Using scanning surveillance data for detecting animal health events: how representative is it?

R. A. Moir[1], L. C. Snow[1], E. N. Watson[1], L. J. Hoinville[1]

1. Centre for Epidemiology and Risk Analysis, Veterinary Laboratories Agency (VLA) - Weybridge, Woodham Lane, New Haw, Addlestone, Surrey, KT15 3NB

Introduction

The key objective for any livestock disease scanning surveillance system is to increase the likelihood of detecting important changes in animal health, or new and emerging diseases at an early stage. The ability of the system to detect these events is dependent on its coverage of the population of interest. In this study we analysed the coverage and representativeness of the VLA scanning surveillance database, Farmfile, which collates epidemiological information about the samples submitted by private veterinary surgeons to the 16 regional VLA laboratories and two surveillance centres. The aims of the work were to:

- Investigate the representativeness of Farmfile cattle data by exploring general holding and animal characteristics (holding size, production type, age) and comparing these to national cattle population data
- Investigate how the spatial distribution of Farmfile submissions correlates with underlying cattle population distributions

Materials and Methods

Data

Table 1 Data used for analysis

Information	Scanning surveillance data	Denominator
Dataset	Farmfile	CTS
Species	Cattle	Cattle
Submissions	Diagnostic and Follow-up	N/A
Time period	12 months (2006)*1	1 month (1st August 2006)
Spatial coverage	England and Wales	England and Wales*2

*1 The time period chosen for analysis was 1st Dec 2005 - 31st Nov 2006 to avoid anomalies in submissions resulting from the 2007 FMD outbreak and changes in the submission forms that occurred in December 2006

*2 CTS is a GB-wide cattle population dataset managed by British Cattle Movement Service (BCMS) and accessed through Defra analytical warehouse, RADAR. For our analysis we restricted analysis to just England and Wales

Analysis

Descriptive analysis was carried out on each of the major holding level factors. In some cases e.g. to obtain herd size, premises were matched by cph.

Spatial analysis was carried out (using ArcGIS) on premises submitting to Farmfile by county as a proportion of the underlying cattle premises in England and Wales (CTS).

Multivariable logistic regression was used to explore associations between holding level factors and the probability of a premise submitting a sample to the VLA. All variables significant at p≤ 0.25 in the univariate analysis were assessed for inclusion in the multivariable model. Variables were entered into the models in forward stepwise fashion and only variables with LRT p<0.05 were retained (Hosmer and Lemeshow, 1989).

Analysis / Results

Descriptive

Breed purpose/Production type

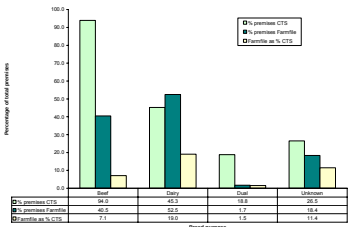

Figure 1. Percentage of premises with cattle of each breed purpose in CTS (n=69,751) and Farmfile (n= 12,292), with number of Farmfile premises as percentage of CTS.

Herd size

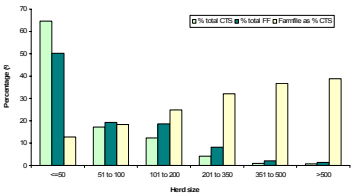

Figure. 2. Herd size in CTS and Farmfile as % of total for each dataset, and number of Farmfile premises as a % of CTS (yellow).

