Pandemic 2020:
An Exercise in Outbreak Detection, International Aid, Disease Mitigation, and Biosecurity

Committee Chair: Ian Jaffe, ian.jaffe@duke.edu

Personal Biography

Hello Everyone! My name is Ian, and I will be your chair for *Pandemic 2020*. I am a junior biology major with a minor in global health and a certificate in community preparedness and disaster management. In my voluminous free time, I am involved with some infectious disease research on campus, and am an intern with the Duke Infectious Disease Response Training program. I also work with our student EMS service, Duke EMS, and (for fun) am the photography editor of our school newspaper, *The Chronicle*. Basically, I'm an infectious disease outbreak nut, and spend a lot of my time analyzing infectious diseases and their potential for spread within populations.

Committee Introduction

The field of infectious disease outbreak control is plagued by misinformation and political maneuverings. The threat of Ebola was largely overplayed in 2015, while 2016 saw a growing Zika outbreak go unnoticed for months, only to cause disproportionate hysteria when it was finally "discovered." In this committee, we will explore many of the issues surrounding infectious diseases through the simulation of an outbreak in Southeast Asia, set two years into the future. One of the axioms of modern infectious disease work is that "diseases do not respect boarders." Unfortunately for humans, it is not that simple: governments and NGOs cannot act in ignorance of international boundaries, cultural differences, and national sovereignty. Quite often, the disease itself is the simple part, as treatments and containment measures are known and well proven. The politics are where things get messy. In this committee, you will be representing small Southeast Asian nations, regional powers, global giants, and international organizations that will be contending with a serious humanitarian crisis. The challenge will not be solving the crisis—instead, your challenge will be to accurately represent your nation's (or organization's) interests and demonstrate a clear understanding of the internal and external politics your national leaders would be weighing.

Using this Background Guide

In preparation for committee, my expectation is that you will have read the entirety of this background guide. I have summarized some of the background information you will need to have in order to succeed in committee. I have also identified additional recommended readings that I strongly encourage you to at least skim to identify areas for reference during committee. There are additional references that you can examine if you wish, and

you are free to do additional research prior to and during committee. This guide will first introduce you to infectious diseases in general, highlight a few case studies that you should be familiar with, and then provide country-specific background regarding outbreak response. If you have trouble accessing any resources during your research, please let me know and I should be able to get you access.

A Note About Committee

This committee is a new one for DUMUNC and will be in a slightly unusual format, combining aspects of our specialized committees and our crisis committees. Throughout committee, myself and the rest of my dais will be giving you "crisis updates" with information relevant to your discussions. However, this will not be a traditional crisis committee with portfolio powers. Instead, my expectation is that delegates will focus on collaborative directives and resolutions, as well as on announcing national intentions.

Additionally, committee will not simply end with global pandemic or worldwide cure; instead, we will conclude committee by outlining an after-action report, analyzing our mistakes and successes as a committee. Those of you that have been in an ad-hoc committee may be familiar with this. At the end of the background guide, I have included some examples of after-action reports from real life events. While we will not be doing anything as substantial as these reports, they serve as good examples of the type of content we will discuss.

Position Papers

DUMUNC policy requires that all committees have position papers. Since this is a unique committee format, I will not be dictating specific position paper formats. However, my general expectation is that you will submit a 1-2 page single-spaced paper that conveys your understanding of how your nation/organization would respond to an outbreak of unknown origin and nature. Some potential formats include:

- A memo detailing how your nation/organization would respond to an infectious disease outbreak based on previous actions.
- An annotated bibliography providing brief summaries of information you found during your research relating to your nation's/organization's response policies, international aid policies, and prior response actions.
- A case study of a historical outbreak in which your nation/organization participated in response (this can include one of the case studies mentioned in this guide, but I would expect you to include novel information).
- A fictional case study in which you create an outbreak scenario in Southeast Asia and explain how your nation or organization might respond.
- Any other format that conveys your research and understanding.

Position papers are due at the beginning of the first committee session. I ask that you submit a hard copy, as well as email your paper to ian.jaffe@duke.edu.

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Infectious Diseases 101

At the most basic level, infectious diseases are illnesses that can be passed from person to person. Infectious diseases are caused by bacterial, viral, protozoan, and helminth infection, as well as by prion infiltration. For the purposes of this committee, you can focus primarily on viral infections. While protozoan and helminth infections are serious in deadly, they are not particularly relevant for pandemics, as both are typical infections of food and water contamination, and are not easily spread between individuals without help from an environmental source. While prion disease could potentially cause major issues in an outbreak scenario, prion disease is extremely rare and unlikely to do so. While bacterial illnesses are commonly communicated between individuals, most bacterial diseases are slow to spread. Additionally, bacterial diseases typically have extremely low fatality rates since we have effective treatment regimes for most classes of bacteria. Potentially pandemic diseases are almost always viral, as viruses multiply quickly and can oftentimes be spread via airborne droplets, such as with influenza. The one exception we will discuss is cholera, which can quickly spread within unsanitary conditions.

Viruses are infectious particles composed of an outer protein shell surrounding viral genetic material. The viral DNA or RNA contained inside the capsule contains all the genetic instructions necessary for the virus to replicate within a host cell. The specificity of this genetic material is one of the reasons why new viruses are rare. A virus must randomly mutate changes that allow it to survive and replicate in humans. Due to the statistically small chance of this happening, new viruses are relatively rare. However, new viruses do emerge, through zoonosis—the process of an animal virus mutating and being able to survive in humans. Recent examples of zoonosis include HIV, which is a human variant of the Simian Immunovirus (which affects primates) and the virus that causes Middle Eastern Respiratory Syndrome (MERS), a coronavirus believed to originate from camels.

