



# Deploying an Ebola Vaccine

AIS Student Chapter – Merck Analytics Challenge

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The Ebola outbreak that ravaged the West African region over the course of the last two years was the worst the world has ever seen. The devastation caused by this disease also made us stop and think about how lucky we are to be members of a society with the resources to combat an illness like Ebola. In that same moment my partner and I realized that we had a responsibility to utilize our resources to make a positive impact on Ebola prevention in whatever way possible. In response to the outbreak, world health leaders like Merck are designing vaccines to combat the virus and change world health. To aid in the effective deployment of a vaccine my partner and I have researched the spread rate, areas of high concentration, strategy risks, and patient income of the Ebola virus.

There are several aspects of our analysis that make it unique. The first being our attention to the geographical spread rate of Ebola. Since the majority of districts within the affected countries are rural, there is little infrastructure for transportation. Thus, the virus spread from neighboring district-to-district making it difficult to locate epicenters where a vaccine would be most effective. Our analysis allows Merck to easily trace the path that Ebola took within each country from start to finish. In the event of a future outbreak this information could prove extremely useful for determining where a vaccine will be most effective in preventing the disease from spreading.

Second, we analyzed the areas that reported the most cases per day during the peak of the outbreak and plotted them on a map of West Africa by district. This can be combined with our analysis of the geographical spread of the virus to further understand how Ebola ran its course through the region. It also feeds into our estimation for the number of vaccines needed to prevent a future outbreak and our calculation of the number of health care workers located in these hotspots. We consider this information to be the most useful in deploying a vaccine to the area. Since we ranked vaccine recipients in order of priority (i.e. health care workers, community responders, patient contact ring) it is easy to see who and how many people are in immediate need of a vaccine to make effective use of this scarce resource.

Lastly, we researched the risks associated with deploying a vaccine to this population and included a brief explanation of how to best mitigate these problems. As stated above, the vast majority of the districts in the 3 affected countries are rural villages, which subsequently have very little individual income. These regions are also extremely poor and have low access to education and health care. Why is this important for understanding risks? Potential victims of another Ebola outbreak are unable to pay more than a few cents for a vaccine and most households have more than 5 people, from which only 1 or 2 provide income. Therefore it is crucial that vaccines are either financed by an outside source or donated. This portion of our analysis cannot be overlooked. Ignoring millions of impoverished West African citizens is not an acceptable course of action. Basic health care must be considered a universal human right and treated as such. Thus, my partner and I recommend that Merck incorporate, as a courtesy to the population, basic education of the risks of receiving vaccination to the patients who will be treated. This should be provided via a mobile campaign which will deploy the vaccine to remote villages, eliminating logistics difficulties. This will also avoid uninformed consent. We believe that together, my team and Merck can change world health for the better and improve the lives of millions.