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Familywise type I error control for multiple testing in equivalence trials with 3 or more treatments

For the all pairwise comparisons for equivalence of k ($k=2$) treatments Lauzon and Caffo (The American Statistician, 2009) "proved" a simple rule: divide the nominal type I error level α by $k-1$ to achieve a Bonferroni based family wise error control when declaring pairs of two treatments equivalent. This proposal is not valid. The rule is shown to be too liberal for $k=4$. It works for $k=3$, yet for reasons not considered by Lauzon and Caffo.

Based on the two 1-sided testing procedures and using the closure test principle I develop valid alternatives based on Bonferroni's inequality. The set H of intersection hypotheses reveals a surprisingly rich structure, leading to the possibility to present H as a directed acyclic graph (DAG). Recently DAGs have received a lot of attention in the assessment of causality in epidemiologic studies. In my case the DAG-like structure allows using graph theoretical theorems in connection with nice graphical presentations to prove properties of the resulting multiple testing problem.