TITLE: Weighted Posterior Odds: An Evidence Summary for Decision Making

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ABSTRACT:

An important role of statisticians is to facilitate decision making. Decision making involves consideration of the consequences of the decisions that could be made. Decision trade-offs can be incorporated formally into a decision analysis with a loss function that quantifies the relative seriousness (loss) of each possible decision error. For example, one may assign a value to the loss of accepting a hypothesis A when it is false (type 1 error) relative to not accepting it when it is true (type 2 error). This value assignment can be based on judgments about the actions that could be taken as a consequence of each decision.

As a summary measure of evidence for a hypothesis A, we consider the weighted posterior odds (WPO) in favor of A , where the weights are determined by a particular class of loss functions described by Dixon (1976). In this class of loss functions, a key quantity is the value k assigned to the loss of falsely accepting A (type 1 error) relative to falsely not accepting it (type 2 error). We show that the WPO is interpretable as that value of k at which the Bayes rule is indifferent to deciding to accept A or not. Thus, a stakeholder in the analysis (e.g., policy maker, manufacturer, regulator, insurer, health care provider, patient) can compare WPO to their own value judgment of the relative seriousness of type 1 and type 2 errors based on downstream actions that might be taken for either decision. We argue that WPO is an attractive alternative to the p value for summarizing evidence for A.