**A stakeholder opinion-led study to identify canine priority diseases for surveillance and control in the UK**

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Article summary line: A range of stakeholders that play a role in animal and public health were surveyed to identify disease priorities to include in a nation-wide epidemic surveillance and control framework.

**ABSTRACT**

Many pathogens cause disease in dogs, however, meaningful surveillance in small companion animals is often only possible on the most impactful diseases. We describe the first stakeholder opinion-led approach to identify which canine infectious diseases should be prioritized for inclusion in surveillance and control strategies in the UK. Participants were identified through a stakeholder analysis. A multicriteria decision analysis was undertaken to establish and weight epidemiological criteria for evaluating diseases, and a Delphi technique was employed to achieve a consensus among participants on the top-priority canine diseases. Leptospirosis and parvovirus were identified as the top two endemic diseases of concern, whilst leishmaniasis and babesiosis were the top two exotic diseases. Respiratory and gastrointestinal diseases were identified as the top two syndromes of concern. Findings from this study are being used to inform the development of a future UK-wide epidemic response strategy. This methodology could provide a blueprint for other countries.

**Keywords**: Disease prioritization; MCDA; canine infectious diseases; stakeholder participation; disease surveillance

**Introduction**

Disease surveillance systems have been developed globally for the protection of animal and human health, facilitating the prevention and control of animal and human diseases, including zoonoses. The last decade has seen a growth in the field of disease surveillance in small companion animals, notably in the UK (University of Liverpool, 2021; University of London; Royal Veterinary College (RVC), 2021) and in the USA (Glickman et al., 2006; Kass et al., 2016). However, despite the efforts made thus far, canine populations still lack coordinated national and international strategies for the timely detection and control of infectious diseases (Hale et al., 2019). This leaves these populations susceptible to disease outbreaks and to the emergence of disease threats which can have direct implications for human health, given the existence of canine zoonoses (Baneth et al., 2016; Deplazes, van Knapen, Schweiger, & Overgaauw, 2011; Rijks, Cito, Cunningham, Rantsios, & Giovannini, 2016) and the constant emergence of pathogens with unknown zoonotic potential (Chomel, 2014; Holm et al., 2015). Since an increasingly large number of dogs are kept as pets in some countries (Murray, Gruffydd-Jones, Roberts, & Browne, 2015), and living spaces are shared (Westgarth et al., 2008), the risk of zoonotic disease transmission among dog and human populations is a growing concern (Chomel, 2014).

In October 2019, the Small Animal Veterinary Surveillance Network (SAVSNET) initiated SAVSNET-Agile (University of Liverpool, 2019), a Dogs Trust funded research project that brings together an interdisciplinary collaboration between Dogs Trust and the Universities of Liverpool, Bristol, Manchester, Lancaster and Cambridge (the latter involving staff previously based at the Animal Health Trust, which closed in July 2020). SAVSNET-Agile aims to improve the response to existing and new diseases in the UK canine population to minimize their impact on canine and human health. SAVSNET-Agile is developing near real-time actionable health resources, that are easily available to stakeholders, by linking SAVSNET data resources to state-of-the-art informatics, statistics, and genomic technologies. The present study represents one of SAVSNET-Agile’s main goals, that is, the establishment of a nationwide framework to improve the timely detection and response to canine disease outbreaks in the UK.

Many pathogens cause disease in dogs, but due to time constraints and limited financial resources, meaningful surveillance in small companion animals is often only possible on the most impactful diseases (OIE (World Organisation for Animal Health), 2010). Thus, to develop an epidemic response framework, the first step is to identify which diseases should be prioritized in such a programme. There are various methods, whether opinion-led (Buckland, Corr, Abeyesinghe, & Wathes, 2014) or data-driven (Cassini et al., 2018), that have been described to prioritize diseases in humans and animals, and they all follow a similar underlying structure; first, an initial list of diseases is established and then ranked through the use of specific criteria relevant to the study's purpose, which are sometimes weighted to reflect participants’ opinion (Balabanova et al., 2011). Multicriteria decision analysis (MCDA) is a well-established approach to provide a sensible ordering of options, according to participant’s opinion (Food Standards Agency, 2021), and is commonly used in disease prioritisation studies (Baltussen & Niessen, 2006; Norheim, 2018). Through MCDA, a range of relevant criteria is considered simultaneously and weighted according to their importance to stakeholders when setting priorities for policy development (O'Brien, Taft, Geary, Ciotti, & Suk, 2016). Published guidelines for disease prioritization recommend an evidence-based approach that uses available epidemiological data, related to the burden of diseases specific to the study’s geographical location (World Health Organisation (WHO), 2006). However, when such epidemiological information is lacking, as it often is for companion animal populations (Cito et al., 2016), a stakeholder opinion-led approach is the preferred method to inform the prioritization process (Bouwknegt, Devleesschauwer, Graham, Robertson, & Van Der Giessen, 2018).

