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The framing of public knowledge controversies in the media: a comparative analysis of the portrayal of badger vaccination in the English national, regional and farming press

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Abstract

This paper maps the 'knowledge controversy' surrounding the control of bovine tuberculosis (bTB) in England, which has become a highly politicized and controversial issue in recent years. The disease, which is now costing the UK over £90 million each year, has received substantial policy and media attention, particularly in relation to badgers and their role in its spread. This paper focuses on the ways in which the various debates associated with bTB and its control are presented in the press, with a specific emphasis on badger vaccination. The analysis compares regional, national and farming press, and identifies a number of complex dualisms against which the debate is framed. Three key dualisms are identified: (1) the scientific evidence on which policy support for badger vaccination is based (science versus practical reality); (2) the controversy surrounding the potential efficacy of proposed control measures (badger vaccination versus badger culling); (and (3) the role of different stakeholders in spreading/controlling the disease (victim versus culprit). These dualisms help to explain the unclear policy direction and constant divisions between those who do and do not support badger vaccination, and the continued status of bTB control as a public knowledge controversy.

Key words: badger vaccination, bovine tuberculosis, media analysis, knowledge controversy

1 Introduction

Science has a central role in modern society. Science fuels innovation, shapes policy development and has the potential to provide the evidence to change public perceptions. However, science is often complex and potentially contentious. In a world where the media brings to the fore developments in science and technology, public disagreements among science and technology experts are often highly visible. For example, the large scale public controversy surrounding genetic modification has often been referenced as an example of

contested science and widely reported in the media (Viella-Vila and Costa-Font 2008, Augoustinos et al 2010). This debate has highlighted the limitations of expert knowledge and the need to give legitimacy and value to a range of perspectives. There has been significant interest among social scientists in 'knowledge controversies' and how the public construct meaning from scientific discourses, focusing on the process of gaining knowledge and understanding rather than the search for scientific fact. The discipline of knowledge controversy mapping seeks to locate the sources of controversy and expose the partisanship of the knowledge claims that are articulated, identifying the similarities and differences in how the controversy is presented by each actor (for a review, see Whatmore, 2009). In this paper, we map the reporting of knowledge controversies in the media in relation to bovine TB and badger vaccination (as a method to control disease spread from badgers to cattle) and explore how controversies originating in scientific discourses are used by different stakeholders to support their knowledge claims.

While individuals construct meaning in a plethora of cultural forums, media discourses have been widely studied due to the accessibility of researchers to a wide range of written, audio and visual sources in which various social groups and institutions debate and define social reality (Gurevitch and Levy 1985). This paper focuses on the analysis of press articles using the tool of framing to explore and map knowledge controversies. Vaccination has often been discussed as a controversial issue in the media. For example, Poltorak et al (2005) explain how the vaccination for measles, mumps and rubella (MMR) emerged as a high-profile controversy which frequently dominated media headlines, influencing parental engagement with the vaccine. Various authors suggest that mass-media coverage of vaccine issues during the

1990s fueled public anxiety and misconceptions surrounding the MMR vaccine (see for example Cookson 2002).

Within the field of livestock disease control, the Foot and Mouth vaccine was subject to significant debate during the outbreak in 2001 and was regularly reported in the press (Nerlich 2004). Using the case study of badger vaccination against bovine tuberculosis (bTB) in England, this paper explores how knowledge controversies within the scientific discourses surrounding a contentious vaccination policy are reported by the media and often used by different stakeholders to support their position. As Lodge and Keira (2014: 367) note, the "badger represents one of the most controversial and highly debated environmental issues in modern Britain." The controversies surrounding badger vaccination stem from the debated role of badgers in the spread of bTB in cattle. BTB is primarily a respiratory disease affecting cattle in different parts of the world. In England, the incidence of the disease has increased dramatically in recent years, with over 30,000 cattle compulsorily slaughtered annually since 2008 (Defra 2014b). The control of bTB has been a controversial issue since the early 1970s when it was first suggested that the disease may be spread to cattle from badgers. Consequently, bTB has become a highly contested knowledge controversy (Whatmore, 2009) and a publically debated issue (Cassidy, 2012), as periodic badger culling, as well as heightened cattle control measures, have failed to curtail the spread of the disease. Based on the scientific evidence available, farmers and veterinarians have publicly supported badger culling to control the disease 'reservoir' in wildlife, while other groups such as the Badger Trust continue to campaign against such policies and to promote increased on-farm biosecurity and cattle control measures. In 2010, the Labour Government put forward an alternative control measure: badger vaccination. The vaccine has been implemented through

the Government's Badger Vaccination Deployment Project (BVDP) as well as through private vaccination projects run by groups including the National Trust and Wildlife Trust. Additionally, recent developments have seen plans outlined for increased government funding for badger vaccination in 'Edge Areas' (surrounding areas where the disease is considered to be endemic), where 50% of costs could be provided to vaccination groups (Defra 2014c).

This paper aims to provide an analysis of media reports to map the construction and framing of the controversies that surround bTB control, with a particular focus on badger vaccination. While badger vaccination forms the focus of the analysis, it is impossible to consider this in isolation from other control measures. Thus, although badger vaccination was used as the search term for the media analysis, it was consistently discussed alongside badger culling and within the wider bTB context. While the control of bTB has received significant attention within epidemiology and the natural sciences, limited research has been undertaken to explore the ways in which bTB is communicated and discussed within and across different stakeholder groups. Additionally, limited consideration has been given to bTB as a knowledge controvercy, particularly within the media. This paper therefore contributes to the practice of mapping knowledge controvercies and furthers our understanding of how bTB discources are shaped and understood. The paper is structured as follows. The next section contains insights from existing literature into the role of science and evidence in influencing understandings of controversial issues. This is followed by a discussion on the use of 'framings' in media reporting and the current cultural understanding of badgers and their role in bTB. The methodology adopted for this study is introduced. Following this, the findings of the media analysis are presented based around a number of identified dualistic framings.

These findings are discussed in relation to bTB control governance and the value of better understanding the role of knowledge controversies in the media.

