A nomogram to calculate output estimates from surveillance models used to confirm freedom from infection

Vanderstichel, R.[1] and Caraguel, C.[2], [1]Centre for Veterinary Epidemiological Research, Univ. of Prince Edward Island, Health Management, Canada, [2]School of Animal & Veterinary Sciences, The University of Adelaide, Department of Science, Roseworthy Campus, Australia; rvanderstich@upei.ca

A nomogram is a graphical representation of mathematical relationships that calculates outcomes derived from one or several parameters by using a simple ruler. Surveillance models, used to confirm freedom from disease, apply Bayes' theorem and rules of probabilities to incorporate historical surveillance data. These complicated equations make it difficult for policy-makers to understand the relationship and the impact of the surveillance system sensitivity and the risk of introduction on the confidence of being free. A nomogram that graphically captures these equations and includes the information, in the form of parameters, needed for the model, allows policy-makers to easily explore the relationships and understand the impact of model parameters on the outcome. The objective of this nomogram is to serve as a pedagogical tool to facilitate the understanding of surveillance models by those not actively involved in analytical modeling. The nomogram is designed as a series of vertical scales starting with the prior probability of infection (far left). A line is drawn through the surveillance system sensitivity for the first time period, the intercept indicating the negative predictive value. The line is then extended until it crosses through the probability of introduction during the first time period and indicates the posterior probability of freedom after that time period. The posterior probability of freedom becomes the starting value for the second time period [1-Prior Pr(Infection)], and the process is repeated for subsequent time periods. We hope this nomogram will serve as a visual link between analysts and those making decisions based on surveillance models.