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Public debate on bovine tuberculosis eradication: Topics and metaphors in the trans-Pyrenees region (Spain and France) 2018–2020

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ABSTRACT

The management of bovine tuberculosis (bTB) is a controversial issue due to the different positions of stakeholders regarding diagnosis and treatment. Considering how they conceptualize bTB might influence the acceptability of eradication programmes, we analyse communication materials published by a range of sources in Spain and France, two countries dealing with this disease. We use content and discourse analyses to investigate topics associated with bTB and to detect metaphorical frames used for talking about it. We identify disease detection and control as a dominant issue bolstered by metaphors of battle and war and by images of farmers having to obey other stakeholders' orders. We argue instead in favour of a less warlike perspective in institutional and scientific communication, which also gives farmers more visibility in bTB management.

1. Introduction

Metaphors play an important role in shaping the way infectious diseases are communicated in the public sphere (Ribeiro et al., 2018), especially when there is no consensus on how their definition and control should be approached. If so, they become key in the promotion of certain frames aimed at imposing the public understanding of the disease and at guiding and seeking public opinion's validation of the policy responses designed to confront it (Nerlich, 2004). And, together with the frequency by which a particular topic is associated to the disease, they can reveal information on the perception and the positioning of the different actors involved in its management. For instance, talking about a disease mainly in detection and control terms may downplay economic and social aspects and can lead to a conceptualization based on a military imagery rather than a more inclusive frame. In this article, we argue that this is the case for Bovine tuberculosis (bTB) – a chronic disease caused by *Mycobacterium bovis* or, less commonly, *Mycobacterium caprae*, which affects livestock (especially cattle) and wild animals and can lead to zoonotic disease transmission to humans –, where stakeholders maintain different positions regarding diagnosis and

treatment.

In developed countries, bTB causes significant economic losses, in both costs to the cattle industry and costs to the government in the form of control programmes, restrictions on animal movement, and compensation for the slaughter of bTB-positive animals. European Union (EU) legislation dictates that disease eradication in member states is necessary, not only to protect the health of people, but also to facilitate free trade in animals and animal products (Robinson, 2017a). Despite the fact that eradication programmes have been in place for several decades, eradication has not been fully achieved, and bTB continues to be a costly and frustrating problem. In the trans-Pyrenean region, straddling Spain and France, the disease is unevenly distributed, with areas of both low and high incidence. In Spain, after nearly two decades of application of the national eradication programme, bTB continues present, with prevalence of around 1.48% (Ministerio de Agricultura, Pesca y Alimentación (MAPA), 2023). France is considered a bTB-free country since 2000, although infected herds have annually been sporadically detected in various areas.

Persistence of bTB despite eradication efforts makes bTB the subject of intense research and debate as to how to tackle the problem. Authors

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have argued that the success of eradication programmes does not rely solely on technical or health aspects, but also on environmental aspects, including interaction with wildlife and economic, sociological, anthropological, and communication aspects. Ciaravino et al., 2020, for instance, have identified non-biological issues as reasons for continued prevalence of the disease. These include cultural values (Enticott, 2008), socioeconomic factors (Bennett, 2017; Robinson, 2017b), and people's attitudes and perceptions (Enticott, 2015). The presence, not of technical or health-related issues, but of social aspects that influence the success of control and eradication programmes makes their investigation by the social sciences necessary (Robinson, 2017b). Thus, Naylor et al. (2017) and Ciaravino et al., 2017 argue that while bTB control has received extensive attention from epidemiology and the natural sciences, limited research has been conducted on how bTB is communicated and debated.

Building on previous research investigating metaphor and infectious diseases (Larson et al., 2005; Nerlich, 2011; Balteiro, 2017; Lu and Schuldt, 2018; Ribeiro et al., 2018; Döring and Nerlich, 2022), as well as topics (Enticott, 2008; Hamilton et al., 2019; Ciaravino et al., 2020; Clarke et al., 2022) and frames of bTB (Cassidy, 2012, 2019; Naylor et al., 2017; Robinson 2017a; Keenan et al., 2020), in this work we examine two low-prevalence (below 1%) trans-Pyrenean regions, namely, Catalonia¹ (Spain) and the Pyrénées-Atlantiques (France), analysing the role played by communications – as the social dimension of the bTB control and eradication problem – in creating a climate of alertness aimed at maintaining low disease incidence. More specifically, we aim to evaluate how communications may affect the success or failure of control and eradication programmes in the trans-Pyrenean region. To address this knowledge gap, we apply content and discourse analyses to communication materials aimed at stakeholders, published between 2018 and 2020 in Spain and France. By examining topics and metaphorical expressions used to frame the disease, we aim to determine what this conceptualization implies for the implementation and acceptance of eradication and control programmes.

2. Theoretical framework

Our study is situated in a line of research that analyses how bTB is communicated. It considers that communication is key in conflictual issues, since how a topic is discussed conditions perceptions and actions. In summary, the academic literature on the topic agrees that eradication of bTB is a controversial and complex (invisible, amorphous, ubiquitous, etc) problem due to the different perspectives of stakeholders. Farmers tend to be sceptical about control programmes, which to date have failed to achieve zero risk and jeopardizes their livelihoods, as farmers have to get rid of their cattle (and to absorb the consequent economic loss). However, scientists, veterinarians, and institutions defend the implementation of control programmes, i.e. eradication, as the only way to prevent health and food-safety problems, claiming a superiority in knowledge. Naylor et al. (2017:4) therefore refer to this difference in understanding of the disease as “knowledge controversy”. Robinson (2017a) detects a gap between scientific discourse and perceptions in circulation regarding knowledge of the disease, while Naylor et al. (2017) highlight the limitations of expert knowledge and the need to concede legitimacy to a broader range of perspectives on bTB.

These different positions on bTB materialize in discourse in the public sphere, a discursive space where knowledge of public interest is shared. In this space, when those affected by bTB refer to the disease, the choice of words, expressions, and concepts plays an important role in defining and understanding the issue. Thus, public statements about bTB often use language that sometimes promotes antithetical views. This

allows competing discourses to develop, which, according to Keenan et al. (2020), need to be bridged, e.g., by using frames that do not lead to an impasse, but rather allow rapprochement between positions. Similarly, Ciaravino et al., 2017:13) point out that “improvement of communication strategies should be considered as a priority, as it seems to be a major factor influencing the trust between stakeholders and the effectiveness of the eradication plan.” Therefore, if we start from the premise that language, in framing issues in a certain way, influences public opinion and so is not neutral, then we need to study how bTB is discursively constructed in order to understand the implications of definitions regarding its management. As pointed out by Keenan et al. (2020:485), “research on environmental conflicts has shown that the ways in which the stakeholders frame the issues and the conflict itself explain collaborative success or failure”.