Viruses are the chief concern for many epidemiologists for a few reasons:

- Viruses can have incubation periods lasting as long as a few weeks (for most potentially pandemic viruses) to a few years (some latent viruses like HIV). This is the period between initial infection and the onset of symptoms. Depending on the virus, during this period the virus may be undetectable (HIV) or may actually be contagious (poliovirus).
- Viruses may be transmitted via contact, airborne droplets, and fluids, amongst other routes. This is more versatility than other pathogens, and the airborne route is of particular concern for its ability to quickly spread a virus to a wide population.
- Viruses evolve relatively quickly compared to other pathogens, as they do not have to be able to survive and grow independently of host cellular machinery. Thus, most emerging pathogens are viral.
- Viruses can survive outside of humans, which is why most re-emerging pathogens are viruses. Viruses are commonly found in animal reservoirs (especially bats) and some can survive independently of a host for a period of time (such as hepatitis B, which can survive for 24 hours in dried blood).

Additional Resources for General Information on Infectious Diseases:

- **Recommended:** *World Health Organization Infectious Disease Fact Sheets*: These fact sheets give detailed summaries of what we know about many common infectious diseases. http://www.who.int/topics/infectious_diseases/factsheets/en/
- *A CDC Framework for Preventing Infectious Diseases*: This article provides a basic guide for US prevention policies, focusing on high-impact prioritization. https://www.cdc.gov/oid/docs/id-framework.pdf
- *Biology of Infectious Disease*: This biology guide from Merck provides a good overview of the basic biology of infectious diseases, including how diseases target certain areas of the body. http://www.merckmanuals.com/professional/infectious-diseases/biology-of-infectious-disease/introduction-to-the-biology-of-infectious-diseases

Ebola Hemorrhagic Disease Outbreak, 2013-2016

Overview of the Outbreak

The Ebola outbreak that grabbed the world's attention started in December 2013 in Guinea, and later moved to Sierra Leone, Liberia, Nigeria, and Senegal. Between December 2013 and April 2016, a total of 28,616 suspected, probable, and confirmed cases of Ebola were reported, although this is likely an underestimate. A total of 11,310 deaths were recorded, which is also likely an underestimate. Most cases occurred in Guinea, Liberia, and Sierra Leone, but an additional three-dozen cases were also reported in Mali, Nigeria, Senegal, European nations, and the United States. In September 2014, a peak 950 cases were reported. Incidence continued to drop in 2015, but it took some time for the epidemic to wind down. The outbreaks in Liberia, Sierra Leone, and Guinea ended in May, November, and December 2015. Additional cases of Ebola were still reported in all three countries through 2016.

Timeline Of The Outbreak

The Ebola outbreak spanned from December 2013 through March 2016, with the majority of cases being reported during 2014-2015. Due to the length of the outbreak, I will not be summarizing the entire timeline here. Wikipedia has a month-by-month summary, categorized by country. The peak case incidence was 950 per month in September 2014. https://en.wikipedia.org/wiki/West_African_Ebola_virus_epidemic_timeline

Outbreak Science

- The basic reproduction number, R_0, which is the number of people an ill person infects at the start of an epidemic and before intervention, was estimated at 1.71 to 2.02 in Guinea, Liberia, and Sierra Leone, a range that is similar to estimates derived from central African outbreaks in the prior decades. Thus, this Ebola outbreak was not different from previous outbreaks in terms of the biology of outbreak expansion. What was different was the fact that the Ebola virus was introduced into densely populated urban centers with large populations, including large populations living in squalid conditions.
- Ebola has a long incubation period, lasting up to three weeks. This means that an outbreak must go for at least that long without a new Ebola case in order for the outbreak to be considered over. The international standard is typically twice the longest incubation period, meaning we would want to see a 42-day period without a new Ebola case in order to declare the outbreak over.
- A general principle of outbreak response is that the faster an outbreak can be detected and responded to, the smaller it will be. The 2013-2016 Ebola outbreak saw an exponential increase in cases during the first few months of the outbreak, prior to intervention. The delay in detection and intervention has since been heavily criticized, with the WHO bearing much of the blame. Many experts believe that the delays in outbreak response were largely responsible for this being the deadliest Ebola outbreak in history.

- Luckily, Ebola is not believed to be transmissible while patients are asymptomatic. The infection viral load is multiple orders of magnitude lower while patients are asymptomatic. In fact, it is common for close family members to never get sick after spending weeks with an asymptomatic patient, while healthcare workers can easily become infected after short exposure to an symptomatic patient.

Outbreak Intervention

The main interventions used in this outbreak were classic methods for Ebola control (and infectious disease control in general): finding symptomatic patients and tracking those they have come into contact with; isolating probable or confirmed cases, admitting patients to treatment centers, and providing supportive clinical care; and ensuring safe (low infection risk) and dignified burial.

Unfortunately, Ebola exposure and illness cannot be accurately predicted or prevented. Thus, future outbreaks will likely be managed similarly to the 2013-2016 outbreak: with community engagement, early detection and diagnosis, comprehensive contact tracing, prompt patient isolation, supportive clinical care, and rigorous infection control, including safe burial. According to most experts, this classical strategy was improved but not revolutionized in 2013-2016. Future intervention may change due to the results of new, accelerated research on vaccines, rapid diagnostic tests, and treatments. Additionally, experts believe that building and improving health infrastructure systems in vulnerable countries will help prevent and mitigate future outbreaks.

