Accounting for matching uncertainty in T-stage capture-recapture models for population size estimation

Abstract

In this paper we illustrate a Bayesian hierarchical modelling approach for estimating the size of a closed population by capture-recapture models when the number of recaptured individuals is unknown but unlabelled data are available for more than two sampling occasions. In particular, we will assume that for each sampling occasion a multi-dimensional contingency table comprising a common set of categorical variables is available. The observed frequencies, generated by a multivariate hypergeometric distribution with parameters given by the unknown population size and population frequencies, will be assumed independent across the samples. Moreover, a super-population model will be used to model the population frequencies and the dependence structure of the observed variables at the population level. To simulate the posterior distribution of the model parameters a Gibbs sampling scheme will be proposed.

Notice that this new hierarchical model partially extends the models proposed in [1] and [2] by tackling the multiple lists matching problem. See also [3] for a recent contribution in this context. Both real and simulated data sets will be used to illustrate and motivate the proposed approach. Moreover, we will show how our model can be profitably adopted in record linkage problems providing a new modelling approach also in this context.

References


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