Language is the means by which we create frames, i.e., the mental structures that reflect how we see the world. Thus, a specific frame chosen to reflect a reality is a means to describe, understand, and evaluate that reality (Entman, 1993). The ideas underlying a frame are reflected in specific linguistic choices, being metaphor a relevant one (Gamson and Modigliani, 1989). Metaphors allow us to understand a complex, new, or conflictive issue (in this case, bTB) based on realities that are close to us or that are common knowledge (Bougher 2012). These structures for expressing meaning establish an association between two concepts, as a point in common through which exchange is made possible. In other words, the issue we are referring to (target domain) is linked to some previous experience or knowledge of the audience (source domain) (Lakoff and Johnson, 1980). In this linkage, “metaphor can render a description more accessible, vivid, and acceptable” (Zhang, 2021:722). Therefore, beyond being a means for structuring the world of the audience through discourse, metaphor is potentially persuasive because it also affects perceptions of the conceptualized issue (Semino, 2008; Ottati and Renstrom, 2010; O'Mara-Shimek et al., 2015). This is possible due to analogy, i.e., a reality is defined in terms of a concept that raises the audience's interest and helps them understand and ponder on it by making relevant inferences about the target (Lakoff, 1993). Shaw and Nerlich (2015) consider metaphors to be powerful anchoring devices that privilege particular understandings of a problem over other possible interpretations and Nerlich (2004:6) does also talk about them as action frame[s] that have “influence on policy decisions and the acceptance or rejection of policies by the general public”.

Metaphors are used for communication purposes in a variety of fields, including science, where they are pervasive in many areas, from theory building to science communication (Stelmach et al., 2022). Likewise, they are considered to be crucial cultural and linguistic tools for conceptualizing disease (Sontag, 1979; Semino et al., 2017) and the control of infectious diseases (Larson et al., 2005), such as bTB. In an analysis on metaphor use in scientific communication, Frezza (2016) underlines that the dialectic between different actors (scientists, experts, journalists, politicians, regulators, physicians, opinion leaders, the general public) in the use of argumentation to talk about controversial topics may result in diverging argumentative narratives that are often expressed by metaphors. Hence, by identifying metaphorical expressions used by bTB stakeholders, we can explore different perceptions of the disease and the supporting rhetorical strategies that make them more persuasive for the public. In doing so, our research aims to contribute to the current knowledge on the use of the linguistic mechanism of metaphor in bTB discourse.

From a broader perspective, in the communications field bTB management has mainly been studied through frame analysis in the UK context. However, and taking a more sociological approach, attitudes to eradication programmes have also been investigated through surveys (in the UK, Ireland, Spain, France, and the USA), in-depth interviews (in the UK and Spain), and content analysis (in the UK and the USA). As for how bTB is framed, research has been marked by the role played by wildlife reservoirs, specifically badgers, in the spread of the disease. In keeping

¹ The Autonomous Community of Catalonia was a low-prevalence area when this study was performed but has recently achieved bTB-free status (Ministerio de Agricultura, Pesca y Alimentación, 2023).

with that, Cassidy (2012) has examined the strategic framing of badgers in debates regarding bTB in the UK media, concluding that coverage takes two opposing perspectives: the ‘good badger’, a cherished, charismatic wildlife species to be preserved, versus the ‘bad badger’, a carnivore, digger, and carrier of disease. This dichotomy has implications for understanding bTB, which should go beyond the reductive yes/no question of badger culling. In a wider study that considers scientific, political, social, and cultural controversies in the UK regarding this topic, Cassidy (2019:4) argues that bTB “is rarely depicted as a public health issue”, but either as an agriculture malaise –a chronic agricultural problem affecting farmers and government– or an environmental risk –that menaces fragile wildlife and ecosystems–, which again are mutually exclusive stories. Naylor et al. (2017) reach a similar conclusion in their analysis of regional, national, and farming press debates regarding bTB. In their work they identify three predominant frames: science versus the practical realities of modern farming (F1), badger vaccination versus badger culling (F2), and victims (farmers and badgers) versus culprits (badgers and policy) (F3). The result is a polarization of the debate that further highlights the controversy that exists in bTB definition and disease control policies.

Other authors working on frame analysis focus on reception studies, e.g., Robinson (2017a), who has explored experiences and opinions in relation to bTB control through in-depth interviews and focus groups held with dairy and beef cattle farmers, and private practice and state veterinarians. Robinson (2017a) detects three main frames used to talk about the disease: *mysterious heterogeneity* (F1), the disease is difficult to control; *vague imaginary* (F2), the disease is relatively invisible; and *everyday ubiquity* (F3), the disease is an unavoidable part of daily farming life. The same author indicates that this divergence shows that a way to understand bTB is to transcend scientific discourse, pointing to the competing versions of reality at the root of the difficulty in managing the disease. Keenan et al. (2020), building on research by Robinson (2017a) and Naylor et al. (2017), have analysed four online discussion groups on badgers comprising cull supporters, cull opponents, aligned antagonists (mixed supporters and opponents affiliated with farming or with an environmental/conservation group), and non-aligned antagonists (mixed supporters and opponents not affiliated with any particular group). The authors detect certain frame elements that lead to a stalemate in reaching consensus on disease management and also identify transformative frames that could be used to bring positions closer. What the research suggests is that it is a matter of looking for a common language and developing new narratives that facilitate the coherent integration of different points of view.

Beyond frame analysis, we may find other approaches to the study of how bTB is communicated within the UK. Enticott (2008), for instance, to explore and unpack the emergence, understanding, and rejection of new forms of biosecurity by many actors engaged in bTB management, relies on ethnographic content analysis, which combines documentary analysis of materials authored by diverse sources with the author’s attendance at meetings organised by scientists and policy makers and interviews with key stakeholders. The same author has further explored the topic by looking at farmer practices and attitudes towards bTB in the UK (Enticott et al., 2015), and by conducting a survey in four different rural areas of Wales to assess public attitudes to badger culling for bTB control in the country (Enticott, 2015). Warren et al. (2013) organized in-depth interviews with tenants in order to study attitudes to the vaccination of badgers and to the alternative of a culling programme, while Maye et al. (2014) interviewed farmers to examine how their responses to animal disease governance are shaped by their own understandings of nature and disease. O’Hagan et al. (2016) conducted an observational study on 192 farms in a high-incidence area in Northern Ireland during 2010–2011 to better understand farmer beliefs in relation to bTB control. Hamilton et al. (2019), meanwhile, thematically analysed in-depth interviews with farmers, concluding that their perspective can be understood through a ‘typology’ of feelings about bTB, particularly in how the farmers expressed feelings of blame, loss,

confusion, ignorance, resignation, and fear. For the Burren zone in Ireland, Clarke et al. (2022) thematically analysed free text responses to a survey that gathered data on farm and animal management approaches. Their study suggests that wildlife and its management, testing quality and its impact on the bTB scheme, and pessimism around eradication were important topics. As can be seen, most of these studies focus on farmer perceptions of bTB management, pointing to the need to look at how this collective processes control and eradication programmes.