Here we developed a qualitative disease prioritization process informed by a wide range of stakeholders that play a role in safeguarding canine and public health in the UK. The aim of this study was to identify canine infectious diseases that are of the highest relevance in the epidemiological context of the UK, and therefore, should be prioritized for surveillance and for the development of a nationwide epidemic response framework.

**Materials and methods**

The methodology steps followed in this study are summarized in Figure 1. Ethical approval for this work was granted by the University of Bristol Faculty of Health Sciences Ethics Committee (FREC, reference code: 98843).

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Figure 1. Flowchart that summarises the methodology steps followed in this study.

**Recruitment of participants**

Participants were selected through a stakeholder analysis process (Varvasovszky & Brugha, 2000). First, institutions that play a relevant role in canine and public health in the UK were identified. A purposive sampling approach was followed. On the basis of the researchers’ experience and the literature (Braun & Clarke, 2013; Francis et al 2010; Guest, Bunce, & Johnson, 2006), we estimated that recruitment of at least two institutions from each sector identified through a stakeholder analysis (Table 1) and the subsequent recruitment of at least one information-rich representative from each targeted institution for a minimum sample size of 16 participants would be sufficient to uncover a variety of opinions. Participants were then selected from this stakeholder network as follows; first, members of SAVSNET put forward persons within each institution with expertise in canine health and with whom they were acquainted. For those institutions without a previously known contact, relevant persons were identified through an internet search. Amongst these candidates, potential participants were contacted in descending order of hierarchy, according to their position within the institution they represented. We used snowballing sampling to identify and establish further contacts from initial participants, both to find adequate replacements when initial contacts were unable to take part and to increase the sample size until an adequate number of participants was reached.

**Elaboration of initial lists of canine infectious diseases**

Using an online survey, participants were asked to provide up to three relevant diseases to include in a future epidemic response framework. We repeated this exercise for the groups of endemic diseases, exotic diseases, and syndromes. The following definitions for each disease group were provided to participants:

* Endemic disease: known diseases that are normally present in the UK and have a certain level of constant prevalence over time (CDC- Center for Disease Control and Prevention).
* Exotic disease: known diseases that are not present or not normally occurring in the UK (Department for Environment Food & Rural Affairs ; Animal and Plant Health Agency).
* Syndrome: groups of conditions and clinical signs that appear concurrently and affect a particular organ system. The 11th International Classification of Diseases (ICD-11) (World Health Organisation (WHO)) was given as a reference.

Proposed diseases on each of the endemic and exotic groups that had more than one vote were further evaluated throughout the disease prioritization process. A sufficient level of prioritisation was assumed in this first step for the syndromic category because only three syndromes had more than one vote.

**Selection and weight of epidemiological criteria to evaluate canine diseases**

A MCDA was conducted to select and weight epidemiological criteria for prioritising canine diseases. Through a second online survey, participants were asked to provide up to five epidemiological criteria that could be used to evaluate the relevance of canine infectious diseases in the context of the UK. Participants were given the option to either choose different or the same criteria to evaluate endemic and exotic diseases. Participants were also requested to rank their answers in a scale from 1 to 5, 1 being the least and 5 the most important criterion. No further indications were given, so as not to influence participant’s responses.

**Grouping epidemiological criteria into themes and generating a score for each theme**

Epidemiological criteria from every participant were pooled together for analysis. We aimed to obtain the minimum number of criteria that were sufficient to adequately evaluate the epidemiological relevance of canine infectious diseases. To obtain final criteria that summarised the group's opinion, participant responses were gathered into different categories or “themes”. These consisted of aggregations of criteria that represented similar ideas, e.g., participant responses that presented the same concepts but using different terminology. This exercise was first performed individually by two of the study authors (CT, FSV). The results were compared and, where there were differences, agreement was reached through a discussion between the authors (CT, FSV).

