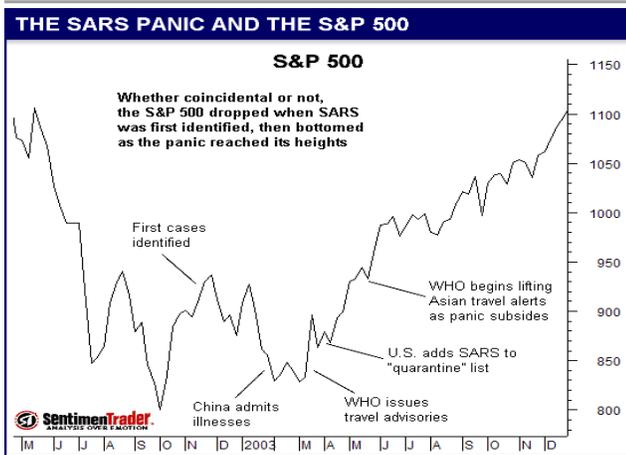
Response to SARS

Media Coverage

Although SARS posed a serious threat to the world, the Chinese government immediately made the conscious decision to not alert the World Health Organization or WHO to the situation at hand. Without the cooperation of the Chinese, the virus soon spread not only throughout the country, but also, it spread throughout the world (3). Independent media within the country took it upon themselves to actively report on the outbreak at great risk to themselves and their family. These outlets, although not associated with state media, showed once again the issues of countering opinions and transparency from the country's government and private media. Once the virus had spread to Western civilization, many within Western media took it upon themselves to report heavily on SARS related issues that many Chinese journalists simply would not risk (due to possible repercussions from China's government) (4)

Economics of the Outbreak

Economically, the lack of response seemed to contribute to an overall monetary loss of around 48 Billion USD (5). Although this seems rather impactful, the actual economic loss was far less than predicted by most economists and media outlets. The greatest economic impact was felt due to the inability of business travel in both Asia and Canada (specifically Toronto) (5). SARS also was able to teach economists how exactly a health crisis would impact world markets in the era of globalization. Looking at the S and P 500 as a benchmark of market performance, the timeline indicates bear market speculation as the illness first appears and progresses.



Lack of Medical Infrastructure

Another effect of this outbreak was the magnification of China's lack of rural medical infrastructure. Again, this showed a large class divide between city centers and the large areas of rural farmland in Chinese territory. SARS was a warning in the sense that it highlighted a global issue of inadequate medical care for those outside of populated city centers. The WHO organization realized that these centers also saw some of the worst mortality rates due to the inadequate level of care experienced. Simply put, these areas also suffered from a lack of health education, and many rural residents simply did not know about disease and the transmission risks of those coming into contact with the infected (6).

Overview of the 1918 Influenza

The 1918 influenza is often reported as one of the worst recorded epidemics encountered by the world. This particular strain of this influenza has been highly researched and debated amongst scientists and public health officials. Usually defined as a U shape mortality curve, the 1918 influenza exhibited what is now called a W mortality curve. This indicated that those ages 18-40 were suffering heavily from this particular strain, and even worse, this influenza seemed to come in much stronger waves than previously witnessed (7). Biologically, the flu targeted the lungs of many of its victims, and eventually, secondary pneumonia caused the vast majority of deaths. World events also had an impact on the spread of influenza. By 1918, WWI was still being fought across the world, and ultimately, this resulted in the influenza travelling rapidly through the ranks of the military and their respective areas of deployment. The actual name "Spanish flu" resulted from the press in neutral Spain being allowed to report on the pandemic much more often/in depth than countries involved in active censorship of their own press during the war effort (8)

Response to the 1918 Influenza

Looking at the influenza outbreak, research now indicates that this particular flu outbreak resulted in an unprecedented event that had a large effect on how countries today handle public health and disease (9). Although this particular outbreak showed obvious mistakes in management, the large portion of actions taken by governments, specifically the United States, played a large part in curtailing the spread of this disease. This was accomplished via the enforcement of public health initiatives that included the closing of places of public gathering, an effort to increase cleanliness in major cities, and a system that was able to identify those that were sick and needed isolation/treatment (9).