As mentioned above, the topic of bTB within the communications field has also been explored in the US context, in relation to deer infection in Michigan and Minnesota. Dorn and Mertig (2005) conducted a survey of five bovine TB-issue stakeholder groups to assess and compare attitudes to bTB-related topics and support for eradication and eradication policies, concluding that stakeholders support the bTB eradication goal but are less supportive of specific eradication policies. Muter et al. (2013) analysed a sample of risk communication materials consisting of agency-based information about bTB in Michigan and Minnesota to check if they contained message components central to the extended parallel process model (EPPM) for evaluation of wildlife disease issues. They state that the success of bTB management necessitates stakeholder support via adoption of preventative behaviours that help reduce the risk of disease transmission among and between wildlife and livestock. In a similar vein, Cross et al. (2018) surveyed northwest Minnesota deer hunters to better understand how stakeholders perceive and act on information regarding disease management in wildlife and to test the utility of the risk information seeking and processing (RISP) model for such management contexts.

In Spain, Ciaravino et al., 2017 studied the opinions of farmers and veterinarians in the Autonomous Communities of Andalusia and Catalonia (high- and low-prevalence areas, respectively) through face-to-face in-depth interviews, concluding that the national bTB programme is perceived as law enforcement that lacks adequate motivation of some stakeholders, leading to a general feeling of distrust. Based on their previous study, Ciaravino et al., 2020 conducted a telephone survey of dairy and beef farmers in the same regions, official veterinarians in charge of infectious diseases control programmes at provincial and county levels, and private veterinarians authorized to carry out routine bTB testing; they detected, as important barriers for effective bTB control, wildlife reservoirs, uncertainty of diagnostic results, and lack of a perceived benefit of eradication, and recommend the design of communication strategies on those topics to increase awareness and motivation to comply with the programme. As for France, Boireau et al. (2017) carried out a sociological survey to explore the factors that lead stakeholders to participate in an experimental trial to assess the gamma-interferon test, determining that appropriate communication tools need to be established to explain the protocol and its aims and to promote farmers participation. Guélin-Poirier et al. (2022), using surveys, assessed the difficulties in protocol implementation for veterinarians, farmers, and the state. Using specific criteria, they ranked the protocols using the PROMETHEE multicriteria decision-aid method, considering the relative importance of each criterion from the decision-maker’s point of view.

As can be seen, while there is plenty of research from the perspective of veterinary science, there are few studies that adopt a sociological focus, and to the best of our knowledge, bTB has not been approached from a purely communication studies framework in the trans-Pyrenean region. Our study, therefore, also aims to add to knowledge on how bTB management is framed in this region and how differences between stakeholder perceptions on the issue can be addressed.

3. Materials and methods

This research aimed to meet the following objectives:

Obj1. To establish the main topics associated with bTB by different stakeholders involved in its management in the trans-Pyrenean region

(Spain and France)

Obj2. To identify how these stakeholders define bTB through metaphors.

Obj3. To determine the implications of differing definitions for the debate on bTB.

We used methodological triangulation consisting of content and discourse analyses. We analysed a sample made up of 219 texts (sample n1), containing the keyword ‘bovine tuberculosis’, as published by different sources (public bodies, scientists, veterinarians, and farmers) in the trans-Pyrenees region (Spain and France). To ensure homogeneity between the Spanish and French samples, the same criteria were applied to the search and selection process.

- **Keyword.** The primary topic of the selected text or item was ‘bovine tuberculosis’.
- **Geographical scope.** The studied area was the trans-Pyrenean region (Spain and France), specifically, Catalonia (Spain) and Pyrénées Atlantiques (France) and excluding other autonomous regions in Spain and other departments in France.
- **Diversity of sources.** Three main sources were considered: (1) public bodies (institutional communications); (2) research centres and groups (outreach material and science communication blogs); (3) associations, unions, federations, blogs, and specialist sectoral press (non-institutional sectoral communications of farmers and veterinarians).
- **Diffusion level.** Diffusion criteria were applied to the sources, based on read/consulted rankings (e.g., number of views for digital journals) and top positions in the main search engines (e.g., Google, Bing, Yahoo) located using the keyword ‘bovine tuberculosis’. In relation to non-institutional sectoral communications, it was agreed to limit the number of journals (sources) included in the sample to the ten with the highest circulation.
- **Time period.** Texts and items published from 2018 to 2020 were analysed. The number of items selected for each source was established under the criterion of ‘repetition’.

Content analysis was applied to investigate the topics associated with bTB in the different sources (Table 1), considering this method to be a rigorous and systematic procedure for assessing the content of documented information (Wimmer and Dominick, 2014).

Content analysis was complemented using discourse analysis, specifically critical metaphor analysis (CMA). We detected 447 metaphorical expressions (sample n2) that led to the main conceptualizations or frames used for bTB. Following Charteris-Black (2011), we started from the metaphorical expressions in order to explore different stakeholder perceptions of bTB and the supporting rhetorical strategies that make them more persuasive for the public. The qualitative methodology mentioned above was developed in three analytical stages: metaphor identification, metaphor interpretation, and metaphor explanation. A metaphor was identified when there was a break in the semantic coherence that altered the normal reading of a passage, being it a single word or a set of words (see example below). Table 2 lists the categories used to detect and code the metaphorical expressions.

Metaphorical expressions were used in practically all the analysed units. However, in many cases this was a question of catachresis, i.e., metaphors so commonly used in general language that they lose their status as such (e.g., the use of words such as ‘sacrifice’, ‘control’, ‘outbreak’, etc). Such words were only identified as metaphors when there was semantic redundancy in a text, i.e., the word was accompanied by other words that semantically referred to a specific domain.

Correspondences were identified between the source and target domains, i.e., conceptual maps were created that highlighted the common points between the two domains and the transfers of meaning between them. Conceptual maps articulate different possible narratives or perspectives of a source domain and thus guide interpretation of the conceptualized issue. To determine the narrative that underpinned the

Table 1
Sample n1 coding categories.