2 Science, knowledge controversies and the media

Various studies have explored the disparity between scientific and local knowledges (see for example Enticott 2008a,b, Enticott and Franklin 2009, Enticott and Vanclay 2011). This has led to the development of various 'knowledge controversies' whereby 'expert' accounts of a physical reality come into conflict (Yearley 2000). Bauer and Bonfadelli (2002) provide an interesting discussion on the distribution of scientific knowledge through the media. They argue that the dissemination of more information will not necessarily lead to a better distribution of knowledge. Instead, they suggest that differences in knowledge between 'experts' and lay people are likely to widen, creating what they call 'the knowledge gap'. However, they also argue that when an issue becomes controversial, public interest increases, inducing a larger demand for information and thus for closing the knowledge gap. This is essential for the implementation of new policies as public familiarity with an issue enables realistic and sustainable decision-taking in relation to it. Bauer and Bonfadelli (2002) suggest that before the media can influence individuals' attitudes, it is necessary for the topic to be established through personal experience, informal conversations or formalised mass media coverage. Thus it cannot be assumed that the media will always generate interest in a topic among its audience. Nevertheless, aware of this, the media frame information in certain ways in order to ensure effective communication. According to Friedman et al (1999), in areas of science that are particularly controversial, it is the uncertainty behind the evidence that

becomes the public focus. While the media reports advances in science, it also highlights disagreements and debates surrounding it.

The connection between policy making and the media is noted throughout the literature (Friedman*, et al.* 1999, Denton and Kuypers 2002). While it cannot be assumed that the media always has an influence on the public's attitudes towards a given issue, it certainly can affect what issues the public consider to be important. As Denton and Kuypers (2002) suggest, the longer an issue remains in the focus of the media the more the public will perceive the issue as a crisis. The media has been noted as playing a key role in 'agenda setting' (Kellstedt 2000, Marks *et al*. 2007), as well as providing an indication of the values that are held by society (Kellstedt 2000). Additionally, the literature notes the concept of 'issue salience' and suggests that the degree of emphasis that the media places on a particular subject is likely to influence its perceived priority in the public psyche (McCombs and Ghanem 2001, Marks *et al.* 2007). While the media can add salience to an issue, it also frames the discussions around it. Hajer and Laws (2006, p.252) define frames as 'ordering devices' and Lockie (2006) explains how the media often uses particular framings to present information to readers. The repetitive use of a framing builds familiarity and allows for certain assumptions or theories to be left unstated, reducing the complexity of the issue being reported. Through deploying frames, certain viewpoints will be emphasised while others may be sidelined. For example, particular words, metaphors or images may be used repeatedly, rendering certain ideas or viewpoints more salient or memorable and others less (or in-) visible (Marks *et al.* 2007). Repetition of particular frames helps to establish accepted knowledge claims. Importantly, Lockie (2006) argues that the use of a particular framing does not guarantee that the reader will interpret the report in the intended way; instead, the reader is likely to interpret the information in the

context of their own framings which may have been influenced by other media and/or personal experiences. Nonetheless, Lockie (2006) also argues that framing provides a useful tool to simplify complex issues and help the public to sift through extensive information.

In the case of bTB, while the pool of scientific evidence relating to its control continues to grow, the question of how to stem the spread of bTB remains unanswered. Each piece of evidence is contested and, as of yet, none has pointed towards a clear policy solution (Wilkinson 2011). The media is an interesting medium through which to explore issues relating to science and knowledge within the bTB debate as it provides a mouthpiece to all stakeholders including policy makers, scientists and farmers; it thus allows for an examination of the representations made by each of them. The frames adopted by different stakeholders to support their positions, as well as the frames that are adopted more generally by the reporting media to engage the public, help to explain the nature of the knowledge controversies surrounding badger vaccination and bTB control. Additionally, the identification of particular frames helps to identify areas of science that are neglected or over simplified in media reporting or where positions are framed around misleading or incomplete information. In order to understand lay understandings of badger vaccination and bTB control as opposed to those based solely on scientific evidence, it is useful to explore the various framings that have been identified by other writers. This is done in the following section of the paper.

3 The controversial framing of badger vaccination and bTB

BTB is present in many mammal species throughout the world, with a number of countries having reservoirs of the disease in a particular species. For example, in Australia and New Zealand, possums are the main cause of disease spread to cattle (Ramsey *et al.* 2002), while white-tailed deer are the main disease transmitters in Michigan in the United States (McCarty and Miller 1998). However, wildlife control measures in these areas have been implemented with relatively little public opposition. It is therefore interesting to understand the nature of the controversy surrounding bTB control in badgers in the United Kingdom.

There has been limited research into public understanding of or attitudes towards bTB and its control, but that which does exist demonstrates the complexities associated with public understandings and perceptions. More specifically, very little research has been undertaken into attitudes towards badger vaccination. While Enticott et al (2011) and Warren et al (2013) provide useful exceptions, the majority of literature around bTB focuses on badger culling. There has been no in-depth analysis of the media in relation to badger vaccination; however, Cassidy (2012) usefully explores the representation of the badger in the media. This paper focuses specifically on the 'good badger/bad badger' dichotomy, which has for many years fuelled the badger control debate. Cassidy (2012) emphasises the engrained representation of the badger in the public's conscience, inspired by Kenneth Grahame's portrayal of Mr Badger in 'The Wind in the Willows'. In her media analysis, Cassidy (2012) notes the significant focus on badgers in discussions of bTB. As such, other factors in the debate including cattle movement and testing regimes have received far less attention. Cassidy argues that a long history of often violent human-badger encounters has influenced the public's view of the

species. Badger-baiting, digging and hunting have been condemned through various pieces of legislation, most significantly the Badger Act of 1973 and the 1992 Protection of Badger Act which prohibited the wilful killing, injuring or taking of badgers. As a consequence, Cassidy shows how the badger has developed into a brave, resilient creature personified by Grahame's Mr Badger.

Other writers have assigned similar characteristics to fictional representations of the creature including Badger in Colin Dann's *Animals of Farthing Wood* (Cassidy 2012). However, the animal has also been presented in more negative forms, emphasising its violent nature such as Beatrix Potter's Tommy Brock. Such representations demonstrate the complex social and cultural understandings of the creature which continue in modern society. While the badger has been used by the Wildlife Trust in its logo to represent native British wildlife, Cassidy (2012) notes that others consider it to be in direct conflict with humans and thus characterise it as vermin. The cultural role of the badger, therefore, remains ambiguous and context-specific. These complexities are demonstrated by Maye et al (2014) who suggest that farmers' beliefs are constructed around specific contexts. Farmers consider badgers to be an important species, which they enjoy watching from a distance. However, if the animal strays into human or agricultural spaces, thereby causing a disease threat to livestock, their role quickly changes to a pestilent intruder. While Cassidy's (2012) discussion on the opposing representations of the badger provides an interesting perspective in understanding the complexities associated with bTB control, further analysis reveals that the controversy runs deeper than this, incorporating debates around science, evidence and knowledge. The methodology which was adopted to explore these controversies in the media is presented in the following section.

