Welfare assessments based on life time health and production data in Danish dairy cows

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OBJECTIVE
To describe health and production variables using the whole life time of the cow as the observational unit.

CONCLUSION
The information on the individual animal's lifetime is more relevant for finding out whether disease occurrence is at an ethically acceptable level than the traditional parameters of prevalence and incidence.

INTRODUCTION
Traditionally, disease incidences or prevalences have been used widely as indicators of animal welfare. But both prevalences and incidences suffer from the limitation of being average measures on the population level. Especially when it comes to defining limits for disease occurrence to fulfil criteria for acceptable welfare, the distribution of events between individuals over time will make more sense in stead of events measured as an average on the population level.

MATERIAL AND METHODS
A subset of data was extracted from the Danish Cattle Database for all cows leaving the herds by slaughter or death (including euthanasia) during 2005 and 2006.

Establishment of life time variables
The following variables were calculated from the original data:
- Total life span: Date of death minus date of birth
- Total productive life span: Date of death minus date of first calving
- Life time milk production
- Total number of inseminations
- Total number of delivered live calves
- Total number of disease treatments within the following disease categories:
    - Reproductive disorders
    - Udder disorders
    - Metabolic disorders
    - Locomotor disorders
    - Other disorders

RESULTS
Information from a total of 392,287 cows was obtained (Table 1). The medium number of treatments a cow had received for any disease was 2, but 10 % of the cows had more than 8 treatments for any disease. On the other hand 25% of cows lived a whole life without a single disease treatment (Figure 1). One cow had 76 treatments during its lifetime.

Table 1. Descriptive analysis of lifetime variables for Danish dairy cows

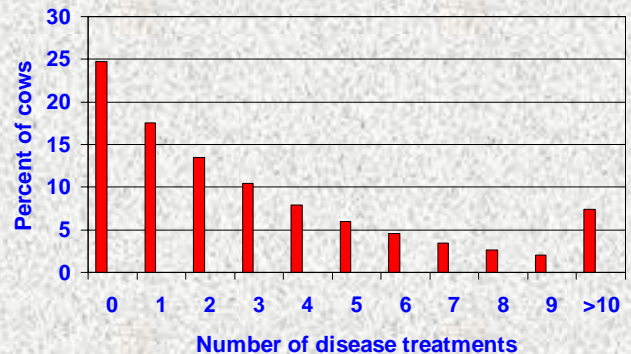|	Min	P10	Median	P90	Max
Total life span (years)	1.32	2.85	4.67	7.43	18.60
Milk (kg)	0	3688	19326	44475	163226
Sum of live calves	0	1	2	5	18
Number of treat-ments (any disease)	0	0	2	8	76

Example

Herd A — Sick once / Not sick
Herd B — Sick six times

Herd A and Herd B have same incidence risk of disease, BUT:

Herd A may be viewed as having ACCEPTABLE WELFARE

Herd B may be viewed as having UNACCEPTABLE WELFARE

Percent of cows vs Number of disease treatments (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, >10)

Figure 1. The distribution of cows according to the number of disease treatments for any disease

DISCUSSION
The established life time variables of the production (milk and calves) of the individual cow and its health measured by the number of disease treatments have direct relevance for the individual animal.
On the herd or population level it can continuously be monitored, what is the probability that individual animals will receive above a certain number of treatments. Therefore, it is possible to identify herds where animals on average have acceptable welfare, but where the welfare for some individual animals is unacceptable. Such herds may be seen to violate a principle of fairness. One of the major advantages of measuring welfare during the whole life of individual animals is the ability of the method to identify individual animals with unacceptable life time welfare even though such an animal is part of a herd with acceptable average welfare. The method can also identify animals with unacceptable total lifetime welfare even though the animal may experience time periods with acceptable welfare. Viewed from an ethical perspective, this new method always comes closer to telling 'the whole story'.