We study various forms of SIR models where the disease dynamics is modeled by either a $\sqrt{SI}$ or $\sqrt{IS}$ term, in contrast to the standard SI representation. We further examine cases where the infective individuals are removed at rates proportional to either $I$ or $\sqrt{I}$. Introducing nullclines, we construct the path of trajectories in the 2-dim S-I phase space and determine their general behavior. Nonstandard finite difference schemes are used to calculate numerical solutions to the differential equations. A major reason for examining SIR square-root models is the possibility of having populations go to extinction in a finite time. This work extends previous results of McNeil (1972) and Liu et al. (1986, 1987).

References