



Detection of Dairy Herds at Risk for Changing Salmonella Dublin status

Stockmarr, Anders; Bødker, Rene; Nielsen, Liza Rosenbaum

Publication date:
2012

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):
Stockmarr, A., Bødker, R., & Nielsen, L. R. (2012). *Detection of Dairy Herds at Risk for Changing Salmonella Dublin status*. Poster session presented at 24th Nordic Conference in Mathematical Statistics, Umeå, Sweden.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Detection of Dairy Herds at Risk for Changing *Salmonella* Dublin status



Anders Stockmarr, DTU Data Analysis, DTU Informatics, Technical University of Denmark. anst@imm.dtu.dk

Rene Bødker, DTU National Veterinary Institute, Technical University of Denmark.

Liza Nielsen, Dept. of Large Animal Sciences, University of Copenhagen.

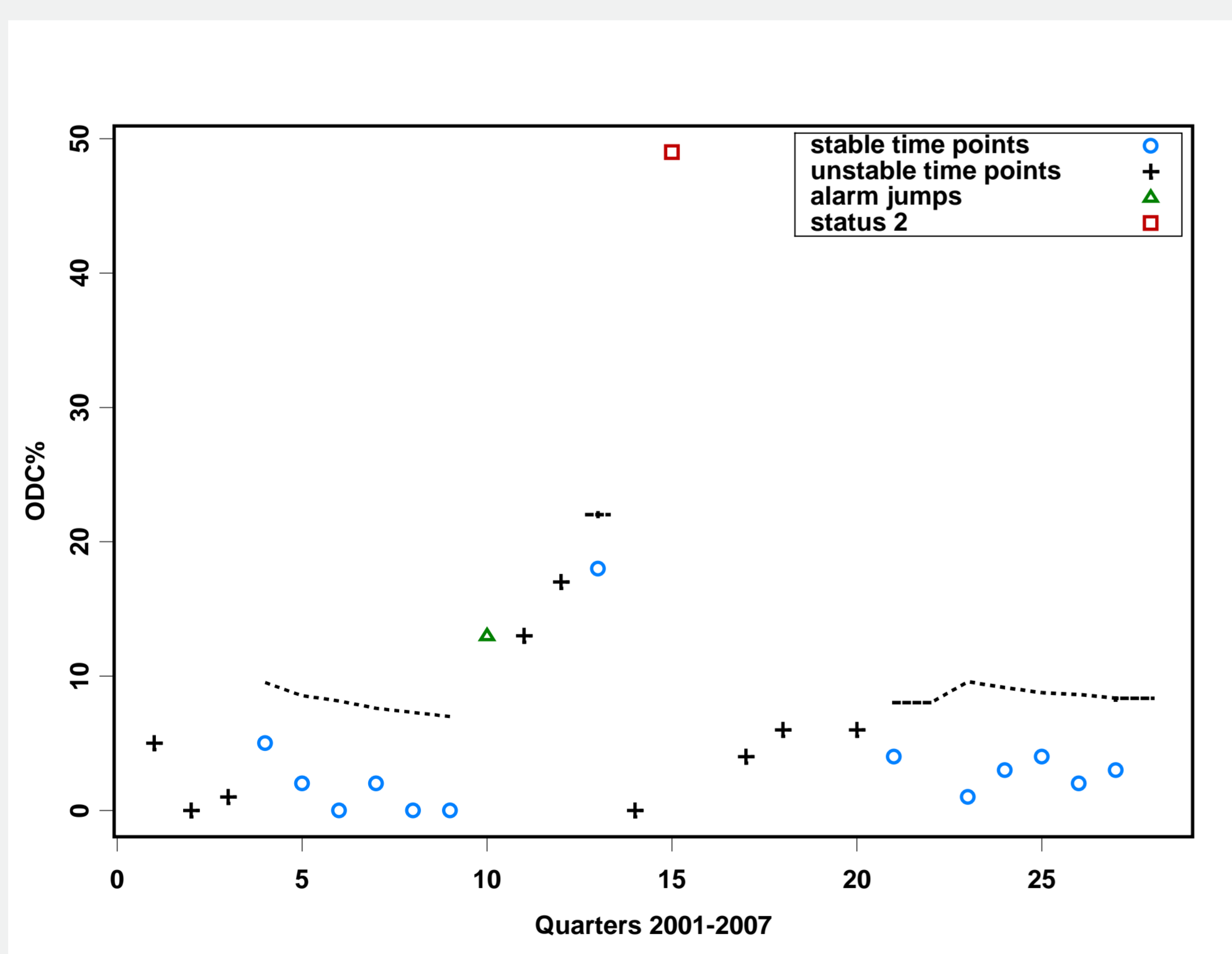
Introduction *Salmonella* Dublin (S. Dublin) is a costly infection for dairy cows, potentially lethal to humans. Surveillance is based on bulk tank milk (BTM) antibody measurements, taken each quarter of the year. Herds are classified as Status 1- likely free of S. Dublin, or Status 2 – likely infected with S. Dublin, based on present /recent characteristics, but not actual S. Dublin detection. We develop a predictive model based on characteristics from last quarter, using on registry data for 2001-2007 for 9387 herds in Denmark . Only 2004-2007 data modeled due to data contamination.

