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Title: Estimation and variance estimation under the cross-classified sampling design.

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Abstract:

The cross-classified sampling (ccs) design consists in drawing samples from a two-dimension population, independently in each dimension. An example of such a design is the French Longitudinal Survey on Childhood called ELFE which comprises more than 18,000 children selected on the basis of their place and date of birth. A sample of 320 maternity units and a sample of 25 days divided in four-time periods have been selected. The sample is made of babies born at the sampled locations and on the sampled days. The objective of this large survey is to analyze the health of children together with their living and environmental conditions. We propose to derive some finite population parameter estimators and variance estimators for the ccs and obtain reliable confidence intervals for the Elfe survey. Generally, the cross-classified design results in a loss of efficiency as compared to the usual two-stage design. Even in the case of simple random sampling designs without replacement in each dimension, the usual Horvitz-Thompson variance estimators may be negative. Non-negative simplified variance estimators are introduced and compared through a simulation study. Finally, an application to the ELFE data is detailed.