Community Engagement is a Key Challenge

[From "Community Trust and the Ebola Endgame," New England Journal of Medicine]

> *Six-year-old Fatou was exposed to Ebola at her uncle's funeral in Forécariah, a district along Guinea's border with Sierra Leone where about 50% of all Guinea's Ebola cases since February 2015 have occurred.1 Fatou's entire family was registered as contacts to be monitored for the next 21 days, during which the disease could develop.*
>
> *A contact tracer began making daily visits to check their temperatures and evaluate them for symptoms. For the first few days, everything seemed fine, but on the fifth day, Fatou was found to have fever and vomiting.*
>
> *A response team was dispatched to bring her to the Ebola treatment center for testing, but Fatou's grandmother vehemently refused. "You are going to cut her into pieces!" she screamed. The team tried to reassure her, but to no avail. The grandmother ran outside and called her neighbors. "Help me! They are trying to kill my grandbaby!" A swarm of people from the neighborhood quickly converged on the home. Sensing the anger in the crowd, the response team withdrew to safety.*
>
> *By now, the sun was setting and the response team decided to return the next morning, though they knew that by then Fatou would most likely have been hidden. If her symptoms were from Ebola, she had already exposed many people in the neighborhood and would spur another chain of transmission.*

> *The following day, the response team came back, this time accompanied by gendarmes in case the neighborhood turned on them again. As expected, Fatou's grandmother reported that Fatou was gone — she had traveled to another village. Then, seeing the officers outside, she relented. "This must be serious if they are here," she remarked. She confessed that Fatou was in fact inside and agreed to let her be tested, but only if she could come along.*

This excerpt highlights a key challenge with the 2013-2016 Ebola outbreak: a lack of community trust. The extreme quarantine measures and overall conditions of the outbreak made it very difficult for international aid workers and national public health ministries to effectively gain the trust of the populations they were dealing with. Communication was often lacking or unclear, and most people did not have an understanding of what Ebola was, why people were dying, and how the actions they were being told to take would help. Imagine if the people asking you to trust them were the same people who had come to take away your sibling, who then died, and who were also the people who told you that you could not bury them following your community's traditional burial practices. It is not exactly a recipe for trust, which makes effective public health intervention extremely difficult to do.

The Media Game

The 2013-2016 Ebola outbreak was significant for its global reach—at least in the media. While less than 20 Ebola cases were treated outside western and central Africa, and only in a handful of these cases was Ebola contracted outside of these regions (in all of these cases, healthcare workers contracted Ebola from treating patients brought to Europe or the United States from outbreak regions). Nonetheless, people outside of outbreak regions were panicked by the outbreak, fearing that it would spread to their countries. In fact, in November 2014, despite there having been only two cases of Ebola transmission inside the United States (both patients survived), an opinion poll found that Americans ranked Ebola as the third-most-urgent health problem facing the country. Only cost and access were ranked higher. Ebola was ranked higher than any other disease, including cancer and heart disease (which are responsible for 50% of US deaths).

In reality, Ebola poses a small risk to European nations and the United States. As a fluid-borne disease, transmission can be easily stopped through using proper personal protective equipment, which is readily available in high-resource settings. Additionally, high-resource nations can more easily treat infected patients with comfort care and rehydration, which significantly reduces the Ebola fatality rate. One reason for the high priority placed on Ebola is that people did not understand, that Ebola is difficult to transmit. Almost 85% of people polled said a person is likely to get Ebola if he or she is sneezed or coughed on by an infectious, symptomatic person. This is false. Additionally, 48% said someone could transmit Ebola while asymptomatic. This is also false. The media not only failed to alleviate panic, but news outlets are believed to have contributed to the panic by systematically misinforming consumers and overplaying the relevance of the outbreak to American and European consumers.

Failure of the WHO

International experts regard the World Health Organization as a major failing point in the outbreak. In particular, the WHO failed to raise the alarm about the outbreak for months after it began, delaying response and possibly contributing to thousands of the deaths. Additionally, the WHO failed to coordinate international NGO and governmental aid during the outbreak response.

Outbreak Significance

Thee 2015 Ebola outbreak garnered international attention as one of the deadliest outbreaks in recent history. The outbreak was also the subject of considerable media attention and speculation, inciting panic in many European countries and the United States as these countries cared for ill caregivers brought home from the outbreak region. However, the most significant observation from this outbreak was the

Additional Resources:

- **Recommended:** *Ebola: Mapping the Outbreak, BBC*: This article provides an overview of the timeline of the Ebola outbreak.
  http://www.bbc.com/news/world-africa-28755033
- *CDC's Ongoing Work to Contain Ebola in West Africa, CDC*: This one-page report provides an example of the work the CDC was doing towards the end of the outbreak in June 2016.
  https://www.cdc.gov/vhf/ebola/pdf/cdcs-ongoing-work.pdf
- **Reference**: *Ebola outbreak timeline, Wikipedia*. This is a basic timeline of the outbreak, with information broken down by country.
  https://en.wikipedia.org/wiki/West_African_Ebola_virus_epidemic_timeline
- *Communicating Uncertainty — Ebola, Public Health, and the Scientific Process, NEJM*. This article covers the difficulties of communicating complex issues surrounding an outbreak to the lay public.
  http://www.nejm.org/doi/full/10.1056/NEJMp1413816?query=featured_ebola
- *Ebola and Quarantine, NEJM*. This article provides background on the science behind quarantine decisions, with a US-centered focus.
  http://www.nejm.org/doi/full/10.1056/NEJMe1413139?query=featured_ebola
- *Will Ebola change the game? Ten essential reforms before the next pandemic. The report of the Harvard-LSHTM Independent Panel on the Global Response to Ebola, The Lancet*. This article summarizes after-action recommendations for the Ebola outbreak.
  http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(15)00946-0/fulltext

Zika Virus Emergence, 2015-2016

Overview of the Outbreak

In 2015, the Zika virus began to cause a widespread epidemic in Brazil, which then spread to much of the Americas. Prior Zika outbreaks had been small and mostly confined to island populations with to few people to estimate the effects of Zika. Once established in Brazil, Zika quickly spread throughout the country and into Central America. Within a year, the virus had been detected in almost every country or territory infested with *Aedes aegypti*. The explosive spread was favored by a lack of population immunity and the ability of *A. aegypti* to thrive in urban environments.

