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The effect of animal health compensation on 'positive' behaviours towards exotic disease reporting and implementing biosecurity: A review, a synthesis and a research agenda

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ABSTRACT

With an increasing burden on public sector budgets, increased responsibility and cost sharing mechanisms for animal diseases are being considered. To achieve this, fiscal and non-fiscal intervention policies need to be designed such that they consistently promote positive disease risk management practices by animal keepers. This paper presents a review of the available evidence towards whether and how the level and type of funding mechanism affects change within biosecurity behaviours and the frequency of disease reporting. A Nuffield Health Ladder of Interventions approach is proposed as a way to frame the debate surrounding both current compensation mechanisms and how it is expected to change behaviour. Results of the review reveal a division between economic modelling approaches, which implicitly assume a causal link between payments and positive behaviours, and socio-geographic approaches which tend to ignore the influence of compensation mechanisms on influencing behaviours. Generally, economic studies suggest less than full compensation rates will encourage positive behaviours, but the non-economic literature indicate significant variation in response to compensation reflecting heterogeneity of livestock keepers in terms of their values, goals, risk attitudes, size of operation, animal species and production chain characteristics. This may be of encouragement to Western Governments seeking to shift cost burdens as it may induce greater targeting of non-fiscal mechanisms, or suggest more novel ways to augment current compensation mechanisms to both increase responsibility sharing and reduce this cost burden. This review suggests that a range of regulatory, fiscal and nudging policies are required to achieve socially optimal results with respect to positive behaviour change. However, the lack of directly available evidence which proves these causal links may hinder progress towards this optimal mixture of choice and non-choice based interventions.

1. Introduction

A series of high profile epidemics of exotic animal diseases including bluetongue, classical swine fever (CSF) and foot and mouth disease (FMD) have called into question current systems of animal disease prevention and control in Western Europe. The benefits of avoiding or better controlling such outbreaks are obvious and could offer substantial returns. Several enquiries (e.g. Anderson, 2002; Royal Society, 2002; Bourn, 2002) and related academic reviews (e.g. Donaldson et al., 2002; Taylor, 2003; Murphy-Lawless, 2004; Campbell and Lee 2003) have examined the experiences in detail in an effort to identify better ways to manage animal health. One of the key findings of these works has been that policies of compensation for both animal and production losses due to infectious diseases need to be re-designed in a way that consistently promotes positive disease risk management practices, such as early reporting and notification of suspicious cases of contagious disease by animal keepers. This will provide the best return on investment for stakeholders. In addition, early detection, diagnosis and notification of disease are considered by the World Organisation for Animal Health (OIE) as critical to minimise

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the consequences of outbreaks (World Organization for Animal Health, 2015a). To tackle the significant problem of financing of costs and losses of epidemic livestock diseases, formation of a global emergency response fund for animal epizootics (GERFAE) has been suggested that will, among its other functions, "encourage an effective and rapid emergency response for control of epidemic livestock diseases in developing and transition countries, including through compensation of livestock holders" (Alleweldt et al., 2007; p.9).

Design considerations of compensation policies for such an outcome should include aspects of information asymmetry, that is when one party has more or superior information compared to another during a transaction, and incentive compatibility, namely when the incentives that motivate the actions of individual participants are consistent with following the 'rules' established by the group. In addition, the design of mechanisms needs to consider whether responsiveness varies with both the nature and source of compensation, as well as other influences on animal keeper behaviour (Gramig et al., 2005; Jin and McCarl, 2006; Koontz et al., 2006; Pannell and Vanclay, 2011; Oparinde and Birol, 2012; Hennessy, 2013; Hennessy and Wolf, 2015).

Positive behavioural change is a common term within Government policy agendas and relates to modifying a target group's actions to achieve an outcome or set of outcomes which are socially desirable. In this case, positive disease risk management alludes to the effect of compensation payment to livestock keepers in changing their biosecurity behaviours and/or disease reporting in order to, ultimately, reduce the total disease cost and incidence. Within a new institutional economics approach, if the behaviours have been adequately identified then farmers could be 'nudged' towards a positive behavioural outcome, or, in some cases, expect elements of stricter regulation to restrict negative behaviours (e.g. Barnes et al., 2013).

