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Lyme disease: Current issues, implications, and recommendations for tourism management

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HIGHLIGHTS

- Lyme disease is an emerging infectious disease that has implications for tourism.
- Exposure, knowledge and beliefs, and personal protection behaviours are risk factors for infection.
- Tourism management stakeholders should liaise with health authorities to mitigate impacts.

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ABSTRACT

Lyme disease is a bacterial infection spread through the bite of an infected tick. In the last few decades, the number and spatial reach of new cases has increased globally and in the United States, Lyme disease is now the most commonly reported vector-borne disease. Despite this evolving public health crisis, there has been little-to-no discussion of the implications for tourism supply and demand. This paper reviews the scientific literature to identify Lyme disease risk factors and the implications for tourism management are discussed. The major contribution of this paper is a set of recommendations for tourism managers who may be tasked with mitigating the risks for visitors and employees as well as the potential impacts of Lyme disease on destination sustainability.

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1. Introduction

Lyme disease is the world's fastest growing vector-borne zoonotic disease with cases reported in over 60 countries and endemic foci in North America, Europe, and Asia (WHO, 2013). The World Health Organization (WHO, 2013) reports that the risk is generally low except for those travelling to rural areas, particularly campers, hikers, and workers in countries or areas at risk. However, this assessment may give a false sense of security for people working or travelling in areas where the risk of Lyme disease is uncertain and it may breed complacency amongst those responsible for occupational, travel, or public health.

The northeastern United States is traditionally defined as the endemic global center for Lyme disease and the public health risk is highest in this area. In 1982, systematic surveillance for Lyme disease was initiated by the U.S. Centers for Disease Control and Prevention (CDC, 2013a), with 11 states reporting 491 cases. In 1990 a standardized case definition was approved and by 2012, the number of cases reported had increased over 200 percent (CDC, 2013b; Ciesielski et al., 1989). The CDC (2013a) states that only 10 percent of Lyme disease cases are being recorded which translates into approximately 300,000 estimated cases in the United States each year (Fig. 1). A majority (95 percent) have been concentrated in the northeast, yet cases have been reported in every state and in many countries around the world and their geospatial analysis reveals that Lyme disease has extended well beyond traditionally defined endemic areas (CDC, 2013b; Diuk-Wasser et al., 2012). Lyme disease case rates have been increasing exponentially at the global scale while in the United States it has become the number one and most medically significant vector-borne infectious disease (Abbott, 2006; Piesman & Eisen, 2008). While it is possible to surmise that better diagnostics and increased reporting are responsible for case rate trends in the United States and other parts of the world, case rates vary because of social, environmental, and economic variables such as climate and ecological change, tick and host species range expansion, human demographics and behaviour, land use patterns, clinical practice, disease reporting standards, surveillance technologies, and true incidence (Daniels, Falco, Schwartz, Varde, & Robbins, 1997; Grenfell & Harwood, 1997; Horowitz et al., 2013).

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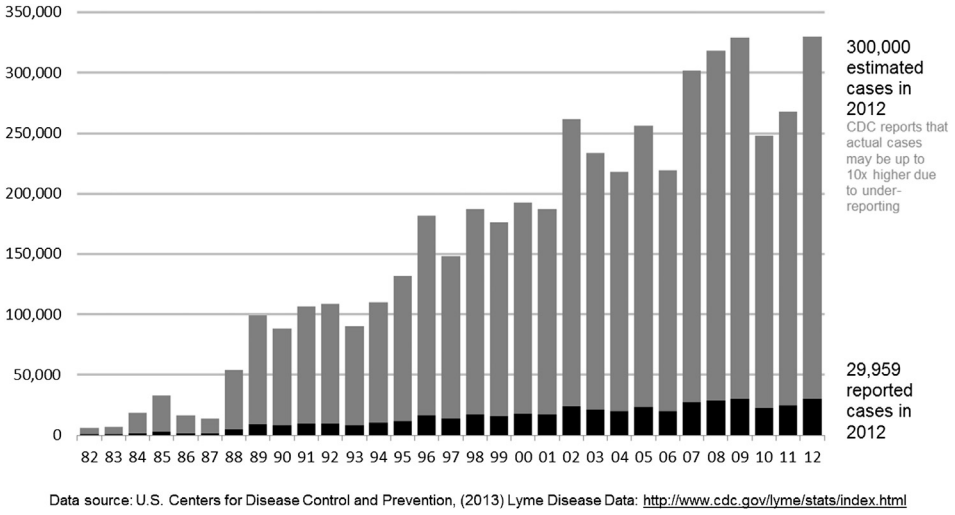

Fig. 1. Annual Lyme disease cases in the United States 1982–2012.

