

## Web-based Tool For Validating Multiple Imperfect Diagnostic Tests

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**Introduction:** Statistical models are well described for estimating diagnostic sensitivity and specificity when reference samples are insufficient. We have recently published a review article as an introduction and guide to undertaking Bayesian latent class analysis when validating multiple imperfect tests (1). However, these analyses are often complex, typically requiring epidemiological and biostatistical support.

**Summary:** We have implemented a web-based tool that enables veterinary diagnosticians to run these complex analyses more easily. The tool can estimate diagnostic sensitivity and specificity for one to four diagnostic tests, even when test outcomes are expected to be partially correlated, such as with serological assays that share similar mechanisms and when samples are derived from populations that may even be disease free (for improving estimation of test specificity). This presentation will overview the tool's usage illustrated through recent case studies, such as our analyses evaluating the diagnostic performance of three serological assays for *Brucella suis* in dogs (2) and four molecular tests (two PCR and two LAMP assays) for Wet bottom (*Chlamydia pecorum*) in koalas (3). We will provide information on how to find support for such analyses and also on a simulation-based approach to check model identifiability and valid inference which lends itself to sample size estimation accounting for prior uncertainty and has emanated from the analyses involved in developing this tool.

### References:

1. Cheung A, Dufour S, Jones G, Kostoulas P, Stevenson M, Singanallur Balasubramanian N, et al. Bayesian latent class analysis when there is an imperfect reference test. *Rev Sci Tech Off Int Epiz.* 2021.
2. Kneipp CC, Coilparampil R, Westman M, Robson J, Firestone SM, Malik R, et al. Evaluation of three serological tests for the diagnosis of *Brucella suis* in dogs using Bayesian latent class analysis. 2024.
3. Wheelahan J, Gomez-Buendia A, Firestone SM, Devlin JM, Legione AR. Validating LAMP and PCR assays for clinical diagnosis of *Chlamydia pecorum* ("Wet bottom") in koalas. in preparation.