Whilst grouping criteria into themes, individual participant’s ranks for each criterion were summed and used to generate an overall theme score or “weight”. Consequently, participant preferences were reflected qualitatively by the defined themes that include their selected criteria, as well as quantitatively through the theme scores, that reflect their relative importance based on participant’s opinions. Criteria whose theme’s score was under five points, and themes defined by a single criterion which was only mentioned by a single participant were all included in a separate “miscellaneous” theme which was not used to evaluate diseases.

**Scoring of canine diseases against identified themes and definitive lists of prioritized diseases**

Participants were provided with disease fact sheets with relevant epidemiological information about each disease from the initial lists (Appendix 1). These fact sheets were based on peer-review and published sources (Appendix 1) to ensure participants had a base-level knowledge of the diseases under scrutiny if these were outside their area of expertise.

Canine diseases were scored and ranked through a Delphi panel (Dalkley N; Helmer O, 1963). Briefly, this consensus-building technique consists in gathering participants’ opinions on a certain subject on an individual-by-individual basis, and subsequently feeding this back to participants with a summary of the group’s answers, so every individual can revise their answer considering the group’s response. Following this approach, an online questionnaire was sent for participants to score diseases from the initial lists against previously identified themes, which included examples of the criteria relevant to each theme (Appendix 2). A 25-point scale (0 no relevance; 25 maximum relevance of the disease for the theme) was used to provide sufficient discrimination between diseases (Gibbens, Frost, Houston, Lester, & Gauntlett, 2016).

An individual participant final score for each disease was derived from summing up the disease scores given to each theme. Participant's disease-level results were then added to obtain an overall score for each disease. To discern the impact of using weighted themes on the final lists of diseases, this process was repeated taken into account the overall theme score or weight as follows. For each disease, an individual participant final weighted score was derived from multiplying the disease score given to each theme by the corresponding theme’s weight before being summed up. Participant's disease-level results were then added to obtain an overall weighted score for each disease. Two separate disease rankings were ascertained according to their final overall unweighted scores and their final overall weighted scores. The resulting rankings of canine endemic and exotic diseases were shared with participants, who were then allowed to review and change their answers considering the group results, and any subsequent change was incorporated.

**Results**

Nineteen individuals from 16 institutions took part in this study (Table 1). Ten participants responded to the initial survey to establish initial lists of diseases including syndromes (Table 2). The initial lists of endemic and exotic diseases included two votes for both kennel cough and tickborne disease. However, these two diseases were not further evaluated throughout the prioritization process because they can have multiple causative agents some of which are already represented by other diseases at the top of the initial lists (e.g., respiratory syndrome includes viral and bacterial causes of kennel cough; and canine babesiosis and canine ehrlichiosis are both diseases transmitted by ticks).

Table 1. Summary of sectors identified through a stakeholder analysis, with the corresponding targeted institutions and number of participants recruited to take part in the present study. A summary of the institutions contacted unsuccessfully within each sector is also provided

|  |  |  |
| --- | --- | --- |
| Sectors identified through a  stakeholder analysis | Targeted institutions | Number of recruited participants |
| Governmental Department or  Agency | DEFRA  Department of Environmental, Food and  Rural Affairs | 1 |
| APHA  Animal and Plant Health Agency | 1 |
| Other contacted government departments (2) | 0 |
| Veterinary Associations | BSAVA  British Small Animal Veterinary Association | 1 |
| ESCCAP  European Scientific Counsel of Companion  Animal Parasites | 1 |
| Other contacted veterinary associations (2) | 0 |
| Animal Charities | Dogs Trust | 2 |
| Kennel Club | 1 |
| Other contacted animal charities (2) | 0 |
| Veterinary Corporate  Practice Groups | CVS group | 1 |
| IVC Evidensia | 1 |
| Other contacted practice groups (3) | 0 |
| Small Veterinary Practice | Anderson Moores | 1 |
| Vine Tree Vets | 1 |
| Academic Institutions | Royal Veterinary College | 2 |
| University of Edinburgh | 1 |
| University of Bristol | 1 |
| University of Liverpool | 1 |
| Other contacted Universities (1) | 0 |
| Pharmaceutical industry | MSD Animal Health | 1 |
| NOAH | 2 |
| Other contacted pharmaceuticals (1) | 0 |
| Veterinary diagnostic  laboratories | 3 contacted | 0 |
| Total | | 19 |

