

**Title: Evaluating diagnostic test accuracy in studies with extreme verification bias**

**Author:** Tingting HU - FDA

**Abstract:**

A diagnostic test result (negative, positive) is accurate when it agrees with the reference standard result establishing true status of the target condition (absent, present). In some studies, target condition status is unverified for some subjects for various reasons, e.g., the reference standard is costly, invasive, or unethical to perform in subjects at low risk for the target condition, e.g., asymptomatic subjects who test negative. When the target condition status is unverified in a non-random sample of subjects, estimators of test accuracy metrics (e.g., sensitivity, specificity, positive and negative predictive value) are subject to verification bias. Extreme verification bias (EVB) is when no one in a particular subset of test result is verified. An example is comparative diagnostic test accuracy studies in which no one who is test negative by both tests receives the reference standard (Schatzkin et al, AJE, 1987). In these so-called verify-the-positive (VTP) designs, some test accuracy metrics are not estimable. However, in VTP and similar designs, Bayesian methods with weakly informative prior constraints on accuracy parameters can extract information on test accuracy parameters without assuming conditional independence between tests, which is commonly used to make parameters estimable but is likely inappropriate when the tests being compared are based on the same technology. For EVB diagnostic test accuracy studies, we develop Bayesian models, Gibbs sampling computational procedures for these models, and describe our RShiny app BayesEVB for visualizing posterior distributions and calculating posterior distribution summaries.