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**BEAT: a software for two-stage stratified sampling design**

**Abstract**

In Istat a generalized software (Mauss) was developed for the calculation of sample size allocation with reference to the design of one stage stratified samples.

The software **BEAT** (*Bethel Extended Allocation for Two stages*), currently developed in Istat by Daniela Pagliuca and Stefano Falorsi, is a new R package implemented with the aim of determining the allocation of sample surveys in one and two stages, in the multivariate and multidomain case.

In the case of one stage sample survey the reference methodology is an extension of the Neyman allocation method to the multivariate case and the adopted algorithm is based on a generalization of the one proposed by Bethel (1989) [1].

In the case of two stages sample surveys the reference methodology is the one proposed by Ganninger (2009) [2].

In detail the package includes three functions:

- a first function implements a generalized algorithm of Bethel, which allows the calculation of the allocation in a simple way, respecting the imposed constraints: in stratified sampling designs the allocation in the different strata can be computed considering the imposed constraints in the accuracy of the different estimates of interest; in the multivariate case, a generalization is implemented for more variables and domains.

- a second function of the package implements an extension, based on the correction of the allocation: this correction is made by means of an iterative method which calculates the inflation of the variability of strata, using the design effect.

- in addition a third function of the package has been implemented, useful for the calculation of the coefficients of variation expected for a specific planned allocation.

The first two functions produce reports with optimal, proportional and equal allocation (useful for a comparison), the planned and expected coefficients of variation, and a measure of sensitivity.

**References**