4 Methodology

This paper reports on a comparative analysis of articles from two main media sources: first, the Lexis Library online print media database, which provided access to national and regional newspaper articles; and secondly, the online press databases of Farmers Weekly (FW) and Farmers Guardian (FG). National, regional and farming press articles were each included in the analysis to provide a degree of triangulation and to assess any potential nuances. This builds on Cassidy's (2012) previous study as it provides a comparative aspect by incorporating the farming press which has not been done previously. The two farming journals were selected on the basis that FW has the highest circulation in UK agriculture (ABC, 2014), while FG is the UK's leading weekly agricultural newspaper (BCPC 2012). Each of the databases was searched using the term 'badger vaccination'.

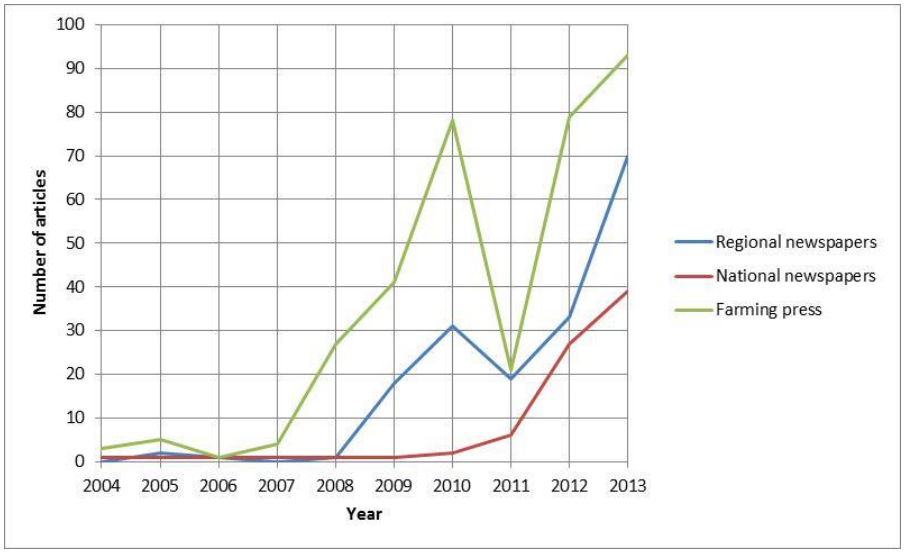
The farming press represented the largest proportion of press coverage, accounting for 296 articles and letters (51.2% of the total sample) while coverage of badger vaccination in the national press accounted for 94 articles and letters. Coverage in the regional press was more considerable as this media analysis represents a component of a larger study (the social science study to accompany the Badger Vaccine Deployment Project funded by Defra) and a sample of media articles was taken from the same study areas. These were Stroud (Gloucestershire), Great Torrington (Devon) and Congleton (Cheshire/Shropshire), each representing areas of high bTB incidence. All regional newspapers whose circulation covered the study areas were included in the analysis. This resulted in 8 regional newspapers and 188 articles and letters (32.5% of the total sample).

Table 1: Badger vaccination press coverage (sample summary)

Source	Number of articles analyzed	% of sample
Farming press (Farmers Guardian and Farmers Weekly)	296	51.2%
National press	94	16.3%
Regional press (covering the three case study areas)	188	32.5%
Total:	578	

The study period for this study ran from 2004, when the first sampled article including the term 'badger vaccination' was published, until the end of October 2013. This period also represents the time during which badger vaccination was developed, licensed and subsequently administered through the BVDP and smaller private initiatives. Initially, the press coverage on badger vaccination was analysed quantitatively: the number of articles and sources were recorded by year in order to map changes over time in terms of the regularity of press coverage. As shown in Figure 1, coverage peaked in 2010, during the consultation period for the Coalition Government's bTB control programme. A second peak occurred at the end of the study period, when the pilot badger culls were underway.

Figure 1: Press articles containing the term 'badger vaccination' in the national, regional and farming press



N.B. Figure 1 shows the regional press coverage in the three study areas, the coverage in the two farming journals and all national newspapers.

After this initial investigation, the articles were subjected to a standard discourse analysis (Hajer and Laws, 2006) using the qualitative software package NVivo9 to examine the use of language in the sample. The articles were coded based on an iterative process whereby ideas from a literature review guided an informal reading of the articles to identify key themes; these themes then helped to develop an initial coding framework. The conceptual tool of 'framing' helped to guide a detailed analysis of the articles by exploring the different ways in which particular themes were discussed and presented. The findings from this analysis are reported in the following section.

5 The dualistic framings of badger vaccination and bTB control

Three dualistic framings were identified in the press coverage. The controversy associated with the scientific evidence relating to bTB and its control is the first frame and is organised around the dualistic relationship between science and what we term 'practical reality'. Badger vaccination vs. culling is introduced as the second frame. The two control options were often

discussed together and regularly framed in dualistic terms. The role of the various human and wildlife actors in spreading/controlling the disease is discussed as a third frame, with actors framed either as victim or culprit. The three frames are discussed in further detail in the following sub-sections.

5.1 Science vs. practical reality

The first dualistic framing identified by the media analysis related to science vs. practical reality. Within the press, various issues were raised regarding badger vaccination, one of which was the evidence (or lack of) that supports its efficacy. In the national, farming and regional press, reference was regularly made to the importance of scientific evidence. In general, the press coverage suggests that, if the evidence (mainly scientific) indicates that a vaccine would reduce TB in badgers, and consequently in cattle, then it should be deployed. However, as shown in the following discussion, evidence is often disputed and sometimes reported in contrasting ways, potentially leading to confusion and misinterpretation.

