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A randomization device for estimating a rare sensitive attribute in stratified sampling using Poisson distribution

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Abstract The nitty-gritty of this paper is to estimate the mean of the number of persons possessing a rare sensitive attribute by utilizing the Poisson distribution in stratified survey sampling. It is also shown that the proposed models are more efficient than Lee et al.'s (Statistics 47:575–589, 2013) models in both the cases when the proportion of persons possessing a rare unrelated attribute is known and that when it is unknown. Properties of the proposed randomized response models have been studied alongwith recommendations. Numerical illustrations are also given in support of the present study.

Keywords Randomized response technique · Estimation of proportion · Rare sensitive characteristics · Relative efficiency

Mathematics Subject Classification 62D05

1 Introduction

Warner [11] developed a randomized response (RR) model to estimate the proportion of sensitive characters, such as induced abortions; drugs used etc., through a randomization device like a deck of cards, spinners etc. in such a way that respondent's privacy should be protected. The Warner model required the interviewee to give a "Yes" or "No" answer either to the sensitive question or to its negative depending on the outcome of a randomizing device not reported to the interviewer. Greenberg et al. [1] proposed the unrelated question randomized response (RR) model that is a variation of Warner's [11] RR model. In Warner's model, both statements and associated questions refer to the same sensitive character "A"

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