Evaluating the Active Surveillance of Scrapie in the EU

Victor J. Del Rio Vilas[1], Dankmar Böhning[2], Ronny Kuhnert[3]

[1]Veterinary Laboratories Agency, Weybridge, UK

[2]Applied Statistics, School of Biological Sciences, University of Reading, UK

[3]Department of Epidemiology and Health, Robert Koch Institute, Germany

OBJECTIVE

In the present study we assessed the standardisation of the active surveillance of scrapie throughout time across the EU and identified countries with similar underlying characteristics allowing comparisons between them.

BACKGROUND

The abattoir and the fallen stock surveys constitute the active surveillance component aimed at improving the detection of scrapie across the EU. Previous studies have suggested the occurrence of significant differences in the operation of the surveys throughout Europe [1]. [1] assessed the presence of heterogeneity between the observed prevalence estimates of 18 EU countries by means of a meta-analysis and showed a large residual variability indicating an inconsistent approach to the surveys across the EU. The study of these differences merits attention as they inform discrepancies in the performance of the surveys between countries. In the absence of sufficient covariate information to explain the observed variability across countries, we can model, still under the general context of the meta-analysis, the unobserved heterogeneity in our data. Countries could be grouped into clusters representing the underlying subpopulations relative to the risk of scrapie between the two surveys in each country.

METHODS

We start our analyses by defining the measure of effect to be compared between the EU countries under the meta-analysis approach. Our EU data can be displayed in a 2x2 table and risk ratios (RR) between the FS and the AS computed for each country. We conducted a random-effects meta-analysis to study the presence of heterogeneity between the countries. We did so for the three years of data available (2003, 2004 and 2005) for classical scrapie. We extended our analysis to atypical scrapie (2005 only). To estimate the RR under conditions of unobserved heterogeneity we applied the profile likelihood (PL) [2] to inform the parametric density, also called the mixture kernel, of the non parametric mixture distribution. This allows the identification of components or clusters of countries. If the number of clusters is 1 we have the homogeneity situation. Furthermore, we extended our analysis to incorporate country-specific covariates informing systematic variability between countries. More specifically, we modelled the proportion of the adult sheep population sampled by the fallen stock survey every year.

RESULTS

Our results show that the between-country heterogeneity dropped in 2004 and 2005 relative to that of 2003 for classical scrapie. As a consequence, the number of clusters in the last year was also reduced indicating the gradual standardisation of the surveillance efforts across the EU. The crude analyses of the atypical data grouped all the countries in one cluster showing non-significant gain in the detection of this type of scrapie by any of the two sources. The proportion of the population sampled by the fallen stock survey appeared significantly associated with our risk ratio for both types of scrapie, although in opposite directions: negative for classical and positive for atypical.

CONCLUSIONS

Two major conclusions can be extracted from our study. The first is that there appears to be a gradual standardisation of the active surveillance of scrapie across the EU. Ideally this would be as a result of homogeneous practices in all countries. We argued that the alternative, the gradual standardisation of the targeted populations across the EU, would be far from ideal. The second major conclusion is the apparent loss of usefulness of the fallen stock survey across the years.

REFERENCES

[1] Del Rio Vilas, V.J., Hopp, P., Nunes, T., Ru, G., Sivam, S.K., Ortiz-Pelaez, A. Explaining the heterogeneous scrapie surveillance figures across Europe: a meta-regression approach. BMC Vet Res 2007; 3(1):13.

[2] Kuhnert, R., Böhning, D. A comparison of three different models for estimate relative risk in meta-analysis of clinical trials under unobserved heterogeneity. Stat Med. 2007; 26(11): 2277-96.