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USING SATELLITE DATA TO HELP ERADICATE DISEASE: POLIO VIRUS IN NIGERIA

Abstract

The use of satellite data results in socioeconomic benefits in a wide range of sectors and applications. However, often these benefits are not explicitly measured and quantified. Benefits are described as anecdotes or in terms of broad areas of applicability. In this paper, we contribute to the empirical understanding of the value of satellite data by examining and quantifying net benefits for a specific case: the use of satellite data to support a polio vaccination campaign in Nigeria in 2014. This project was developed in support of the Resources for the Future Consortium for the Valuation of Applications Benefits Linked to Earth Science (VALUABLES). In the 1980's, polio crippled an estimated 350,000 children a year and was rampant in 125 countries. Since that time, global vaccination campaigns have eradicated the disease in all but three countries. The ability to interrupt transmission of polio in these locations requires that the portion of people vaccinated against the disease is above a given threshold. To ensure this is the case, decisionmakers must have an accurate estimation of the population size and distribution. In early 2014, the Nigerian state of Kano was considered a key battleground in the fight for eradication of polio in Nigeria. Many campaigns had been conducted in Kano in the prior years, but those campaigns had failed to interrupt transmission of poliovirus. These campaigns followed standard practices, using UN estimates of population based on growth-adjusted census information, and a variety of sources, including government maps and hand-drawn maps, to plan vaccination campaigns. However, in 2013, officials argued that better data and analysis was needed at the Local Government Area (LGA) level. To support this effort, a team of scientists from Oak Ridge National Laboratory and the University of Southampton with funding from the Bill and Melinda Gates Foundation used 0.5 meter resolution imagery from Digital Globe and Airbus to estimate both the density and the spatial distribution of population in Kano state from the bottom up. These satellite-based estimates of population showed that the true population was greater and differently distributed than what was estimated using the traditional method of census extrapolation. Using document analysis and interviews with key officials, this project calculates the magnitude of the socioeconomically meaningful outcomes (campaign cost saving and improved health) associated with the use of satellite-based estimates of population to support this campaign.