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Hierarchical Bayesian Models for Uncertainty-Quantified Ranking of Restaurant Chains by Food Safety Compliance

For an episode of CBC Marketplace (April 2014), data has been collected on the number of food safety violations found during inspections at hundreds of locations of 13 restaurant chains in 5 Canadian cities. We describe several methods to produce an uncertainty-quantified nationwide ranking of the chains by food safety compliance, addressing the issue of differing standards for what constitutes a violation in different cities. We demonstrate a ranking based on the coefficients of a Poisson regression. To obtain more precise rankings with less uncertainty, and gain insights about the data, we fit a series of Bayesian overdispersed Poisson models.