The 1918 influenza saw large amounts of media censorship. This is often attributed to countries involved in WWI not trying to show weakness within their particular population. Daily life in some parts of the world came to a halt, and a great number of countries saw a dramatic change in how things operated in both the public and private sector (10). A general shortage of healthcare workers was also experienced due to the involvement of many with the war effort. In the United States, most physicians and nurses were being used to provide treatment and assistance to the military. Economically, the flu resulted in many businesses being without workers, and sectors like farming simply could not find enough people to help harvest crops (10)

Bubonic Plague in Early 1900s California

The outbreak of bubonic plague in the early 1900s stands as perhaps is the most unknown yet infamous public health crisis experienced by the United States. It represents a crisis that involved local government denial, racism, and pure violence resulting from the outbreak. Due to immigration from Eastern Asian countries, California stood as the perfect extension of the bubonic plague outbreaks occurring in mainland China. Ravaged by bubonic plague since the late 1800s, China was also encountering large numbers of its population immigrating to the United States. With such a huge influx of immigrants, the United States could simply not screen all those entering the country. As a result, San Francisco suffered a large outbreak of the plague from 1900-1904 (11). Henry Gage, the then current governor of California, denied the outbreak outright for a number of years and refused to pledge state support for those affected by the outbreak. His denial was one based on preserving both the social and economic reputation of California, and the idea of a plague outbreak was something that he feared would greatly affect the state's economy and his upcoming bid for reelection (12).

Response to Plague in 1900s San Francisco

Governor Gage attempted to prevent any press coverage of the page, and he succeeded in censoring medical publications from being published or circulated about California's specific plague epidemic. Discrimination against the Asian population also was widely active by both the government and residents of San Francisco/California. In particular, the San Francisco Chinatown was quarantined for only approximately two days, and at that point, the city's public health officials decided to then go into the area to clean and identify sources of the plague (13). This program resulted in distrust from the Asian community, and thus, they failed to cooperate with public health officials and even kept their sick hidden to avoid treatment from the department of health (14). This represented a clear divide between the residents of Chinatown and the city of San Francisco the crisis continued, the federal government considered a national quarantine being enacted on the state of California. Despite the governor's best attempts, the city also saw a negative economic impact from lack of business and travel within the city of San Francisco and the state overall (12).

Smallpox Eradication Program

Smallpox provides an interesting case study. By measure of mere historical prevalence, the virus has been around since almost the beginning of recorded human history. However, the Middle Ages saw Smallpox grow to a level of prominence. Perhaps the best-known smallpox outbreak occurred after settlers initially came to the Americas. Due to the natives' lack of immunity, smallpox would go on to wipe out a large majority of the population. By the early 1800s, a vaccine for smallpox had been developed via the method of inoculation by cowpox. Using the previously known idea that those who suffered from smallpox gained immunity, a vaccine was developed by Edward Jenner that gave patients a form of cowpox that then provided immunity to the smallpox virus. Although a vaccination existed, smallpox was still a prevalent issue over the next 150 years. Many initially saw forced vaccinations as a point of religious/moral contention, and the idea of personal rights in being forced to receive said vaccination also would come to the forefront of the debate (15).

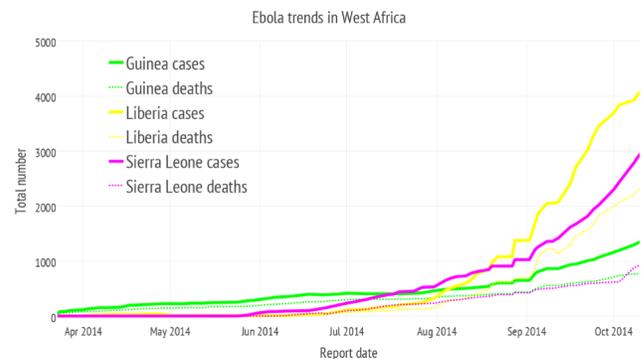
By the early 1900s, smallpox had become less lethal in favor of what was now classified as "variola minor" rather than "variola major", and ultimately, this proved to work in favor of those combating the virus (16). Although less lethal, smallpox persisted throughout the 20th century in areas of low standard of living. It was at this point that Western civilization seemed to decide to eradicate the disease once and for all. The initial idea was to

