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Title: Jackknife variance estimation for functions of Horvitz-Thompson estimators under unequal probability sampling without replacement

Abstract: The jackknife is a popular method in survey sampling which is widely used for standard error estimation (e.g. Shao & Tu (1995) and Wolter (2007)). The applicability and theoretical properties of jackknife variance estimation under unequal probability without-replacement sampling have been studied to a limited extent in the survey sampling literature. Some examples are given by Campbell (1980), Berger & Skinner (2005), Berger & Rao (2006) and Berger (2007). In these works the jackknife variance estimation is defined for functions of Hajek (1971) point estimators.

In practice, however, it is well known that the performance of Hajek point estimation may be restricted by common situations found in multipurpose surveys, e.g. various weight-adjustments, small sample sizes that are result of high stratification, and in general, the use of survey weights which are poorly correlated with some variables of interest contained in the survey.

We propose a set of generalised jackknife variance estimators suitable for functions of Horvitz-Thompson (1952) point estimators. The proposed variance estimators naturally include finite population corrections and are defined for any without-replacement unequal probability sampling design. We explore briefly some of their limit properties. Also, a simulation study shows that the proposed methods may improve customary jackknives which handle unequal probabilities (e.g. Campbell (1980)).