National Environmental
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The National Environmental Health Association (NEHA) represents more than 6,700 governmental, private, academic, and uniformed services sector environmental health professionals in the U.S. and its territories and internationally. NEHA is the profession's strongest advocate for excellence in the practice of environmental health as it delivers on its mission to build, sustain, and empower an effective environmental health workforce.

Position Statement on Comprehensive Mosquito Control

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The National Environmental Health Association (NEHA) advocates for national, state, territorial, local and tribal policies, regulations, research, and resources that will enhance environmental health professionals' abilities to prevent the spread of mosquito-borne diseases and to protect public health. NEHA recognizes the association between the health of humans, animals, and the environment. Through incorporating the vector management framework outlined by the World Health Organization and integrating its One Health approaches to address environmental sources of emerging infectious diseases in programs, it is possible to reduce the health impacts to humans, animals, and the environment (CDC, 2017).

NEHA supports the following policies and actions:

- Development of model standards for mosquito management programs at the local level and support of those standards through the provision of additional funds.

- Development and implementation of training programs that support and build coordination between environmental health, epidemiology, and mosquito control professionals to allow for fully integrated mosquito control.

NEHA supports federal, state, territorial, local and tribal funding for health departments and mosquito control agencies to provide technical assistance, education, and programs to accomplish the following:

- Support integrated mosquito management programs designed to benefit or reduce harm to people, domestic animals, wildlife, and the environment (National Association of County and City Health Officials, 2014; Northwest Mosquito and Vector Control Association, 2016; WHO, 2012).

- Improve the state, local, territorial and tribal infrastructure and capacity to predict and prevent mosquito-borne disease outbreaks.

- Support emergency management actions for mosquito-borne disease outbreaks (Association of State and Territorial Health Officials [ASTHO], 2005).

- Social mobilization and community empowerment through education of the public about preventive behaviors and practices.

- Advocate for policies that address climate change, which contributes to the global change in mosquito distribution and the resulting spread of mosquito-borne diseases (ASTHO, 2015a; Githeko et al., 2000; Gubler et al, 2001).

- Support the development of policies that address social injustices that contribute to the disproportionate burden of mosquito-borne or collateral disease on vulnerable populations (U.S. Environmental Protection Agency, 2016).

NEHA and its members will continue to work with partners such as public works, mosquito control districts, code enforcement, departments of agriculture, departments of environment and conservation and other appropriate partners (van den Berg, Mutero, & Ichimori, 2012) to further enhance the effectiveness of mosquito control activities.

Analysis

Mosquito-borne diseases affect millions of people globally every year and will be an ongoing challenge in the U.S. West Nile virus (WNV), which appeared in the U.S. in 1999, has since become a widespread health problem, afflicting thousands of U.S. residents every year (Lindsey, Lehman, Staples, & Fischer, 2015). It is currently active in all 48 contiguous states with 96% of counties reporting evidence of transmission in humans, mosquitoes, birds, horses, and other mammals (Centers for Disease Control and Prevention [CDC], 2017; World Health Organization [WHO], 2012). Research has shown certain mosquito species can transmit multiple diseases such as dengue, malaria, Yellow Fever, Chikungunya virus, WNV, Zika virus and other encephalitic diseases, as well as a combination of these diseases.

In order to reduce the impact of mosquitoes and mosquito-borne illnesses, many state, territorial, local and tribal health agencies have established mosquito control programs. These programs consist of a combination of three basic interventions—surveillance, control, or disease monitoring—with the level of intervention based upon cost and available funding. Programs can include gathering surveillance data to detect the species of mosquito, as well as to detect possible outbreaks, manage prevention through source reduction, provide public education, and implement mosquito control/integrated mosquito management practices (CDC, 2016; Northwest Mosquito and Vector Control Association, 2016; U.S. Department of Health and Human Services, 2013). In many areas, environmental health professionals are responsible for these activities.