eradicate smallpox via a nationalized vaccination program in countries suffering from the virus. However, governments soon realized that a much more practical approach was to identify those with the virus and vaccinate all points of contact and or possible transmissions. In effect, this was a strategic public health initiative that looked at taking out the virus as quickly as it could appear. Smallpox was the perfect candidate for eradication because it was easy to determine those suffering from the virus and isolation was a measure that proved effective in containing the virus.

By 1977, the virus was declared eradicated by the World Health Organization, and thus, the world had finally taken out a virus that ravaged human society (17). Although a success in the realm of public health, smallpox proved to be a relatively easy opponent for public health officials to take on. For one, the virus had become less lethal by the 20th century. The fact that the virus was not easily transmittable unless one was to have close contact with an infected person also proved to be an exploitable weakness (18).

2014 Ebola Outbreak in West Africa

Due to the mortality rate and symptoms, the Ebola outbreak in West Africa consumed world media and scientific coverage for over two years. Discovered in 1976 along the Ebola River, the Ebola virus appeared rather quickly and violently. Classified as a hemorrhagic fever, the virus causes severe hydration, diarrhea, and blood loss (19). The bigger issue is that the mortality rate of Ebola reaches up to ninety percent in some appearances of the virus. Ebola also has been shown to be highly contagious via exposure to bodily fluids of an infected person. This level of contagiousness combined with symptoms that result in a good amount of bodily fluids being expelled makes the Ebola virus a formidable opponent for public health officials (19).



The graph above portrays just how rapid a handful of cases can progress to a multicounty outbreak. The infection rate of Liberia exemplifies the issue of Ebola in an urban setting. By September of 2014, the outbreak had reached major cities in Liberia, and

subsequently, the close quarters/city infrastructure promoted a breeding ground for the virus to find new hosts. This type of spread required international health organizations to set up treatment centers and also identify points of contact for those stricken with the virus. This process required fast action and the use of quarantines to prevent the linear transmission from continuing.

Response to Ebola

The World Health Organization considers their response to the Ebola outbreak a failure that was slowed due to a number of contributing factors. Accused of lacking a well-executed response, the WHO has been said to have provided insufficient resources to their response due to the majority of those affected belonging to lower socioeconomic West African countries (20). The Ebola outbreak has been traced back to rural Guinea, and scientists believe this involved a bat to human transmission. Within a few months, the virus had spread throughout West Africa, and the number of patients soon overwhelmed the health infrastructure of the ill prepared Western African nations. Distrust between the locals and outside health organizations soon became an issue and some local leaders denounced the Ebola outbreak as a Western conspiracy. This was also seen during the AIDS epidemic, and the same strains of distrust became apparent as the outbreak spread (21).

Burial Practices Involved in the Spread of Ebola

Culturally, the issue of Ebola was amplified by burial practices in many rural West African villages. In these cultures, the body is left exposed and those in the village are encouraged to handle the body via touching, kissing, etc. during the funeral ceremony. This custom was responsible for Ebola's devastating effects on isolated villages. Even more worrisome was the fact that villagers from adjacent villages would come to these funerals, and as a result, they carried the virus back to their village. This process continued until the virus finally had a carrier that took it into a larger city center. Many experts used this information to understand linear transmission/spread of the disease by examining those that attended the funeral of specific patients that died from the Ebola virus. This type of basic epidemiology greatly helped in tracking the origin of the outbreak. Organizations like the WHO and Doctors Without Borders attempted to curtail the risky burial practice by instituting a system of body disposal of those that died from the virus (22). This system, although effective, led to distrust between the government and the local populations. Local citizens began to associate government healthcare workers with death, and this

resulted in villages hiding their sick to avoid government intervention (21). This distrust was so detrimental to the efforts of healthcare providers, many began to rely on the local community to become activists in favor of attacking this particular outbreak. This involved locals being used to help guide/act as an ambassador for the healthcare workers, and ultimately, the local communities in many areas had leaders that took it upon themselves to travel within the community (23).

