Abstract

Global health concerns are complex, boundless, and influenced by numerous factors. Recent challenges in infectious disease and global health have influenced the emergence and re-emergence of various plagues and outbreaks of vaccine preventable diseases such as Measles and Polio. Other outbreaks that have caused alarm among the traveling public in particular include Ebola, Zika Virus, Plague, Yellow Fever, and Dengue (CDC, 2018; WTO, 2018). The changing dynamics of epidemiology has been linked in the literature to economic change, land use, and population mobility (Smith & Whittaker, 2014). Despite economic growth, various development projects, climate change and population movements have led to increases or shifts in the spatial distribution of infectious diseases and other public health issues. Population mobility and movements present a challenge when attempting to control for infectious disease and to expand health care services, as their spatial distributions shift through time and various locations. The travel industry faces operational challenges in the process of controlling travel flows and access to areas where particular diseases are endemic but have become highly interconnected over time.
Epidemics of infectious disease have been documented throughout history (Nelson & Williams, 2013). Early studies of epidemiology attributed illness to numerous characteristics in the environment (e.g., soil, water, climate, nutrition) surrounding the individual. Current knowledge of disease epidemiology, more rapid identification of infection-causing microorganisms, and technological advances contribute to not only a better understanding of disease epidemiology but also prevention strategies and improved treatments. The role of human travel has been investigated in the context of spatial epidemiology in order to better predict the timing of outbreaks, spread of global epidemics, and for improved public health planning (Tizzoni et al., 2012). However, considering the 1.3 billion travelers recorded in 2017 alone—expected to reach 1.8 billion by 2030 (UNWTO, 2018), infectious disease epidemiologists need to factor in the dynamics of this unprecedented human movement by examining “human mobility across spatial and temporal scales for multiple countries and pathogens” (Wesolowski, Buckee, Engø-Monsen, & Metcalf, 2016, p. 491).

Global transmission of viruses has been examined in both older and current discourses on travel and disease and the ‘pathologies of travel’ (Warren, Bell, & Budd, 2010). Disease emergence has been linked to global climate and land use change (Patz, Olson, Uejio, & Gibbs, 2008; Semenza, & Menne, 2009; Wu, Lu, Zhou, Chen, & Xu, 2016), transportation networks (Nakata, & Röst, 2015), commercial air travel (Namilae, Srinivasan, Mubayi, Scotch, & Pahle, 2017; Nelson, Marienau, Schembri, & Redd, 2013; Plotkin, & Hardiman, 2010; Read, Diggle, Chirombo, Solomon, & Baylis, 2015; Warren, Bell, & Budd, 2010), passenger movement (Namilae et al., 2017), and mass gatherings (Rashid, Haworth, Shafi, Memish, & Booy, 2008). Patterns of human mobility in its various forms (i.e., immigrants, refugees, asylum seekers, displaced persons, migrant laborers, military, tourists) and their impacts on infectious disease transmission and acquisition have profound impacts on containment, treatment, and policies.
The relationship between infectious disease and travel can be viewed as a complex adaptive system (CAS). Many physical, social, biological, and other systems are increasingly understood as complex, dynamical, and adaptive (Gross, 2015) and properties such as self-organization, adaptation, agent and spatial heterogeneity, nonlinear feedbacks, and time scales render their management challenging (Scheffer, 2009). Mathematical and computational advances have expanded our understanding of breakdowns in complex biological (i.e., cardiac arrhythmias) (Olde-Rikkert, Dakos, Buchman, de Boer, Glass, et al., 2016) or social (i.e., natural or human-caused crises) systems (Mascareño, Goles, & Ruz, 2016)—except for our understanding of mechanisms that determine systemic failures in population health (e.g., disease spread), which remains limited. A CAS approach holds potential for the global travel industry in managing travel flows in light of infectious disease risks around the globe.

References