Category	Description	
Item Date	Number of the analysed item Publication date	e.g., 2 e.g., Unknown (last consulted May 2021)
Source	Publisher of the analysed item	e.g., Ministerio de Agricultura, Pesca y Alimentación (Spain), Ministère de l’Agriculture et de l’Alimentation (France)
Message type Target	Message type analysed Publication target	e. g., Website information General public Scientists Veterinarians Farmers Other (e. g. Hunters)
Country	Country referred to	Spain France
Publication scope	National or regional publication	National (Spain) National (France) Catalonia Pyrénées-Atlantiques Not specified
Primary topics	Main topic of the publication (Ciaravino et al., 2017)	Detection and control: Reliability of diagnosis; organizational and human resources; programme measures. Training, information, and communication: training for farmers and veterinarians, involvement of different stakeholders, communication and information circulating in and between levels and categories. Wildlife and domestic species reservoirs, hunting areas and farms, specific legislation for fighting bull farms. Economic and social aspects: Reciprocal relationships between stakeholders. Risks and eradication benefits: perception of economic risks such as programme implementation costs and direct and indirect losses due to bTB. Proposed changes to the programme and future perspectives.
Secondary topics	Topics that develop the primary topics (there may be more than one topic in the same item)	Detection and control Training, information, and communication Wildlife and domestic reservoirs Economic and social aspects bTB risks and eradication benefits Proposed changes to the programme and future perspectives.

use of a metaphor, the different expressions categorized in a source domain were grouped and studied in depth in terms of their context. Those first two phases of the CMA were completed with a detailed analysis of the metaphors used by the different stakeholders based on the pragmatic aspects of the different discourses. As an example, in declaring that “indiscriminate cattle health programmes **gamble with** the survival of many farms and turn the process into a **lottery** that can affect anyone”, the regional coordinator of Unión de Campesinos de Castilla y León (UCCL), Jesús Manuel González Palacín, is using the GAME/SPORT source domain to specifically indicate that the current eradication programme interferes with the viability of businesses, since the diagnostic technique used (intra-dermal route tuberculin) is not 100% reliable.

Samples n1 and n2 were coded by two researchers. To ensure reliable

Table 2
Sample n2 coding categories.

Category	Description
Metaphor in the analysed text	Yes/No
Metaphor	Detected metaphorical expression
Source domain (Musolff, 2004; Charteris-Black, 2011; Semino, 2008; Capdevila and Moragas-Fernández, 2019)	CONFLICT-WAR-CRIME; PERSONIFICATION; MECHANICS-PHYSICS; JOURNEY-ROUTE-MOVEMENT; NATURE-TIME; SHOW-FILM; GAME-SPORT; HEALTH-DISEASE; RELIGION-BELIEFS; FAMILY-LOVE-FRIENDSHIP; CONSTRUCTION; CONTAINER; ECONOMICS-BUSINESS; FANTASY-DREAM; OTHERS.
Target domain	Aspect to which the metaphor refers (e.g., bTB; national eradication programme; farmers; scientific advances, wildlife; livestock farms, etc.)

coding, the two coders met regularly to compare their findings. To achieve consensus, any uncertainties or disagreements were subsequently discussed and assessed in team meetings.

4. Results

The main results of the research are presented below, structured according to the specific objective they address.

4.1. Disease detection and control as a hegemonic issue

The thematic structure of the analysed units (Obj1) was the same for both countries. As Table 3 shows, in both Spain and France disease detection and control and the wildlife and domestic reservoirs were the most common topics – practically the only ones dealt with, in fact. The greatest difference between the two countries was the importance attached in the analysed publications to topics related to bTB risks and eradication benefits, featuring in 13.60% of the French articles but in only 1.3% of the Spanish articles.

Table 4 reflects a more precise x-ray of the Spanish and French topics. For Spain it can be seen that social and economic aspects and proposed changes in the programme, which had little incidence as main topics, acquired greater relevance as secondary topics in the analysed items. On the other hand, and similar to the main topics, bTB risks and eradication benefits, and training, information, and communication were little evident in the analysed sample. As for France, notable is the fact that disease detection and control and the incidence of wildlife and domestic reservoirs continue to be relevant as primary and secondary topics. On the other hand, social and economic aspects, which were not featured as a main topic, now appear as secondary topics. Absent, at the other extreme, is the topic of training, information, and communication.

While there was a certain similarity between the main topics in Spain and France, the pattern of secondary topics differed. In Spain, social and economic aspects of bTB clearly predominated as a secondary topic, while in France the most common secondary topic was bTB detection and control. The two countries coincide in that aspects related to wildlife and domestic reservoirs feature highly in both samples as secondary topics.

Table 3
Primary bTB topics.

Topics	Spain	France
Economic and social aspects	4.6	0
Detection and control	57.5	45.5
Training, information, and communication	3.9	9.1
Proposed changes to the programme and future perspectives	7.8	6
Wildlife and domestic reservoirs	24.9	25.8
bTB risks and eradication benefits	1.3	13.6
Total	100%	100%

Table 4
Primary and secondary topics in Spain and France.

Topics	Spain		France	
	Primary	Secondary	Primary	Secondary
Economic and social aspects	4.6	30.3	0	15.1
Detection and control	57.5	15	45.5	34.8
Training, information, and communication	3.9	4.6	9.1	0
Proposed changes to the programme and future perspectives	7.8	17	6	3
Wildlife and domestic reservoirs	24.9	20.3	25.8	33.3
bTB risks and eradication benefits	1.3	2	13.6	28.8
Total	100%		100%	

Analysing the relationship between topics and stakeholders in more detail, in Spain (Fig. 1) issues related to disease detection and control were the main topics of publications targeted at all groups: farmers, 65.5%; veterinarians, 54.3%; and scientists,² 50%. It is interesting to note the less frequent topics aimed at the different audiences. Training issues were not addressed for farmers or veterinarians, with only one item dealing with disease risks and eradication benefits in the case of the former.

In France (Fig. 2), as in Spain, issues related to disease detection and control were the main topics in publications aimed at farmers (33.3%), veterinarians (50%), and scientists (50%). Note that, different from Spain, proposed changes in the programme were the main thread in some of the communications addressed to farmers. It can easily be seen that the materials that targeted farmers and veterinarians dealt with a greater variety of topics than the materials aimed at scientists.

4.2. Disease definitions

In relation to our second objective (Obj2), it was found that the various stakeholders use different metaphorical frameworks to refer to the disease. Thus, the main metaphor used in institutional and science communications was the fight against the disease, while a greater variety of metaphors were used in farmer and veterinarian communications.

4.2.1. Public bodies

Both French and Spanish public bodies primarily used the war metaphor to refer to bTB. As can be seen in Table 5, Spain (70%) and France (82.1%) primarily used metaphors referring to bTB from the CONFLICT/WAR/CRIME source domain. Some examples of the war metaphors used are as follows: “The framework for **fighting** diseases caused by *Mycobacterium tuberculosis* is broad” [Ministerio de Agricultura, Pesca y Alimentación]; “The **strategy** to eradicate bovine tuberculosis includes a series of measures through regulations and documents, both at the European Union level and at the national level” [Ministerio de Agricultura, Pesca y Alimentación]; “to improve the acceptability of the control system (management of **suspected cases** adapted to the level of risk, non-systematic total slaughter, etc)” [Ministère de l’Agriculture et de l’Alimentation]; “The aim of bovine tuberculosis **surveillance and control** measures in livestock farming in France is to eradicate the disease” [Plateforme ESA].

4.2.2. Science communication

In science communications in both countries, as shown in Table 6,

² This category also includes communication materials aimed at the general public; although the materials are not published on specialized sites (for instance, a Ministry of Agriculture website), their content is mostly used by the scientific community dealing with bTB.