Table 2. Summary of stakeholder responses to a survey to establish initial lists of relevant canine endemic diseases, exotic diseases, and syndromes

|  |  |
| --- | --- |
| Disease | No. of voting participants |
| Canine endemic diseases | |
| Parvovirus | 7 |
| Cutaneous and renal glomerular vasculopathy (CRGV, Alabama Rot) | 6 |
| Leptospirosis | 6 |
| Distemper | 5 |
| Lungworm | 2 |
| Kennel cough | 2 |
| Campylobacter | 1 |
| Lyme disease | 1 |
| Coronavirus | 1 |
| Canine exotic diseases | |
| Leishmaniasis | 8 |
| Babesiosis | 7 |
| Canine Influenza | 4 |
| Ehrlichiosis | 2 |
| Dirofilariasis | 2 |
| Tickborne diseases | 2 |
| Brucellosis (*Brucella canis*) | 1 |
| Rabies | 1 |
| Canine syndromes | |
| Respiratory disease | 8 |
| Gastrointestinal disease | 6 |
| Neurological disease | 3 |
| Vascular disease | 1 |
| Poisonings | 1 |
| Infectious and parasitic diseases | 1 |

Sixteen participants provided and weighted epidemiologic criteria. Nine and ten themes were established to evaluate endemic diseases (Appendix 3) and exotic diseases (Appendix 4), respectively. Four participants selected the same criteria and allocated the same weights for criteria to evaluate endemic and exotic diseases. The remaining twelve participants either chose the same criteria but had different weights (n=5) or picked different criteria altogether (n=7). Five and four criteria were included in the miscellaneous theme for endemic and exotic diseases, respectively (Appendix 5).

The themes with the highest scores were “amount of disease in the UK” for endemic diseases and “impact on public health” for exotic diseases; economic impact of disease was the lowest-rated theme (Appendixes 3 and 4).

The three most voted canine syndromes were respiratory, gastrointestinal, and neurological disease (Table 2). The final lists of prioritised endemic and exotic diseases with their corresponding weighted and unweighted scores are shown in Table 3, the use of weighted criteria did not alter the disease rankings. The highest scored endemic and exotic canine diseases were leptospirosis and leishmaniasis, respectively.

Table 3. Final list of prioritised endemic and exotic canine diseases in descending order of their corresponding weighted and unweighted scores

|  |  |  |  |
| --- | --- | --- | --- |
| Disease | Total unweighted sum | Total weighted sum | Ranking |
| Endemic diseases | | | |
| Leptospirosis | 1849 | 9275 | 1 |
| Parvovirosis | 1768 | 8198 | 2 |
| Distemper | 1580 | 7138 | 3 |
| Lungworm | 1538 | 7086 | 4 |
| Cutaneous and Renal Glomerular Vasculopathy (CRGV, Alabama Rot)) | 1480 | 6727 | 5 |
| Exotic diseases | | | |
| Leishmaniasis | 1676 | 8815 | 1 |
| Babesiosis | 1586 | 8039 | 2 |
| Ehrlichiosis | 1431 | 7494 | 3 |
| Dirofilariasis | 1430 | 7156 | 4 |
| Canine Influenza | 1214 | 6457 | 5 |

**Discussion**

To the authors' knowledge, this is the first stakeholder opinion-led study aimed to establish the surveillance priorities for canine infectious diseases in the UK. Respiratory, gastrointestinal, and neurological diseases were identified as the top three syndromes of concern. In descending order of unweighted and weighted score, leptospirosis, parvovirus, distemper, lungworm, and CRGV (Alabama rot) were the top five endemic diseases of concern; and leishmaniasis, babesiosis, ehrlichiosis, dirofilariasis and canine influenza were the top five exotic diseases. These findings are being used to inform the development of a national epidemic response framework aimed to improve the timely detection and response to canine disease outbreaks in the UK.

The lack of population health surveillance for companion animal populations leaves them vulnerable to the emergence of health threats without means of early detection. To fill this gap in surveillance in companion animals, the SAVSNET-Agile team is developing and testing the components necessary for a nationwide system for the early detection and rapid response to canine disease threats. We were recently able to test the effectiveness of such a system during an outbreak of canine gastroenteritis, identifying a canine enteric coronavirus as a potential cause (Radford et al., 2021). However, due to time constraints and a lack of dedicated funds to sustain these activities, surveillance in small companion animals is often only possible on an ad hoc basis and for the most impactful diseases. Thus, to optimise future efforts and funding allocation, the development of any future national epidemic response framework should be tailored to prioritize specific infectious diseases, as well as syndromes; those identified in this study as the highest relevance in the epidemiological context of the UK can provide such a foundation.