When discussing the role of badger vaccination, regular reference is made to scientific research in the national, regional and farming press. One such study was conducted by the Food and Environment Research Agency (FERA) in Gloucestershire in 2006 which assessed the efficacy of badger vaccination in reducing the incidence of bTB in badgers. The findings were widely reported when they were released in October 2010. For example, The Gloucestershire Echo (09/10/2010) reported that: *"The study found injecting badgers resulted in a 74 per cent fall in the proportion of the animals testing positive to the antibody blood test for TB."* This figure was also included in articles in national and regional newspapers (Western Morning

News 09/10/2010, Gloucestershire Echo 09/11/2010, Western Daily Press 17/11/2010, Western Mail 27/11/2010, the Guardian 20/04/2011). However, based on the research findings, a number of concerns were raised. For example, some articles noted the inability of the vaccine to cure badgers already infected with bTB. Vets were regularly quoted by the press in relation to this concern (see for example Western Morning News 25/03/2009, Mid Devon Gazette 07/07/2009, FW 05/07/2008). The CLA South West Director was also quoted as raising similar concerns:

> *"Vaccination can only protect healthy animals from contracting the disease, it cannot cure infected animals."* (Western Daily Press 21/04/2011)

Quoting the FERA publication, the Gloucestershire Echo (09/11/2010) reported the negative aspects of the vaccination trials: "*officials point out, while the findings indicate a clear effect of vaccination on the badger disease, it does not give a "definitive" figure for its effectiveness* [in cattle]*."* Other articles also refer to this shortfall in the evidence base (Western Morning News 02/12/2010 and 09/11/2010), emphasising the 'science-problem' associated with bTB and framed around the science vs. practical reality dualism. Results from the same study are often reported to support, as well as oppose, a certain stance.

The 'science-problem' is not isolated to the debate surrounding the use of badger vaccination. In fact, it is even more prevalent in discussions around the issue of badger culling. The problem was emphasised in 2010 with the change in both the Government and the direction of disease control policy. In 2010 the government quickly voiced its support for a combination of control measures, including badger vaccination and culling. While this approach is generally supported by the farming press (although slightly less so in the last two years of the study

period), concerns regarding the reliability of the scientific evidence on which the decision to support culling was made were consistently raised in the national and regional press. In particular, a number of press articles argued that the results of the RBCT, which provided evidence for the efficacy of culling, were flawed. This came after the publication of research findings which voiced concerns about the long-term effectiveness of a cull and warned of potential negative effects. The possibility that a cull would cause perturbation[i] of badger groups, leading to bTB diffusing further across the countryside, was repeatedly noted in the national press (e.g. Western Mail 27/10/2009 and 24/03/2010, Western Daily Press 16/09/2010, Daily Telegraph 24/04/2011). Moreover, articles reported that any positive results from culling would not be sustained in the long-term (Western Mail 27/04/2010) and that a sustained cull would only "*at best*" reduce cattle herd breakdowns by 0.5% (Daily Post (Liverpool) 03/11/09). A similar opinion was published in the Guardian (2012) where it was stated that the culling trial had found that, at best, TB incidence was reduced in the cull area by just 16% after nine years.

While the need for evidence is emphasised in the press, what is reported presents a wide range of viewpoints. Both negative and positive aspects of badger vaccination and culling have been identified, as well as those associated with a dual strategy. The seemingly conflicting, or at least divergent interpretations of the available evidence exemplify the complex and contested nature of the debate. However, the importance of an evidence-based policy (see for example Grant, 2009; Wilkinson, 2011) appears to remain paramount, as was summed up by Elin Jones, the then Welsh Government's Rural Affairs Minister quoted in an article published in the Western Mail (03/11/2009):

"Remedial action has to be based on solid evidence rather than emotion… based on rigorous analysis of all available evidence, consultation with experts and investigation of ethical and environmental considerations."

Views on oral badger vaccination were also expressed. For example, in 2010 it was reported that the new Government Minister responsible for bTB policy had stated that a viable oral badger vaccine is still "*years away"* from being available (FG 17/9/2010). The issue of availability regularly appeared in the press. For example, in an article published in the FW (07/09/2010), the Defra Minster was reported as saying:

"*Yes there's an oral vaccine on the way but that's not going to be available until 2015 at the earliest, and that's even if we get the right to use it. We can't wait that long.*"

The availability and effectiveness of oral vaccination was also raised in the context of culling by the NFU Deputy President in an article published in the FG (11/2/2010). This indicated that the assumed benefits of culling disappearing after four years could be irrelevant as an oral badger vaccination could be available in four to five years and hence provide an "*exit strategy*" for a culling policy.

Science and evidence are consistently framed in simplistic terms in the media, with fragments of study findings being reported without context to support a particular position. Therefore incomplete information is often reported, with the benefits of particular bTB control measures exaggerated and the potential flaws neglected. The media discourses surrounding science and evidence are therefore unlikely to help clarify the knowledge controversy surrounding bTB control. Instead the opposing interpretations of the evidence base are likely to widen the 'knowledge gap' and increase calls for further evidence.

5.2 Badger vaccination vs. badger culling

As discussed in the previous sub-section, vaccination is regularly compared to culling in relation to the scientific evidence which supports each method. This sub-section shows that the comparisons between badger vaccination and culling go further to encompass other issues including efficacy, practicality and costs. Badger vaccination is discussed as both a sole measure and a component of the disease control 'toolbox', in combination with badger culling and other measures. While the government in 2010 came to be fully supportive of badger vaccination as a primary disease control measure, bTB policy was significantly revised later on to include badger culling and vaccination as well as stricter farm-level control measures. Thus the role of badger vaccination has been reduced significantly (Defra 2011a, 2014a). This rise and fall in the prominence of badger vaccination has been followed by the media, particularly in the farming and regional press. The national press paid less attention to the measure until the prospect of badger culls escalated, when it was widely promoted as the alternative by commentators such as wildlife groups and shadow cabinet representatives.

In January 2010, the then agricultural Minister, Hilary Benn, was reported in the FG (07/1/2010) as acknowledging that the number of bTB breakdowns was still *"far too high".* He explained that the Government had opted for vaccination over culling on the advice of the Independent Scientific Group because he had wanted to find "*the most effective way*" of dealing with the disease. Further supporting the Labour Government's approach, the then farming minister, Jim Fitzpatrick, was quoted in the regional press as saying: *"Government policy clearly stated that vaccination was the right approach"* (Express and Echo (Exeter)

17/02/2010) and that the Government was therefore committed to going ahead with the BVDP.