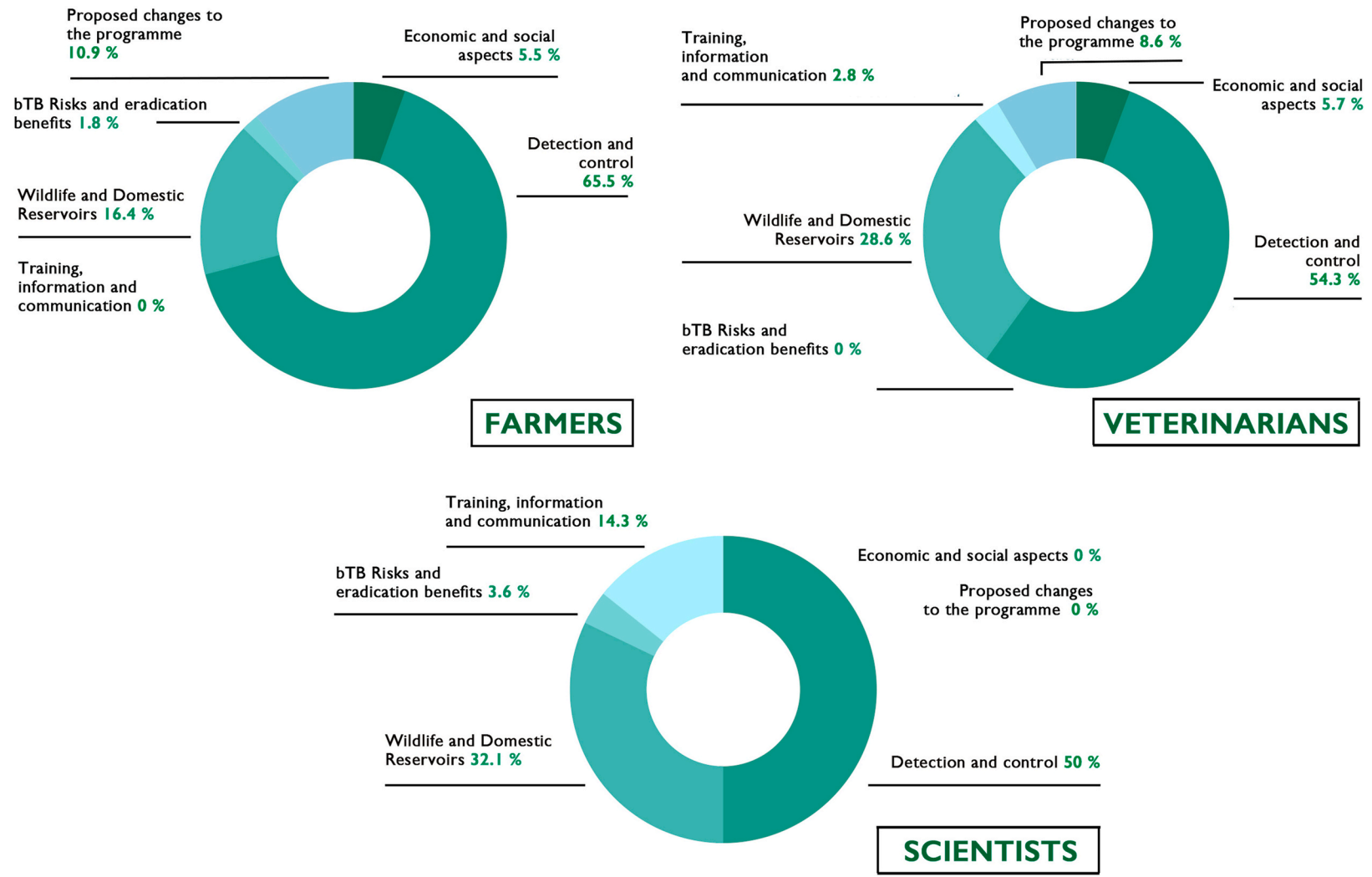


Fig. 1. Primary topics by targets in Spain.

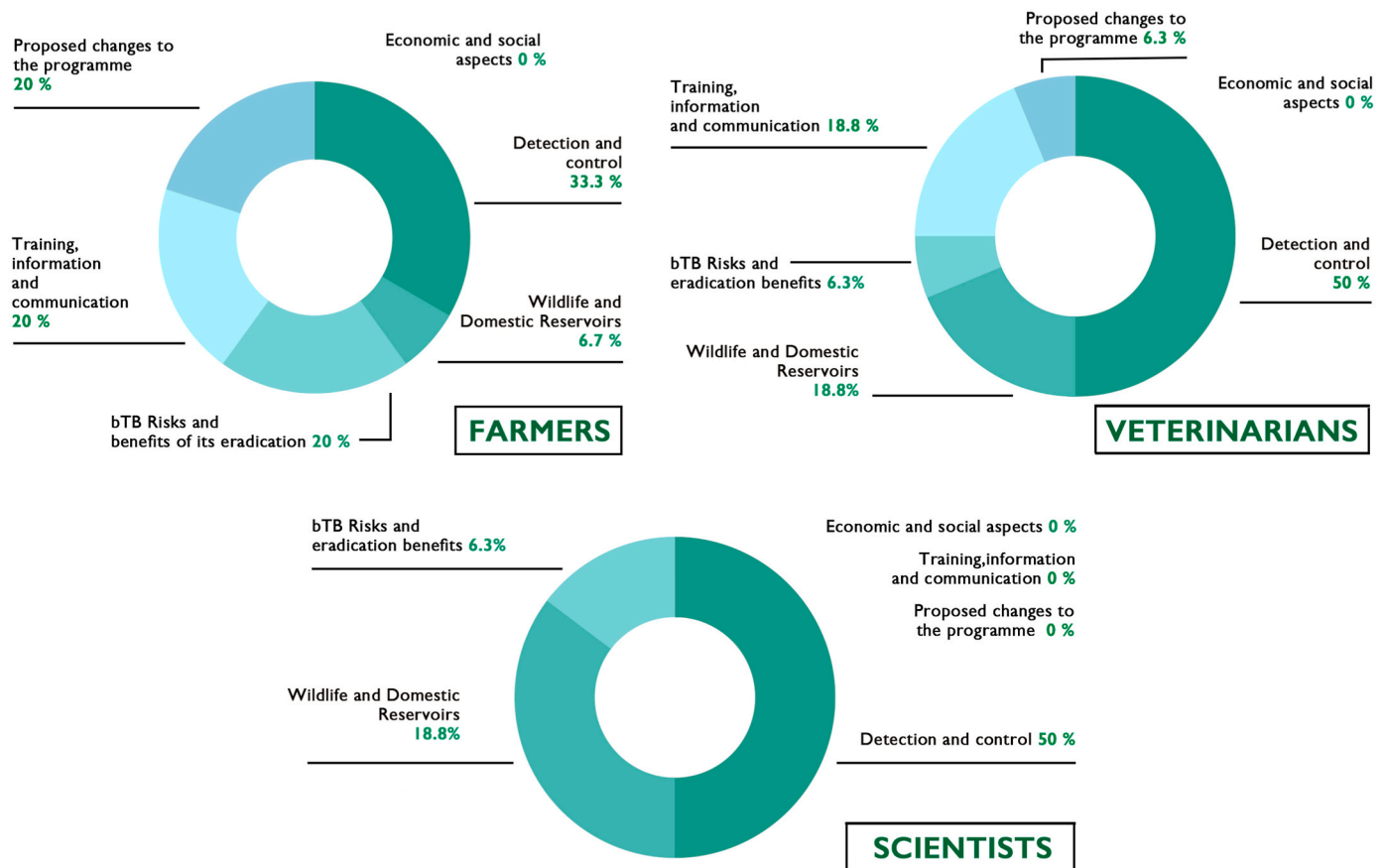


Fig. 2. Primary topics by targets in France.