Lyme disease is caused by *Borrelia burgdoferi* – a bacterial pathogen transmitted to humans through the bite of an infected tick. The pathogen is sylvatic; meaning that it cycles between wild animal hosts and vectors. Humans are not the primary host and as such are usually incidental or dead-end hosts. Although the symptoms have been observed since the 19th century, it has only been 30 or so years since the etiological agent and the primary vector(s) for Lyme disease were recognized and their medical significance reported. The infection is characterized by a distinctive bull's eye rash that occurs in 60–80 percent of patients (CDC, 2011). From the early symptoms of fever, headache, muscle and joint pain to the more serious symptoms such as cognitive impairment, cardiac abnormalities, arthritis, and paralysis, the impacts on individual health are noteworthy (WHO, 2012). Diagnosis is completed through a clinical examination and confirmed through serological tests and treatment consists of oral or intravenous antibiotics. Currently, there is no vaccine available for human use but several are available for veterinary use (Willadsen, 2006).

Although the medical and scientific communities have been pursuing the problem for years, tourism has been slow to recognize that Lyme disease can affect both tourism supply and demand. In the supply context, outdoor workers in endemic areas are at increased risk because of their frequent exposure to ticks and tick habitat (Piacentino & Schwartz, 2002). Antecedent studies have established that outdoor workers are up to 10 times more likely to be infected than the general population (Bowen, Schulze, Hayne, & Parkin, 1984; Smith et al., 1988). Given that a proportion of individuals employed in the tourism, parks, and outdoor recreation sectors are required to spend some to all of their time working outdoors, the potential threat to individual and industry health is cause for concern. For those infected, days to weeks of sick time may be required to complete treatment and the medical costs can be significant. In addition to the social costs, the U.S. Department of Labor reports that workplace illnesses have a major impact on an employer's economic sustainability and profit margin. The annual number of nonfatal illnesses has been estimated at 430,000 with direct cost of $12 billion and indirect costs of approximately $100 billion (Leigh, 2011). Direct costs include workers' compensation payments, and it is estimated that employers pay $1 billion per week for direct workers' compensation costs (U.S. Department of Labor, 2014). Workers' compensation covers less than 25 percent of these costs, so all members of society share the economic burden. Indirect costs include but are not limited to training replacement employees, implementation of corrective measures, lost productivity, and costs associated with lower employee morale and absenteeism. The direct medical costs associated with Lyme disease in the United States are estimated at 2.5 billion dollars annually but the true cost of Lyme disease is the profound impacts on personal health and well-being (Maes, Lecomte, & Ray, 1999; Magnarelli, 2009; Zhang et al., 2006).

From a demand perspective, the WHO reports that the risk to those travelling to endemic areas of the world is generally low but nonetheless, they warn travellers to avoid tick-infested areas and tick exposure on their dedicated Lyme disease webpage for international travellers (http://www.who.int/ith/diseases/lyme/en). When outdoor activities are planned during a trip to an endemic area for tick-borne disease, a tourist is at risk and the WHO's assessment can be misleading (Falco & Fish, 1989; Hayes, 2010; Raoult et al., 2001; Smith et al., 1988). Their risk can be magnified because tourists may not have all of the necessary information or access to resources that would enable them to make informed decisions regarding Lyme disease prevention before and during travel (Jonas, Mansfeld, Paz, & Potasman, 2011; Kelly-Hope, Purdie, & Kay, 2002). For tourists who are aware of health risks before choosing a destination, Sönmez and Graefe (1998) and Kozak, Crotts, and Law (2007) report that perceived risk can be a strong predictor for avoiding certain regions or changing travel plans. Dixon et al. (2010) report that the macroeconomic consequences of a health threat or crisis are highly sensitive to demand-side effects such as the reductions in international tourism and leisure activities that result from elevated risk perceptions. For example, during the severe acute respiratory syndrome (SARS) pandemic, traveller's health risk perceptions had a significant effect on international tourism demand. Over 8000 cases and 774 deaths in 26 countries were reported in 2003 with a majority of cases occurring in Asia (WHO, 2004). The initial spread of SARS was exponential with predictive models showing that if uncontrolled, a majority of people would become infected wherever it was introduced (Dye, 2003). Air travel to areas affected by the advisories decreased dramatically during the epidemic (Kuo, Chen, Tseng, Ju, & Huang, 2008; Zeng, Carter, & De Lacy, 2005). In East Asia, tourist arrivals dropped by 41 percent during the month of April compared to the same period in 2002, with China, Hong Kong, Singapore, and Vietnam reporting the greatest losses (Pine & McKercher, 2004; Wilder-Smith, 2006). Growth of the broader travel and tourism economy, which measures visitor spending and capital investment around the world, slowed to 2.9 percent down from 5 percent in previous years and international arrivals fells 1.2 percent (World

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