Negative views towards the badger vaccination programme were voiced by the agricultural sector at the time. For example, a farmer writing in the FG (10/4/2009) considered that the Minister (Hilary Benn) had, "*despite the science, turned his face against a badger cull for reasons of adverse public reaction*". At this time, there was limited coverage of badger vaccination at the national level and any coverage tended to be brief. However, a letter to the editor from a member of the public, published in the Daily Telegraph (14/02/2010), put forward some strong views on the matter:

> *"The proposed eight-year badger vaccination project is little more than appeasement to pressure groups – a substitute for a targeted cull of infected badgers. The project will not only squander yet more of our money, but, being poorly designed, is also doomed to fail."*

After the change of government in 2010, the BVDP was scaled back from six study areas to one. In the midst of seemingly reduced confidence in badger vaccination at the government level, negative portrayals of badger vaccination became more commonplace, particularly in the farming press. The new Coalition Government's agricultural minister Jim Paice summarised the new approach as one in which an injectable badger vaccination had a role, but not as a viable alternative to culling (FG 17/9/2010). Comments from a broad range of stakeholders were reported in the farming press. For example, the NFU supported this change of government direction as summarised in FW (10/12/2010):

> "*The use of vaccination is not at present cost-effective and it is widely agreed that it will not reduce the incidence of bTB as fast as can be expected with culling. Also in*

addition there is no evidence that vaccinating badgers will have a positive effect upon cattle disease incidence".

In comparison, the Badger Trust was reported to be "*disappointed"* with the decision to limit the scale of the BVDP (FG 28/6/2010) and warned against drawing conclusions about the effectiveness of vaccination "*in the light of this now truncated and consequently distorted project".*

While concerns regarding badger vaccination were clearly evident in the farming press during the study period, the experience of other countries in addressing bTB were regularly reported and, in doing so, a consensus in relation to the role that badger vaccination can, in part, play in controlling bTB in the long-term became evident. For example, according to the FG (06/07/2007), there is an acceptance by officials in Ireland that culling the badger population is a "*stop-gap measure"*, and that vaccination would replace culling in the future. The Irish Deputy Chief Veterinary Officer, quoted in the same article (FG 06/07/2007) warned of *"many obstacles*" to the development of a wildlife vaccine. In Wales, where control policies and initiatives have developed almost asymmetrically to England, the NFU Cymru gave support to the development of vaccination, but only within the context of delivering a longer term strategy for eradication of the disease (FG 03/08/2009, FG 19/10/2010). However, the limitations of vaccination and the need for a range of measures to be employed was highlighted in the FW (24/03/2010) by a then Welsh Assembly Government spokesman who stated that: "*Our policy is to eradicate TB in all species. This is why we have adopted a comprehensive package of measures".* The Welsh Minister of Rural Affairs later added that "*vaccination cannot resolve this problem on its own"* (FG, 20/09/2010). However, in May 2012 the Welsh Government implemented a five year badger vaccination project in the Intensive

Action Area in South-West Wales, following a change in policy away from culling towards vaccination.

As Defra announced plans for pilot badger culls in December 2011, the number of articles covering badger vaccination in the media began to increase, particularly in the national press. An article published in the Guardian (14/12/2011) provided the lengthiest coverage of this event, whilst the new plans were also covered briefly in the Times (17/12/2011), and regional papers (Gloucestershire Echo 16/12/2011, Herald Express 22/14/2011). In the early summer of 2012, The Badger Trust took the case of culling to the High Court, arguing the culls would not "*prevent the spread of disease*" (Guardian 25/06/2012). Following the verdict that badger culls would be legal, David Bowles of the RSPCA was quoted in the Independent (17/2/2012):

> *"It will wipe out huge numbers of this much-loved species, virtually eliminating badgers from these areas… [Badger] Vaccination could be a more effective and sustainable way of dealing with the disease, and one which does not involve killing most of the badger population in very large areas of the countryside."*

The changing political agenda surrounding the role of badger vaccination has been widely reported in the media. Political figures are regularly quoted, framing bTB control measures in different ways (either negatively or positively) to shape public understandings and to seek support for their approach. The conflicting political messages, as reported in the media, further intensify the knowledge controversies surrounding bTB control and the role that badger vaccination might play.

5.3 Victim vs. culprit

In order to more fully understand public understandings of the debates around badger vaccination, it is useful to explore the way in which different actors within the bTB debate are portrayed in the media. A victim vs. culprit dualistic framing was also evident in the press. This focused mainly on blame, and how different groups allocate that blame. Badgers, cattle, farmers, and the Government were each portrayed as both victim and culprit by the press, as discussed in the following sub-sections.

5.3.1 Badgers and cattle

The two opposing framings of the good-bad badger presented by Cassidy (2012) were prevalent throughout this media analysis. Cassidy's conceptualisation goes some way towards explaining the public controversy surrounding the control of the animal. However, also important is the role of the badger in spreading the disease. Within the time period covered by this media analysis, the focus of badger control policy continually changed. Further complicating the debate was the devolution of bTB policy and the different stances taken by Westminster and the Welsh Government, as explored in the previous section. While those supporting badger culling argued that there is sufficient evidence to warrant the control of badgers, those opposed maintained that badgers should be protected. Analysis of the three types of media identified a general consensus that badgers are a source of bTB in cattle. However, the extent to which badgers contribute to disease spread continues to be debated. For example, in FG (23/11/2012) it was reported that "*In areas of high disease incidence infected badgers will undoubtedly infect cattle*." Badgers are also assigned the role of culprit in the national and regional press, although this is often when farmers are being quoted. For

example, a Gloucestershire dairy farmer quoted in the Daily Telegraph (24/04/2009) explained:

> *"There is no doubt in my mind that badgers are the main culprits…All it takes is one sick badger to cough in or near the cattle feed and the bacteria spreads like a virus in a primary school."*

It is not only the issue of disease which causes tension between farmers and badgers. For example, the Guardian (22/06/2013) reported the following quote from a dairy farmer:

> *"I am not on the side of the badger…They've uprooted all the orchids, and killed or eaten all the hedgehogs. They're still treated like a protected species, but they're actually quite a damaging animal."*

This emphasises the role of lay understandings of wildlife particularly in relation to keeping nature in balance. The extent of the badger's role in spreading the disease remained a source of debate within the press with one article explicitly suggesting that *"badgers aren't the main problem"* (Western Mail 27/10/2009). In 2012, the Independent (12/07/2012) reported that:

> *"At a hearing last month, the [Badger] Trust accused the livestock industry of using badgers as a scapegoat and underestimating the risk of cattle-to-cattle transmission of bovine tuberculosis."*

In such instances, badgers were seen to be the victim of misguided disease control policy.

