The complexity of population-level health issues including the spread of infectious diseases and their associated costs are significant and requires a considerable amount of prevention efforts and involvement of various stakeholders. The advantages of modeling complex problems using a system dynamics (SD) methodology is to investigate what-if strategies and propose effective ones to improve outcomes. Also, SD is a perfect tool for facilitating communication between stakeholders of the system and modeling complex problems through stakeholders’ assistance. For this purpose, I have dedicated part of my dissertation to model complex systems of infectious diseases including Lyme Disease and HPV using system dynamics (SD) simulation modeling. The purpose of the first two essays of this dissertation is to use SD as a decision making and analytical tool to study the interactions between several factors within these complex systems over time and model the feedback structure to explore the influence of different interventions and propose ones that can alleviate the burden of these infections in New York state. Furthermore, I merge two different methodologies, SD and geographic information system (GIS) to investigate the spatial accessibility of primary care in the third essay of my dissertation. The integration of these two methodologies led me to study spatial factors that are impeding primary care access by Medicaid enrollees throughout multiple counties in upstate New York. This new methodology integration approach identifies the areas that lack primary care providers and suggests locations for policymakers to establish primary care sites.