

Generalization of Two-Stage Randomized Response with an Extension in Optional Randomized Response

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ABSTRACT

In the era of survey sampling, there is an increasing interests in sensitive features of the population that people generally prefer to hide from people. A novel technique called the Randomized Response Technique (RRT) is used to gather reliable data, protect the confidentiality of respondents, and estimate the population proportion, bearing the sensitive attribute. But the perception of sensitivity is not the same for every person. It has been observed that a group of people are willing to disclose their true nature rather than the compulsory Randomized Response (RR). Considering this fact, the concept of optional RRT was developed. In the present work, we reformulate an estimation method of sensitive population proportion addressed by Singh, Singh, Mangat and Tracy's two-stage RRT. The procedure is more generalized here when respondents are chosen exclusively by an unequal probability sampling scheme and an unbiased estimator is derived along with its unbiased variance estimator. Further, we develop an Optional Randomized Response (ORR) method based on our proposed work. A simulation study has been carried out to find out the efficacy of the proposed RR and ORR procedures.

1. Introduction

In socio-economic surveys, often the study relates to personal features such as drinking habits, drug usage, abortion, doping which people wish to keep secret. Sometimes the survey question itself is sensitive; an interviewer may hesitate to ask such a question. In such cases, the respondents may simply refuse to answer such questions. Thus, the direct survey fails to produce reliable estimates. Therefore, it is impossible to derive an unbiased estimator of the unknown population parameter θ_A , bearing the sensitivity attribute A .

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