

Efficient Design Of Cross-Sectional And Longitudinal Studies

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Planners of observational studies, such as the large scale assessment studies in education, the cohort studies on prevention and cancer research in health sciences and the developmental studies in psychology, usually face the problem of selecting a design that leads to efficient parameter estimation and to powerful tests. These studies are often hampered by the logistic and financial constraints resulting from the required large sample sizes and the long follow-up periods. In some cases a choice between a longitudinal set up and a cross-sectional set up can be made. In other cases, a combination between a cross-sectional comparison and a longitudinal comparison is needed. Different choices of the number and sizes of distinct cohorts, the number of measurements and number of time points can be made.

Usually linear mixed effects regression models can be applied to handle the analysis of data from such cohort studies, and the selection of an efficient design for these studies can be based on the variances of the estimators of the fixed parameters in these models.

In this paper the methodology of selecting an efficient design for cross-sectional and longitudinal data will be presented. A comparison of efficiencies of parameters from cross-sectional and longitudinal studies will be presented together with some methods to overcome the problem that the design has to be selected without exactly knowing what linear mixed model will fit the data best. It will be shown how increase of efficiency of a design can be directly translating into reduction of costs of data collection. Some rules and guidelines will be offered for researchers to select an efficient design.