

A Design-Based Approach for Multivariate Hypothesis Testing in Complex Surveys

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Classic multivariate statistical methods of inference for the mean vector and the covariance matrix are commonly based in the multivariate normal distribution and simple random sampling with replacement. However, in practice, it is common to use different complex survey designs in order to get the sample implying that the parameter estimation should incorporate the sampling weights. In this paper, an extension of the classical multivariate inference methods for the mean vector and the covariance matrix to complex survey designs is considered under a design based approach and specific density distributions for the data. The expressions for the estimators of the parameters of interest under any arbitrary sampling design are presented assuming normal and lognormal finite populations. Once these expressions are obtained, we find their asymptotic density, their corresponding confidence regions and we establish hypothesis test of the parameters. At the end, an application with actual data from a lognormal distribution is shown in order to present the advantages of the methodology using a probability proportional to size sampling design.

Keywords: Confidence regions, covariance matrix, mean vector, sampling weights.