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Salmonella Outbreaks: Assessing Causes and Trends

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According to the Center for Disease Control and Prevention, it is estimated that each year foodborne disease is the cause of roughly 48 million illnesses, 128,000 hospitalizations, and 3,000 deaths among American citizens. Of the 31 known pathogens that contribute to domestically acquired foodborne illness, Salmonella is deemed the leading pathogen causing hospitalization and death. Although there has been greater implementation of government regulations, the CDC has confirmed that since 1998 the rate of infection of Salmonella is slightly increasing rather than decreasing. For this reason, Salmonella presents itself as a public health concern that needs to be addressed immediately.

Because statistical models are essential in detecting outbreaks, this research performed a model comparison, which focused heavily on using a Bayesian statistical methodology to determine change-points using a Markov Chain Monte Carlo computational method, as well as a Bayesian Poisson Analysis. In order to determine how well the tested models were able to successfully identity outbreaks, a simulation study was developed to examine their accuracy. In addition to model efficiency, the simulation study also provided insight to how different factors affect the model results. Results showed that the Bayesian Poisson analysis was the best at detecting outbreak trends of Salmonella. Furthermore, the simulation study showed that the two most influential factors in detecting the correct number of outbreaks are the frequency of outbreaks and a user-specified parameter value.

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Page 111