CASE-CONTROL ANALYSIS OF HUMAN WEST NILE VIRUS CASES IN A HIGH-RISK AREA OF SOUTH DAKOTA

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ABSTRACT

The Centers for Disease Control and Prevention (CDC) have found that the Great Plains region has consistently high West Nile virus (WNv) incidence rates relative to the rest of the United States. The CDC believes these high incidence rates may be due to the efficient mosquito vector, Culex tarsalis. South Dakota had the highest state-level cumulative incidence of WNv neuroinvasive disease from 2002-2006. Studying spatial patterns of WNv clusters can indicate areas with high risk of human WNv, and the investigation of environmental variables associated with these clusters can improve our understanding of the determinants of WNv. In this study, we used Geographical Information Systems (GIS) and spatial statistics (SaTScan) to identify significant spatial clusters of high WNv incidence within South Dakota during epidemic years (2002-2003) and endemic years (2004-2007). We localized the analysis and used a case-control multiple regression analysis to investigate the environmental variables that were associated with the distribution of WNv in a high risk cluster located in the northeastern part of the state.

SaTScan found six clusters during the epidemic years and two clusters during the endemic years. Rural areas, agricultural land use and irrigation are considered favorable habitats for C. tarsalis, and all were significant determinants of the spatial distribution of human WNv cases. These results can help predict future human WNv epidemics and allow for effective allocation of resources and prevention of WNv.