Silent Circulation of Poliovirus in Small Populations

Celeste Vallejo

Abstract

Poliovirus is an enterovirus that causes the infectious disease called poliomyelitis. The virus can cause fever and flu-like symptoms, and, in more rare instances, acute flaccid paralysis (AFP). One characteristic of poliovirus is asymptomatic transmission amongst individuals who have already had a poliovirus infection. This allows the virus to silently circulate in an endemic population unless a surveillance system is put into place. Eradication efforts have reduced the regions of endemic circulation down to three localities. However, there have been outbreaks in areas in which the virus seemed to be eliminated. There are also areas in which small villages (population $< 10,000$) are common and in which one or more sub-populations are difficult to reach with a vaccination program. These conditions increase the possibility of silent circulation of the virus, which is perpetuated by both imperfect or nonexistent vaccination coverage and immunity waning. We have constructed a stochastic microsimulation model to understand how stochastic effects alter the ability of small populations to sustain virus circulation in the absence of vaccination. In addition, we explored the effects of modifying the AFP detection rates on the duration of a silent circulation in small populations.