Table 5
Most common bTB source domains for institutional communications.

	Spain		France	
	N	%	N	%
CONFLICT/WAR/CRIME	7	70	23	82.1
SHOW/FILM	1	10	-	-
RELIGION/BELIEFS	1	10	-	-
JOURNEY/ROUTE/MOVEMENT	1	10	-	-
CONTAINER	-	-	3	10.7
GAME/SPORT	-	-	1	3.6
PERSONIFICATION	-	-	1	3.6
Total	10	100%	28	100%

Table 6
Most common bTB source domains for science communications.

	Spain		France	
	N	%	N	%
CONFLICT/WAR/CRIME	11	32.4	94	75.2
SHOW/FILM	3	8.8	-	-
CONTAINER	13	38.2	26	20.8
JOURNEY/ROUTE/MOVEMENT	2	6	1	0.8
CONSTRUCTION	1	2.9	-	-
GAME/SPORT	1	2.9	4	3.2
MECHANICS/PHYSICS	3	8.8	-	-
Total	34	100%	125	100%

the two main metaphors used to refer to bTB were the war and the container metaphors. Metaphorical expressions from the CONFLICT/WAR/CRIME source domain were used in 32.4% of Spanish science communications and 75.2% of French science communications. The metaphorical

expressions from this domain coincided with those used by institutions. Examples are as follows: “**fight** against the disease” [IRTA-CReSA]; “The need to **fight** the disease on different fronts.” [IRTA-CReSA]; “**strategies to combat** the disease” [IRTA-CReSA]; “the **fight** against this infection” [ENSV]; “tools for the **battle**” [ENSV]; “Measures for **surveillance and to fight ...**” [ANSES].

The CONTAINER source domain was used to a greater extent in the Spanish sample (38.25%) than in the French sample (20.8%). In relation to container metaphors, bTB was considered in terms of control or lack of control, i.e., emphasis was placed the need to keep the disease within certain limits, and that control could be lost when those limits are breached. Examples are as follows: “**contain** the disease” [IRTA-CReSA]; “keep it under **control**” [IRTA-CReSA]; “keep it **constrained**” [IRTA-CReSA]; “improve disease **control** in animals” [ANSES]; “**control** wildlife infection” [ANSES].

Table 7
Most common bTB source domains for farmer communications.

	Spain		France	
	N	%	N	%
CONFLICT/WAR/CRIME	42	39.3	29	65.9
SHOW/FILM	2	1.9	-	-
CONTAINER	23	21.5	4	9.1
JOURNEY/ROUTE/MOVEMENT	17	15.9	2	4.5
RELIGION/BELIEFS	9	8.4	5	11.4
GAME/SPORT	1	0.9	3	6.8
MECHANICS/PHYSICS	8	7.5	1	2.3
HEALTH/DISEASE	5	4.6	-	-
Total	107	100%	44	100%

4.2.3. Farmers

A greater variety of metaphors to refer to bTB was evident in the communications of farmers. Thus, as can be seen in Table 7, while Spanish (39.3%) and French (65.9%) farmers mainly used war metaphors (practically the only metaphors used by institutions and scientists), they also frequently used container and movement metaphors.

Under the CONTAINER source domain, bTB was understood to be something that must be contained and kept within certain limits. Farmers were perceived as stakeholders who must set the limits and keep the disease under control. Examples of these metaphorical expressions are as follows: “Several **avenues for the fight** must be opened” [Feagas]; “that is, whether it is possible to eradicate the disease or just **control it**” [ASAJA]; “Farmers, in accepting this new **constraint**, improving restraint and accepting diagnostic slaughter ... these efforts are welcomed and encouraged by the administration.” [GDS Pyrénées Atlantiques].

Under the source domain JOURNEY/ROUTE/MOVEMENT, bTB was seen as an entity in motion, that evolves, advances, regresses, has stages, milestones, etc. Examples include: “... tuberculosis [is] a major **obstacle** to international trade” [Agroinformacion]; “The problem **comes from afar**, with more than 250,000 slaughtered.” [Agrodigital]; “... a series of interventions in wildlife species to **slow down** the rate of growth of the disease.” [Feagas]; “Behind us is a **long road** that began in the mid-1950s when the disease began to be combated.” [Feagas]; “... a marked **setback** in the evolution of the fight against the disease.” [Agroinformacion]; “Serida **puts a brake on** the spread of bovine tuberculosis.” [Feagas]. This metaphor is used on a single occasion in the French case: “... the goal of eradication is **unattainable** as long as screening and scientific knowledge of the disease remains poor.” [Confédération Paysanne]. This metaphorical perspective reflects a more dynamic and open understanding of the disease, as something that evolves and that goes through different stages.

Also noteworthy was the use of the RELIGION/BELIEFS source domain to refer to various aspects, but especially reflecting the target domain of the farmers themselves and their cattle. Going beyond the religious connotations of the word ‘sacrifice’, farmers resort to the religious imaginary of guilt, punishment, and dogmas of faith when they claim to improve control programs and develop “... a test by which that animal could be **saved from slaughter**” [tuberculosis.com] or claim “no to **punishing** farmers through unfair protocols” [Unión de Uniones] and “to put an end to **blaming** farmers affected by bovine tuberculosis and to hold public authorities accountable” [Confédération Paysanne quoted in La France Agricole], as this entails a “**stigma** [which] is unbearable and contributes to further isolating breeders affected by the disastrous management of bovine tuberculosis” [Confédération Paysanne], even by their peers: “I tried to resist the total **slaughter**, I was really considered a **plague victim** at the time, The peasant is also the **black beast** in this case” [a farmer quoted by Confédération Paysanne]. Unión de Uniones criticizes the application of unfair protocols against bTB and asks farmers to “abandon certain beliefs that have been assumed as **dogmas**” and “UPA recalls the controversial ‘and shameful’ case of the cow Carmen [saved from slaughter despite being positive for bTB] and has called for legislation to end ‘the **paradise** of zoos as so-called disease sanctuaries’”.

