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Title: Estimation of Population Total based on Linear Models using Social Network Information

Abstract: Standard statistical approaches for social statistics obtained from sample surveys, censuses and administrative sources usually focus on individuals. For example in a study of smoking, drinking and exercise behaviour a survey may collect information on these variables and other social and demographic variables for a sample of individuals. Applying naively a single level analysis assuming independent individuals is inappropriate and can lead to incorrect inferences and conclusions. A more appropriate approach is a multilevel one, with levels corresponding to households and geographic areas to account for correlations among members of the same household or area.

Social networks are another source of information to model survey variables. For example, best friends form a social network and can be assumed to influence the individual characteristics significantly. Common modelling approaches using social network information are autocorrelation, disturbance and contextual models.

Our main focus is on the effect of the inclusion of such social network information on the estimation of the population total. In a simulation study we investigate and compare the efficiency of the BLUP for two main situations: (i) The network information is included in the model; (ii) this information is excluded. This addresses a fundamental question: 'Is it worthwhile collecting social network information for surveys?' We also address the question how much network needs to be collected, for example 'Does the network need to be collected for the whole population or only for the survey sample?'