An Adroit Stratified Unrelated Question Randomized Response Model using Neyman Allocation

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ABSTRACT

In this paper we consider the use of stratified random sampling with Neyman allocation to Singh et al. (1994) unrelated question randomized response strategy for completely truthful reporting. It has been shown that for the prior information given, our new model is more efficient in terms of variance (in the case of completely truthful reporting) than Kim and Elam's (2007) model. Numerical illustrations and graphs are also given in support of the present study.

Keywords: Randomized response technique, Stratified random sampling, Estimation of proportion, Neyman allocation.

1. Introduction

Warner (1965) was the first to suggest an ingenious method to estimate the proportion of sensitive / stigmatizing character like induced abortion, drug abuse, homosexual activities, tax evasion etc. through a randomization device such as deck of cards, spinner etc. such that the respondent's privacy should be protected. Other developments in this technique are due to Greenberg et al. (1969). The unrelated question randomized response data – gathering device to procure trustworthy information on stigmatized characters was introduced by Horvitz et al. (1967). They avow better cooperation from the respondents as compared to Warner's (1965) original model. While developing theory for this model, Greenberg et al. (1969), considered both the situations when π_y, the proportion innocuous character (say) Y in population is known and when it is unknown, we shall call this model as UY- model. Some modifications in the randomized response (RR) model has been suggested by Chaudhuri and Mukerjee (1988, 2011), Mangat et al. (1992), Mangat and Singh (1990), Mangat