4.2.4. Veterinarians

Veterinarian communications is where the greatest differences were detected between the samples analysed for the two countries (Table 8), although in both cases, and in line with institutional and science communications, with a clear predominance of war metaphors (Spain 57.5% and France 58.3%).

Regarding Spain, as happened with the farmer communications, veterinarian communications used a diversity of metaphors to refer to bTB. Thus, Table 8 shows that, despite the fact that more than half of the metaphors referring to the disease were warlike, also numerous were container metaphors that consider bTB as needing control and limits.

Table 8

Most common bTB source domains for veterinarian communications.

	Spain		France	
	N	%	N	%
CONFLICT/WAR/CRIME	27	57.4	14	58.3
SHOW/FILM	2	4.3	–	–
CONTAINER	7	14.9	4	16.7
JOURNEY/ROUTE/MOVEMENT	9	19.1	2	8.3
RELIGION/BELIEFS	–	–	3	12.5
GAME/SPORT	2	4.3	–	–
PERSONIFICATION	–	–	1	4.2
Total	47	100%	24	100%

Movement metaphors were also present to refer to the disease. Some examples of metaphors framed under the CONFLICT/WAR/CRIME, CONTAINER, and JOURNEY/ROUTE/MOVEMENT source domains for Spain are as follows: “Bovine tuberculosis is a **threat**” [Animal’s Health]; “A powerful tool in the **battle** against the disease” [Portal Veterinaria]; “the **fight** against this deadly disease” [Diario Veterinario]; “the zoonotic consequences of TB have been **contained**” [Diario Veterinario]; “Proposed are reforms at the national level to **control** bovine tuberculosis” [Animal’s Health]; “no **advances** have been made in any field” [Diario Veterinario]; “to **follow up on** tuberculosis to achieve control and eradication” [Animal’s Health]; “a major **barrier** to disease control” [Animal’s Health].

Regarding France, Table 8 shows that, for veterinarian communications, the main metaphors were also centred on similar source domains to Spain, with the noteworthy exception of the use of religious metaphors. Examples under the CONFLICT/WAR/CRIME, CONTAINER, and JOURNEY/ROUTE/MOVEMENT source domains for France are as follows: “Through this original approach to TB management, the UK demonstrates its willingness to **fight** this **devastating** disease more effectively.” [Depeche Vétérinaire]; “... shows that the **mobilization** of actors on the ground, combined with the adoption of **strategies to fight** [the disease] are necessary, and lead to a significant improvement in the epidemiological situation” [Le Point Vétérinaire]; “Similar methods are currently being implemented in the broad southwest to try to **control the infection**.” [Le Point Vétérinaire]; “the implementation of new technical means and diagnostics to tackle erasing its **development**” [Depeche Vétérinaire]. As for the RELIGION/BELIEFS source domain, examples are as follows: “TB, a true **scourge** with dramatic medical and economic consequences, has long been present enzootically” [Depeche Vétérinaire]; “On November 28, 2019, a team of researchers announced, in the journal *Nature*, that they had developed a new vaccine against this **scourge**.” [Le Point Vétérinaire].

4.3. Implications for the bTB debate

The different metaphors analysed can be articulated through various metaphorical frameworks that show the stances of the stakeholders in relation to bTB in the derived narratives (Obj3).

4.3.1. Conflict/war (institutions and scientists) versus religion/belief (farmers)

There is a first dichotomy in the way stakeholders understand bTB. While all of them use war metaphors to refer to the disease, institutions and scientists use these metaphors almost exclusively. From this perspective, the disease, or the pathogen that causes it, is an enemy to vanquish in a battle in which strategies and weapons are placed at the service of the foot soldiers. The narrative deriving from this metaphorical framework is polarizing in that it posits winners and losers, and so makes it difficult to find a middle ground. In the analysed texts, in terms of management of the disease: the institutions depict a war in which they delimit the battle lines; science provides weapons such as vaccines and screening tests (which, incidentally, are perceived as ineffective); farmers, and to a certain extent veterinarians, are the foot soldiers who directly battle with the disease; and farmers and their cattle are the main

potential victims. In this narrative, farmers can be winners or losers, but as long as the disease is not eradicated, farmers are perceived and perceive themselves as defeated.

In this framework, the war metaphors used by French farmers to define their relations with the French government make sense; they transfer responsibility for dealing with the disease to public bodies, given a perception that they are not being provided with the necessary weapons or are left to battle alone. A perception of defeat leads Spanish farmers to resort to a religious metaphorical framework in their communications. They see themselves as being punished by both public bodies that impose a war framework and by the disease itself. They consider the disease to be a condemnation on them, as the institutions apply rules as if they were dogmas of faith that cannot be questioned. Their cattle are slaughtered, while wild animals are protected in paradisaical zoos, with pardoned cows (e.g., Carmen) taken to sanctuaries and given a second chance.

Faced with this scenario, farmers alternatively consider the disease in terms of metaphors of movement, which leads to their perception of disease management in a more open and less traumatic way. The metaphor of travel/movement suggests that progress with bTB sometimes advances and sometimes regresses. Setbacks are understood as obstacles to be overcome along a route marked by stages. Such metaphors generate a less dichotomous vision, since there are no winners or losers. In this narrative, the issue is not to aim to defeat or eradicate the disease, but to cause it to regress or at least prevent advances. In this context, farmers are immersed in a changing reality, perceiving that different solutions are possible that can be implemented at different speeds. For instance, the rate at which bTB can be controlled may not be the same in high- and low-incidence areas, and this would suggest differing measures for those areas.

4.3.2. Control (farmers and veterinarians) versus non-control (institutions)

We can find a second metaphorical axis centred on how bTB affects farmers and their livestock, and how they perceive wildlife as a disease reservoir; note that this perception has been heightened by pending approval of the Spanish Tuberculosis Action Plan for Wildlife Species (PATUBES) in Spain. This framework is present especially in the communications of farmers and, to a lesser extent, of veterinarians. Here farmers are perceived as being responsible for keeping bTB within certain limits – hence the metaphor of the CONTAINER. Individual farms are perceived as watertight compartments, and controls must ensure that the disease remains outside.

In this control frame, individual farmers are under great pressures to keep their farms disease-free (as evidenced by the CONTAINER metaphors used by veterinarians who demand a certain flexibility that ensures that farms do not become bunkers). Part of this pressure comes from the lack of control over wildlife, suggesting that farms are ‘porous’ and cannot be genuinely isolated, and so the disease manages to penetrate. Wildlife is perceived as a source of contagion, as wild animals lead to disease seeping into farms. The farmers, in their communications, hold public bodies responsible for this situation, and complain that, while farmers are under strong and constant pressures to control their farms and livestock, no limits or controls are imposed on wildlife, whose free movement means they are a potential contaminating agent for their farms and livestock.

