Weighting and Variance Estimation Under Responsive Designs and Related Forms of Sample-Driven Resource Allocation for Complex Surveys

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With some notable exceptions, formal inference from complex sample data has traditionally been based on the premise that randomization mechanisms for resource allocation are determined a priori. This resource allocation may include several components, including sample selection; assignment of collection mode and interviewers; nonresponse follow-up; and re-interviews to evaluate measurement error properties. In practice, however, field-level decisions in the abovementioned areas often involve decisions that are not entirely determined a priori, and that may be based on paradata or other preliminary information available on some of the sample units. For the case of nonresponse follow-up, Groves and Heeringa
(2006) and subsequent publications explored some of these decision processes under a "responsive design" framework, and suggested a number of ways in which to use this framework to improve the balance between data quality and cost.

The current paper explores issues of weighting and variance estimation under a "responsive design" framework and related forms of sample-driven resource allocation. It places primary emphasis on methods based on extensions of standard analyses of data collected through two-phase or multi-phase sample designs. Three complementary approaches receive primary attention. These involve methods based on, respectively: (1) a set of randomized resource-allocation rules determined a priori; (2) conditioning on the observed paradata; or (3) integration with respect to the distributions induced by a superpopulation model for the paradata, as well as the randomization distribution induced by the original sample design. A simulation study illustrates some practical distinctions in results obtained through approaches (1) through (3), respectively.