Outbreak Timeline

It is believed that Zika arrived in Brazil during the 2014 Brazil World Cup. The influx of people during the world cup may have brought the virus from an active outbreak zone. However, some researchers believe that the virus was brought to Brazil a few months later, when canoeing teams from French Polynesia, New Caledonia, Easter Island, and the Cook Islands (Zika outbreak zones), attended the Va'a World Sprint Championships in Rio. Other researchers believe that the virus may have arrived earlier, in 2013. In January 2016, the World Health Organization said the virus was likely to spread throughout most of the Americas by the end of 2016. In February 2016, WHO declared the outbreak a Public Health Emergency of International Concern as evidence grew that Zika can cause birth defects as well as neurological problems. In November 2016, the WHO announced the end of the Zika epidemic in Brazil. This decline occurred because much of the population is now immune to Zika, which has sufficiently interrupted the Zika life cycle.

For more information about the Zika outbreak timeline, Wikipedia has a good month-by-month summary: https://en.wikipedia.org/wiki/Zika_virus_outbreak_timeline

Outbreak Science

- Zika virus was previously believed to be largely asymptomatic prior to the 2015-2016 outbreak. Due to the scale of the Brazil outbreak, we now have a better epidemiological understanding of the disease. Approximately 20% of infected individuals will experience a mild flu-like Zika fever. Additionally, a small percentage of patients will develop Guillan-Barré syndrome, a normally rare autoimmune neural disease. Zika virus has also been linked to birth defects when pregnant mothers are infected, particularly microcephaly.
- Zika is spread via a mosquito vector. Humans and nonhuman primates are the known reservoirs for the disease. This means that if Zika can be eliminated from a geographic region, it will not naturally be reintroduced. The virus is primarily transmitted via mosquito bite, but it may be transmitted via body fluids and evidence indicates that the virus may be sexually transmitted.
- Infected individuals develop a temporary immunity to the Zika virus after initial infection. This means that most outbreaks will fizzle out of their own accord, unless they are able to move geographically into different populations. Air conditioning,

mosquito control, and other control measures can also break the Zika life cycle, ending an outbreak.

- Since the majority of patients are asymptomatic, Zika is relatively difficult to track in real-time. Retrospective population-level epidemiological studies have revealed most of what we know about the virus.
- The Zika outbreak has declined due to an increase in natural immunity in the Brazilian and South American population. This immunity is short-lived, so experts expect that we will observe spikes in Zkia every few years for the foreseeable future.

Outbreak Intervention

Currently, there is no vaccine for the prevention of Zika infection, although multiple prototype vaccines are currently in development. One prevention strategy is to intercept the Zika life cycle by stopping the vector growth in its native environment. This strategy is not easy for Zika since mosquito vectors are difficult to control. Another limitation is that there is no available vaccine for Zika to inoculate primates. Another strategy is to reduce the exposure of vulnerable people to mosquitos by applying bed nets and mosquito repellents that can decrease the exposure. Another technique that can reduce Zika infections is to limit the vector/source to the urban population. This could be done by limiting travel to infected areas. An additional strategy is to eliminate vector reservoirs (such as by exterminating mosquito breeding grounds). In the case of Zika, proper drainage of stagnant water can inhibit mosquito reproduction. Adequate garbage management could also help. Another intervention that can be helpful is to avoid humans acting as Zika virus reservoirs by avoiding mosquito bites to infected humans.

Asymptomatic Patients and Vector Control are Key Challenges

When controlling adult mosquitoes, many of the species actively host-seek at night. However, *Aedes aegypti* does not actively host-seek and bites primarily during the day, a huge departure. *Aedes aegypti* waits for a person to enter its geographic area before biting instead of seeking out hosts. Typical mosquito control involves nighttime sprayings with mosquito insecticide. This is ineffective for *Aedes aegypti* mosquitoes, which are resting under shelter during this time, preventing the insecticide from working. An additional problem with *Aedes aegypti* is its preference for small natural and manmade containers (tree holes, flower pots, etc.) for laying larva. The high quantity of small containers that the species can turn into a larval habitat requires more resources to control the mosquitos.

The Media Game

[From "Zika Virus and the Media," Hospital Pharmacy]

> *Every time I hear "Zika virus," I immediately think about Henny Penny (aka Chicken Little) or a Robin Cook novel. Last year, I did not see much information regarding the Zika virus. But over the last 2 months (January and February 2016), I have received at least one email a week that includes information about the Zika virus; over the past several weeks, that has increased to at least one or more per day. The titles of these stories included "Fears Over Spread of*

> *Zika Virus Grow in the Caribbean," "CDC Guidelines on Preventing Sexual Transmission of Zika Virus Issued," "CDC Updates Interim Zika Virus Guidelines for Pregnant Women and Women of Reproductive Age," "CDC Issues Updated Zika Guidelines for Health Care Providers," "EU Drugs Agency Sets Up Zika Task Force to Speed Vaccine Work," "Zika Virus a Global Health Emergency, W.H.O. Says," "Zika Virus Isn't the Only Concern for Rio Olympics" and "Public Health Agencies, Hospitals Prepare for Potential Zika Spread." No, I don't think "the sky is falling," but I do think there is a dramatic change in how information is released and how quickly it is disseminated using email, the Internet, social media, and the more traditional news outlets compared to past decades.*

The Zika outbreak garnered a great deal of media attention, particularly focused on the link between the virus and birth defects, as well as on the potential for the disease to spread to the United States. This media attention had both positive and negative effects. In Brazil and a few of the surrounding nations, the focus on Zika led to a focus on vector control, which also had positive effects on other diseases, like dengue, malaria, yellow fever, and chikungunya, which are also spread by mosquitos. On the negative side, resources were sometimes diverted from more important health priorities to deal with Zika when it did not make sense to divert resources. For example, one North Carolina county (which has one of the highest HIV rates due to injection drug users) spent $40,000 USD on vector control supplies instead of funding a needle exchange program. For context, North Carolina has not had a single case of Zika that was contracted within the state. Media obsession has fueled similar misappropriation throughout the southern US.

