

Connecting Environmental Observations with Cholera Outbreaks in Bangladesh  
GSFC Summer 2011

Start Time	End Time	Text
0:10	0:30	How do environmental factors impact the outbreak of cholera in developing countries? DEVELOP interns at NASA Goddard Space Flight Center are connecting satellite observations with ground and clinical data which will lead to the development of an early warning system for outbreaks.
0:32	0:44	The DEVELOP Program focuses on addressing national application areas to enable innovative uses of NASA earth science data to benefit society. Health and water are two of these areas.
0:45	0:50	I'm David Stack and I study Hazards, Global, and Environmental Change at Chapman University.
0:50	0:55	Hi, I'm Avery Sandborn and I'm studying Geographic Information Sciences at the University of Maryland.
0:55	1:00	Hi, I'm Paul Widmeyer and I'm studying Environmental Science and Policy at the University of Maryland.
1:00	1:08	Three students dedicated their summer to unite NASA Earth observations with society.
1:10	1:27	Developed countries, like the United States, are not concerned with waterborne diseases because of water treatment programs and the availability of clean water. However, people in developing countries, such as Bangladesh, are not as fortunate.
1:30	1:54	Cholera is an acute infection in the small intestine caused by the bacterium <i>Vibrio cholerae</i> . It is often transmitted by consuming or bathing in contaminated water. Unlike other diarrheal diseases, cholera can kill a healthy adult within hours and can cause 100,000 to 130,000 deaths per year.
1:54	2:27	Bangladesh is located in south-Asia between India and Burma, with the Bay of Bengal located to the south. Natural hazards, such as monsoon floods and cyclones, frequently impact the region. It is also one of the most vulnerable countries to climate change. Dhaka, the capital of Bangladesh, is inhabited by 7 million people. Matlab, Bakerganj, and Mathbaria are smaller villages closer to the Bay of Bengal.
2:28	2:57	Partners at the University of Maryland-College Park plan to use a virtual map created by the students in the DEVELOP program to visually link remote sensing products to human cases. This base map will contribute to an early warning system for potential cholera outbreaks. Salinity data from the Chesapeake Bay, supplied by Johns Hopkins University, will also be incorporated into the early warning system.
2:57	3:29	Using NASA Earth Observation Systems, relationships between human case data and environmental variables can be examined. The Aqua satellite, NASA's mission to measure Earth's water cycle, collects global chlorophyll and sea surface temperature measurements using the MODIS sensor. The SeaWiFS satellite, designed to monitor ocean characteristics, collected chlorophyll data. TRMM, a mission to study tropical rainfall, provides global precipitation measurements.
3:33	3:48	Google Earth is a software platform that can be accessed and used by many people around the world. Because of its ease of use and popularity, Google Earth is a logical choice to visually communicate research findings.
3:48	4:04	The map displays the satellite imagery over the area of interest and includes clinical and ecological data for each city. This map allows the user to see changes over time through the various colors and symbols.
4:05	4:13	Generally, the seasonal trend for an increase in cholera cases has 2 peaks, with one in the spring, and one in the fall.
4:14	4:38	When compared with human case data, the chlorophyll concentrations show seasonal trends. In the spring, chlorophyll concentrations, vibrio count and cholera cases increase, indicating a possible relationship. However, in the fall, the relationship is not as strong, potentially indicating a different cause for the increase in cholera cases.
4:38	4:48	There is no strong correlation between sea surface temperature and cholera cases, as the data are non coastal, which is where most cases occur.
4:50	5:01	During the summer monsoon season, there is a decline in the number of reported cholera cases. Future studies may be able to shed more light on this relationship.
5:02	5:30	In the future, more parameters, such as sea surface height and salinity, can be examined to better understand the link between the environment and cholera outbreaks. Additionally, other regions, like the Chesapeake Bay, can be studied in order to compare how geographic location can influence environmental variables. This would help to understand why certain locations are more prone to disease outbreaks than others.
5:32	5:56	Looking forward, the effects of climate change will become more wide spread. The increasing intensity and frequency of rainfall events in the region will have a greater impact on disease outbreaks, including cholera. International policy action addressing climate change plays a central role in the mitigation of future outbreaks.
5:57	6:29	Virtual interactive maps can serve as a template for an early warning system for potential cholera outbreaks. Communication in such a visual medium can allow emergency responders and government agencies to better understand and easily distribute resources where most needed. Due to an ever-changing world, there may not be a complete picture, but it is still possible to understand how environmental variables can influence disease outbreaks.