

STANFORD UNIVERSITY  
DEPARTMENT OF STATISTICS  
DEPARTMENTAL SEMINAR

4:15 p.m., Tuesday, September 28, 2004  
Sequoia Hall Room 200  
(Cookies at 3:45 in 1st Floor Lounge)

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**Error Control in Multiple Testing**

Abstract:

(This talk is based on collaborations with Erich Lehmann, Juliet Shaffer, and Michael Wolf.)

Consider the multiple testing problem of testing  $s$  null hypotheses. In this talk, various stepwise methods are constructed under constraints of various notions of error control.

In the first part of the talk, we assume a parametric family of distributions which satisfies a certain monotonicity assumption. Attention is restricted to procedures that control the familywise error rate (FWE) in the strong sense and which satisfy a monotonicity condition. Under these assumptions, we prove certain maximin optimality results for the well-known stepdown and stepup procedures.

In the second part, we consider the general problem of constructing methods that control the FWE in a general (nonparametric) setting. In order to improve upon the Bonferroni method or Holm's (1979) stepdown method, Westfall and Young (1993) make effective use of resampling to construct stepdown methods that implicitly estimate the dependence structure of the test statistics. However, their methods depend on an assumption called subset pivotality. We will show how to construct methods that control the FWE, both in finite and large samples. A key ingredient is monotonicity of critical values which allows one to effectively reduce the multiple testing problem of controlling the FWE to the single testing problem of controlling the probability of a Type 1 error. Resampling methods are then incorporated into the stepwise schemes.

In the final part of the talk, alternative measures of error control will be discussed. Explicit construction of stepwise procedures for these alternative methods will be presented as well.