

Optimal Allocation in Small Area Mean Estimation Using Stratified Sampling in the Presence of Non-Response

Abstract.

Sample survey provides reliable current statistics for large areas or sub-population (domains) with large sample sizes. There is a growing demand for reliable small area statistics, however, the sample sizes are too small to provide direct (or area specific) estimators with acceptable and reliable accuracy. This study gives theoretical description of the estimation of small area mean by use of stratified sampling with a linear cost function in the presence of non-response. The estimation of small area mean is proposed using auxiliary information in which the study and auxiliary variable suffers from non-response during sampling. Optimal sample sizes have been obtained by minimizing the cost of survey for specific precision within a given cost using Lagrangian function multiplier λ and Partial Differential Equations (PDEs). Results demonstrate that as the values of the respondent sample increases sample units that supply information to study and auxiliary variable tends to small area population size, the non-response sample unit tends to sample units that supply the information as the sampling rate tends to one. From theoretic analysis it is practical that the Mean Square Error will decrease as the sub-sampling fraction and auxiliary characters increase. As the sub-sampling fraction increases and the value of β increases then the value of large sample size is minimized with a reduction of Lagrangian multiplier value which minimizes the cost function.

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