# Meta-analytical issues in linear models

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**Abstract**

Meta analysis of linear models is an active field of research, and its interaction with optimal design theory should be a main goal in the emerging area of cumulative meta analysis

In classical regression we may use one or more covariates to assess the relationship between those covariates and a dependent variable. In meta-regression a similar approach is used, with a substantial difference: the covariates are at the level of the study. Optimal design theory (Anderson, 1962; Fedorov, 1972; Kiefer and Studden, 1976) deals with the appropriate choice of observations to accomplish the estimation of the coefficients in a regression model in an optimal or quasi-optimal way (Dette and Studden, 1997; Martins et al., 2008).

When the available studies do not provide, in the light of classical meta analysis, enough statistical evidence, the researcher may conduct a new study to add to his meta analysis, so that conclusive evidence may be reached. In this context, it is of great importance not to choose the covariates levels of this new study haphazardly, or even at random, rather they must be selected so that the extra study efficiently contributes to an enlightening cumulative meta analysis.

We develop a framework to deal with optimal or quasi-optimal choices when planning new studies whose aim is to achieve, or at least to reinforce, convincing evidence.

Optimal discriminant, optimal robust and quasi-optimal mixed designs are used to provide competitive ways of dealing with the issue.

The classical example of meta analysis of studies to assess the impact of the vaccine BCG to prevent the development of tuberculosis is used to emphasize the importance of the choice of the design in cumulative meta analysis.

## Keywords

Prospective cumulative meta-analysis, Optimal designs, Discriminant designs, Mixed designs, Quasi-optimal designs.

# References


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