ON BAYESIAN ESTIMATIONS OF THE OFFSPRING MEAN IN BRANCHING PROCESSES WITH APPLICATION TO OUTBREAKS OF INFECTIOUS DISEASE

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A single-type Bienaymé--Galton--Watson branching process (BGWBP) with a generalized power series offspring distribution is considered as a model of the spread of an infectious disease in a population. Our main goal is to estimate the basic reproduction number \( R_0 \), which is represented by the offspring mean of the BGWBP, applying a Bayesian approach. Two kinds of estimates are discussed: based on the total number of infected individuals by the end of the outbreak (see [1]); and based on the number of infected individuals from the beginning of the outbreak to the current week. We are using the Metropolis--Hastings algorithm to simulate the posterior distribution. The usefulness of the described methods is demonstrated on some real data on the number of reported cases of mumps in Bulgaria during the period 2005-2008.

Keywords: Bienaymé--Galton--Watson branching process, offspring mean, Bayesian estimation, reproduction number, Metropolis--Hastings algorithm

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References