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Vaccine enhanced extinction in stochastic epidemic models[1]
LORA BILLINGS, Montclair State University, LUIS MIER-Y-TERAN, Johns Hopkins Bloomberg School of Public Health, IRA SCHWARTZ, U.S. Naval Research Laboratory — We address the problem of developing new and improved stochastic control methods that enhance extinction in disease models. In finite populations, extinction occurs when fluctuations owing to random transitions act as an effective force that drives one or more components or species to vanish. Using large deviation theory, we identify the location of the optimal path to extinction in epidemic models with stochastic vaccine controls. These models not only capture internal noise from random transitions, but also external fluctuations, such as stochastic vaccination scheduling. We quantify the effectiveness of the randomly applied vaccine over all possible distributions by using the location of the optimal path, and we identify the most efficient control algorithms. We also discuss how mean extinction times scale with epidemiological and social parameters.

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