Subtopics of Interest

Use of Personal Protective Equipment (PPEs)

When dealing with a highly contagious and deadly virus, the primary goal is to take precautions that avoid further spread of the virus. In the most recent Ebola outbreak, many started to reexamine current procedures for PPEs, and ultimately, a large array of inconsistencies were found that contributed to this issue of infection control. In order to understand PPEs, one must look at why we have chosen to use these in the first place. With the arrival of Ebola in Guinea, scientists from across the globe used this epidemic to examine longstanding procedures of how exactly to combat a hemorrhagic fever and how to protect the healthcare workers treating this infection. According to a recent study, it was determined that the implementation of increased medical interventions resulted in a lower mortality rate of those treated. This included things such as, oral/intravenous fluids, electrolyte replacement, targeted clinical laboratory testing, and the use of appropriate antibiotics. It must be noted that these lower mortality rates were observed in the capital city of Conakry at a hospital run by personnel from both the CDC and WHO (24).

Although positive infection control procedures combined with the use of PPEs provide safety for workers, it also results in limited clinical ability due to the fact that this equipment was simply not plausible to wear for periods longer than 2-3 hours. Due to the extremely high temperatures experienced in the central African region, the restrictions of PPEs were only made worse when treating Ebola patient (25).

Another recent study looked at the issue of overheating in a tropical environment while wearing protective equipment, they found that this not only limited clinical time with patients, but also, the long bouts of heat exposure resulted in health care workers becoming dazed and more prone to make mistakes in donning/removing this protective gear (26) This presents PPEs as serving both a positive and negative purpose in the world of infection control. Although far from perfect, the risks of these devices were accepted due to the needed one on one patient

care that showed effectiveness in treating said patients.

Improving comfort and effectiveness of PPEs

Multiple health organizations have differed in recommendations for PPEs when dealing with an Ebola like virus. However, common threads persist. This includes a basic outer suit that involves the use of a gown, gloves, boots, and some type of face protection. In terms of respirators, most suggest avoiding a separate air supply in favor of a simple surgical mask combined with a secondary cover. PPEs, although common in nature, provide differing levels of safety and comfort to healthcare workers (26).

The current industry standards have seen rapid change during the most recent Ebola crisis. For example, Johns Hopkins recently signed a licensing agreement with DuPont chemical company to start production on a new PPE that has shown promise in improving comfort and reducing incidents of contamination (27). This new PPE tackles the issue of overheating by creating a feedback system that cools and filters outside air and blows it back into the suit for reduction of suit temperature (27). The suit also provides a color feedback system that provides healthcare workers with the ability to discern which parts of the suit are safe to handle and which parts must be avoided at all costs to avoid post donning contamination (27). This innovation highlights the ability of private industry to greatly affect a public health matter. In terms of economic theory, this example lends credence to the idea that monetary incentives greatly speeds up the development of developing solutions encountered by public health organizations.

Bioterrorism

Bioterrorism in the post 9/11 political climate has acted as a sort of “boogeyman” for both politicians and the media. Bioterrorism has taken shape as a potential vector for the next outbreak and or pandemic of a deadly virus/disease. Viruses such as smallpox, Ebola virus, bubonic plague, and SARS have all been indicated by intelligence sources as possible weapons of choice for both state sponsored biological warfare programs and terrorist organizations. Japan stands as the most infamous example of state sponsored biological warfare that specifically occurred during WWII. Unit 731, a Japanese military unit made up of Japan’s brightest scientists, focused heavily on the study and implementation of biological warfare (28). Using occupied China as their testing ground, the Japanese enacted a sophisticated and coordinated research operation that looked at a variety of delivery

