

# A Stratified Unknown Repeated Trials in Randomized Response Sampling

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## Abstract

This paper proposes an alternative stratified randomized response model based on the model of Singh and Joarder (1997). It is shown numerically that the proposed stratified randomized response model is more efficient than Hong *et al.* (1994) (under proportional allocation) and Kim and Warde (2004) (under optimum allocation).

**Keywords:** Randomized response technique, stratified random sampling, proportional allocation, optimum allocation.

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## 1. Introduction

A randomized response (RR) data gathering device to procure thrust worthy data on sensitive issues was developed by Warner (1965). The Warner model required the interviews 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. Several authors including Mangat and Singh (1990), Mangat (1994), Singh and Mangat (1996) and Singh *et al.* (1994) have modified and suggested alternative randomized response procedures applicable to different situations.

Stratified random sampling is generally obtained by dividing the population into non-overlapping groups (called strata) and selecting a simple random sample from each stratum. An RR technique using a stratified random sampling provide group characteristics related to each stratum estimator; in addition, the stratified sample protects a researcher from the possibility of obtaining a poor sample, see Kim and Warde (2004).

Hong *et al.* (1994) suggested a stratified RR technique that applied the same randomization device to every stratum. Mahajan *et al.* (1994) have considered the problem of construction of optimum strata boundaries for scrambled responses. Under Hong *et al.*'s (1994) proportional sampling assumption, it may be easy to derive the variance of the proposed estimator; however, it may cause a high cost because of the difficulty to obtain a proportional sample from some stratum. To rectify this problem, Kim and Warde (2004) presented a stratified randomized response technique using an optimal allocation that is more efficient than a stratified randomized response technique using proportional allocation.

## 2. Review of Some Related Models

### 2.1. Unknown repeated trials in randomized sampling due to Singh and Joarder (1997)

Warner (1965) considered a case in which the respondents in a population can be divided into mutually exclusive groups (one group with sensitive character A and the other group without it). To

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