In 2012, a survey of all state health departments and 30 large city and county health departments assessed their collective capacity for mosquito-borne disease surveillance, as well as looked at funding for essential personnel and how that funding has changed since 2004 (Council of State and Territorial Epidemiologists [CSTE], 2014). The survey showed a decrease in mosquito-borne virus surveillance since 2004 and respondents indicated a 41% reduction in staff for surveillance, 58% reduction in mosquito trapping activities, and 68% decrease in mosquito testing due to budget cuts (CSTE, 2014). In total, 18 states confirmed the presence of *Aedes aegypti* mosquitoes, the primary vector for dengue and Zika virus, with only five (28%) of those states reporting active dengue surveillance and control plans (CSTE,

2014). The expanding range of several *Aedes* mosquito species, including those capable of transmitting diseases to humans (*A. aegypti* and *A. albopictus*), coupled with the lowered capacity for surveillance, is cause for public health concern (CSTE, 2014).

Due to a lack of annual and organized federal funding for mosquito or vector control programs, state, territorial, tribal and local jurisdictions have had to develop independent funding systems. This trend has led to nationally inconsistent and socioeconomically biased programs as some jurisdictions can implement fees and specific tax revenues to supplement state or locally allocated funding.

The growing incidence and changing geographical distribution of mosquito-borne diseases can be partially attributed to climate change, transglobal migration, and international travel (Githeko, Lindsay, Confalonieri, & Patz, 2000; Gubler et al., 2001; WHO, 2017). The expanding habitat of *Aedes* mosquitoes in the U.S. might lead to increases in local transmission of Zika virus along with other diseases. Therefore, state, territorial, local and tribal health departments have a pressing need for consistent funding to support mosquito-borne disease surveillance programs, mosquito control programs, and comprehensive integrated mosquito management programs that cover all U.S. residents.

Justification

Mosquito-borne diseases add significant healthcare, lost productivity, and income costs to the economy. In the U.S., it is estimated that the average cost of WNV is $56 million annually with the lifetime lost productivity and death growing to $449 million (Staples, Shankar, Sejvar, Meltzer, & Fischer, 2014). It is estimated that dengue infections alone cost the global economy $8.9 billion annually (Margolis, 2016). There are also emerging diseases in the U.S., such as Zika virus, whose effects and costs are still being discovered (Margolis, 2016). While the full impact is not yet known, research has shown a strong link between Zika virus and microcephaly in newborn children (Kaiser Family Foundation, 2016). The Centers for Disease Control and Prevention (CDC) Center for Birth Defects states that a child with birth defects can have a lifetime cost of care between $1–$10 million (Kaiser Family Foundation, 2016). In comparison, the average lifetime cost of asthma per person is around $260,000 on top of regular health needs (American Academy of Allergy, Asthma & Immunology, 2017). Prevention of mosquito-borne diseases through vector control programs is significantly cheaper, both in real dollar amounts and in disability-adjusted life years (DALYs) (Kaiser Family Foundation, 2016; LaBeaud, Bashir, & King, 2011).

Mosquito control program budgets vary widely in relation to the types of mosquito present, disease impact, and population size. Lee County, Florida, had a 2016 budget of $17.5 million for mosquito control, compared to $8 million for San Diego County, California and $150,000 for Conway, Arizona (SCI Consulting Group, 2013; Vector Disease Control, 2016). In addition to boots on the ground prevention and surveillance activities, laboratory capacity is vital in the identification and tracking of mosquito borne diseases. Federal funding for epidemiology and laboratory capacity grants from CDC's Division of Vector-Borne Diseases was $9.2 million in 2013, a drastic decrease from $34.7 million in 2002 (ASTHO, 2015b). Accounting for inflation, a minimum of $46.5 million is currently needed to fund programs at the same level as in 2002.

The return on investment in mosquito control will be a significant reduction in medical bills, gains in years lived, and decreases in deaths that will lead to increased number of days worked, which impacts the U.S. gross domestic product.

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