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ESTIMATION OF RARE SENSITIVE PARAMETER UNDER POISSON APPROXIMATION USING STRATIFIED THREE STAGE RANDOMIZED RESPONSE MODEL

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Abstract. *This study investigates the process for estimating the mean number of individuals having rare sensitive attribute in stratified random sampling for known population using Poisson distribution. The properties of the suggested estimation procedures are deeply examined. Empirical studies are performed to support the theoretical results, which show the dominance of the proposed estimators over well-known existing estimators. The results are interpreted and suitable recommendations have been put forward to the survey practitioners.*

Keywords: *randomized response model; rare sensitive attribute; rare unrelated non-sensitive attribute; stratified random sampling; Poisson distribution.*

1. INTRODUCTION

In human population surveys, direct questions about sensitive character often yield untruthful response or non-response. Sensitive issues in sample surveys may include tax evasion, alcohol, drugs habit and some stigmatized disease such as Aids, etc. In such situations, it is very cumbersome task to get truthful response from the respondents. To beat such circumstances, [1] first introduced an unpretentious indirect survey technique known as randomized response technique (RRT). To enhance the confidence of the respondents [2] proposed unrelated question model or U model. Some noteworthy contributions related to randomized response technique and their importance have been carried out by researchers such as [3-15] and among others.

In [6] it is used the randomization device carrying three types of cards bearing statements: (i) "I belong to sensitive group A1," (ii) " I belong to group A2," and (iii) " Blank cards," with corresponding probabilities Q1, Q2, and Q3, respectively, such that $\sum_{i=1}^{3} Q_i = 1$. In case the blank card is drawn by the respondent, he/she will report "no." The rest of the procedure remains as usual. The probability of "yes" answer is given by

$$\theta_1 = Q_1\pi_1 + Q_2\pi_2 \tag{1}$$

where π_1 and π_2 are the true proportion of the rare sensitive attribute A1 and the rare unrelated attribute A2 in the population, respectively. From the above Equation (1) the estimator of π_1 is as

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