International Conference on

Recent Developments and Applications in Materials Science and Engineering

RDAMSE 2025

30th – 31st January, 2025

In association with

Indian Photobiology Society, Jadavpur University, Kolkata

&

Sripat Singh College, Murshidabad

Book of Abstract

ISBN: 978-81-983133-3-1

Editors

Dr. Dipankar Das, Asst. Prof., BSH, SurTech

Dr. Biswajit Das, Asst. Prof., BSH, SurTech

Published by:
Dr. Sudhir Chandra Sur
Institute of Technology And Sports Complex,
Dum Dum, Kolkata

Organized by: Department of Basic Science & Humanities,
Dr. Sudhir Chandra Sur Institute of Technology and Sports Complex
(SurTech), (Autonomous Institution), Dum Dum, Kolkata

International Conference on Recent Developments and Applications in Materials Science and Engineering
RDAMSE 2025
ISBN: 978-81-983133-3-1

Oral Presentation – OOP-25

Formulation of General Estimation Strategy for Population Variance under Two-Phase Cluster Sampling

A. Bandyopadhyay1*, Mithu Dey (Sarkar)2 and P. Parichha3

1*Department of Basic Science & Humanities (Mathematics), Dr. B. C. Roy Engineering College, Durgapur-713206, India
Email: *arnabbandyopadhyay4@gmail.com
2Department of Basic Science & Humanities (Mathematics), Asansol Engineering College, Asansol-713305, India
Email: mithu.maths@aecwb.edu.in
3Department of Mathematics, National Institute of Technology, Durgapur – 713209, India
Email: parthaparichha1989@gmail.com,

ABSTRACT

We have formulated the general estimation technique for population variance in two-phase multistage cluster sampling, where random non-responses may occur. Available information on one auxiliary variable has been utilized to develop one general class of estimators that may handle the nuisance effect of non-responses in practical surveys. It may be observed that several estimators may originate belonging to this proposed class. The properties of the proposed class of estimators have been discussed. The supremacy of the suggested strategy over the conventional ones has been established through the empirical investigation carried over the data set of natural populations as well as simulated populations. The encouraged findings are forwarded to the survey statisticians for their application in practical surveys.

Introduction

In practical surveys, it is noted that non-responses are unavoidable phenomenon. Rubin (1976) addressed three concepts: missing at random (MAR), observed at random (OAR), and parameter distribution (PD). There is a lack of significant attempt to address the problem of random non-responses situation in estimation of population variance through cluster sampling schemes.

Fascinating and inspired with the points raised above, we have constructed a general estimation procedure for population variances under two-phase cluster sampling scheme in two-stages. We have also incorporated the problems of random non-responses (MAR) in real life surveys.

Formulation of Proposed Class of Estimators

We have assumed that the second auxiliary variable Z is readily available for all over the population U. We propose the following functional type estimation based on responding of the second stage sample S_2 to estimate the population variance $S^2_{y..}$

Utilizing information on an auxiliary variable x and z, we construct a general class of estimators of population variance in two-phase cluster sampling as

$$T= f\left(s^2_{y_{n(m-r)}}, s^2_{x_{n(m-r)}}, h_1\left(s^2_{x_{n'M}}, s^2_{z_{n'M}}\right)\right) \quad (1)$$