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Comparison between dairy cow disease incidence in data registered by farmers and in data from a disease-recording system based on veterinary reporting

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ABSTRACT

Sweden has a national disease-recording system based on veterinary reporting. From this system, all cattle-disease records are transferred to the dairy industry cattle database (DDD) where they are used for several purposes including research and dairy-health statistics. Our objective was to evaluate the completeness of this data source by comparing it with disease data registered by dairy farmers. The proportion of veterinary-treated disease events was estimated, by diagnosis. Disease incidence in the DDD was compared, by diagnosis and age, with disease data registered by the farmers. Comparison was made, by diagnosis, for (i) all disease events and (ii) those reported as veterinary-treated.

Disease events, defined as "observed deviations in health, from the normal" were recorded by the farmers during January, April, July and October 2004. For the diagnoses calving problems, peripartum disorders, puerperal paresis and retained placenta, incidence proportions (IP) with 95% confidence intervals (CIs) were estimated. For all other disease problems, incidence rates (IR) were used.

In total, 177 farmers reported at least 1 month and 148 reported all 4 months. Fifty-four percent of all disease events in the farmers' data were reported as veterinary-treated. For several of the most common diagnoses, the IRs and IPs for all events were significantly higher in farmers' data than in the DDD. Examples are, in cows: clinical mastitis, cough, gastro-intestinal disorders and lameness in hoof and limb; and in young stock: cough and gastro-intestinal disorders. For veterinary-treated events only, significant differences with higher IR in the farmers' data were found in young stock for sporadic cough and sporadic gastro-intestinal disorders. The diagnosis "other disorders" had significantly more events in the DDD than in farmers' data, i.e. veterinarians tended to choose more unspecific diagnoses than the farmers. This result indicates that the true completeness is likely to be higher than our estimate.

We conclude that for the time period studied there was differential under-reporting associated with the diagnosis, the age of the animal and whether the herd was served by a state-employed or private veterinarian.

1. Introduction

Databases with animal-disease information are valuable resources in epidemiological research as well as for evaluation of genetic progress (Philipsson et al., 1995;

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Oltenacu et al., 1998; Hultgren, 2002; Maizon et al., 2004; Valde et al., 2004). However, the potential pitfalls of using such databases for a secondary purpose, such as research, have been discussed and a general need for validation of such data has been identified (Bartlett et al., 1986; Lawrenson et al., 1999; Olsson et al., 2001). Jordan et al. (2004) defined the completeness (epidemiologic sensitivity) of a secondary database as the proportion of cases that were actually recorded and the correctness (positive predictive value) as the proportion of cases reported that actually had the disease. In veterinary medicine, there are only a few examples where the correctness and/or completeness of a disease database have been evaluated. Examples are evaluations of the agreement between information in the computerized record and the paper files in a Canadian veterinary teaching hospital (Pollari et al., 1996a) and in Swedish insurance data (Egenvall et al., 1998; Nodtvedt et al., 2006; Penell et al., 2007).

The national animal disease-recording system in Sweden started in 1984 with the aims to monitor the incidence of disease in animal populations, provide data on national and herd disease status, include disease data in breeding goals and provide data for research (Emanuelson, 1988). It is based on veterinary reporting and all species of animals are included, although the emphasis is on production animals. In Sweden, and for dairy cattle, veterinarians are obliged to report disease events for which they have been consulted to the Swedish Board of Agriculture (SBA, 2000). Further, drugs used in veterinary medicine for food animals need a prescription (NPA, 1997) and veterinarians are only allowed to prescribe after medical examination of the animal (SBA, 2006). Consequently, the Swedish disease-recording system should cover all cases of disease in cattle where a veterinarian is consulted, including all cases where there is a need for prescribed drug treatment.

All disease records involving cattle are transferred from the Swedish Board of Agriculture to the Swedish Dairy Association (SDA). The link is the animal's unique identity, and therefore records where the individual identity is not recorded (such as group treatments), or is incorrect, cannot be used. At the SDA, the data are used for sire evaluation, extension services, annual statistics and research. Disease events can also be reported by farmers through the Swedish Official Milk Recording Scheme, but this route is not extensively used (for a more detailed description of the Milk Recording Scheme, see Andersson, 1988). Consequently, the disease events in the database at the SDA are mainly those associated with veterinary treatment of individual animals. Hereafter we refer to the disease database at the SDA, including disease events that are either transferred from Swedish Board of Agriculture or reported by farmers to the SDA, as the dairy-disease database (DDD).

Our objective was to evaluate the completeness of the DDD by (i) estimating the proportion of disease events, for each diagnosis, that were veterinary-treated (according to the dairy farmers), and (ii) comparing disease incidence estimates from the DDD and from disease data registered by dairy farmers, by diagnosis and age (cows/young stock). An additional aim was to investigate whether the proportion of veterinary-treated disease events reported in the farmers' data that was also registered in the DDD was different for state-employed veterinarians and private practitioners.

2. Materials and methods

2.1. Sample recruitment and study population

In Sweden, there are two main dairy breeds: Swedish Red and White and Swedish Holstein. The population is free from, or has a very low prevalence of, specific infections such as salmonellosis, paratuberculosis, infectious bovine rhinotracheitis, enzootic bovine leucosis and bovine viral diarrhoea. During 2004, the mean herd size was 44 cows and the average milk yield per cow was 9177 kg ECM (energy-corrected milk). There were 7072 herds enrolled in the Swedish Official Milk Recording Scheme, including 86% of the 400,000 Swedish dairy cows. Our sampling frame was herds in the Swedish Official Milk Recording Scheme, with a herd size $\geq$25 dairy cows at the time of sampling. For example, to detect a loss of 20% at the official numbers of clinical mastitis (17 events per 100 lactations) with a power of 80% and 95% confidence level, a sample of 2060 cows was needed, without considering the farm-level variation (Win Episcope 2.0). Based on such sample calculations, practicality and expected participation (50%), a sample of 400 herds was randomly selected, i.e. we aimed at having approximately 8000 cows in the study. The random selection of herds was done by giving all herds that fulfilled the criteria a random number and the herds with the lowest 400 numbers were sampled.

The dairy farmers were contacted by mail and the aim of the study and the work associated with participation was explained. The farmers were asked to reply by prepaid mail whether they were interested in participating or not. Respondents were then contacted by phone for further information. Farmers who had not responded to the letter were also contacted to avoid misunderstandings. As a gesture of appreciation, the farmers that agreed to participate were offered a subscription to a Swedish dairy magazine or a gift voucher of similar value.

2.2. Data collection by farmers

Disease events were recorded by the farmers during January, April, July and October 2004. Forms and instructions were sent to the farmers a week before the first study month. Prior to each study month, the farmers received a reminder. The farmers reported by mail, e-mail or fax. Reporting was weekly during the first month and monthly thereafter. Farmers that had not reported 2 weeks after the end of a study month were contacted by phone every second week until the forms were submitted. Because knowledge about the study could affect the veterinarians reporting routines, participating farmers were explicitly asked not to discuss the study with their veterinarians.

Farmers were instructed to report "observed deviations in health, from the normal," regardless of whether he/she chose to wait, treat the animal himself/herself, contact a veterinarian or slaughter the animal. For each disease