

Chapter 17

Weighting Survey Data

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To many researchers, the survey weighting process appears as a “black box” where, through some mysterious process, weights are derived that they are told must be used in the estimation process. They may be perplexed that some observations have a relatively small weight (say 20) while other observations receive a much larger weight (say, 3000). How is it that some observations are assigned so much more importance in the estimation process than others? They may complain when the weights have as much influence on their research findings as the survey data themselves and wonder whether the weights can be trusted. This chapter has attempted to illuminate this seeming black box by describing why survey weights are needed, what the weighting process entails and how each step of the weighting process should implement.

Clearly, the steps of the weighting process are quite subjective: whether to adjust or not adjust for nonresponse and noncoverage error, how to form weighting class and post-stratification cells, what data to use in the adjustment process, whether and how to trim the weights, etc. Even computing the base weights can be subjective; for example, in many RDD surveys, the number of telephones per household is not obtained and, thus, not used for computing selection probabilities.

Given the influence weights have on survey results, it is important that researchers understand enough about the weighting process to be discerning users of the survey data. At a minimum, researchers should know whether post-survey adjustments were applied to the weights to reduce sampling variation and the effects of missing data. If no adjustments were applied, should they have been? If they were applied, what information was used in the adjustments, what is known about their quality, and what analyses have been performed to assess their effects on survey error? Were the weights trimmed and to what extent? We hope the information contained in this chapter will better prepared the data user to ask these questions and understand the answers.

GLOSSARY OF KEY CONCEPTS

Target (or inferential) population. The population to be studied in the survey and for which the basic inferences from the survey will be made.

Frame population. The subset of the target population that is represented by the sampling frame.

Respondent population. That subset of the frame population that is represented by units who would respond to the survey if selected.

Base (or design) weight. The starting point for weight construction and derives from the survey design. It is the inverse of the probability of selection for unit i .

Post-survey weight adjustments. Multiplicative factors applied to the base weights to compensate for nonresponse, noncoverage and to reduce the variance through post-stratification and ratio estimation.

Nonresponse bias. Defined as the expected nonresponse rate times the difference in the means of the respondent and nonrespondent populations

Nonresponse adjustment. An adjustment to the base weight that is designed to partially correct the bias due to nonresponse.

Weighted class adjustment (WCA). A type of nonresponse adjustment that uses weighted classes and nonresponse rates to estimate and correct for nonresponse bias.

Frame noncoverage. Occurs when the frame population does not include all units in the target population.

Noncoverage bias. The bias in parameter estimates due to frame noncoverage.

Noncoverage adjustment. An adjustment to the nonresponse adjusted base weight that is designed to partially correct for bias due to frame noncoverage.

Post-stratification adjustment (PSA). A type of noncoverage adjustment that uses strata selected after sampling and target population counts to estimate and correct for noncoverage bias.

Probability proportional to size (PPS) sampling. Gives a greater probability of selection to larger units than to smaller units according to some size measure. If sampling is without replacement, it is referred to as pps sampling.

Final weights. The weights used in analysis and are a multiplicative combination of the base weights and post-survey adjustments.

Extraneous units (or erroneous inclusions). Refers to the inclusion of nonpopulation units on the frame.

Frame multiplicity. Occurs when some population elements are listed multiple times on the sampling frame.

Raking (or raking ratio estimation). An iterative process of estimating cell counts from marginal counts for weighted class cells.

Unequal weighting effect (UWE). The adverse effect of unequal weight variation on the precision of estimates.

Weight trimming. The process of moderating extreme weights for the purposes of improving the MSE of estimates.