ESTIMATION OF MEDICAL EXPENDITURE THRESHOLD EXCEEDANCE USING A BAYESIAN "SQUARE" APPROACH

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We introduce *Bayesian Smooth Quantile Ratio Estimation* (B-SQUARE), a new method for estimating and comparing expenditure distributions across two groups, with emphasis on the estimating the probability of exceeding large expenditure thresholds. Distributions of medical expenditures are often highly positively skewed, and tail probability estimation is challenging even for relatively large samples. Our method is based upon two ideas: 1) to flexibly model the distribution of medical expenditures for cases by using a mixture of gamma distributions; 2) to combine information across the disease group of interest and a large control group by assuming that the log quantile ratio is a smooth function of the percentiles. Our work is a Bayesian extension of Dominici et al. (Biometrika 2005). It also provides a closed form expression for the likelihood function and computational algorithms for approximating the marginal posterior distributions of all parameters. We apply the method to the 1987 National Medicare Expenditure Survey, to estimate the risk of exceeding a given medical cost among persons suffering from lung cancer and chronic obstructive pulmonary disease, as compared to persons without these diseases.