Disease prioritization studies can be classified according to the source of data that is used to inform the prioritization process (Rist, Arriola, & Rubin, 2014). Qualitative studies base their disease rankings on expert or stakeholder opinion (Brookes, Hernández-Jover, Cowled, Holyoake, & Ward, 2014; McKenzie, Simpson, & Langstaff, 2007) and, in contrast, quantitative studies, rely on available epidemiological data (Havelaar et al., 2010; Kurowicka, Bucura, Cooke, & Havelaar, 2010; Ng & Sargeant, 2012). However, none of these disease prioritization methods have been described previously in the context of canine diseases. Although population health data is becoming available for some diseases from sentinel networks of practices and laboratories (Smith et al., 2021), significant gaps mean they cannot yet inform such an evidence-based approach to prioritize canine diseases. Hence, harnessing alternative sources of data, such as expert and stakeholder opinion, was key for the development of this study. Research studies have increasingly placed importance on purely quantitative methods for disease prioritization (Havelaar et al., 2010), as qualitative studies have been criticised for their lack of transparency and objectivity (McKenzie et al., 2007). We believe to have addressed this issue by rigorously describing our methodology steps and disclosing participant responses, as well as the rationale behind our strategy to group epidemiological criteria. Furthermore, our study is unique in involving participants in each step of the prioritization process, including the elaboration of initial disease lists and selection of epidemiological criteria to evaluate diseases. By consulting a multidisciplinary stakeholder group, it is possible to set priorities for surveillance and control that accurately reflect the canine sector’s needs.

In previous disease prioritisation studies based on expert opinion, two main methodological approaches are used to reach a consensus amongst participants namely face-to-face group discussions such as workshops (Bouwknegt et al., 2018; Buckland et al., 2014; Gibbens et al., 2016), and Delphi techniques (Balabanova et al., 2011; Stebler, Schuepbach-Regula, Braam, & Falzon, 2015; World Health Organisation (WHO), 2006). In our case, the latter was chosen, since we intended to consult an ample number of participants, from diverse geographical locations across the country, and a Delphi methodology is indicated where there are difficulties to arrange an in-person consultation (World Health Organisation (WHO), 2006). This approach ultimately proved critical as the study took place when considerable movement restrictions were in place to contain the spread of COVID-19 in the UK. Our findings indicate that there is a great consensus among participants on which canine diseases are the most pressing for surveillance in the UK. This became apparent from the start, given the low variability of responses and clear participant preferences seen on the initial disease lists. Indeed, final rankings derived from our ad-hoc Delphi panel offered adequate levels of discrimination between diseases for prioritization purposes. Furthermore, these rankings were not affected using weighted criteria, that rather set diseases further apart generating a more pronounced differentiation.

This is also the first prioritization study to use the specific classification of endemic diseases, exotic diseases, and syndromes. The prioritization process for endemic and exotic diseases can take place at a pathogen level; however, this approach cannot account for newly emerging diseases where the causative agent remains undetermined. We tackled this issue by also identifying the syndromes of concern that should be prioritized when developing an epidemic response framework. The rationale is that emerging pathogens with undetermined diagnoses and non-specific clinical presentations are likely to be detected in a timely manner through syndromic surveillance, since such diseases can cause changes in reporting rate patterns of cases affecting one or more organ systems. In contrast, the detection of emerging pathogens via other surveillance approaches such as laboratory-based surveillance is challenging because they can traditionally only identify anomalous patterns of disease associated with known infectious agents (Paterson & Durrheim, 2013). In our study, gastroenteric and respiratory diseases were considered the two top ranked syndromes of concern. The reasons for this result may be that these syndromes are two of the most common presenting complaints in first opinion small animal consultations in the UK (Collins et al., 2021), and that they can be caused by various transmissible infections that severely impact dog health and welfare (Day et al., 2020; Suchodolski, 2011). SAVSNET-Agile has developed an early detection system that, to date, has enabled a rapid response to two different canine gastroenteritis outbreaks in the UK, in 2020 and 2022 (Radford et al., 2021; Small Animal Veterinary Surveillance Network (SAVSNET), 2022). As a result of this study, in future work the system will be expanded to also detect outbreaks in other syndromes, such as respiratory disease. Conveniently, this also broadly parallels similar syndrome-level surveillance undertaken by Public Health England (UK Health Security Agency)(UK Health Security Agency, 2022) providing opportunity to spot changing patterns of disease that might suggest a common cause such as a zoonosis.