After the change of government in 2010, and as policy discourses began to incorporate the possible implementation of a badger cull, cattle were also drawn into the victim vs. culprit debate. The victim-culprit paradox is emphasised by the use of emotive or euphemistic language to describe the death of either badgers or cattle. Phrases used in the regional press to describe the death of cattle, range from *"Some 40,000 cattle are lost every year"* (The

Gloucestershire Citizen, 02/06/2010) to cattle being *"needlessly slaughtered"* (Western Morning News 27/05/2010) or *"destroyed"* (Western Daily News, 31/05/2010). Similarly, depending on the stance of the author, the death of badgers is described very differently. For example, quoted in the Somerset Guardian (03/06/2010) and speaking in favour of a badger cull, chairman of the Royal Association of British Dairy Farmers suggested that badgers *"need to be removed"*. The same euphemism was used by Wales Chief Veterinary Officer, also in favour of a cull (FG, 01/06/2010). In contrast, those against culling use phrases such as the "*complete extermination of our native badgers"* (Brian May, quoted in the Gloucestershire Citizen, 02/05/2010) and *"[badgers] will pay the ultimate price"* (letter from a member of the general public to the Western Daily News 05/06/2010).

5.3.2 Government

When badgers are portrayed as victims, it is often the Government that becomes the culprit. Poorly thought-out policy and mismanagement of the bTB situation were regularly blamed for the continued spread of the disease. Before the change of government in 2010, the Labour Government was criticised for its lack of action to tackle the disease. For example, in 2009 an article published in the Western Morning News (02/07/2009) suggested that:

> *"Farming organisations are justifiably pointing out that the spread of bovine TB may be laid firmly at the door of a New Labour administration that cared little, and understood less, about farming and the countryside."*

At the time, many of the articles, particularly those appearing in the farming press, were questioning the ability of government officials to manage the disease. Phrases such as "*dilatory antics*" echo the frustrations felt by many farmers in relation to the lack of action

taken by the Government to tackle the disease. This negativity was often supported by reference to monthly statistics released by Defra reporting increasing numbers of cattle being slaughtered due to bTB. Nonetheless, at the same time, Government representatives defended the approach adopted by their respective administrations in the press. For example, according to the Rural Affairs Minister for the Welsh Government quoted in the Western Mail (03/11/2009):

> *"Every decision on TB eradication for the past two years had been based on rigorous analysis of all available evidence, consultations with experts and investigation of ethical and environmental considerations."*

The article in question emphasised the difficulties that successive governments have faced in terms of appeasing both the generally pro-cull farming industry and anti-cull/pro-vaccination campaigners such as the Badger Trust.

5.3.3 Farmers

The victim-culprit framing is complicated further by the role of farmers. Farmers are most often presented as victims in the farming press, with 55.6% of articles noting the emotional and financial strain caused by the disease. For example, an article published in FW (25/10/2012) quoted the Conservative MP for Shrewsbury and Atcham, who stated: "*Grown men and myself have sat round the table and cried…The impact that slaughtering a herd has on farmers and their families is devastating*." However, the framing is also evident elsewhere. For example, the Gloucestershire Echo (11/09/2013) quoted the Chief Executive of Gloucestershire Wildlife Trust, who said: "*We are very conscious of the hardship that bTB causes our farming community.*" In other articles, particularly in the national press, farmers

are blamed for the spread of the disease through intensification and modern farming practices (see for example Daily Mail 25/05/2010). Farmers causing their own hardship was highlighted in the Western Daily Press (25/05/2013) where it was suggested that, "*if farmers would sort out their biosecurity they wouldn't keep bringing the problem of TB on themselves*". An article published in the Telegraph (13/02/2013) also suggested that farmers have caused the disease problem in the wildlife population.

It is clear from the above that the victim vs. culprit debate has become increasingly heated and, in some instances, emotive as the implementation of a badger cull became more firmly rooted in Defra's bTB eradication programme and the focus on badger vaccination was reduced. While both the pro and anti-cull/vaccination lobbies are represented in all press sources, a higher proportion of articles featured in the national press put forward arguments in opposition to the cull. In comparison, while there was slightly more support for the approach among the farming press, both the farming and regional press were fairly balanced in the arguments put forward. The use of emotive framings and the polemic representation of certain stakeholders fuel the controversies surrounding bTB control.

5.4 Quantitative summary of the three framings

Table 2 reports the percentage of farming, national and regional articles which made a direct reference to a particular aspect of the frames discussed above. For example, the table shows that 67.9% of the articles from the farming press included a pro-badger vaccination reference, while 49.0% also made an anti-badger vaccination reference. It also shows that the coverage of badger vaccination was fairly consistent with a high proportion of articles making pro-

vaccination references. Less space was given to anti-vaccination stances, particularly within the regional press. The regional press in the South West covered the subject of badger vaccination more often and in greater detail than in the other regions and at a national level. This is not surprising as the South West has a high incidence of bTB breakdowns and Gloucestershire is home to the BVDP. Approximately one quarter of the media coverage presented badgers as a victim of bTB; this frame was slightly more prevalent in the farming press. Farmers were often presented as victims in the farming press where over a half of all analysed articles including at least one reference to farmers being victims of bTB. Yet, farmers were also presented as culprits of bTB across the media sources. The largest difference in coverage relates to the badger being presented as the culprit of bTB. While only a small proportion of national and regional press coverage was framed around 'badger as culprit', over 60% of the farming press included this reference. The coverage of the Government was fairly consistent across the media sources. Science is clearly a focus in the farming press, as well as receiving significant attention in the national press. Reference to science was far less prominent in the regional press. Instead, the regional press makes more reference to reality, reporting on individuals' experiences or the implementation of particular control measures.

