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Research Journals

1. 5/12/19

Research Results and Findings: To start off my research, I want to define all the prevalent words and vocabulary to establish a solid foundation for the rest of the material. First off, a pandemic is “an outbreak of global proportions.” They are usually caused by an infectious agent that is capable of spreading rapidly. Differentiating between pandemics and epidemics is also crucial. Epidemics are more localized compared to pandemics. The death toll of a pandemic is also much higher compared to that of an epidemic. Increased travel and mobility are usually what turn an epidemic into a pandemic by allowing confined outbreaks to spread globally. An epidemic occurs when the number of people who experience an infection is higher than the number expected within a country or a part of a country. If an infection becomes widespread in several countries at the same time, it can become a pandemic. Most often pandemics arise due to a new virus strain or subtype that becomes easily transmissible between humans, or by bacteria that become resistant to antibiotic treatment.

Thoughts On My Progress: I think by starting off basic and properly defining all the relevant vocabulary and terms, I’ve established a solid foundation for my research. It's important to first understand the reoccurring terms to them properly analyze the rest of the

material. I'm also planning to find as many pictures as I can as I go through this research phase because I'm planning on making an animated video and visuals are a crucial component to present information in this way.

2. 5/12/19

Research Results and Findings: Now, I want to start looking into the history of some of the world's deadliest pandemics. In order to organize it in an understandable sequence, I'll go in chronological order from the earliest recorded pandemic to the latest.

Reiterating, In the realm of infectious diseases, a pandemic is the worst case scenario.

When an epidemic spreads beyond a country's borders, that's when the disease officially becomes a pandemic. 430 B.C.: Athens; The earliest recorded pandemic happened during the Peloponnesian War. After the disease passed through Libya, Ethiopia and Egypt, it crossed the Athenian walls as the Spartans laid siege. As much as two-thirds of the population died. The symptoms included fever, thirst, bloody throat and tongue, red skin and lesions. The disease, suspected to have been typhoid fever, weakened the Athenians significantly and was a significant factor in their defeat by the Spartans.

Thoughts On My Progress: It's surprising how old pandemics are in the history of mankind and that they prevailed in our world long before modern sciences and medicine. Doing this research on ancient history has also made me curious on how they dealt with these outbreaks in those years. In the end of my research, If I have time, I may quickly look into prevention methods and treatments through the years.

3. 5/15/18

Research Results and Findings: Moving on, there is a big gap between this pandemic and the previous one. This could, however, also be due to missing historical records and just lack of finding any evidence of pandemics between these periods. In 165 A.D., the Antonine Plague occurred. The Antonine plague was possibly an early appearance of smallpox that began with the Huns. The Huns then infected the Germans, who passed it to the Romans and then returning troops spread it throughout the Roman empire.

Symptoms included fever, sore throat, diarrhea and, if the patient lived long enough, pus-filled sores. This plague continued until about 180 A.D.. The next epidemic, the Cyprian Plague, was in 250 A.D.. Named after the first known victim, the Christian bishop of Carthage, the Cyprian plague entailed diarrhea, vomiting, throat ulcers, fever and gangrenous hands and feet. City dwellers fled to the country to escape infection but instead spread the disease further. Possibly starting in Ethiopia, it passed through Northern Africa, into Rome, then onto Egypt and northward. There were recurring outbreaks over the next three centuries.

Thoughts On My Progress: Many of the pandemics during this period had similar symptoms and presented themselves the same way through those that they infected. I would like to maybe dwell a little deeper on what experts believe the cause of these outbreaks were and what exactly caused them. I also want to know why all these diseases were labeled as 'plagues' and if there was any significance in this term being used. I would also like to see if geographic location has any significance on the outbreaks.