Outbreak Significance

This outbreak exemplifies many points that are important to understand. First, this outbreak demonstrated how a disease with a low symptom rate could quickly spread across a large population in a matter of weeks. Second, this outbreak shows the difficulties of epidemiology, since we have known about the Zika virus for decades, but were only recently able to link the virus to Guillain-Barre Syndrome and birth defects, including microcephaly. Third, this outbreak highlights how vector-based control measures can be effective. Many of the diseases of concern are vector-borne, and mosquitoes are a particular concern.

Additional Resources:

- *Surveillance and Control of Aedes aegypti and Aedes albopictus in the United States, CDC*. This article outlines US-based surveillance and control measures, and gives a broad background of the Zika outbreak. https://www.cdc.gov/chikungunya/pdfs/Surveillance-and-Control-of-Aedes-aegypti-and-Aedes-albopictus-US.pdf
- **Recommended:** *Prevention and Control Strategies to Counter ZIKA Epidemic, Frontiers in Microbiology*. This article gives an overview of basic Zika response measures. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5328966/

- *One year into the Zika outbreak: how an obscure disease became a global health emergency, WHO*. This article outlines the first year of the Zika outbreak using a biology-based approach. http://www.who.int/emergencies/zika-virus/articles/one-year-outbreak/en/

Severe Acute Respiratory Syndrome, 2002-2003

Overview of the Outbreak

The 2002-2003 SARS outbreaks was perhaps the most significant infectious disease outbreak in the 21st century. SARS, an emerging pathogen, puzzled scientists for some time, and delays on the part of the Chinese government contributed to the large size of the outbreak. The SARS outbreak was also the first outbreak of a rare disease that was quickly spread worldwide by transoceanic airline travel. The multi-locus nature of the outbreak (which had major epicenters in China, Hong Kong, and Toronto) is also unusual and noteworthy.

Outbreak Timeline

The SARS epidemic started in Guangdong Province, China in November 2002 where the first case was reported a local farmer who died. China informed the World Health Organization of the outbreak in February 2003, a delay that contributed to the rise of SARS. The outbreak first appeared on November 27th 2002, when the World Health Organization's Global Outbreak Alert and Response Network (GOARN) detected unusual "flu activity." By the time the WHO got sufficient information from China and took action, over 500 deaths and 2,500 cases had already occurred.

The epidemic reached the global media in February 2003, when an American businessman traveling from China had signs of SARS while on a flight to Singapore. The plane stopped in Vietnam, where the victim died. On March 12th 2003, the WHO issued a global alert, followed by a CDC health alert. During the outbreak, both Hong Kong and Toronto were centers of large local transmission. The WHO declared SARS contained on July 9th 2003.
A more detailed timeline of the SARS outbreak can be found on Wikipedia: https://en.wikipedia.org/wiki/Timeline_of_the_SARS_outbreak

Outbreak Science

- As with many viruses, patients infected with the SARS coronavirus will not be infectious until symptoms appear. This can take 2-7 days, although incubation periods of up to two weeks have been observed. This represents a serious challenge to outbreak containment, since people that infected individuals come into contact with will need to be quarantined. Additionally, many healthcare providers have been infected while caring for patients.
- There are currently no known treatments for SARS, and the disease has an overall case fatality rate of around 9%, although this rate is significantly higher in older populations. Supportive treatment is helpful, and there are laboratory tests to confirm SARS coronavirus infection.
- The average R_0 (basic reproductive rate—the number of people an infected person will infect) for SARS is estimated to be between 2 and 5 depending on the population density and number of individuals an infected patient comes into contact with. A R_0 of 5 (likely in a dense population) could potentially lead to an explosive

outbreak. The WHO recently listed SARS as one of the viruses most likely to cause a major global outbreak in the future.

- There are currently unfavorable economic conditions for SARS vaccine and treatment development, since it is such a rare outbreak. Thus, little progress has been made towards mitigating the size and effect of future SARS outbreaks.

Outbreak Intervention

Quarantining potential patients, combined with rapid identification and management of contacts, were highly effective in interrupting transmission in several countries. For the SARS outbreak, people under quarantine were mostly confined at home and monitored for symptoms. In a few countries, quarantine was legally mandated and monitored by government officials. In most countries, quarantine was not mandatory, but court orders were issued for blatantly noncompliant individuals. Of people quarantine, up to 3% ended up being diagnosed with SARS, on average. Governments also put in place public campaigns to decrease the interval between symptom onset and patient quarantine. Additionally, many governments asked affected populations to measure their temperature daily, and be evaluated if they had a fever.

Governments also put in place measures to increase social distance, particularly cancelling large public events. Some places also required people using public transportation or visiting some public areas to wear masks. Travel advisories (especially advice to postpone nonessential travel) were issued by the WHO and national governments. Airplane travel to outbreak centers decreased dramatically during the epidemic. Entry and exit screening were also used in many countries to help slow the spread of SARS across international boarders.

Airplane Travel was a Key Challenge

During the outbreak, multiple airplane flights were associated with SARS transmission. Airplanes present a particular challenge to outbreak containment for a few reasons. Close-quarters contact for an extended period of time provides a significant opportunity for transmission between individuals. Additionally, airplane travel allowed people to travel around the world, bringing SARS with them. As a result, SARS was easily able to move from China all the way to Toronto in a matter of days. This makes SARS extremely difficult to contain, since an asymptomatic patient can go almost anywhere, and then spread the virus around once they become symptomatic.

