Threshold Theorem for Size Epidemic in Model of Weis With Non-Homogeneous Mixing

Zoya Chay
Electrotechnical Institute of Communications
Tashkent, Uzbekistan

Consider a closed population consisting initially of n susceptibles and m carriers. Let R(t) and S(t) represent the number of susceptibles and the number of carriers at time t>0, respectively. Model of epidemic is homogeneous double – measuring Markov process $x(t) = (R(t), S(t))$ and the transition probabilities in short interval (t, t+Δ) are given by

$$P\{x(t+\Delta) = (r-1, s)\ /x(t) = (r, s)\} = l r^{a} s\Delta + 0(\Delta)$$
$$P\{x(t+\Delta) = (r, s-1)\ /x(t) = (r, s)\} = m s\Delta + 0(\Delta)$$
$$P\{x(t+\Delta) = (r, s)\ /x(t) = (r, s)\} = 1 - l r^{a} s\Delta - m s\Delta + 0(\Delta)$$

Where λ and μ are coefficients of removals of susceptibles and carriers respectively, a>0 – fixed parameter.

The size of epidemic is the number of removals of the number susceptibles to the end of epidemic.

We note that infected by carriers susceptibles are not infection source, but identify and removing out of population.

It was got symtotical analysis for all correlating of initial parameters of model and obtained limit distributions for epidemic size.

In this model the parameter $g_n = \frac{S n^{1-a}}{m}$ is called the adjustable parameter and is value influences the development of epidemic. The thresholding case is the most interesting and it is different from the model with homogeneous mixing. Here appear new effect, which connected with the increasing of the size of epidemic but it does not when $q_n = \frac{p}{m} \to 0$ as at a=1, and it does wnen n 1-a, where 0<a<1.