

Estimation of sensitivity and specificity of pregnancy diagnosis using transrectal ultrasonography and ELISA for pregnancy-associated glycoprotein in dairy cows using a Bayesian latent class model

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Supplementary Figure 1. Equations used for Bayesian estimation of sensitivity and specificity of a single rectal ultrasound pregnancy examination and a single milk ELISA pregnancy test in the absence of a gold standard.

TRUS.pos_ELISA.pos

$$\begin{aligned} &= \text{bin}(N, p) \\ &= \theta * (\text{TRUS.Se} * \text{ELISA.Se} + \text{CovPreg}) + (1 - \theta) * (\text{TRUS.Sp} * \text{ELISA.Sp} \\ &\quad + \text{CovNonPreg}) \end{aligned}$$

TRUS.pos_ELISA.neg

$$\begin{aligned} &= \text{bin}(N, p) \\ &= \theta * (\text{TRUS.Se} * (1 - \text{ELISA.Se}) - \text{CovPreg}) + (1 - \theta) * ((1 - \text{TRUS.Sp}) \\ &\quad * \text{ELISA.Sp} - \text{CovNonPreg}) \end{aligned}$$

TRUS.neg_ELISA.pos

$$\begin{aligned} &= \text{bin}(N, p) \\ &= \theta * ((1 - \text{TRUS.Se}) * \text{ELISA.Se} - \text{CovPreg}) + (1 - \theta) * (\text{TRUS.Sp} * (1 \\ &\quad - \text{ELISA.Sp}) - \text{CovNonPreg}) \end{aligned}$$

TRUS.neg_ELISA.neg

$$\begin{aligned} &= \text{bin}(N, p) \\ &= \theta * ((1 - \text{TRUS.Se}) * (1 - \text{ELISA.Se}) + \text{CovPreg}) + (1 - \theta) * (\text{TRUS.Sp} \\ &\quad * \text{ELISA.Sp} + \text{CovNonPreg}) \end{aligned}$$

Where, *TRUS.pos* is a positive ultrasound test result, *ELISA.pos* is a positive ELISA test result, *TRUS.neg* is a negative ultrasound test result, *ELISA.neg* is a negative ELISA test result, *N* is the

number of animals tested, $TRUS.Se$ is the sensitivity of the ultrasound test, $TRUS.Sp$ is the specificity of the ultrasound test, $ELISA.Se$ is the sensitivity of the ELISA test, $ELISA.Sp$ is the specificity of the ELISA test, θ is the proportion of tested cows that are pregnant, $CovPreg$ is the covariance between test results in pregnant cows, $CovNonPreg$ is the covariance between test results in non-pregnant cows, bin is a binomial sampling function that samples from a population of size N with individual probability of selection, p .