Interestingly, the risk of airplanes was not fully realized during the initial months of the outbreak. From "Transmission of the Severe Acute Respiratory Syndrome on Aircraft," New England Journal of Medicine:

> *Although there have been anecdotal reports of transmission on aircraft, the risk, if any, to passengers has not been well documented. WHO and the Centers for Disease Control and Prevention (CDC) issued guidelines for air travel to and from areas affected by SARS, specifying that hand hygiene is important and that it may be appropriate to place a mask on a passenger suspected of having SARS. Nevertheless, the public perception of the risk of in-flight transmission resulted in the widespread use of masks by passengers and crew members, as*

> *well as the implementation of preflight screening by airlines and a substantial decrease in air travel from and to some Asian countries. We conducted a study involving the evaluation of the passengers and crew members on three flights that had carried one or more persons in whom SARS was later diagnosed, in an attempt to quantify the risk of transmission during various phases of illness.*

The Media Game

In March 2003, when the WHO issued its first warning against SARS the media immediately jumped on the disease—they were captivated with the new deadly virus. The media focused on apocalyptic graphics detailing rapid SARS transmission around the world. Misinformation was rampant, and many people around the world did not understand many details about the virus, such as whether asymptomatic individuals could transmit the virus (similar to concerns with Ebola virus), whether people should wear masks in public, and what symptoms to look for. The general consensus is that the media coverage was excessive, sometimes inaccurate, sensationalist and potentially detrimental to the public.

Outbreak Significance

The SARS outbreak, as previously mentioned, was significant for its global reach in the context of an emerging pathogen. The outbreak was an international focus for months after a long delay in international recognition of the crisis. As the WHO recently stated, SARS remains one of the most significant threats for a resurgent global outbreak.

Additional Resources

- **Recommended:** *Public Health Interventions and SARS Spread, 2003*. This article provides an excellent review of the public health interventions used by national governments to slow and contain the spread of SARS during the outbreak. https://wwwnc.cdc.gov/eid/article/10/11/04-0729_article
- *Epidemic curves - Severe Acute Respiratory Syndrome (SARS), WHO*. This site contains numerous epidemic curves showing the explosive growth of the outbreak. http://www.who.int/csr/sars/epicurve/epiindex/en/
- *The SARS Epidemic and its Aftermath in China: A Political Perspective, The National Academies*. This article provides background on the political aftermath of SARS, as well as the political reasons behind China's delay in informing the international community of the outbreak. https://www.ncbi.nlm.nih.gov/books/NBK92479/
- Model Parameters and Outbreak Control for SARS, Emerging Infectious Diseases. This article discusses outbreak control measures and the parameters affecting their success or failure based on outbreak circumstances. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3323341/

Cholera Outbreak, 2010-2017

Outbreak Summary

The ongoing Haitian cholera outbreak began in October 2010 in rural Haiti. Within a few months, almost 5,000 people had been killed, with thousands more being hospitalized. The outbreak started ten months after the powerful January 10th 2017 7.0-magnitude earthquake, which devastated Port-au-Prince and many southern towns. Cholera is believed to have been introduced by UN peacekeepers from Nepal. Within the first 10 weeks of the epidemic, cholera cases had been reported in every Haitian province.

Outbreak Timeline

The outbreak began in mid-October 2010 in the rural central Haiti. A few local hospitals began to report high numbers of patients dying from severe diarrhea. A few days later, the Haiti National Health Laboratory confirmed that these cases were cholera. By the end of October, cholera had spread to nearly half the country. By the end of October, there had been more than 300 deaths and 4,000 hospitalizations, representing an explosive outbreak. By mid-November, cholera had spread throughout the country. Overcrowding in hospitals, a result of the earthquake and outbreak, prevented many from getting treatment for cholera, causing case fatality rates as high as 6% in some regions.

Due to the rapid growth of the outbreak, there were fears that the disease would continue to spread quickly, as many people were still living in unsanitary camps after the earthquake. PAHO predicted that nearly 270,000 people would be infected within a year of the outbreak if growth continued at the rates seen in the first two months of the outbreak. The cholera outbreak spread to the Dominican Republic in mid-November 2010, causing a few hundred cases in the next few months, representing a much slower spread than the rate observed in Haiti. The outbreak also briefly spread to Venezuela after tourists from that country contracted cholera on a trip to the Dominican Republic. Control measures have greatly reduced the size of the outbreak in Haiti (aided by a growing relative immunity in the population). Still, the outbreak remains active, killing nearly 40 people per month. Thus far, approximately 7% of the Haitian population has had cholera during the outbreak, and nearly 10,000 confirmed deaths have resulted.

AlJazeera America has a great interactive timeline with more detail about the outbreak (as well as more context with the earthquake and international response) available at this link: http://america.aljazeera.com/watch/shows/fault-lines/FaultLinesBlog/2013/8/21/haiti-the-un-andcholeraatimeline.html

Outbreak Science

- Haiti was a country that had not previously experienced a cholera outbreak. Thus, the native population had no immunity to the disease. Within most cholera-endemic countries, the acquired relative immunity of the local population is one of the largest factors in helping to contain an outbreak. Without this, cholera can quickly spread between susceptible individuals.

