Application of economics to equine health and welfare

Jonathan Rushton[1] and Elizabeth Redmond[2]

[1]Royal Veterinary College, London, UK (jrushton@rvc.ac.uk)

[2]Independent consultant, UK

Importance of the equine industry

Equines, and horses in particular, have been a critical element in the development of societies across the world. They were used for transportation and cultivation, and were fundamental in warfare. Their social and economic importance was such that the veterinary profession emerged through the care of equines (Jones, 2003). With the rise of the combustion engine and the replacement of the horse with tractors, cars, trucks and aeroplanes, the horse's prominence in society has reduced. Yet the equine industry continues to be an important source of rural employment and generator of economic activity (Gordon, 2001; Deloitte, 2009) and remains important in many developing countries as a source of draught power (Admassu and Shiferaw, 2011; Wilson, 2003). In the developed world the equine sector has evolved with a shift towards popular sporting and leisure based activities. The importance of equines therefore remains, with equine health being critical to underpinning the economic prosperity and stability of many people (Hoare, 2011). The sector is significant enough in many countries to compete for resources across the wider economy and provides significant goods and services through its many activities.

Given this perspective, the application of economic concepts and tools to guide decisions around the allocation of resources to equine health and welfare interventions should be a regular occurrence (see the preface in Rushton, 2009). Although economic methods are not yet widely adopted, the work of Robert et al (2014) is a welcome contribution to the economics of animal health. They report an apparent discrepancy between best and general practice in the control of parasites in horses in Europe and the USA. Their observations are an important starting point and the paper highlights some interesting areas for further work, in particular the need to assess the relative economic impact of these different approaches to parasite control. To understand the possible approaches that could be taken, it is helpful to look first at the critical frameworks for application of economics to animal health and welfare.

Economic frameworks

In the 1970s the economics of animal health began to emerge as a field of study and at the University of Reading two different, yet related, strands of thought began. Peter Ellis and his team pursued a practical approach of looking at the ***additional or marginal costs and benefits***[1] of health interventions using ***cost-benefit analysis*** approaches. The standard metrics from such analyses where the ***net benefit*** (net present value if discounted) of a change or the ***benefit cost ratio***[2]. Both these metrics generate information on the economic

---

[1] This includes the avoidance of losses and therefore applies the principle of ***opportunity cost***

[2] Where a cost benefit analysis has been performed over a number of years and the marginal costs and benefits have been discounted, there may also be a metric generated called the

profitability of a change, and need to be supplemented with a financial feasibility assessment if the change is to be implemented.

John McInerney (1996) considered that the application of a cost-benefit analysis to one or two alternative strategies restricts the exploration of alternatives. It potentially means that, while a proposed strategy may be economically profitable, it is not ***optimal*** as all alternatives have not been explored and the opportunity cost of ignoring better alternatives is not included. Therefore, McInerney (1996) proposed a theoretical framework for the economics of animal health which looks at the balance between the losses caused by a health or welfare problem and the costs of the measures required to manage the problem. If applied as a continuum, a ***technical frontier*** can be created where additional resources used in control would reduce the losses created by disease. The ***optimal point of control*** would relate to the ***relative value*** of the ***losses avoided*** and the ***costs of control***.

In these analyses, the value of resources is represented in a majority of societies by prices, which are assumed to be set by market forces. Therefore, for example, the price of a horse and the price of a parasite intervention are a critical aspect of establishing what is the optimal level of control for parasites in horses.

Key assumptions of McInerney's approach

McInerney's approach is powerful, yet there are issues that limit the ease of its application. Three major assumptions are made; 1/ that the impact of a health or welfare problem is well understood; 2/ that the prices for all resources used or generated by the intervention are established through existing markets; and 3/ that the resources used for control interventions can be divided into small units and do not require significant capital investments.

On the first assumption, empirical datasets for the relationship between animal health problems and impacts in terms of animal losses and reduced performance are relatively poor, though parasites are probably the best understood. In the case of equine parasites the literature appears to be scarce around the impacts of anthelminthic use on equine health and the relative impacts of different treatment regimens (Robert et al, 2014).

With regards to the second assumption, there are well understood methods where the management of a health problem can have wider implications on prices of resources with well established markets (see Upton, 2009). However, there may also be the generation of a new technology that currently has no market and therefore no price. There are a number of approaches to managing this issue. Robert et al (2014) have adopted a ***willingness to pay*** method to establish the price of a series of potential changes in equine parasite management. This method is commonly used in environmental assessments where the resources are not traded in the marketplace, and involves asking people what they would be willing to pay for the generation of a good or service. The complexity of this approach has grown as researchers have recognized the need to have greater accuracy in estimation. An alternative to this approach is the ***hedonistic pricing*** mechanism, where another market exists that can be used to impute the value people place on a good or service that is perhaps not widely available. This is widely used in human health economics and has been applied by Stowe (2013) to examine the price for thoroughbred stud fees. A final method would be the calculation of the ***cost*** of provision of the service, which would require estimation of the cost of implementing a new intervention. This method allows the resources needed for an

