

The Hidden Costs of Mosquito-Borne Disease

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Mosquitoes are most known for being a nuisance to humans and animals alike. However, these little pests can potentially create enormous health problems by spreading numerous diseases. The most well-known disease carried by mosquitoes is the West Nile Virus. Yet, blood-sucking arthropods - mosquitoes and ticks, for example – can spread many more diseases that threaten not only *quality* of life, but life itself. With disease and illness comes the cost of caring for the sick, containing the threat of further infection, and public awareness efforts.

The Centers for Disease Control and Prevention (CDC) lists several arboviruses, for example Arthropod-borne viruses, spread by mosquitoes: eastern and western equine encephalitis, Japanese encephalitis, La Crosse encephalitis, St. Louis encephalitis, West Nile virus, malaria, dengue fever, rift valley fever, and yellow fever. The largest group of arboviruses is encephalitides; which causes inflammation of the brain. Transmission of these and other diseases is spread when an infected vector takes a blood meal from another non-infected source. Encephalitis-like diseases alone are quite expensive to research due to the complex nature of the central nervous system of the human body. According to the state of Michigan website, West Nile virus had first been encountered in Uganda in 1937 and has since spread to the United States. In 1999, the virus was first seen in New York City and reaches coast to coast. In Michigan, though, the first avian case of West Nile occurred in 2001 in crows. It wasn't until 2002 that the first documented human cases of West Nile were reported in the Great Lakes area. As for hidden costs of maintaining public safety, whenever disease threatens human life, hospital costs and medications are among the first concerns.

In an effort to lessen the threat of mosquito-borne diseases, the Michigan Mosquito Control Association was founded in July of 1986 (Michigan). Since then the MMCA upholds

five major goals: “to promote mosquito control in Michigan whenever control is feasible, to maintain public interest in areas where mosquitoes are now being controlled, to keep up with new developments in control methods, to disseminate information concerning mosquitoes and diseases they transmit to its membership and general public through publications and meetings, and to unite and coordinate common interests and efforts” (Michigan). The MMCA is made up of four districts that work to control mosquito populations around Michigan: Bay County, Midland County, Saginaw County, and Tuscola County. Mosquito control procedures include field operations and biological surveillance. These procedures alone cost money to keep them running effectively and efficiently. If mosquito-borne illnesses were more prevalent, more funding would be necessary to keep the general public as safe as possible. Funding for mosquito control operations comes from public voters when millages are passed or renewed and from tax dollars.

Mosquito control programs take care of many behind-the-scenes tasks to analyze, identify, and control the population of mosquitoes. The program consists of three main groups: administrators/officials, lab biologists, and field technicians. A successful program cannot operate without all three groups working together. Officials guide field technicians where to search for breeding sites. These locations are deduced from careful observations from the lab biologists and the information they gather. Once biologists gather live, adult mosquitoes, they can run tests to deduce whether or not disease like West Nile is present in the area. Biologists also run blood tests on birds known for carrying mosquito-borne diseases. Not all testing can be accomplished within the local lab; sometimes, tests must be sent away to large universities. All these tests require money. Many people in the public do not realize this hidden cost of gathering information regarding the spread of mosquito-borne diseases.

Since mosquitoes do not take blood meals from human hosts alone; dogs, horses, and birds are also susceptible to arboviruses. One example is how dog heartworm is spread. Within the last twenty years, dog heartworm has become more widespread. If heartworm is left untreated, it can cause painful heart failure to the animal. The mosquito plays an important role in spreading heartworm; the microfilariae taken into the mosquito from the blood meal must stay within the digestive tract of the mosquito for two to three weeks before becoming an infective worm (“Does”). There are vaccines available to cure heartworm if it is diagnosed early enough. Furthermore, there are also preventative medicines that can be given to dogs during the peak mosquito-breeding months. However, any medicine and/or vaccine comes at a cost to the owner of the animal. This supports that mosquito-borne diseases do not only affect humans and can be expensive by an economic standpoint.

Additionally, horses can easily be affected by mosquito-borne diseases due to their outside living conditions. Horses are most prone to contracting eastern equine encephalitis, or EEE. Vaccines, which are funded by state and/or government research, are available and pose an additional cost of controlling and aiding in the prevention of the spread of mosquito-related illness. Once a horse contracts EEE, it affects the central nervous system, causing “unsteadiness, erratic behavior, and a marked loss of coordination” (“Questions”). Most EEE cases in horses result in death because there is no treatment; the only method of protection is purchasing the vaccine. A hidden cost in the spread of EEE, as stated earlier, is proper medication - euthanasia or vaccination. Not only does medication cost money, but replacing deceased horses is equally or more expensive than the proper medication itself. An additional hidden cost includes heavier treatment and surveillance of mosquitoes wherever horses are present. Currently, Bay County Mosquito Control often surveys many horse farms locally.

Horses have troughs for drinking that are sitting stagnant outside – this equates to prime breeding spots for many mosquitoes. Field technicians must pay special care to these places to ensure horse and human safety; however, time spent at these places is taking away from surveying other breeding hot spots.

With heavier treatment comes the use of more concentrated pesticides. Many people in the public are weary of mosquito control operations already. They fear that the pesticides used to treat water containing mosquitoes and/or their larvae and the chemicals sprayed after dusk are harmful to the environment, their pets, and to humans. Chemicals with higher concentrations of the active material would add to the current costs of mosquito-control operations, thus defining yet another hidden cost of controlling mosquito-borne diseases. Another cost that goes hand-in-hand with pesticide use is the employment of more field technicians to carry out the application of the pesticides. Application is accomplished by searching for and destroying mosquito habitats by manual labor.

Mosquitoes are pests that have been around for ages. Humans and animals alike have had to deal with them since the beginning of time. Controlling mosquitoes is a costly operation that requires a lot of technicians and biologists to carry out proper tasks. The public understands that mosquitoes spread disease, yet most people are unaware of the hidden costs that accompany controlling mosquito-borne diseases that have been outlined here. The process of surveying and controlling mosquitoes is an intricate one that takes a lot of funding. There are many hidden costs that accompany controlling and preventing mosquito-borne diseases. Public awareness and extra efforts made to control mosquito populations help alleviate some of the hidden costs that are associated with these organizations. Efforts made by the public and mosquito-control organizations help keep communities – the people and the animals living there – safe from the

threat of mosquito-borne diseases. In conclusion, there is no price to be put on human health, so hidden costs will never outweigh the outcomes of controlling mosquito-borne diseases.

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