A useful schematic of the choices available to Government agencies is the Nuffield Health Ladder of Interventions (NCB, 2007). This shows a series of interventions mapped against the imposition of available choices for the target population. This approach facilitates the identification of possible interventions which encourage positive behaviours through fiscal (e.g. financial compensation or penalties) and non-fiscal processes, (e.g. group sharing of information or increasing pressure through social norms to report a suspicious incident). An example of such a ladder applied to positive behaviours is shown in Fig. 1.

This figure shows a range of interventions which could be used to encourage positive behaviours. These are ranked in terms of increasing levels of choice for the livestock keeper. Regulatory approaches and incentive-based systems tend to impose more control on the livestock system compared to the other interventions and hence, within a neo-liberal agenda such as in the UK, there is a desire to shift this responsibility and cost burden through more voluntary approaches, to encourage co-operation both across livestock keepers, but also within a supply chain to manage animal health or, more commonly, by providing and targeting information on biosecurity and awareness of exotic disease for reporting. The main focus of this review is on fiscal or incentive-based interventions, namely compensation and penalties. Nevertheless, the possibility of using a mixture of fiscal and less fiscal incentives that promotes greater positive disease risk management practices by animal keepers is also discussed.

What follows is a review of literature which has examined the consequences of these various interventions on encouraging or, indeed, discouraging these desirable positive behaviours. This is established against the landscape of highly contagious exotic diseases, which has been explored by a number of authors (Ekboir, 1999; Sumner et al., 2005; Otte et al., 2004).

In re-designing compensation schemes, governments and other stakeholders need to reframe incentives to change behaviour in a way that reduces overall risk and scale of exotic diseases. Evidence and lessons from the literature on the impact of exotic disease compensation policies on animal keeper behaviours' and the likely effectiveness of different compensation measures for promoting positive disease risk management practices, are therefore essential. A series of seven questions (Table 1) that were deemed to be the most important to underpin the redesign of compensation policies were posed by the research sponsor (Defra), who required a quick (two-month) turn-around on the project and hence commissioned a Rapid Evidence Assessment (Petticrew and Roberts, 2006) rather than a more extended study.

The purpose of this paper is to investigate whether these questions have been answered in the literature and, in so doing, identify possible knowledge and research gaps. Accordingly, the main objective of this review is to investigate the relationship between exotic disease compensation policies and observed positive behaviours in terms of reporting and implementing biosecurity when outbreaks occur and in "peacetime". In parallel, the effects of possible other factors that induce positive behaviours were also investigated.

The fragmented nature of the literature, across several domains such as agricultural economics, sociology, human behaviour as well as veterinary epidemiology, may constrain a search of relevant literature. However, prevailing literatures in behavioural theory as well as that existing in the animal health economics sphere (covering farmers' individual and social behaviours, socioeconomic and epidemiological studies) were the main domains of these studies. Overall this approach enabled us to assess the level of evidence around exotic disease compensation and positive behavioural response. The primary questions were defined as: (a) to identify the relationship between exotic disease compensation and positive behaviours with respect to biosecurity measures; and (b) other factors that most influence how quickly animal keepers report exotic disease and carry out essential biosecurity measures.

The next section outlines the methodology used and the application to the framework. This is then followed by results which firstly examine the economic investigations, as the role of compensation in shaping incentive structures is clearly driven primarily by economic insights. This is then followed by 'non-economic' investigations to provide a broader perspective to fully implement these mechanisms in a heterogeneous population such as farmers and hobby livestock keeping. Gaps are identified and then a list of recommended topics to address the identified gaps are presented and discussed.

2. Methodology

An adapted Population, Intervention, Comparator, Outcome (PICO) approach was used to design search strings for use in web search engines and databases of academic literature. In addition, to further understand the policy dialogue and regional impact of compensation on positive biosecurity behaviour 10 international experts and academics who have conducted research and reviewers of animal health related compensation mechanisms were contacted based on their contribution to the literature and also through suggestions from policy colleagues. This enabled us to seek further (grey) literature on compensation in these countries including Germany, the Netherlands, France, Belgium, Spain and Australia.

The PICO process which is a widely used method in conducting systematic literature reviews was adopted to develop a literature search strategy (Miller et al., 2013; Houghton-Carr et al., 2013; Petticrew and Roberts, 2006). Particularly the PICO process was used to break down the mentioned research questions into components (Table 2) that best represent the initial scope of the work and to aid further analysis of the available evidence. A selection of