---

internal rate of return, which represents the discount rate at which the net benefit equals zero.

intervention to be examined in depth and the separation of costs of capital investment – ***fixed costs*** – and running or recurrent costs of implementation – ***variable costs***. In the case of a parasite surveillance programme the fixed costs would be laboratory capacity, microscopes, laboratory equipment and education of the laboratory staff on the sampling and laboratory procedures, recording and interpretation of results. The variable costs would be the time for sampling, diagnostics, reagents, analysis and reporting. Tisdell (2009) recognized the importance of the fixed cost elements of animal health interventions and made modifications to the McInerney model to reflect their importance. In general, practical experience demonstrates that high fixed costs reduce the ability of individuals or small companies to adopt procedures such as parasite surveillance and are only feasible if these costs are spread over a larger population of horses. This would be a potential explanation for the observation by Robert et al (2014) that larger horse breeding units are more likely to adopt parasite surveillance programmes to guide anthelmintic use.

Applying the framework to equine health

Adapting the McInerney framework it is possible to identify critical steps in the economic assessment of an equine health problem, such as equine parasites, and the possible interventions, as follows: (1) Understand and quantify current equine losses in terms of animals lost and performance reduced, and the costs of current surveillance, prevention and control activities; (2) Assess whether the current intervention activities have weaknesses, to determine whether they are close to optimal in the management of the problem; (3) Establish if one or more alternative technology and/or strategy could be made available; (4) Derive the price of providing and/or the willingness to pay for the alternative technologies/strategies; (5) Assess if the new technologies/strategies will provide improved economic returns if adopted. These steps should provide information on technical feasibility and economic profitability, but should also deal with social acceptability and financial feasibility issues (Rushton, 2009 – pages 194-197).

Ideally these steps should be built on empirical data around the relationships between health and welfare problems and the potential interventions (technology or strategy). Datasets need to be constantly updated through surveillance in order to improve the accuracy of technical and economic assessments. Without this empirical background there will be doubt about whether the economic analysis is truly scientific and also uncertainty about whether adoption of the preferred option from an economic assessment will lead to an improvement in resource allocation.

Filling the data gaps to improve the accuracy of economic assessment

Robert et al (2014) have identified a potential weakness in the management of parasites in a particular sector of the US horse industry and have shown that there is interest in addressing this problem. Their paper also demonstrates that further empirical work is required to identify technically superior solutions and to examine if they are also economically optimal. Methods such as ***randomized control trials*** could be used, together with careful collection of cost data for interventions in order to refine the technical and economic analysis. Some lessons can be learned from human health economics in this regard, and the challenge in the application of economics to equine health and welfare is to adopt and adapt best practice in the use of economics to improve the allocation of resource to a very important part of society – the equine sector.

For further information on the use of economics in animal health please register with NEAT (http://www.neat-network.eu) and send questions to the blog.

References

Admassu, B; Shiferaw, Y. (2011) Donkeys, horses and mules - their contribution to people's livelihoods in Ethiopia. Report for the Brooke, London, UK. 72 pages

Deloitte (2009) Economic Impact of British Racing. British Horse Racing Authority. UK. 52 pages

Gordon, J. (2001) The Horse Industry – Contributing to the Australian economy. Publication No. 01/083, Project No. CIE-9ARural Industries Research and Development Corporation, Australia. 66 pages

Hoare, R. (2011), Overview of the industry and social impacts of the 2007 Australian equine influenza outbreak. Australian Veterinary Journal, 89: 147–150.

Jones, S.D. (2003) Valuing Animals. Veterinarians and Their Patients in Modern America. John Hopkins University Press, Baltimore & London. 213 pages

McInerney J. (1996) Old economics for new problems – Livestock disease: Presidential address. Journal of Agricultural Economics 47 (3) pp 295-314

Robert, M.; Hu, W.; Nielsen, M.K.; Stowe, C.J. (2014) Attitudes towards implementation of surveillance-based parasite control on Kentucky Thoroughbred farms – Current strategies, awareness and willingness-to-pay. Equine Veterinary Journal.

Rushton, J. (2009) The economics of animal health and production. CABI, Wallingford, UK. 364 pages

Stowe, C. Jill. (2013). "Breeding to Sell: A Hedonic Price Analysis of Leading Thoroughbred Stud Fees." *Applied Economics* 45:7, 877-885.

Tisdell, C. (2009) Economics of Controlling Livestock Diseases: Basic Theory. In Rushton (2009) Economics of Animal Health & Production. CABI, Wallingford, UK pages 46-49

Upton, M. (2009) Tools for Assessing the Price and Market Impacts of Livestock Policies. In Rushton (2009) Economics of Animal Health & Production. CABI, Wallingford, UK pages 136-143

Wilson, R.T. (2003) The environmental ecology of oxen used for draught power. Agr. Ecosyst. Environ. 97, 21–37.