The final ranking of both canine endemic and canine exotic diseases had two zoonoses ranked at the top. Leptospirosis is an endemic zoonotic disease caused by gram negative spirochaetes and is of worldwide importance (Raj, Campbell, & Tappin, 2021). Leishmaniasis is a protozoal vector-born zoonotic disease transmitted by sandflies and associated with lethargy and dermatological signs; it is generally considered exotic to the UK with most affected dogs having a recent travel history into the UK form endemic regions (Silvestrini et al., 2016). This indicates that one of the participants’ main concerns about canine epidemics, in addition to disease burden and animal welfare, is the protection of public health. Indeed, *impact of disease on public health* was the highest- and the second highest-rated theme for exotic diseases and endemic diseases, respectively. The relevance of canine infectious diseases has been acknowledged on previous human and farm animal disease prioritization studies, where zoonoses such as leptospirosis, leishmaniasis, campylobacteriosis, rabies or echinococcosis were placed amongst the highest-ranking relevant diseases in the UK (Gibbens et al., 2016), Europe (Cito et al., 2016) and internationally (Cardoen et al., 2009).

The lowest-rated theme overall was *economic impact of disease,* which suggests that stakeholders do not consider the costs of controlling disease as an important determinant factor for establishing priorities for canine disease surveillance. This supports the notion that companion animals, particularly dogs, are considered by many as a part of their family, whose welfare overshadow economic considerations (Blouin, 2013). This juxtaposes with the results of prioritization studies of livestock diseases, where economic impacts were ranked among the most relevant criteria, in some cases even more so than zoonotic implications (Brookes et al., 2014). Consideration of economic aspects when developing policies that impact public health and welfare can be controversial, and this is why other relevant prioritization guidelines in humans and animals consider the economic impacts of disease separately (Gibbens et al., 2016).

This qualitative disease prioritisation study is based on expert opinion. Participants were required to possess knowledge about or experience with canine infectious diseases in the epidemiological context of the UK to address the aims of the study. Probabilistic sampling is often used in quantitative research to ensure the generalizability of findings; however the present study did not aim to obtain generalizable results, but to identify information rich cases to survey. For this reason, we chose purposive sampling which is a technique widely used in qualitative research for the identification and selection of information-rich informants related to the phenomenon of interest (Patton, 2002).

Veterinary diagnostic laboratories were the only sector identified through a stakeholder analysis that was not represented in our study. However, while still valuable, we believe that this would not modify the overall conclusions obtained from this study.

The conduct of this study coincided with the peak of the COVID-19 crisis, and many of the stakeholders that participated in the study were involved in the pandemic response. This meant that not every participant could contribute to each step of the prioritisation process. Despite this, our purposive sampling approach ensured that individuals from varied backgrounds contributed data to achieve each step of the study.

In conclusion, we describe the first stakeholder opinion-led approach to identify which canine infectious diseases should be prioritized for inclusion in surveillance and control strategies in the UK. We have demonstrated the feasibility of this methodology to rank canine diseases in order of relevance and with sufficient differentiation for prioritization purposes. The establishment of relevant epidemiological criteria for evaluating diseases was achieved through an MCDA framework and a high level of consensus was reached using a Delphi panel technique. This methodology can be easily adapted to prioritize diseases in other canine populations. Findings from this study, i.e., lists of priority endemic diseases, exotic diseases and syndromes, are being used to inform the development of a future UK-wide epidemic response framework. The obtained lists of priority diseases will need to be periodically reviewed and updated to match the country's epidemiological and socioeconomic characteristics. In the future, the ongoing increasing collection of demographic data and electronic health data in the small animal sector (Sánchez-Vizcaíno et al., 2017) could be utilised to estimate values for the epidemiological criteria measured in this study and complement these results with a parallel quantitative prioritization approach.

**Acknowledgements**

This work was funded by Dogs Trust. We wish to thank the participants for their contribution to the study.

**Conflict of interest statement**

The authors have no conflicts of interest.

**List of figures**

Figure 1. Flowchart that summarises the methodology steps followed in this study.

**Author contributions**

The study was conceived and designed by C.T. and F.S-V. The financial support for the project leading to this publication was acquired by A.D.R., R.N. and F.S-V. The data collection and curation were conducted by C.T. The methodology and formal analysis were conducted by C.T. and F.S-V. The manuscript was drafted by C.T. and F.S-V. The manuscript was revised critically for important intellectual content by A.D.R, E.S. and R.N. All authors gave final approval for publication.

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