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Editorial

Economic Burden of West Nile Virus in the United States

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West Nile virus (WNV), a mosquito-borne neurotropic flavivirus, emerged in the Western hemisphere in New York in the summer of 1999 and rapidly spread and established itself throughout the United States. It has been estimated that more than three million persons in the United States have been infected with the virus up to 2010,[1] and although approximately 80% of infections are asymptomatic, there are have been more than 39,400 clinical cases. The most common clinical condition is an acute systemic febrile illness. However, few (≤ 1%) clinical cases proceed to a condition known as West Nile neuroinvasive disease (WNND), which typically manifests as encephalitis, meningitis, or acute flaccid paralysis (AFP) and has a mortality rate of approximately 10%. Most patients with meningitis or non-WNND recover completely, but this may take months. Patients who recover from encephalitis or AFP often have residual neurologic sequelae.

Over the past 15 years, there have been at least 17,367 WNND cases and 1,654 deaths. Although it is clear that WNV is a major public health problem, like most vector-borne diseases, the number of clinical cases and precise geographic location of the virus varies each year. Consequently, predicting and planning for WNV outbreaks is extremely difficult. This difficulty is made more complicated by some years having large numbers of cases (e.g., 2002, 2003, and 2012) and other years having small numbers of cases (e.g., 2009, 2010, and 2011). However, the resurgence of WNV cases in 2012, in Texas in particular, was a major public health emergency.[2] Thus, questions are raised about the economic impact of WNV infection and the cost-effectiveness of countermeasures.

There have been two previous evaluations of the economic burden of WNV in 2004 and 2005.[3,4] These evaluations were conducted relatively early after the introduction of WNV into the United States. In this issue of the journal, Staples and others[5] provide a timely study of the economic costs of WNV infection based on initial acute care and subsequent long-term costs associated with infection after an earlier published study of a retrospective chart review of the medical records from 221 hospitalized WNV cases-patients in 17 hospitals in 4 counties in Colorado in 2003.[6] The current study is based on 80 cases from this group but only 38 had data for a five-year long-term follow-up period. Initial costs were highest for patients with AFP (median = $25,117, range = $5,385–$283,381) and encephalitis (median = $20,105, range = $3,965–$324,167). Long-term costs were highest for patients with AFP (median = $22,628, range = $624–$439,945) and meningitis (median = $10,556, range = $0–$260,748). Extrapolating from this small cohort to national surveillance data suggests the total cumulative costs of reported WNV hospitalized case-patients during 1999–2012 were $778 million (95% confidence interval = $673 million–$1.01billion), which is equivalent to an average of approximately $56 million per year.

Unfortunately, there have been few studies on the economic burden of WNV infection. Thus, the question arises can data obtained in Colorado be extrapolated to other states as population demographics vary by state and geographic locations of WNV cases differ each year? Furthermore, the authors make a major assumption that the 38 patients in the five-year follow-up period are representative of the entire United States.[6] Overall, this makes averaging costs difficult because some states have had few cases over the last 15 years and other states have had cases most years. Although there are clearly limitations to the study, it is probably significant that an earlier study of burden of encephalitis-associated hospitalizations in the United States[7] proposed a mean estimated cost for 1997 of $28,151, which is similar to the $25,117 obtained in this study and suggests that the data in the present study may be indicative of the national situation. In addition, the calculation of costs is likely conservative because it does not include costs incurred by non-hospitalized WNV cases, make any adjustment for the under diagnosis or underreporting of WNV disease cases, or indirect costs such as mosquito control measures.

It is clear that studies such as those by Staples and others are critical to assessing cost-effectiveness of prevention and therapeutic countermeasures and various intervention strategies, and are important in helping guide public health decisions. Nonetheless, there is a need for more studies of economic burden caused by WNV infection that evaluate populations in other states, costs involved in multi-year long-term follow-up of patients with neurologic sequelae, and studies with larger sample sizes, although it is recognized that such studies are difficult to conduct. There has been extensive discussion regarding the need for vaccines and antiviral drugs to treat WNV infections, especially WNND cases. The geographic focal nature of clinical cases each year in different locations and the variable numbers of cases has argued against a national prophylactic vaccination program.[8] However, there are a number of candidate vaccines and antiviral drugs in development and the figures for economic burden reported in this paper will aid policy makers in assessing the economics of vaccine and drug development.

The resurgence of WNV activity in 2012 (2,873 WNND cases and 286 deaths) suggests that a targeted prophylactic or therapeutic vaccine program, possibly to include senior

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citizens who represent the major population group who get WNND, would probably be cost-effective. Similarly, an antiviral drug would also likely be cost-effective. However, preliminary data for numbers of cases in 2013 show a greater than 58% decrease compared with that in 2012 (1,171 WNND cases and 105 deaths), which demonstrates the difficulty for policy makers in evaluating the cost-effectiveness of vaccines and drugs.

There is no doubt that vaccines and drugs are needed for WNV infections but there is limited money available for public health interventions because of the large number of infectious diseases, and policy makers have to carefully decide where to spend their money. Studies such as those by Staples and others are critical in aiding those who make these important decisions.

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