Table 2: Summary of press coverage relating to the three dualistic framings

Badger vaccination vs. Badger cull		Victim vs. Culprit		Science vs. practical reality
Badger vaccination	Badger cull	Victim	Culprit	

	Pro	Anti	Pro	Anti	Badger	Farmer	Badger	Farmer	Government	Science	Reality
Farming press	67.9%	49.0%	68.2 %	57.1 %	33.4 %	55.6 %	60.8%	19.6 %	53%	78.4 %	64.2%
National	71.3%	45.7%	56.4 %	63.8 %	25.5 %	26.6 %	18.1%	15.9 %	51.1 %	65.9 %	4.3%
Regional	67.0%	38.8%	47.3 %	54.8 %	19.1 %	30.8 %	14.4%	7.4%	46.8 %	7.9%	77.1%

6 Discussion and conclusion

The role of badger vaccination as a bTB disease control measure has been met with a great deal of uncertainty in the media. As the findings of this media analysis have shown, there are numerous debates which surround its use and future prevalence in disease control policy. The political prominence of badger vaccination has changed since 2010 and is now no longer seen as the main tool for tackling the disease in wildlife in England; instead, it is part of a wider 'toolbox' of measures. This evolving policy message is notable over time across the press articles analysed. However, the media is often unclear on the potential role of vaccination. This is heightened by the limitations around the available evidence proving the efficacy of badger vaccination. This echoes other vaccination knowledge controversies such as the MMR vaccine discussed earlier. A lack of scientific consensus requires farmers to take

a ‘leap of faith’ based on their own rationality and familiarity, some of which may well be influenced by the media (Brownlie and Howson 2005).

Badger vaccination is therefore discussed both independently and as a part of a wider strategy. Most commonly, badger vaccination is presented alongside culling and comparisons are often made between the two. While vaccination is considered to be the most humane option, concerns have been raised regarding its efficacy in relation to badgers that are already infected. Additionally, concerns were raised in relation to the practicalities associated with cage trapping badgers and ensuring that a sufficient proportion of the population is vaccinated. Culling was seen as a more reliable method, although it is often condemned by animal rights activists. When making comparisons between the two measures, quotes in the media from farmers emphasise the recognition that vaccination fails to address the lack of natural balance in the badger population, an issue that has been noted elsewhere (see for example Maye et al 2014).

Throughout this media analysis of badger vaccination, some interesting themes have emerged. An overarching factor influencing the portrayal of badger vaccination in the press is the changing nature of government and how this influences bTB control policy. This has led to confusion in relation to the role and prominence of badger vaccination. Initially, the BVDP was a larger project and the Government was committed to badger vaccination as a key control measure. However, in 2010, the BVDP was reduced in scope and the role of badger vaccination became less clear. This was echoed in the press as vaccination was increasingly compared to culling, particularly in relation to practicality, effectiveness and cost.

The inconsistencies that run throughout the reporting of badger vaccination in the media are further complicated by the way science and evidence are presented to support different viewpoints. Some researchers, particularly Wilkinson (2011), have explored the bTB evidence base and emphasised the lack of any conclusive findings that would point towards a clear direction for disease control policy (see also Grant, 2009). Throughout the media coverage, the findings of the RBCT and research undertaken by FERA are reported both in support of and opposition to both badger vaccination and culling. Different aspects of the studies are often reported without reference to their wider context. Additionally, the original conclusions of the RBCT have recently come into disrepute (see for example Fenwick 2011); this has found its way into the media, adding to the lack of a clear evidence base on which to frame disease control arguments.

Within the debate, the role of badgers in spreading bTB was discussed, raising questions about the need for any kind of badger control measure. Drawing on Cassidy's (2012) good-bad badger paradox, much of the debate presented in the press is framed around the victim vs. culprit dualism. The media has presented badgers, cattle, farmers and the Government as both victim and culprit. While badgers are mainly blamed for spreading the disease, some consider the animal to be a scapegoat. Similarly, particularly within the farming press, farmers are seen as victims of the Government's poor management of the disease. However, in some instances farmers are also presented as culprits, fuelling the spread of the disease through intensification and poor husbandry. While the Government is often condemned by the press for its lack of action, their difficult position of appeasement is also recognised. Where the responsibility for disease control lies is, therefore, not explicit.

This analysis has identified a series of complex debates which run throughout the coverage. Rather than clarifying the knowledge controversy that currently surrounds bTB control, the complex and at times emotive framings that are evidenced in the media coverage are likely to continue to fuel the controversies further. The role of badger vaccination, or indeed disease control in general, remains inconclusive. The debate is dichotomised through a number of paradoxical framings, both in relation to the various bTB stakeholders and the control strategies themselves. Thus the various political, social and economic controversies associated with the issue have become the focus of the media coverage. Following Friedman et al's (1999) argument, it is the *uncertainty* that has become the public focus, fuelled by the consistently dualistic framings of the issue in the media. If, as Curran et al (1987) suggest, the media represents an important influence on people's attitudes, it is likely that attitudes towards badger vaccination will remain contested.

7 References

ABC (2014) Farmers Weekly Circulation Certificate. Reed Business Information Limited

Augoustinos, M., Crabb, S. and Shepherd, R. (2010) Genetically modified food in the news: media representations of the GM debate in the UK. *Public Understanding of* Science. 19: 98-114

Bauer, M. B. and Bonfadelli, H. (2002) Controversy, media coverage and public knowledge. In, Bauer, M. W. and Gaskell, G. (eds.) *Biotechnology - the Making of a Global Controversy.* Cambridge University Press: Cambridge.

BCPC. (2012) *Farmers Guardian and BCPC Relaunch Congress.* [online] Available from: http://www.prnewswire.co.uk/news-releases/farmers-guardian-and-bcpc-relaunch-congress-152724385.html [Date accessed: 10/09/2012]

Brownlie, J. and Howson, A. (2005) 'Leaps of Faith' and MMR: An empirical study of trust. *Sociology*. 39(2): 221-239

Cassidy, A. (2012) Vermin, Victims and Disease: UK Framings of Badgers In and Beyond the Bovine TB Controversy. *Sociologia Ruralis* 52(2): 192-214.

Cookson, C. (2002) Benefit and risk of vaccination as seen by the general public in the media. *Vaccine*. 20:S85-S88

Curran, J., Smith, A. and Wingate, P. (eds.) (1987) *Influences: Essays on media power in the twentieth century.* Methuen & Co. Ltd.

Defra (2011a) Bovine TB Eradication Programme for England, Defra

Defra (2011b) Bovine TB: National spread since 1986. Defra.

Defra (2014a) The Startegy for Achieving Officially Bovine Tuberculosis Free Status for England. Defra [online] Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/300447/pb14088-bovine-tb-strategy-140328.pdf

Defra (2014b) *Monthly publication of National statistics on the incidence of tuberculosis (TB) in cattle to end March 2014 for Great Britain.* Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/310854/bovinetb-statsnotice-14may14.pdf.

Defra (2014c) Badger vaccination scheme launched to curb bovine TB spread. [online] Available at: https://www.gov.uk/government/news/badger-vaccination-scheme-launched-to-curb-bovine-tb-spread

Denton, R. E. and Kuypers, J. (2002) *Press Bias and Politics: How the Media Frame Controversial Issues.* Greenwood Press.

