# Investigating the value dairy farmers place on a reduction of lameness in their herds using a willingness to pay approach

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## A R T I C L E   I N F O

## A B S T R A C T

A survey was conducted to elicit dairy farmers' willingness to pay (WTP) to reduce the prevalence of lameness in their herds. A choice experiment questionnaire was administered using face-to-face interviews of 163 farmers in England and Wales. Whole herd lameness assessments by trained researchers recorded a mean lameness prevalence of nearly 24% which was substantially higher than that estimated by farmers. Farmers' responses to a series of attitudinal questions showed that they strongly agreed that cows can suffer a lot of pain from lameness and believed that they could reduce lameness in their herds.

Farmers' mean WTP to avoid lameness amounted to UK£411 per lame cow but with considerable variation across the sample. Median WTP of UK£249 per lame cow was considered a better measure of central tendency for the sample. In addition, the survey found that farmers had a substantial WTP to avoid the inconvenience associated with lameness control (a median value of UK£97 per lame cow) but that they were generally prepared to incur greater inconvenience if it reduced lameness. The study findings suggest that farmers need a better understanding of the scale and costs of lameness in their herds and the benefits of control. To encourage action, farmers need to be convinced that lameness control measures perceived as inconvenient will be cost effective.

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## Introduction

Endemic livestock diseases can result in substantial economic costs for farmers and for others in society, as well as have very undesirable implications for animal suffering. For example, Bennett and Ijpelaar (2005) estimated the economic losses associated with 34 different endemic diseases in Great Britain, including costs to human health and implications for animal welfare. In that study, lameness in cattle was estimated to cost up to UK£107[1] million per year largely due to effects on milk output and premature culling, together with substantial costs associated with control and treatment (around 40% of total cost). The authors' stated uncertainty of the estimate of economic losses associated with lameness reflects the difficulty of estimating such costs, largely due to lack of data. In the same study, a survey of veterinarians suggested that, of the cattle diseases considered, lameness had the highest animal welfare impact score.

In 2009, the negative economic and animal welfare impacts of lameness in cattle were further highlighted by the Farm Animal Welfare Council (FAWC, 2009).[2] This identified lameness as a cause of considerable pain and distress to the cow, a major reason for premature culling and a cause of impairment of fertility, reduction of milk yield and increases in veterinary costs and staff time.

The most recent data on levels of lameness in the UK are prevalence figures obtained by researchers assessing whole herds on farm visits. Barker et al. (2010) found a mean prevalence of lameness (scores 2 and 3) on 205 farms of 36.8% (range 0–79.2%) while Rutherford et al. (2009) found a mean of between 16.2% and 19.3% in a study of 80 farms (range 1.4–48.6%). Published estimates of the costs associated with lameness in dairy cattle are wide-ranging, largely dependent on the cause and how it is treated. Estimates from Willshire and Bell (2009) in the UK are UK£76 for a case of digital dermatitis, UK£154 for a case of interdigital lameness, UK£514 for a case of sole ulcer and UK£300 for a case of white line disease. These calculations include direct costs of treatment and indirect costs arising from detrimental effects on milk production and fertility.

Despite the estimation of such costs, farmers and advisors are still asking questions about the costs and benefits of lameness control. Therefore it was considered that an alternative approach involving evaluating what farmers perceive to be the costs associated with lameness and the value to them of reducing lameness would be useful.

Given the difficulty of assessing the economic importance of particular diseases, and the potential value of programmes for disease prevention and control, researchers have turned recently to the use of non-market valuation methods to shed light on the perceived importance and costs of diseases and the benefits of control. There are a number of economic tools that can be used to estimate people's willingness to pay (WTP) for things such as reduction in disease incidence; for example, stated preference methods which include contingent valuation (CV) (Mitchell and Carson, 1989) and the choice experiment (CE) method (Louviere et al., 2000).

There are currently relatively few WTP studies relating to livestock disease control in the research literature although there are a host of studies in associated areas, such as farm animal welfare (for a review, see Bennett et al., 2012). Papers that do report the use of CV or CE to value people's preferences in relation to livestock disease control include Swallow and Mulatu (1994) who estimated WTP for tsetse control in Ethiopia and Bennett and Willis (2008) who used CE to explore people's WTP to reduce the incidence of tuberculosis in cattle in England and Wales.

The CE approach characterises 'a good' in terms of its main attributes and presents respondents with different sets of attribute bundles (with attributes set at varying levels) from which they have to choose their preferred bundle. This enables respondents' trade-offs between attributes to be estimated and scaled against each other. Because one of the attributes is usually price, the monetary value that people ascribe to a change in any individual attribute of the good can be estimated. The main advantage of CE is that it can estimate these attribute values separately and not just the value of the whole good.

It is known that limited availability of labour, unpopular tasks and inconvenience are among the barriers to the control of lameness in dairy herds (Leach et al., 2010a). The ability of the CE method to consider such factors in addition to financial value makes this a useful approach to exploring farmers' views on the costs and benefits associated with lameness control. The aim of the research presented here was to gauge, using a CE approach, the value that dairy farmers place on reducing lameness by estimating their WTP to reduce lameness in their herds.