4. 5/15/18

Research Results and Findings: Looking into this same time period of the first century, yet another plague, the Justinian Plague, presented itself in 541 A.D.. First appearing in Egypt, the Justinian plague spread through Palestine and the Byzantine Empire, and then throughout the Mediterranean. The plague changed the course of the empire, squelching Emperor Justinian's plans to bring the Roman Empire back together and causing massive economic struggle. It is also credited with creating an apocalyptic atmosphere that spurred the rapid spread of Christianity. Recurrences over the next two centuries eventually killed about 50 million people, 26 percent of the world population. It is believed to be the first significant appearance of the bubonic plague, which features enlarged lymphatic gland and is carried by rats and spread by fleas. This pandemic is a significant bookmark in history in that it marks an important marker for the first seen ancestor to the bubonic plague.

Thoughts On My Progress: This is the last of the significant recorded pandemics of the first century and it's important to note how widespread and impactful that they were. They all ravaged through the population for centuries and killed off millions of people. Without advanced medical treatments and medicine available, people were very susceptible to these diseases and they died easily once they were infected. I would also like to research further into what made these 'plagues' in this century so deadly and if the high death rate was simply due to the times of less advancement, or if the infections that were spreading were truly deadly.

5. 5/15/18

Research Results and Findings: The next major outbreak jumps to the 11th century with a case of leprosy. Though it had been around for ages, leprosy grew into a pandemic in Europe in the Middle Ages, resulting in the building of numerous leprosy-focused hospitals to accommodate the vast number of victims. A slow-developing bacterial disease that causes sores and deformities, leprosy was believed to be a punishment from God that ran in families. This belief led to moral judgments and ostracization of victims. Now known as Hansen's disease, it still afflicts tens of thousands of people a year and can be fatal if not treated with antibiotics. Leprosy's a term that's still relevant today, though much less fatal than it once was.

Thoughts On My Progress: I've definitely made a big jump in time periods, skipping almost ten centuries. It's surprising that there was this big of a gap between the two outbreaks. I wonder if this is just from a lack of reporting from this source or if no big pandemics actually took place in these 10 centuries. Such a big break is very unlikely given that growing populations and migrating individuals would have surely ensured the spread and outbreak of one disease or another. As I continue my research, I want to see if there is any relation and consistency between all the different outbreaks. For example, if the number of fatalities are related to one another and if the symptoms and geographic locations have any relations.

6. 5/18/19

Research Results and Findings: This outbreak is really what started my interest into looking into pandemics. The Black Death was one of the biggest and deadliest plagues to ever take place in the history of humanity. Appearing in 1350, it was responsible for the

death of one-third of the world population. This second appearance of the bubonic plague possibly started in Asia and moved west in caravans. Entering through Sicily in 1347 A.D. when plague sufferers arrived in the port of Messina, it spread throughout Europe rapidly. Dead bodies became so prevalent that many remained rotting on the ground and created a constant stench in cities. England and France were so incapacitated by the plague that the countries called a truce to their war. The British feudal system collapsed when the plague changed economic circumstances and demographics. Ravaging populations in Greenland, Vikings lost the strength to wage battle against native populations, and their exploration of North America halted.

Thoughts On My Progress: It's amazing to see how these epidemics had an impact on so much of history as we know it. Crucial events through our history have been majorly impacted by the spread of these diseases. The connection between medicine and history, given medical impacts on social environments, is really evident through this research. For me, this is truly fascinating because of my deep interests in both of the subjects and my love for studying both history and biology. The connection between the two subject matters is where my passion lies. Doing this project has opened me up to look into two of the subject areas that I like the most and combine them into one.

