Epidemiology and Infection

Evidence of multiple intraspecific transmission routes for *Leptospira* acquisition in Norway rats (*Rattus norvegicus)*

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Supplementary Material

S1. Survival model

If the probability of not yet being infected is modelled using the cumulative distribution function from the Weibull distribution, then,

if we chose to model the scale parameter as log linear, then and so,

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Then we can estimate coefficients by maximising the likelihood function,

where is the probability of already being infected, with .

S2. Delta method

The delta method (Oehlert 1992) was used to find the standard errors of the Weibull cumulative distribution function (cdf) . The variance matrix of the Weibull cdf is,

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Where is the vector of partial derivatives of with respect to the model parameters and is the covariance matrix. The covariance matrix was estimated by numerical approximation of the hessian matrix.

Rewrite the cdf as with . In the final model . As the shape parameter is strictly positive, we specify the shape parameter as , hence our covariance matrix is for the parameter . We must calculate the standard errors of with respect to . The partial derivatives were,

 where

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