

AN ADROIT SINGH AND MATHUR'S RANDOMIZATION DEVICE FOR ESTIMATING A RARE SENSITIVE ATTRIBUTE USING POISSON DISTRIBUTION

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Abstract

This paper presents the problem of estimating the mean of the number of persons possessing a rare sensitive attribute based on Singh and Mathur (2004) randomization device by utilizing the Poisson distribution in survey sampling. Properties of the proposed randomized response model have been studied. It is also shown that the proposed model is more efficient than Land et al. (2011) when the proportion of persons possessing a rare unrelated attribute is known. Numerical illustration is also given in support of the present study.

Key Words: Randomized Response Technique. Estimation Of Proportion, Rare Sensitive Attributes, Variance, Simple Random Sampling.

1. Introduction

The randomized response technique to procure trustworthy data for estimating the proportion of a population possessing a sensitive attribute "A" (say) was first introduced by Warner (1965). This model considers simple random sampling design. It requires the interviewee to give a "Yes" or "No" answers either to the sensitive question or to its negative depending on the outcome of a randomizing device not reported to the interviewer. This pioneering work of Warner's (1965) led to modifications and developments in various directions. Greenberg et al. (1969) felt that, to protect the privacy of respondents, it is desirable that the two questions be unrelated and suggested an unrelated question randomized response model. In Greenberg et al.'s (1969) unrelated question model, the data – gathering randomization device consists of two questions: (i) Are you a member of group "A"? (ii) Are you a member of group "Y"? , where the characteristic "Y" or its complement or innocuous and unrelated to "A". For instance in estimating the proportion of persons having extramarital relations in a certain community, the two questions may be : (a) Are you having extramarital relations? (b) Were you born in the month of March? Evidently, the second question has nothing to do with extramarital relations. Greenberg et al. (1969) in their theoretical development, dealt with two situations involving π_Y (the proportion of persons with unrelated character, Y): that where it is known and that where it is unknown. Greenberg