7. 5/18/19

Research Results and Findings: Discovery of new territories and the migration of populations throughout the world aided in an increase of pandemics. In 1492, The Columbian Exchange occurred. Following the arrival of the Spanish in the Caribbean, diseases such as smallpox, measles and bubonic plague were passed along to the native

populations by the Europeans. With no previous exposure, these diseases devastated indigenous people, with as many as 90 percent dying throughout the north and south continents. Upon arrival on the island of Hispaniola, Christopher Columbus encountered the Taino people, population 60,000. By 1548, the population stood at less than 500. This scenario repeated itself throughout the Americas. In 1520, the Aztec Empire was destroyed by a smallpox infection brought by African slaves. Research in 2019 even concluded that the deaths of some 56 million Native Americans in the 16th and 17th centuries, largely through disease, may have altered Earth's climate as vegetation growth on previously tilled land drew more CO₂ from the atmosphere and caused a cooling event. The effect of diseases on the Natives was devastating throughout the world.

Thoughts On My Progress: The colonization of new lands by Europeans devastated native lands and indigenous people. Immunity, one of my previous research topics, was a big factor in this rapid spread of disease. This just goes to show how big of a factor vaccinations and immunizations have on outbreaks and pandemics. This is why vaccinations are seen as one of the greatest achievements of modern medicine. They prevent outbreaks such as this from foreign diseases. I also hope to make this connection in my presentation to further emphasize the importance that immunization has.

8. 5/18/19

Research Results and Findings: The bubonic plague came back once again in 1665. In its second recorded appearance, the bubonic plague led to the deaths of 20 percent of London's population. As human death tolls mounted and mass graves appeared, hundreds of thousands of cats and dogs were slaughtered as the possible cause and the disease

spread through ports along the Thames. The worst of the outbreak tapered off in the fall of 1666. It reappeared in 1855. Starting in China and moving to India and Hong Kong, the bubonic plague claimed 15 million victims. Initially spread by fleas during a mining boom in Yunnan, the plague is considered a factor in the Parthay rebellion and the Taiping rebellion. India faced the most substantial casualties, and the epidemic was used as an excuse for repressive policies that sparked some revolt against the British. The pandemic was considered active until 1960 when cases dropped below a couple hundred.

Thoughts On My Progress: With its appearance and disappearance every couple centuries, I want to look more into the medical side of this plague. I want to research what component of this plague makes it reemerge so many times throughout history. I also would like to know if there are any prevention methods for this disease.

9. 5/19/19

Research Results and Findings: In the late 1800s and 1900s, there was an outbreak of flu viruses through the world. The first significant flu pandemic, the Russian Flu, started in Siberia and Kazakhstan in 1889, traveled to Moscow, and made its way into Finland and then Poland, where it moved into the rest of Europe. By the following year, it had crossed the ocean into North America and Africa. By the end of 1890, 360,000 had died. In 1918, the Spanish Flu spread. The avian-borne flu that resulted in 50 million deaths worldwide, the Spanish flu is theorized to have originated in China and been spread by Chinese laborers being transported by rail across Canada on their way to Europe. In North America, the flu first appeared in Kansas in early 1918 and was visible in Europe by spring. Wire service reports of a flu outbreak in Madrid in the spring of 1918 led to

the pandemic being called the “Spanish flu.” By October, hundreds of thousands of Americans died and body storage scarcity hit crisis level. But the flu threat disappeared in the summer of 1919 when most of the infected had either developed immunities or died. Finally, in 1957, the Asian Flu ravaged the world. Starting in Hong Kong and spreading throughout China and then into the United States, the Asian flu became widespread in England where, over six months, 14,000 people died. A second wave followed, causing 69,800 deaths in the United States. A vaccine was developed the same year, ending the pandemic.

Thoughts On My Progress: As my research progresses, and the pandemics that I’m looking at get closer and closer to modern times, these diseases are spreading further and further throughout the world and impacting more and more people. This is because advancements in transportation and technology led to the migration and increased movement of a big number of people traveling through the world. These people also carry more diseases with them from one place to another, leading to bigger outbreaks through the world and therefore increased chances of a pandemic occurring. This is why it's harder to keep rapid spreading viral infections contained within certain borders in modern times. The effect of modern advancements on pandemics could also make a nice side addition to my presentation, adding greater complexity than just discussing the history of all the pandemics that have taken place.

