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Intervention-Based Stochastic Disease Eradication[1] LORA BILLINGS, Montclair State University, LUIS MIER-Y-TERAN-ROMERO, Johns Hopkins Bloomberg School of Public Health, BRANDON LINDLEY, IRA SCHWARTZ, US Naval Research Laboratory — Disease control is of paramount importance in public health with infectious disease extinction as the ultimate goal. Intervention controls, such as vaccination of susceptible individuals and/or treatment of infectives, are typically based on a deterministic schedule, such as periodically vaccinating susceptible children based on school calendars. In reality, however, such policies are administered as a random process, while still possessing a mean period. Here, we consider the effect of randomly distributed intervention as disease control on large finite populations. We show explicitly how intervention control, based on mean period and treatment fraction, modulates the average extinction times as a function of population size and the speed of infection. In particular, our results show an exponential improvement in extinction times even though the controls are implemented using a random Poisson distribution. Finally, we discover those parameter regimes where random treatment yields an exponential improvement in extinction times over the application of strictly periodic intervention. The implication of our results is discussed in light of the availability of limited resources for control.

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