Methods

Status 2 is given if *mean of the last 4 BTM measurements are above 25, or if a jump of at least 20 occurs.*

Non-traditional risk factor:

Alarm Status: leaving a steady BTM antibody progression with a 'sufficiently high' upwards jump (jump to level of at least 13).



Analysis

Previous quarter values of Alarm status, previous BTM antibody values, trade patterns, neighbors (<4.9km) and herd size was entered into a dynamic logistic regression model for herd status change. The linear predictor was used as *risk score index*.

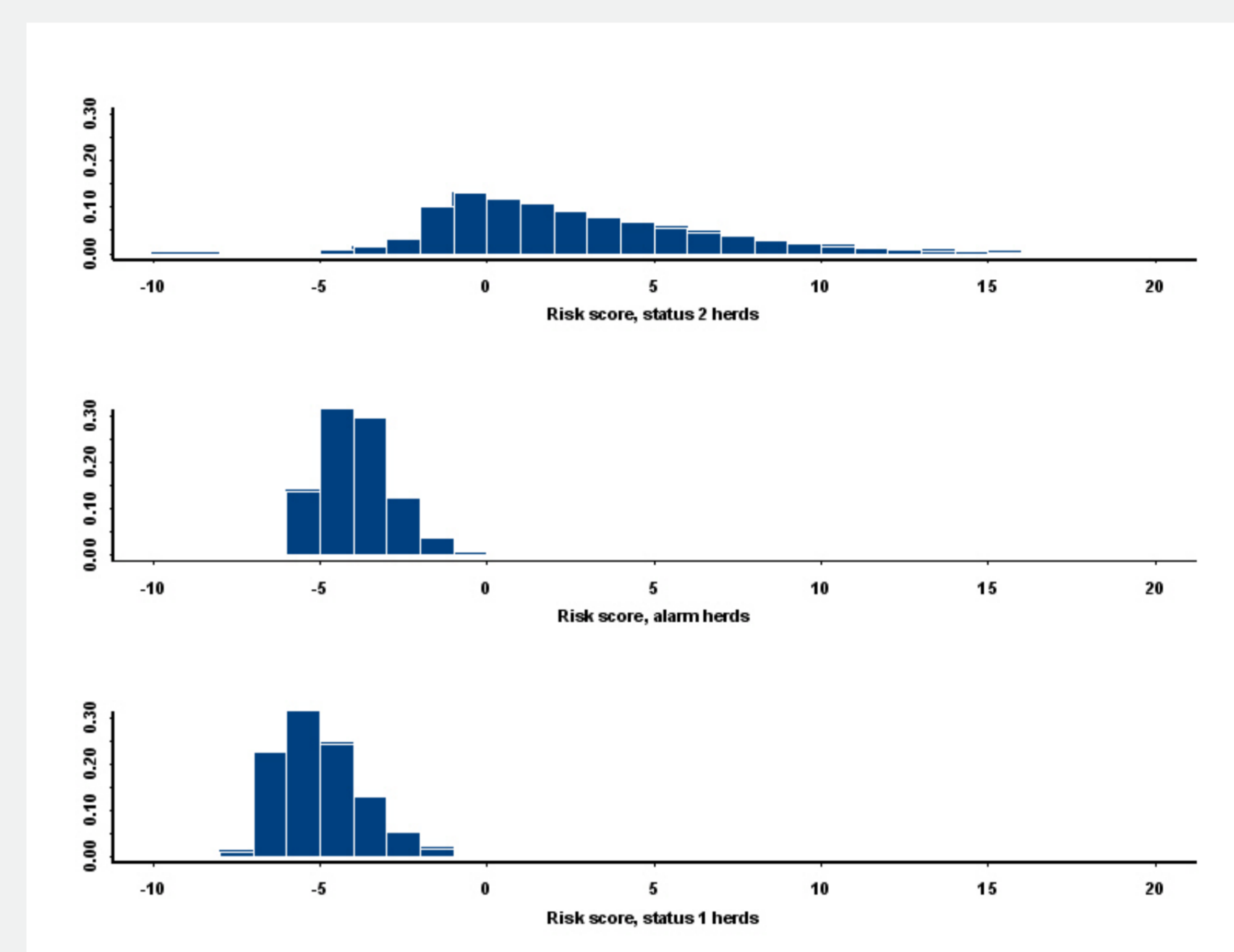
Results

Trade impacted through #trade contacts with Status 2 herds, #animals traded with Status 2 herds, and #animals traded with Status 1 herds.

Neighbors impacted through #Status 2 neighbor farms and #Status 2 neighbor animals; Status 1 neighbors did not impact.

Alarm status and **previous values** impacted, while **herdsize** did not.

