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Estimation of Contingency Tables for Small Areas using Multi-Level Loglinear Models

It is sometimes of interest to estimate population counts cross-classified by multiple survey variables, for example Smoking Status by High Blood Pressure by the health districts of a country. Methods are available for estimating counts by a single categorization (for example labour force status) using random effects multinomial models. We apply these methods to the estimation of 2 by 2 tables for small areas, using saturated and unsaturated loglinear models with random effects; the former is usually superior. Small area estimators using the new approach have much lower mean squared errors than direct estimators. Mean squared errors are estimated by parametric bootstrapping. The methods are illustrated using data from the New Zealand Health Survey.