

Spatial modeling of HIV prevalence in Kenya

Livia Montana, Melissa Neuman, Vinod Mishra
MEASURE DHS, ORC Macro, Calverton, MD

Short Abstract:

This study will model and map HIV prevalence in Kenya in relation to its spatial and behavioral determinants, using data from the 2003 Kenya Demographic and Health Survey (DHS). The 2003 Kenya DHS was the first population-based national survey to link individual HIV test results with the full set of behavioral, social, and demographic indicators included in the survey. The survey also collected spatial coordinates of the communities where survey respondents lived. These coordinates will be used to estimate spatial indicators such as distance to roads, population density, and others. Using these spatial, social, demographic, and behavioral indicators, we will develop a model to predict HIV prevalence. We will apply this model to map HIV concentration areas at sub-provincial level, and will assess the Voluntary Counseling and Testing (VCT) coverage in relation to the spatial distribution of HIV prevalence.

Long Abstract:

This study will model and map HIV prevalence in Kenya in relation to its spatial and behavioral determinants, using data from the 2003 Kenya Demographic and Health Survey (DHS). The study has three components. First, we will generate a set of spatial indicators, such as proximity transportation networks, and densely populated areas. These spatial indicators, along with social and behavioral data from the 2003 Kenya DHS, will be used in a multivariate statistical model to predict HIV prevalence. Second, the multivariate model will be used with other spatial data to generate a map showing areas of high HIV prevalence at relatively local levels. Finally, we use a national database of locations of Voluntary Counseling and Testing (VCT) sites and describe the spatial relationships between high-HIV-prevalence areas and locations of health facilities providing HIV-related services. This is a critical area for programmatic intervention, as 4 of 5 adults in Kenya either do not know their HIV status, either because they were never tested or they were tested and did not receive the results.

The 2003 Kenya DHS was the first population-based national survey to link individual HIV test results with the full set of behavioral, social, and demographic indicators included in the survey. The survey included 8,195 women age 15-49 and 3,578 men age 15-54 in 400 sample communities throughout Kenya. The survey collected detailed information on marriage, fertility, family planning, sexual activity, nutritional status of women and young children, maternal and child health, and awareness and behaviors regarding STDs and HIV/AIDS. In one-half of the households selected for the men's survey, all women and men who were interviewed were tested for HIV, using voluntarily provided blood samples that were analyzed in a medical laboratory. The

survey also collected spatial coordinates of the sample communities using global positioning system (GPS).

The survey shows that 7 percent of Kenyan adults are infected with HIV—just under 5 percent of men age 15-54 and about 9 percent of women age 15-49. The female to male ratio of 1.9 is higher than that found in most population-based studies in Africa. This is due to greater prevalence of HIV among young women than among young men. The prevalence among women peaks at age 25-29, whereas for men it peaks at age 40-44. The prevalence is much higher in urban areas (10 percent) than in rural areas (6 percent), and it varies considerably by geographic region.

The information on geographic coordinates of survey communities will be used to estimate spatial indicators such as distance to roads, and densely populated areas. The information on these other indicators will be obtained from available secondary sources. Also, with the help of the National AIDS/STD Control Program, Ministry of Health, we will gather information on existing VCT sites. Using these spatial, behavioral, and other indicators, we will develop a multivariate statistical model to predict HIV prevalence. We will apply this model to estimate HIV concentration areas at sub-provincial level. We will use the modeled surface along with a population density surface to estimate the predicted number of HIV positive adults and compare this with the VCT coverage to determine if there are over or underserved areas, especially in high prevalence areas.

The findings of this study will be useful in understanding the disease patterns, will allow us to assess the existing VCT coverage in relation to the spatial distribution of HIV prevalence, and improve calibration of annual sentinel surveillance data to more accurately measure the trends and monitor the epidemic.