Research Results and Findings: The most recent big pandemic that took place is the HIV/AIDS epidemic, which was first identified in 1981. AIDS destroys a person's immune system, resulting in eventual death by diseases that the body would usually fight off. Those infected by the HIV virus encounter fever, headache, and enlarged lymph nodes upon infection. When symptoms subside, carriers become highly infectious through blood and genital fluid, and the disease destroys t-cells. AIDS was first observed in American gay communities but is believed to have developed from a chimpanzee virus from West Africa in the 1920s. The disease, which spreads through certain body fluids, moved to Haiti in the 1960s, and then New York and San Francisco in the 1970s. Treatments have been developed to slow the progress of the disease, but 35 million people worldwide have died of AIDS since its discovery, and a cure is yet to be found. HIV/AIDS is the most relevant modern example of how impactful a pandemic can be on world and this fact is all the more prevalent in our modern society where diseases and infections spread rapidly and widely.

Thoughts On My Progress: I've finished my research on all the major pandemics that have taken place in our recorded history. These events highlight both the major medical outbreaks and also major historical events that took place during these outbreaks. Now that I've gotten a very artificial start on research in that I've dug out the foundation of what a pandemic is and how it's impacted our world, I want to go on to answer some of my deeper questions and draw relations and conclusion on all of this research. I don't want to leave my presentation as artificial and shallow as my research has been so far. I want to be able to dig deeper and uncover some core foundation of a pandemic.

11. 5/20/19

Research Results and Findings: Now, that the preliminary research is over on all the prominent pandemics, I wanted to focus in more on the topic. I want to research influenza because these outbreaks claimed more lives than any other pandemic. The influenza virus in humans usually comes from an animal strain that has changed. An animal influenza virus circulating in domesticated or wild animals is known to have caused infection in humans and is therefore considered a specific potential pandemic threat. Levels of pandemic influenza in most countries with adequate surveillance have dropped below peak levels. Levels of influenza activity have returned to the levels seen for seasonal influenza in most countries with adequate surveillance.

Thoughts On My Progress: Many of these virus strains spreading from human to human dangerously originated from animals. I don't know if this is what makes them more deadly or if it really has no impact on the spread of the disease. Some core themes of biology, such as evolution and cell recognition are all applied here in the evolution and changing of animal strains to become dangerous to human beings. And with people travelling more to foreign and tropical countries, they have a greater chance of bringing these diseases home affecting others,

12. 5/21/19

Research Results and Findings: Now that I've thoroughly discussed the history of pandemics and the significance of influenza, I want to focus on modern pandemics and their problems. If an influenza pandemic were to emerge today, the following problems could arise: People today are more international mobile and more likely to live in cities than in the past, factors which increase the risk of a virus spreading. Faster communication increases the risk of panic, and the chance that people who may be infected will travel in an attempt to escape the disease, potentially taking the virus with them. It can take months or years for a vaccine to become available, because pandemic viruses are novel agents. Medical facilities would be overwhelmed, and there could be shortages of personnel to provide vital community services, due to both the demand and illness. It's important to understand the modern significance of such outbreaks and know how they impact us beyond just the high death rates. This section would be kind of a nice conclusion to my presentation because I started off talking about diseases tens of thousands of years and talking about the present just kind of ties everything together.

Thoughts On My Progress: I'm coming to a conclusion on my presentation and am finished with most of my research. I am very happy that I picked this packet because finding something that I'm actually interested in has made the work a lot less tedious. Now that I'm finishing off my research, for the rest of my journals I'm probably just going to go back to my older journals and answer some of the questions that I noted down that I wanted to explore further. This just ensures that there's no holes in my research or my presentation.

