Design-based analysis of factorial designs embedded in probability samples

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At national statistical institutes experiments embedded in ongoing sample surveys are frequently conducted, for example to test the effect of modifications in the survey process on the main parameter estimates of the survey, to quantify the effect of alternative survey implementations on these estimates, or to obtain insight into the various sources of non-sampling errors. A design-based analysis procedure for factorial completely randomized designs and factorial randomized block designs embedded in probability samples is proposed in this paper. Design-based Wald statistics are developed to test whether estimated population parameters, like means, totals and ratios of two population totals, that are observed under the different treatment combinations of the experiment are significantly different. The methods are illustrated with a real life application of an experiment embedded in the Dutch Labor Force Survey.

Key words: completely randomized designs, design-based inference, embedded experiments, measurement error models, model-assisted inference, randomized block designs.