Spatial

Proportion of cattle premises that submit a sample to VLA

Beef

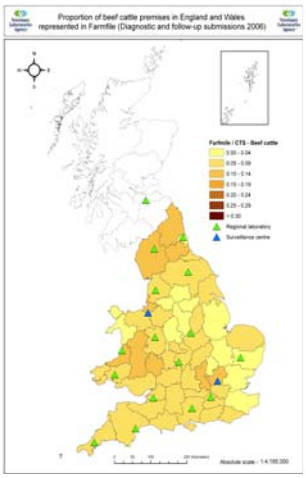

Figure. 3a. Proportion of beef premises in England and Wales represented in Farmfile 2006

Dairy

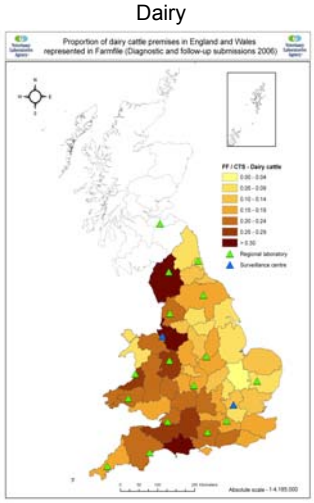

Figure. 3b. Proportion of dairy premises in England and Wales represented in Farmfile 2006

Statistical

Multivariable logistic regression

Analysis was carried out for premises with Beef and Dairy cattle separately. Distance from VLA regional lab and herd size were significantly associated with likelihood that a premise submitted a sample over the study period.

Table 2a Logistic regression mode for Dairy breed purpose (n=31519)

Covariate	Odds Ratio	Std. Err.	P>|z|	95% Conf. Interval
Distance to VLA RL				
<30km*	1			
30-49	0.931	0.032	0.038	(0.873 to 0.990)
50-69	0.802	0.032	<0.001	(0.742 to 0.866)
>=70km	0.576	0.038	<0.001	(0.506 to 0.656)
Herd size				
<=50*	1			
51 to 100	0.774	0.031	<0.001	(0.715 to 0.837)
101 to 200	0.684	0.033	<0.001	(0.623 to 0.751)
201 to 350	0.693	0.054	<0.001	(0.594 to 0.808)
351 to 500	0.496	0.068	<0.001	(0.379 to 0.651)
>500	0.554	0.117	0.005	(0.366 to 0.839)

* Baseline category

Table 2b Logistic regression mode for Beef breed purpose (n=65476)

Covariate	Odds Ratio	Std. Err.	P>|z|	95% Conf. Interval
Distance to VLA RL				
<30km*	1			
30-49	0.833	0.032	<0.001	(0.772 to 0.899)
50-69	0.788	0.034	<0.001	(0.724 to 0.857)
>=70km	0.694	0.043	<0.001	(0.614 to 0.785)
Herd size				
<=50*	1			
51 to 100	3.46	0.151	<0.001	(3.177 to 3.768)
101 to 200	6.635	0.279	<0.001	(6.110 to 7.204)
201 to 350	10.527	0.569	<0.001	(9.468 to 11.704)
351 to 400	14.145	1.307	<0.001	(11.802 to 16.953)
>500	15.517	1.721	<0.001	(12.486 to 19.284)

* Baseline category

Conclusions

- Compared to CTS, a smaller proportion of premises in Farmfile had beef cattle, while a higher proportion had dairy cattle (Figure 1). Whether a Farmfile holding is classified as having beef or dairy cattle is based on the animals from which samples were submitted so may not reflect the total population of animals on the holding.
- The distribution of premises by size was similar in both datasets (Figure 2) and overall, larger premises were more likely to be represented in the Farmfile database. This pattern was consistent for beef premises (Table 2a) but not for premises with dairy cattle, where smaller premises were more likely to be represented (Table 2b).
- There are spatial and regional differences in the proportion of premises represented in Farmfile. Premises further from a VLA RL are also significantly less likely to make a submission to Farmfile (Tables 2a&b). This is consistent for both beef and dairy cattle and is not related to the herd size or type of sample.

Acknowledgements

This work is funded by Defra within the Delivering Intelligent Surveillance project (ED1039) as part of the implementation of the UK Veterinary Surveillance Strategy. We are grateful to the Defra RADAR team for providing the CTS extract and to Lara Wootton for managing the project.

Contact: Lucy Snow, Centre for Epidemiology and Risk Analysis, VLA Weybridge, Surrey, UK, l.snow@vla.defra.gsi.gov.uk