Risk scores



Alternative classification: Characterize herds prospectively through risk scores. A *Herd At Risk* have risk score above a threshold *r*.

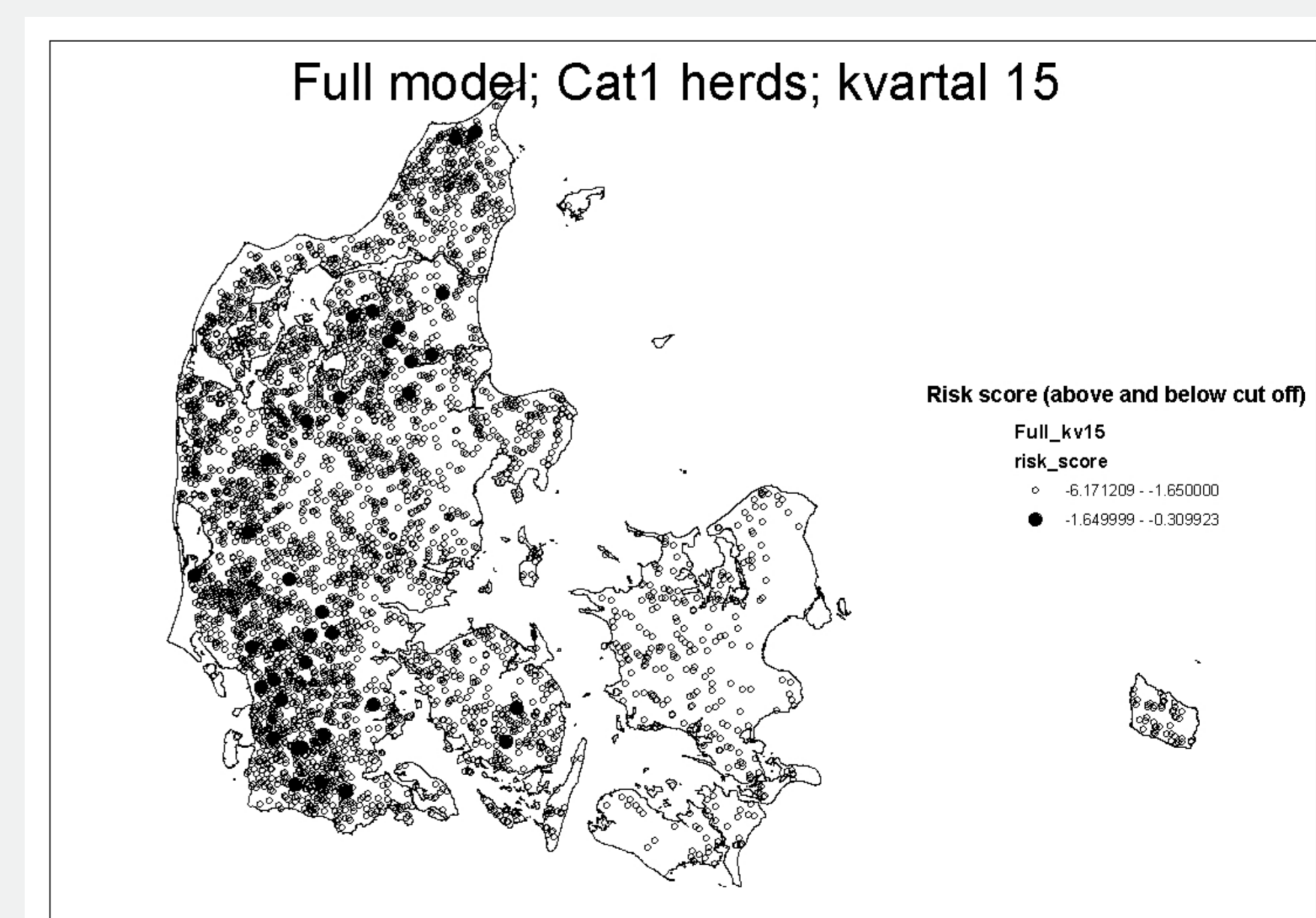
r = -1.05 optimizes status change prediction in current system. With Status 2 changes about 5 times as important to predict than non-changes, the optimal *r* is -1.65 from the gain ϕ :

$$\phi(r) = \alpha P(C|PC_r)P(PC_r) + P(C^{|}PC_r^{|})P(PC_r^{|})$$

where C="Status change", PC_r="Predicted Change" with threshold *r*, ie. "Herd At Risk" status, and α the relative importance of Status 2 herds.

Alarm herds has a status change frequency of 6%, which compares to the overall frequency of 1.6%.

Neighbor effects constitutes a *hidden geographical component* through spatial inhomogeneity of herd density in Denmark.



Conclusion

Alternative classification may be formed with a relatively high level of agreement with the current system, and based on values obtained 3 months earlier, but must conform with legislation. Alternative classification may provide farmers with incentive to contain the risk of an undetected emerging infection.