- Cholera has been found in shellfish and plankton. Transmission is usually via the fecal-oral route, through contaminated food or water (typically caused by poor sanitation or hygiene). Most cholera cases in developed countries are a result of contaminated food, while in the developing world cholera is more often transmitted through contaminated water.
- Cholera is treatable through oral rehydration salt solutions (like a more intense Gatorade), intravenous fluids, or antibiotics, depending on severity of the illness. Prior exposure does confer some level of immunity to near-future infection. While these treatments are available and can easily be brought into rural developing nations, these treatments all require that the patient have access to clean water, which can be difficult (especially when contaminated water was the source of the outbreak).
- Cholera is the only bacterial illness that was important enough to be included in a case study. That is because it is one of only a handful of bacterial illnesses that can be quickly spread within a population. Cholera has an average incubation length of less than 2 days, which means that the disease can be spread from person to person quickly. Additionally, cholera is one of the few bacterial illnesses to have caused a major outbreak on multiple occasions.
- There is a cholera vaccine that is effective for preventing the majority of cases. Vaccination coverage is poor worldwide, and vaccine distribution remains a challenge in Haiti. A lack of vaccination and the relatively high cost of the vaccine (up to $4 USD) have certainly contributed to the size of the outbreak and its persistence.

Outbreak Intervention

Health officials started compiling daily reports to monitor the outbreak spread and to know where to devote cholera prevention and treatment resources across Haiti. By the end of October 2010, formal surveillance with daily reports was fully implemented. The CDC collaborated with the Haitian health ministry and other partners to conduct rapid field investigations and laboratory studies. A key issue was that most of the population had heard messages about treating their drinking water, many lacked the materials and means to do so. In addition, the healthcare infrastructure in Haiti was overwhelmed with the number of patients. Guidelines were quickly disseminated to ensure antimicrobial drug treatment was as quick and effective as possible. The CDC also prepared trainings for local health workers specifically on cholera, training hundreds of healthcare providers within a few months. Additionally, the Haitian government had 10,000 community health workers (also trained by the CDC) staff local first aid clinics, teach health education classes, and lead prevention activities in their communities to alleviate the strain on healthcare workers and traditional infrastructure. The community health worker materials discussed treating drinking water, how to triage potential cholera patients, how to use oral rehydration salt solutions, and how to disinfect.

Supply Chain Problems were a Key Challenge

Supply logistics were daunting as cholera spread rapidly across Haiti, as much of the supply chain infrastructure was compromised during the earthquake (and typically was in poor

condition prior to the earthquake). Surges in cases depleted local stockpiles of IV fluids and oral rehydration salts, and resupplying them could be slow. To help with this issue, the Haitian supply chain program worked to get donated supplies to local treatment centers as soon as possible. Additionally, the US allowed PEPFAR treatment centers to use their supplies and resources to help deal with cholera surges. However, supply chain problems were persistent, and many people died due to delays in getting resources during the first year of the outbreak. As the outbreak has stabilized, supply chain issues have largely been remedied as earthquake recovery has progressed, but a surge in cholera could still test the limits of the supply chain.

The Media Game

Unlike the other case studies we have examined, the cholera outbreak in Haiti has received relatively little media attention outside of Haiti and a few surrounding nations. The majority of Americans know about the 2010 earthquake in Haiti, but few are aware of the cholera outbreak. The lack of media attention can be attributed to a few different factors. Cholera is not a new disease, so it may not be as interesting to the general public—we know too much already. Additionally, cholera is not really perceived to be a potential threat to the United States, so media outlets may believe that consumers will not be interested in hearing about the outbreak.

Outbreak Significance

The 2010 Haiti cholera outbreak was significant for being one of the deadliest cholera outbreaks in history. It also serves as a great example of how a humanitarian disaster can turn into a health disaster. In fact, in disaster management, there is a saying that "every disaster is a health disaster" because anything that causes a displacement from normal activities will cause health problems.

Additional Resources

- *Cholera in Haiti: Reproductive numbers and vaccination coverage estimates, Scientific Reports*. This article provides useful information and models for understanding the rapid spread of cholera in Haiti during 2010. https://www.nature.com/articles/srep00997
- **Recommended:** *Lessons Learned during Public Health Response to Cholera Epidemic in Haiti and the Dominican Republic, Emerging Infectious Diseases*. This article provides a good overview of the public health response to the cholera outbreak and the issues that were encountered during the response. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3310587/
- Eliminating Cholera Transmission in Haiti, New England Journal of Medicine. This article discusses measures taken to slow the spread of cholera. http://www.nejm.org/doi/full/10.1056/NEJMp1614104#t=article
- *The 2010 Cholera Outbreak in Haiti: How Science Solved a Controversy, PLOS Pathogens*. This article provides information about the potential point source introduction of cholera from Nepalese UN peacekeepers. http://journals.plos.org/plospathogens/article?id=10.1371/journal.ppat.1003967

Southeast Asia

Southeast Asia: An Introduction

Southeast Asia is considered to be the region south of China, east of India, and north of Australia, bounded by the Pacific Ocean to the east. The region's economy is largely agriculture and ocean-based, with some tourism and manufacturing. Geographically, the region is dominated by water, containing the South China Sea, Indian Ocean, Philippine Sea, and the Pacific Ocean. Only one nation, Laos, is landlocked, while many others have large archipelagos. The region is relatively impoverished, and has a history of inadequate health infrastructure. The climate is warm, humid tropics, making the region particular susceptible to emerging infectious diseases.

Southeast Asia: The Surroundings

There are numerous nations that surround Southeast Asia. In particular, China, India, and Australia all share land or maritime boarders with Southeast Asian nations, and have important economic stakes in the region, particularly in maritime resources. For the purposes of our committee, all of these powers will play an important role. China in particular is very active in Southeast Asia, as it tries to exert control over the South China Sea.