mechanisms that enacted the spread of the virus (28). This set modern historical precedent for countries to soon follow suit during the Cold War. Currently, countries like North Korea and Syria are also said to maintain a supply of biological weapons (29). The idea of a rogue terrorist group using biological warfare has long been touted as a possibility from radical Islamic extremist groups; however, the fact is that these groups have shown inadequate capability to weaponize a biological agent. Ultimately, history has shown that these groups have taken up chemical weapon production because it’s rather much easier to produce and handle than a biological weapon (29). Cult groups within Japan attempted to weaponized a strain of Ebola during the 1990s; however, the group found issue in actually dispersing said agent in an effective manner. Issues surrounding lack of resources and equipment also hampered their attempts, and ultimately, these groups shifted to chemical weapons rather quickly (30).

Conclusion of Findings

Public health response throughout the past one hundred years has found both common ground and dissimilarities. In particular, state media coverage seems to be a common thread that has been manipulated throughout these outbreaks. The term “fake news” or “yellow journalism” actually finds validity when looking at the case of Bubonic Plague in early 1900s California. The lack of government response greatly contributed to issues surrounding this outbreak. A parallel situation occurred almost exactly one hundred years later during the SARS outbreak in China. Via government censorship and lack of international cooperation, China was able to curtail media coverage, and thus, stifle a proper response that contributed to the spread of the disease due to lack of information leaving the country. Again, transparency between governments must be increased in order to prevent the spread of these future outbreaks. Sophistication of personal protective equipment has obviously increased over time; however, issues surrounding the contamination/infection of health care facilities and workers continues to be an issue that health organizations still grapple with today.

In regard to the overall world response to a possible future outbreak, the sharing of information both public and private should not be hampered by government bureaucracy nor geopolitical rivalry. Funding of the World Health Organization should be continued and ultimately increased by the United Nations through proactive presentation of the need of this entity during the 21st century. With increased funding of the WHO, the idea of government management during these situations must be

explored and ultimately accepted. Without a clear and concise public response, outbreaks described in this research could continue to worsen as our world becomes smaller and smaller. This does not mean that the government should have unchecked power; however, organizations that were created for these types of situations (CDC, WHO, etc) must be allowed to operate in a manner that minimizes bureaucracy. Most importantly, the education of healthcare workers regarding contagious diseases/viruses should be greatly increased. As seen in the most recent outbreak of Ebola, healthcare workers are some of the most at risk for continuing the spread of these deadly outbreaks, and the proper procedure regarding the handling of PPEs and or infected materials/patients can greatly reduce the issues of infecting said healthcare workers.

To combat the transmission of these deadly viruses, the use of Personal Protective Equipment must increase on two fronts. First, the equipment itself must become more sophisticated and standardized. Second, training/education surrounding proper PPE use must be rigorous and more widespread. With increased use of PPEs, Ebola like viruses will fall in their rate of transmission and allow healthcare professionals to provide treatment while maintaining their own personal safety. Special consideration must be given to health systems that simply lack the funds to purchase/store these materials for a possible outbreak, and ultimately, international organizations must identify possible places of interest and provide the necessary materials to prepare that specific country and or area's specific medical infrastructure (supplies, training, etc).

Issues like bioterrorism provide governments and their respective populations with a constant fear of a possible outbreak being caused by a state or terrorist sponsored biological attack. Although intelligence agencies show that groups continue to pursue these types of attacks, the research indicates that this is simply not plausible without some sort of state backing, and therefore, state sponsored biological warfare is a more plausible issue rather than a rogue terrorist organization. Perhaps the biggest threat related to these outbreaks comes in the form of a possible economic crisis or temporary stagnation of the market. Simply stated, fear of any sort of health crisis will likely continue to result in a down market. However, as the world becomes more reliant on computers and automated infrastructure, the economic effects stemming from these outbreaks could slowly be reduced over time.

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