13. 5/21/19

Research Results and Findings: Focusing in on another area of pandemics, I want to discuss risk factors and common start offs for most of these diseases. This will also help me get a better understanding on why pandemics are so significant and how they rapidly evolve from epidemics to pandemics. Medical science has advanced rapidly in recent years, but it is unlikely ever to offer full protection from a possible pandemic, because of the novel nature of the diseases involved. Viral hemorrhagic fevers, including the Ebola and Marburg viruses, could become pandemics. However, close contact is needed for these diseases to spread. Modern surveillance systems, lessons learned from the Ebola outbreak in West Africa in 2014 to 2015, and an experimental vaccine that is currently available for people who may be affected by the disease, offer hope that, in future, new cases will be dealt with swiftly and that the disease can be contained. Another major concern is antibiotic resistance. Resistant strains of tuberculosis are among the most worrying. Each year, almost half a million new cases of multidrug-resistant tuberculosis (MDR-TB) are estimated to occur globally. With modern medicine also comes the risk of evolutionary adaptations and antibiotic resistances leading to a never ending cycle of outbreaks which result in pandemics occurring more frequently.

Thoughts On My Progress: Going further than just the basic history of pandemics, I'm able to use my knowledge from AP Bio and apply it to some of the trends seen as pandemics evolve through the millenniums. Because I have so much of this background knowledge on the topic, my presentation will be more engaging. It'll also be a lot easier to write the script for the video because I can rely a lot more on previous knowledge than

all the new information that I looked up. Overall, by this point I have the presentation mostly scripted out and I have an idea of what kinds of visuals that I need to find. I'm happy with all the information that I've found so far and I think that I have more than enough to start my presentation, but I want to dig deeper and look into a couple different related topics to maybe spice up the material.

14. 5/22/19

Research Results and Findings: I want to finish off my research by going back to the definition of a pandemic and discussing the word in a larger sense, but also specifically relating to influenzas. An influenza pandemic occurs when a new influenza virus emerges and spreads around the world, and most people do not have immunity. Viruses that have caused past pandemics typically originated from animal influenza viruses. Some aspects of influenza pandemics can appear similar to seasonal influenza while other characteristics may be quite different. For example, both seasonal and pandemic influenza can cause infections in all age groups, and most cases will result in self-limited illness in which the person recovers fully without treatment. However, typical seasonal influenza causes most of its deaths among the elderly while other severe cases occur most commonly in people with a variety of medical conditions. Influenza pandemics are a central part of disease outbreaks and therefore, something that I would like to explore further in my presentation.

Thoughts On My Progress: I'm basically finished with all of my research. I'm really happy with the diverse plethora of information that I gathered through these journals. Now there's just the challenge of composing all this information in a fluent and fluid

manner in the presentation. I need to make sure that it is all cohesive and flows into one another. Through my research, I also found some really good videos that I think would fit good into my presentation and would bring that multimedia aspect to it.

15. 5/22/19

Research Results and Findings: In this final journal, I'm going to focus on what exactly leads to pandemics, other than the obvious disease that is being spread. I want to look in the risk factors and causes. This will be nice way to close everything off. Pandemics have occurred throughout history and appear to be increasing in frequency, particularly because of the increasing emergence of viral disease from animals. Pandemic risk is driven by the combined effects of spark risk (where a pandemic is likely to arise) and spread risk (how likely it is to diffuse broadly through human populations). Some geographic regions with high spark risk, including Central and West Africa, lag behind the rest of the globe in pandemic preparedness. Influenza is the most likely pathogen to cause a severe pandemic. EP analysis indicates that in any given year, a 1 percent probability exists of an influenza pandemic that causes nearly 6 million pneumonia and influenza deaths or more globally.

Thoughts On My Progress: Now that I have finished all of my research, I can get started on my presentation. I feel that I have more than enough material to get me started. For the presentation, I'm thinking of starting off talking about what the word means, and then causes of pandemics, then the history, and then finally it's modern impacts and influence in shaping the world as we know it. I'm happy that for this research I really

diversified the sources and material that I got and didn't keep all the information so basic and narrow, but tried to dig deeper. I'm looking forward to making this presentation.

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