

# Vulnerability Analysis in Post-Ebola Sierra Leone

## Introduction

The largest Ebola outbreak in history began in Guinea in December 2013, quickly spreading to the neighboring West African countries of Sierra Leone and Liberia in early 2014, with over 28,000 cases reported throughout the outbreak. There is still a risk of Ebola flare-ups in all three affected countries. In Sierra Leone, health infrastructure was severely weakened after a devastating civil war that lasted from 1991 to 2002. In order to prepare for the possibility of flare-ups or another outbreak, Sierra Leone needs significant health system strengthening, as well as general infrastructure development, such as improved sanitation and access to clean water. For this project, the most vulnerable districts of Sierra Leone were determined in order to identify where these health system strengthening efforts should be focused.

## Methods

These data were obtained from the NGA Ebola Open Data Download. For this vulnerability analysis, six factors were used to determine the level of vulnerability of each of the fourteen districts in Sierra Leone: (1) Ebola fatality rate, (2) number of unofficial border crossings, (3) number of hospitals, (4) number of health clinics, (5) sewage access, and (6) water access. For each of these factors, the values were classified into quintiles before beginning the analysis. Then, each district was assigned a score from 1 to 5, with 5 being the most vulnerable, for each factor, based on the quintiles. For example, the district with the smallest number of clinics in Sierra Leone received a clinic score of 5 and the district with the highest Ebola fatality rate received a fatality score of 5. In the total vulnerability score, each factor was given equal weight, as the total score is the sum of the individual factors for each district.

## Results

The district of Koinadugu received the highest total vulnerability score of 24. The second-highest total vulnerability score was 23 in the Pujehun district. The two lowest-scores were 9 and 10, in the Western Area Urban and Bo districts, respectively. It is worth noting that the Western Area Urban district contains Freetown, the capital city of Sierra Leone. Additionally, the Bo district contains the city of Bo, the country's second-largest city. These results show that there are significant disparities in Sierra Leone that make rural districts especially vulnerable to future outbreaks or flare-ups based on these six factors.

## Conclusion

The results for this project are limited as only six factors are used to obtain the total vulnerability score for each district. In future projects, more factors could be considered and these factors could be weighted differently in the final score. Many districts in Sierra Leone lack a hospital and were significantly impacted by high fatality rates during the Ebola outbreak. Health systems in Sierra Leone need to be strengthened in order to prevent another outbreak and decrease the risk of flare-ups. This vulnerability analysis and others similar to it can be used to identify districts such as Koinadugu and Pujehun where it is especially important to develop strong health systems and infrastructure.

## Data Sources

National Geospatial-Intelligence Agency Ebola Open Data Download:  
<http://ebolaopendata.nga.opendata.arcgis.com/>  
Geographic Coordinate System: WGS 1984

