On January 12, 2010, Haiti was hit with a magnitude 9.0 earthquake that killed over 100,000 people. The capital city of Port-au-Prince was only 16 miles away from the epicenter of the earthquake, and was completely leveled. Following the earthquake, Haiti was also struck with a cholera epidemic which has killed tens of thousands of people, despite having zero cases of cholera reported historically. The first case did not appear until October 2010, 10 months after the earthquake.

In this project, hospital density, poverty rate, earthquake magnitude exposure and proximity to the Artibonite River were all studied as factors that could have contributed to the outbreak. The Artibonite River is the longest river in Haiti, and is used for both recreation and drinking water. Following the earthquake, more people used the river for drinking water due to loss of access to clean drinking water elsewhere. Studies have suggested that it was the UN’s accidental contamination of the Artibonite River that caused the outbreak. IDP camps along the river staffed by cholera-stricken Nepalese workers were improperly disposing of waste, which contaminated the entire river. Factors such as poverty, hospital density, and intensity exposure may have exacerbated the epidemic, but it is likely that proximity to the Artibonite River is the main cause of the number of reported cases per department.

Additionally, the spread of cholera after Hurricane Matthew on October 4th, 2016 will be considered. Hurricane Matthew was a Category-Four storm which struck all of Haiti, killing thousands. After Matthew there has been a resurgence of cholera. Based upon the same factors, it will be decided if cholera incidence is likely to get as large as it did following the earthquake.

Firstly, a data layer showing cholera incidence in Haiti as of December 5, 2010 was made using a table join from a table constructed in Excel with cholera incidence for each department of Haiti on this date. Next used a model to convert incidence per district to percent of population affected with cholera per district (See Figure 2). From here, the earthquake magnitude was mapped (See Figure 1). A cholera susceptibility map was then made (See Figure 4). In order to make this map, the poverty and magnitude polygon layers were converted to rasters, which were then each reclassified with 7 values. The hospitals point layer was converted to a raster point density layer. These 3 layers were then overlaid using a weighted overlay. The earthquake was given 40% weight while hospital density and poverty were given 30% weight, since the main focus was on the impact of the earthquake on cholera incidence. This map was compared to the cholera incidence percentage map for analysis.

Additionally, cholera after Hurricane Matthew on October 4th, 2016 was mapped. To map the hurricane (See Figure 4), an intersect was performed between wind swath data and the Haiti departments to determine wind intensity just in Haiti. Since Hurricane Matthew was just under two months ago, very little data is publicly available cholera incidence since. Instead, cholera “hotspots” or concentrated areas where there have been many reports of cholera were mapped. A table join was performed to link number of reported cases to the georeferenced “hotspots”. Since many of these “hotspots” overlapped and all had different numbers of reported cases, the clusters were merged into a central location, making them easier to visualize spatially. The “hotspots” were mapped as graduated symbols, and labeled with the number of reported cases to make it easy to visualize which areas were struck the hardest with cholera.

Based upon Figure 4, it would be expected that cholera incidence would be highest in southwestern Haiti and along the east coast. However, as can be seen by Figure 2, this is not the case. All areas through which the Artibonite River flow have a “medium” or “moderate” susceptibility to cholera according to Figure 4. However, again in reality, this is not the case. The Artibonite department, and those surrounding it had the highest percentage of population affected with cholera in reality. All of these departments are close to the Artibonite River. From analysis of Figure 2, it is likely that the cholera epidemic in Haiti did begin with IDP camps along the Artibonite River. The epidemic was not the result of pre-existing factors within Haiti, or the earthquake (note that the high magnitude areas have relatively low cholera percentage), but rather due to improper waste disposal along the Artibonite River.

Following Hurricane Matthew, it is unlikely that cholera incidence will spike as high as it did following the earthquake. Given Figure 3 and the hypothesis about the Artibonite River, it seems that most reported cases were a direct result of the hurricane, since most hotspots are near the trackline of the storm and within the “Hurricane Force” intensity winds. The one 120 cases hotspot on the east coast could be explained as a residual effect of the Artibonite River contamination since it is close to the river. Assuming there will be no external forces this time to allow cholera to proliferate, cholera incidence will likely not be as great.