Additional Resources

- *Introduction to Southeast Asia, Asia Society*. This article provides a basic overview of the cultural, geographic, and economic realities of Southeast Asia. https://asiasociety.org/education/introduction-southeast-asia
- **Recommended:** *Southeast Asia: A Political and Economic Introduction, UK Parliament.* This article provides a strong overview of the region, as well as analysis of international relations in the region. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=22&ved=0ahUKEwiusaDj29rYAhVN3GMKHXcDDFEQFgiaATAV&url=http%3A%2F%2Fresearchbriefings.files.parliament.uk%2Fdocuments%2FRP11-78%2FRP11-78.pdf&usg=AOvVaw15S6jlMDuxXvq8AOZMDQs-
- **Recommended:** *Health and Healthcare Systems in Southeast Asia, UN University.* This article explains the current health infrastructure and risks in Southeast Asia, with aggregate and nation-specific analysis. https://unu.edu/publications/articles/health-and-healthcare-systems-in-southeast-asia.html
- *The New Geopolitics of Southeast Asia, London School of Economics Ideas*. This article provides an extensive analysis of the geopolitics in Southeast Asia, focusing on external trade and competition. http://www.lse.ac.uk/ideas/Assets/Documents/reports/LSE-IDEAS-New-Geopolitics-of-Southeast-Asia.pdf

Committee Members

Representatives in Committee

The nations represented in committee can be broken down into three categories: Southeast Asia nations, regional powers, and global powers. In the event of an infectious disease outbreak in Southeast Asia, it is likely that all three of these levels would get involved. Affected nations would obviously have to deal with the outbreak, neighboring countries would have to prevent the outbreak from spreading, regional powers would be looked to for aid, and global powers (powers that are physically distant from the situation) would also be likely to provide support and expertise. Additionally, a few international groups will be represented in committee, in recognition of the roles that supranational and nongovernmental agencies play in disaster response, particularly in the context of infectious diseases.

Southeast Asian Nations

- Brunei Darussalam
- Cambodia
- East Timor
- Indonesia
- Laos
- Malaysia
- Myanmar
- Phillipines
- Singapore
- Thailand
- Vietnam

Regional Powers

- Australia
- China
- India
- Japan
- South Korea

Global Powers

- Canada
- France
- Germany
- Russia
- United Kingdom
- United States

International Organizations

- International Committee of the Red Cross
- International Monetary Fund
- Médecins Sans Frontières
- Oxfam
- World Bank
- World Health Organization

How to Represent Your Nation/Organization

Please spend some time researching your nation/organizations current situation and previous actions. Use this, as well as prior statements on relevant issues, to decide how your nation/organization would respond to an international health disaster. During committee, please think about what your nation/organization would say publically, do publically, and do privately. Be realistic—do not try to tell me that the US is prepared to devote $22 billion to the disaster when that is more than 80% of the United State's annual aid budget.

Resources

- *CIA World Factbook, CIA*. It's a basic resource, but I would rather you get your information from here rather than from Wikipedia whenever possible. https://www.cia.gov/library/publications/the-world-factbook/
- **Recommended:** *WHO Country Profiles, WHO*. This has factsheets for each nation with very basic information about health statistics, policies, and practices. http://www.who.int/countries/en/
- University of Michigan Library Research Guide for Global Health Information and Resources. This guide provides links to databases for global health statistics and information that you may find useful. http://guides.lib.umich.edu/c.php?g=282776&p=1884202

Committee In Depth

Introduction

As I said in the introduction to this background guide, this committee is a new one for DUMUNC and will be a hybrid crisis-specialized committee. The basic premise of this committee is an ad-hoc special meeting of a subset of the World Health Assembly. Hence, only a small number of countries and NGOs are present, and countries and organizations that do not need to be present are not invited. Our committee will be focused on international action and aid. While I anticipate that many of you will discuss what your individual nations are doing within your own boarders, the crisis updates that my dais will give you will largely be reacting to committee-wide action.

Resolutions and Directives

For committee, we will be using traditional committee-wide resolutions as well as directives, actions requiring approval of the nations/organizations that will participate in them, but do not require committee-wide approval. An example of this would be Myanmar, Laos, Thailand, Cambodia, and Vietnam cooperating on entry/exit screening on all land boarders, with technical assistance from the US and China. Resolutions will follow UN conventions and will be non-binding. A resolution would be used for issuing containment guidelines to affected nations, but could not require affected nations to meet these standards. At the beginning of committee, the dais will announce signatory requirements for resolutions (required by UN conventions) and directives (to limit directives with little international cooperation). For information on writing resolutions, please see your delegate guide.

Crisis Updates

Throughout committee, the dais will be releasing crisis updates, to bring you information about the spread of the outbreak and the effects of various control measures. These updates will take the format of popular news articles, laboratory findings reports, and epidemiological information similar to what would be found in the CDC's Morbidity and Mortality Weekly Report (the MMWR). We will try to limit the interruptions that these updates cause to committee, but sometimes a little interruption is exactly what committee needs. We welcome your feedback throughout committee.

After Action Report

As I also said in the introduction, committee will not simply end with global pandemic or worldwide cure; instead, we will conclude committee by outlining an after-action report, analyzing our mistakes and successes as a committee. This will take the format of a discussion of strengths and weaknesses of our response, and outlining these in writing. Here are two examples of after action reports:

- *After Action Report for the Response to the 2013 Boston Marathon Bombings, State of Massachusetts*. This report is a good example of the type of information discussed in an after action report, and the general approach to discussing these points.

http://www.mass.gov/eopss/docs/mema/after-action-report-for-the-response-to-the-2013-boston-marathon-bombings.pdf

- **Recommended:** *CDC's Response to the 2014-2016 Ebola Epidemic—West Africa and the United States, MMWR*. This report is a good example of the type of content relevant to a post-epidemic after action report. https://www.cdc.gov/mmwr/volumes/65/su/pdfs/su6503.pdf

Get Ready for Committee!!!

I am very excited to have all of you in committee at DUMUNC XXXVI. Please take some time to do your research and get ready for committee. Know your country/organization's positions and how they might respond to a crisis. And get ready to be flexible! I am not telling you exactly where the outbreak will start or what it will be because I want you to be reacting to the situation as it changes and using your creativity. It should be a great weekend.