

How would classical swine fever spread in Great Britain? Data fit and predictions

Thibaud Porphyre¹, Kokouvi Gamado², Carla Correa-Gomes³, Aaron Reeves³, Harriet K. Auty³, George J. Gunn³, Glenn Marion², Mark E. J. Woolhouse¹, ¹University of Edinburgh, Edinburgh, United Kingdom; ²Biomathematics & Statistics Scotland, Edinburgh, United Kingdom; ³Scotland's Rural College, Inverness, United Kingdom. Contact: t.porphyre@ed.ac.uk

Purpose: Classical swine fever (CSF) is a notifiable, highly contagious viral disease of swine which results in severe sanitary and economic consequences in affected countries. In order to improve preparedness for disease incursion, it is critical to have some understanding of how disease would spread should it be introduced into a CSF-free country.

Methods: In Great Britain (GB), the last epidemic of CSF occurred in 2000 and involved 16 farms located in East Anglia, a major pig-rearing area in GB. Based on these data, we used a Bayesian framework to infer both the extent of the local disease spread and the rate at which infected farms are detected during active surveillance. These inferences informed a spatially explicit, premises-based model used to explore the risk of widespread dissemination of CSF, through both local spread and animal movements, in the British pig industry.

Results: We found that CSF infection would locally spread from primary sites but the probability of spread beyond 5 kilometers was limited. The performance of active surveillance in GB in 2000 was found to be similar to that reported in other member states, with an average of 31.7 days required to detect an infected premises (95% Cr.I. 11.2 - 72.7). When projecting inference over GB, the overall probability of epidemic take-off remained consistently low throughout the year despite increasing the duration of the silent period, varying from 0.028 to 0.078. When 8 weeks of silent spread was considered, the probability of epidemic take-off was strongly spatially dependent, with few geographic areas showing a take-off probability greater than 0.15. Widespread outbreaks (>50 farms) were nevertheless possible, regardless incursions occurring in low or high risk areas.

Conclusions: These results suggest that, although rare, widespread epidemics of CSF would be possible in GB at any time of the year and regardless of the duration of the silent period.

Relevance: Knowledge of spatial and temporal variation in the probability of epidemic take-off are key components for surveillance planning and resources allocation, and this work provides a valuable stepping stone in guiding policy on CSF surveillance and control in GB.