Enticott, G. (2008a) *Biosecurity, "Sound Science" and the Prevention Paradox: Farmers' Understandings of Animal Health*. The Centre for Business Relationships, Accountability, Sustainability & Society (BRASS), Cardiff University.

Enticott, G. (2008b) The spaces of biosecurity: prescribing and negotiating solutions to bovine tuberculosis. *Environment and Planning A* 40(7): 1568-1582.

Enticott, G. (2011) The local universality of veterinary expertise and the geography of animal disease. *Transactions of the Institute of British Geographers* 47(1): 75-88.

Enticott, G. and Franklin, A. (2009) Biosecurity, Expertise and the Institutional Void: The Case of Bovine Tuberculosis. *Sociologia Ruralis* 49(4): 375-395.

Enticott, G. and Vanclay, F. (2011) Scripts, animal health and biosecurity: the moral accountability of farmers' talk about animal health risks. *Health, Risk and Society* 13(4): 293-309.

Enticott, G., Maye, D., Ilbery, B., Fisher, R. and Kirwan, J. (2011) Farmers' confidence in vaccinating badgers against bovine tuberculosis. *Veterinary Record*. 10.1136/vr.100079

Farmers Weekly. (2012) *Farmers Weekly - Our Media.* [online] Available from: http://www.fwi.co.uk/mediacentre/our-media/ [Date accessed: 07/09/2012]

Fenwick, N. I. D. (2011) Modelled impacts of badger culling on cattle TB in a real area with geographic boundaries. *Veterinary Record doi: 10.1136/vr.100051*

Friedman, S. M., Dunwoody, S. and Rogers, C. L. (1999) *Communicating Uncertainty: media coverage of new and controversial science.* Lawrence Erlbaum Associates, Inc.

Grant, W. (2009) Intractable policy failure: The case of bovine tb and badgers. *The British Journal of Politics and International Relations* 11: 557-573

Gurevitch, M., and Levy, M. (1985) *Mass communication yearbook*. Vol 2. Beverly Hills, CA: Sage

Hajer, M. and Laws, D. (2006) Ordering through discourse in Moran. **In**, Rein, M. and Goodwin, R. (eds.) *Public Policy.* Oxford University Press: Oxford.

Kellstedt, P. (2000) Media Framing and the Dynamic of Racial Policy Preferences, *American Journal of Political Science*. 44 (2): 245-260

Lockie, S. (2006) Capturing the sustainability agenda: organic foods and media discourses on food scares, environment, genetic engineering, and health. *Agriculture and Human Values* 23: 313-323.

Lodge, M. and Matus, K. (2014) Science, Badgers, Politics: Advocacy Coalitions and Policy Change in Bovine Tuberculosis Policy in Britain. *Policy Studies Journal*. 42(3): 367-390

Marks, L.A., Kalaitzabdonakes, N., Wilkins, L., and Ludmila, Z. (2007) Mass media framing of biotechnology news, *Public understanding of science.* 16: 183-203

Maye D, Enticott G**,** Naylor R, Ilbery B, Kirwan J. (2014) Animal disease and narratives of nature: Farmers' reactions to the neoliberal governance of bovine Tuberculosis. J*ournal of Rural Studies,* DOI: 10.1016/j.jrurstud.2014.07.001

McCarty, C. W. and Miller, M. W. (1998) A versatile model of disease transmission applied to forecasting bovine tuberculosis dynamics in while-tailed deer populations. *Journal of Wildlife Diseases* 34(4): 722-730.

McCombs, M.E. and Ghanem, S.I. (2001) The Convergence of Agenda Setting and Framing, **in** S.D. Reese, O.H. Gandy and A.E. Grant (eds.) *Framing Public Life: Perspectives on Media and our Understanding of the Social World*, pp. 67–81. Mahwah, NJ: Lawrence Erlbaum Associates

Nerlich, B. (2004) War on foot and mouth disease in the UK, 2001: Towards a cultural understanding of agriculture. *Agriculture and Human Values.* 21: 15-25

Poltorak, M., Leach, M., Fairhead, J. and Cassell, J., (2005) 'MMR talk' and vaccination choices: An ethnographic study in Brighton. *Social Science and Medicine*. 61: 709-719

Ramsey, D., Spencer, N., Caley, P., Efford, M., Hansen, K., Lam, M. and Cooper, D. (2002) The Effects of Reducing Population Density on Contact Rates between Brushtail Possums: Implications for Transmission of Bovine Tuberculosis. *Journal of Applied Ecology* 39(5): 806-818.

Robinson, P. (2001) Theorizing the influence of media on world politica: models of media influence on foreign policy. *European Journal of Communication* 16: 523-544.

Tuyttens, F. A. M., Delahay, R. J., Macdonald, D. W., Cheeseman, C. L., Long, B., & Donnelly, C. A. (2001). Spatial perturbation caused by a badger (Meles meles) culling operation: implications for the function of territoriality and the control of bovine tuberculosis (Mycobacterium bovis). *Journal of Animal Ecology 69*(5), 815-828.

Viella-Vila, M. and Costa-Font, J. (2008) Press media reporting effects on risk perceptions and attitudes towards genetically (GM) food. *The Journal of Socio-Economics,* 37(5): 2095-2106

Warren, M., Lobley, M., & Winter, M. (2013). Farmer attitudes to vaccination and culling of badgers in controlling bovine tuberculosis. *Veterinary Record*, *173*(2), 40-40.

Whatmore, S. (2009) Mapping knowledge controversies: science, democracy and the redistribution of expertise. *Progress in Human Geography* 33, 5, 587-598.

White, P. C. L. and Whiting, S. J. (1999) Public attitudes towards badger culling to control bovine tuberculosis in cattle. *Veterinary Record* 147: 179-184.

Wilkinson, K. (2011) Organised chaos: an interpretative approach to evidence-based policy making in Defra. *Political Studies* 59: 291-306.

Yearley, S. (2000) Making Systematic Sense of Public Discontents with Expert Knowledge: Two Analytical Approaches and a Case Study. *Public Understanding of Science* 9: 105-122.

[i] Perturbation in this context refers to the action of disturbing badgers' natural social structure which can cause increases in badger movements beyond their normal territories and thus potentially spread TB. For a detailed discussion of perturbation, see Tuyttens et al (2001).