# Recent Advances and Applications of Optimal Design Theory in the Health Sciences

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## Abstract

Optimal design theory and ideas are increasingly applied to many research areas, including education, biomedical sciences, chemical engineering and bioengineering, health services and food science. In this talk, I present an overview of the optimal design methodology and recent advances in the field. The statistical foundation is briefly reviewed and discussed in the context of practical problems in the biomedical and health sciences.

To promote optimal design ideas, I present a website that allows practitioners to generate a variety of optimal designs easily and freely. After selecting a suitable model from a list of statistical models on the site and an optimality criterion, the practitioner inputs design parameters for his or her problem. The site returns the optimal design and the efficiency of any selected design. I will give demonstrations using problems in the biomedical sciences and hope that the site will facilitate practitioners implement a more informed design that provides improved statistical inference at minimal cost.

KEY WORDS: approximate design, efficiency, equivalence theorem, multiple-objective optimal designs, toxicology model, early cancer trial.