## Materials and methods

A questionnaire was designed to elicit from farmers their WTP to reduce lameness in their herds. The questionnaire consisted of four main sections. The first contained questions concerning lameness in the herd and farmers' perceptions of the problem. As part of the 'Healthy Feet Project' farmers were asked to record cases of lameness in the herd during the period from 2007 to 2010. The information was used to calculate the incidence of lameness in the herd for the year prior to the interview. If farmers had failed to keep records, they were asked the number of cows that had been lame in the past year and this estimate was used to calculate the lameness incidence. Data on the prevalence of lameness on the day of the visit were collected by the researchers, who locomotion scored the whole milking herd as described by Barker et al. (2010).

The second section of the questionnaire presented farmers with a brief statement about lameness and its treatment followed by an explanation of the CE exercise and then the CE exercise itself (which is explained in more detail below). In an open question, farmers were asked to explain their reasoning for the choices they made. The third section was a series of attitudinal questions concerning lameness and its control. The final section contained questions about the farmers themselves (such as how long they had been dairy farming).

### Design of WTP questions

Because restrictions of time and labour have been ranked highly by farmers as barriers to lameness control (Leach et al., 2010a), and because cost is not the only driver in choice of control measures, we included an attribute described as 'inconvenience' in the CE. This allowed us to estimate farmers' WTP to avoid the inconvenience associated with lameness control and how this relates to their WTP to reduce lameness, thus indicating their willingness to incur additional inconvenience in order to reduce lameness in the herd.



|  | **A** | **B** | **C** |
|---|---|---|---|
| **Reduction in lameness** | 75% | 100% | Your current situation |
| **Change in inconvenience of lameness control measures** | 25% more | 50% more |  |
| **Additional cost per cow/year (all cows in herd)** | £15 | £30 |  |

**Fig. 1.** Example choice set.

The CE presented farmers with eight different choice sets similar to that shown in Fig. 1. Each choice set contained three choices (A, B and C) each of which then contained different levels of three attributes, namely: the percentage reduction in prevalence of lameness in the herd in a year's time (i.e. if the current level of lameness in the herd is 10% then a 50% reduction would reduce it to 5%); the percentage change in the level of inconvenience caused by implementing lameness control measures (which might be greater or less than the farmer's current situation), and the additional total cost of the new lameness measures divided by the total number of cows in the herd (i.e. average cost per cow across all cows in the herd). The first of these attributes, reduction in lameness prevalence, was allocated the following possible percentage levels – zero, 25, 50, 75 and 100. The second attribute, change in inconvenience of control measures, was allocated five levels: 50% less, 25% less, no change, 25% more, and 50% more. The third attribute, additional cost per cow (UK£/yr), was allocated values of 0, 15, 30, 45, 60.

Farmers had to choose their preferred option (A, B or C) in each choice set separately where C was the individual farmer's current situation. Thus, in Fig. 1, if a farmer preferred a reduction in the prevalence of lameness in their herd of 75% but with a 25% increase in inconvenience associated with control for a payment of £15 per cow, to a 100% reduction in lameness, with a 50% increase in inconvenience and payment of £30 per cow, and to the current situation, then they would choose option A.

Choice sets were designed to ensure a good balance of attribute levels in each set. WTP was estimated statistically by using a Bayesian procedure applied to a random parameter logit model (see Appendix A, Supplementary material). The statistical software package GAUSS 7.0 (Aptech Systems) was used for the estimation procedure.

### Administration of questionnaires

A focus group of eight dairy farmers was undertaken. Various issues concerning lameness in the dairy herd were discussed and a draft of the questionnaire was tested. As a result of this, some changes were made to the questionnaire which was then piloted on 20 farmers. Following this, final changes were made to the questionnaire. Face-to-face interviews were carried out with farmers on 163 farms by trained interviewers. Farmers were among those who had participated in the Healthy Feet Project (Main et al., 2012) and were located in England and Wales. The interviews were carried out with the person responsible for major decisions on spending on the farm. For the analysis of WTP sample size was reduced to 140 observations because some farmers failed to complete the CE exercise whilst three farmers interviewed were excluded from the analysis due to inconsistencies in their responses.

## Results

### Descriptive statistics

Descriptive statistics of the sample of farmers show that the majority (73%) had been dairy farming for over 20 years with a mean of 30 years (minimum 2, maximum 65) and 91% said that their aim was to continue in dairy farming in the foreseeable future. Most farmers (70%) were in the 40–60 years old age group. Herd size averaged 169 cows but varied from 43 to 790 whilst milk yield per cow averaged 7074 L/year (range 3000–11,000 L).

Only 7% of farmers felt they had a 'major' lameness problem, 58% thought they had a 'moderate' problem, 34% a 'minor' one and one farmer reported not having a problem at all. When asked to rank herd health issues on the cost to the business over the past year, 27% of farmers mentioned lameness as the top or one of the top ranking problems, 36% mentioned mastitis and 37% mentioned fertility problems (joint ranking of conditions was permitted). Thirty per cent of farmers ranked lameness second and 20% ranked lameness third. When asked to do the same for the effort put into