Can information derived from the analysis of farm-to-farm movement events be used as a predictor of bovine tuberculosis breakdown risk?

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Since 1995 the national milk recording authority in New Zealand, Livestock Improvement Corporation (LIC), has provided facilities to allow herd managers to record details of movements of individual dairy cows from one farm to another. While the main purpose of this service is to allow production records to be transferred when animals are sold to another herd for milking, it is likely that information derived from the analysis of farm-to-farm movement events should also be able to be used as a predictor of herd level tuberculosis (TB) breakdown risk. This was a retrospective cohort study of New Zealand dairy enterprises that used the herd recording facilities of LIC during the period 1 July 1995 to 30 June 2010. Social network analyses were carried out on herds that recorded farm-to-farm movements of dairy cattle during each of the 15, 12-month intervals during this time frame. Herds included in each of the social network analyses were matched with TB information kept by the Animal Health Board. Data was used that defined historical disease status and areas with differential risk of infection transfer from wildlife. Our hypothesis was that a herd breaking down due to movement risk in a given year depended on network characteristics accumulated during the previous five years. The number of dairy cow movement events ranged from 6.5 to 13.5 million per year. For the majority of herds network parameters were relatively constant from one year to the next. In a small number of herds network parameters were more variable: presumably due to a change in ownership or due to a management decision to increase or decrease herd size. TB breakdown risk was associated with herd in-degree and the TB status of areas supplying incoming movement events.