



A chaotic model for the plague epidemic that has occurred in Bombay at the end of the 19th century

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The plague epidemic that has occurred in Bombay at the end of the 19th century was detected in 1896. One year before, an Advisory Committee had been appointed by the Secretary of State for India, the Royal Society, and the Lister Institute. This Committee made numerous investigations and gathered a large panel of data including the number of people attacked and died from the plague, records of rat and flea populations, as well as meteorological records of temperature and humidity [1].

The global modeling technique [2] aims to obtain low dimensional models able to simulate the observed cycles from time series. As far as we know, this technique has been tried only to one case of epidemiological analysis (the whooping cough infection) based on a discrete formulation [3]. In the present work, the continuous time formulation of this technique is used to analyze the time evolution of the plague epidemic from this data set. One low dimensional model (three variables) is obtained exhibiting a limit cycle of period-5. A chaotic behavior could be derived from this model by tuning the model parameters. It provides a strong argument for a dynamical behavior that can be approximated by low dimensional deterministic equations. This model also provides an empirical argument for chaos in epidemics.

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