5. Discussion

This research represents (as far as we are aware) the first study that has analysed the communication materials distributed by stakeholders involved in bTB management in Spain and France, specifically in the trans-Pyrenean region. As evidenced by our results section, and in line with previous literature on bTB communication (Cassidy, 2012; Naylor et al., 2017; Robinson, 2017a; Keenan et al., 2020), bTB is mired in controversy, given the differing stances on how to understand and approach its management. Controversy covers a lack of trust in bTB

screening tests, disagreement regarding eradication or simply control, differing criteria on how to deal with farms testing positive for bTB, and the role played by wildlife and other domestic species as disease reservoirs. The difficulties in reaching consensus on tackling bTB are rendered visible in the discursive strategies deployed by public institutions, scientists, farmers, and veterinarians in Spain and France. Focusing on the topics linked to bTB in the analysed communication materials and on the metaphors used for framing bTB reveals that the disease is experienced in a particularly complex manner by farmers.

Content analysis reveals that the topics appearing most frequently in relation to bTB coincide with those pointed out by previous studies (Enticott, 2008; Hamilton et al., 2019; Ciaravino et al., 2020; Clarke et al., 2022), e.g., quality of testing, wildlife, changes to the eradication programme, etc. However, different from the UK, Irish, or even the US context (marked by the role of wildlife in the spread of the disease), most of the communications materials dealing with bTB in Spain and France focus on detection and control, and so the greatest concern for all stakeholders is related to testing. This does not mean that wildlife is not a relevant topic (overall, in fact, it emerges as the second most important topic), as it is central to the communications aimed at the scientific community and veterinarians. However, it features less in the communications aimed at farmers, who, conversely, stress the need for changes to be made to the eradication programme.

Adopting an objective perspective of the different stakeholders, the fact that a greater variety of topics arise in publications that target farmers and veterinarians would suggest that the problem has multiple dimensions that need to be addressed. In contrast, publications aimed at the scientific community (mostly issued by public bodies) seem to opt for a more constrained narrative in which bTB is portrayed merely as a health threat.

Despite the war metaphor was used by all the analysed stakeholders, confirming that it “persistently structures in powerful ways the political and public conceptualisations of the disease” (Nerlich et al., 2002:93), the metaphorical frameworks used by public bodies, scientists, farmers, and veterinarians tended to differ. Institutions posit bTB in terms of a war, and scientists in terms of a war and of advances towards eliminating the disease. Farmers metaphorize the disease using more varied metaphors, especially, CONTAINER and JOURNEY/ROUTE/MOVEMENT metaphors, and also suggest that they are being sacrificed and blamed (RELIGION/BELIEFS source domain). Such differences in the use of bTB metaphors reveal divergent and sometimes even incompatible narratives by the different stakeholders. Accounting for the disease as a battle (CONFLICT/WAR/CRIME source domain) puts farmers in a position where they can only win or lose – and since bTB has not yet been eradicated, they are currently losing the fight. The fact that farmers use metaphors such as those of movement suggests that their perspective is not a win-lose scenario, but a scenario marked by faster and slower progression stages to elimination. The analysis thus reveals the divergence between farmers and public bodies and scientists, largely focused on the health aspect and bTB as a battle to be fought and won. Different from what Nerlich et al. (2002) show in their analysis on the conceptualization of Foot and Mouth disease, in this case the identified metaphors were not placed under a broader war frame but used for laying out the alternative views promoted by the analysed stakeholders. This is consistent with what Enticott (2001) had already shown in his work on how statistics were used by the Ministry of Agriculture, Food and Fisheries (MAFF) in the UK for legitimizing rural policies, namely bTB management. Instead of metaphorical frameworks, he outlines three epistemologies of nature and concludes that the nature as numbers view implemented by the MAFF was contested by other knowledges, such as nature as known –supported by farmers and suggesting that nature is known through daily contact and observation– and nature as network –an ecological vision of nature defended by wildlife groups–.

All things considered, we agree with Keenan et al. (2020) regarding the importance of sharing the different frameworks held by stakeholders as a way to build up a similar vision of the same issue, with metaphor

acting as a device for fostering mutual understanding. Combining frameworks, for instance, would allow the development of more persuasive narratives, given that, since the debate takes place within agreed limits, it will be easier to establish the roles to be played by the different stakeholders.

The use of a battle framework places farmers in the position of having to 'obey the orders' of other stakeholders, leaving them, as foot soldiers, without the option of proposing or introducing modifications. Within this framework, farmers are soldiers fighting blindly under the orders of others, and, in Spain at least, given that bTB has not been eradicated, the battle is ultimately lost. However, if bTB was to be metaphorically framed in terms of JOURNEY/ROUTE/MOVEMENT, a less markedly military hierarchy would allow alternative narratives to develop. The disease could be tackled at different speeds and by various routes, and more importantly, obstacles along the way would not represent defeat, merely temporary setbacks to be overcome.

6. Conclusion

In exploring the topics and metaphors that framed the public debate on bTB in the trans-Pyrenees region in 2018–2020, we make three main contributions. Firstly, our study contributes to filling the gap on the communicative dimension of the bTB in Spain and France and adds to research done in the UK, Ireland, and the USA. Secondly, and related, we reveal differences in how diverse stakeholders understand bTB and its management, and so widen the focus of bTB research to communications. Lastly, we have specifically analysed how bTB is metaphorically framed, complementing the metaphor and disease studies of zoonotic diseases like bird flu (Larson et al., 2005; Nerlich, 2011); Zika virus (Lu and Schuldt, 2018; Ribeiro et al., 2018), Ebola (Balteiro, 2017), and most recently, Covid-19 (see the special issue edited by Döring and Nerlich, 2022). In doing so, we have also contributed to the literature on the use of metaphors in rural animal disease contexts, a field that has been little investigated, and to which metaphor analysis could provide ways for discovering and illustrating this and other problems (C. Ye et al., 2018).

Limitations that affect our study include having only analysed low-incidence areas, and topics and metaphors are likely to be different in high-incidence areas. Moreover, while our findings, based on analyses of communication materials, reveal differences in the narratives of the stakeholders involved in bTB management, a useful contrast could be to conduct in-depth interviews of stakeholders to determine the extent to which they agree with those identified narratives. Lastly, it must be noted that, while this is an investigation that takes the trans-Pyrenean region as a case study, no cross-border mentions were found in the analysed texts, implying there was apparently no dialogue between stakeholders in the two regions (Catalonia and Pyrénées-Atlantiques). Future studies should also consider if there are, for instance, bonds between public bodies, veterinarians or farmers that transcend national borders for working on shared strategies to tackle bTB.

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CRedit authorship contribution statement

Carlota M. Moragas-Fernández: Conceptualization, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing. **Arantxa Capdevila:** Conceptualization, Investigation, Methodology, Writing – original draft. **Ciaravino Giovanna:** Resources. **Josep Espluga:** Supervision. **Timothée Vergne:** Resources. **Alberto Allepuz:** Resources, Funding acquisition.

Declaration of competing interest

The authors report there are no competing interests to declare.

Data availability

Data will be made available on request.

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