

# On the Use of Randomization Device for Estimating the Proportion and Truthful Reporting of a Qualitative Sensitive Attribute

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## Abstract

In this paper, a simple and obvious procedure is presented that allows to estimate the population proportion  $\pi$  possessing sensitive attribute using simple random sampling with replacement (SRSWR). In addition to T, the probability that a respondent truthfully states that he or she bears a sensitive character when experienced in a direct response survey. An efficiency comparison is carried out to investigate in the performance of the proposed method. It is found that the proposed strategy is more efficient than Warner's (1965) as well as Huang's (2004) randomized response techniques under some realistic conditions. Numerical illustrations and graphical representations are also given in support of the present study.

**Keywords:** Randomized response technique, Direct response, Estimation of proportion, Privacy of respondents, Sensitive characteristics, Relative efficiency.

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## 1. Introduction

A major source of bias in surveys of human populations results from the refusal of participants to cooperate and provide truthful responses, especially in cases where a question of sensitive nature is involved. To eliminate this source of bias, in estimating the proportion of a population possessing a characteristic of sensitive nature, Warner (1965) introduced a technique termed "randomized response". Other randomized response techniques were introduced by various other authors. These techniques either improves upon Warner's procedure provide alternative procedures, or consider more complicated situations, for example allow unequal probabilities of selection. One can mention the work Fox and Tracy (1986), Mangat and Singh (1990), Mangat (1994), Mahmood et al. (1998), Chua and Tsui (2000), Singh et al. (2000), Chang and Huang (2001), Huang (2004), Chang et al. (2004a,2004b), Chaudhary (2011) and Singh and Tarray (2012).

In this paper we have developed an alternative to Huang's (2004) randomized response model. A brief discussion of Warner's (1965), Direct Response (DR) procedure and Huang's (2004) models is given in Section 2. Properties of the proposed procedures are given in Section 3. Efficiency comparison is worked out in Section 4 to investigate the performance of the suggested procedures. Numerical studies and graphical representations are worked out to demonstrate the superiority of the suggested model.