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The UK public's perceptions on the issue of the dog overpopulation problem and people's willingness to pay (WTP) for a humane stray dog management.

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Abstract

The present study surveyed a UK representative sample of 500 individuals and employed the Choice Experiment (CE) to elicit the UK public's views on the management of stray dogs and people's willingness to pay (WTP) to reduce the current euthanasia rate. The results revealed that people have an emotional bonding with companion animals and are willing to pay to reduce the current euthanasia rate. According to the findings the UK public believes that the current stray dog management of euthanizing unhomed dogs is of grave or moderate concern and appears to be keen on the imposition of welfare-improving policies such as dog licensing, compulsory micro-chipping, etc. In addition, the CE investigated people's willingness to pay (WTP) on a monthly basis to extend the current stray dog seven day statutory period in order to reduce the euthanasia rate. By constructing two payment methods, those of a Voluntary Contribution and of a Mandatory Council Tax Charge the study revealed that people are willing to pay £5.83 per month for small cross/mixed breed dog under the Voluntary Contribution regime and £2.14 per month for a young dog under the Mandatory Council Tax Charge regime.

Keywords Animal Welfare, Choice Experiment

JEL code Q00, Q19

1. Introduction

Each year Local Authorities are expected to deal with over 100,000 stray dogs. In 2013 more than 111,000 dogs were handled across the UK (Dogs Trust, 2013). Once these dogs are apprehended, they enter into contracted holding kennels for their statutory seven day period (T. Oxley, Swale Borough Council Dog Warden, personal communication, October 12, 2011). During this time, some dogs are reconnected with their owners, some are adopted out or transferred to private animal welfare organizations and the rest are put to sleep. The estimated total number of dogs that were put to sleep by all Local Authorities across the UK, in 2012, was 8,903 dogs (Dogs Trust, 2012). Of these, 5,337 dogs were put to sleep without an official reason reported with a high chance of them all being healthy adoptable pets.

The maintenance and upkeep of dogs entering Local Authorities and private dog welfare organizations is of a certain cost. The total expenditure, in 2011, of animal welfare organizations and Local Authorities was estimated to be £57.5 million (HL Deb, 8 Feb., 2012, c251). The cost for caring for each dog Local Authorities try to rehome has been estimated to be £1,100 (*ibid*). There is, also, a significant cost in keeping stray dogs alive until they can be rehomed; it is estimated that the daily rate cost of animal welfare organizations for the overall care of a dog is £15, including food, housing and staff (RSPCA, n.d.a). Of this, kennel space was estimated to cost £7.54 per day for each dog (RSPCA, 2010).

Given that studies addressing stray dog population management involve the public as the source of the cause, as irresponsible owners, and as the source of the solution, as the funding body for the alternative policies, this article aims to investigate whether people place a high value on dog welfare and whether they would be willing to pay to improve stray dog management in the UK by prolonging the current seven day statutory period which would subsequently lead to a reduction of the euthanasia rate. By prolonging the seven day period a reduction of the euthanasia rate will be achieved as it will allow owners more time to be connected to their lost pet, give private organizations more time to have available space in their kennels, and on a mathematical point, more days of a statutory period will subsequently lead to less dogs killed on an annual basis. Furthermore, this paper seeks to investigate the factors that influence people's willingness to pay (WTP) and also seeks to elicit the public's views on alternative policies that aim to mitigate the dog overpopulation problem.

The structure of the paper is as follows: Section 2 provides information on the chosen methodology and the data; Section 3 presents and discusses the results; Section 4 presents and discusses people's views on the dog overpopulation problem and on alternative policies; and the paper ends with a conclusion.

2. Methodology and Data

2.1 Methodology

The methodology chosen to elicit whether people value dog welfare and whether they would be willing to pay to contribute to the reduction of the number of dogs that are being put to sleep was the Choice Experiment method. A Choice Experiment is a stated preference technique based on the combination of Lancaster's theory of consumer demand and random utility theory (Hanley et al., 1998). According to Lancaster (1966) the utility gained from a good can be described as the utility derived from the bundle of its characteristics. Each bundle will yield a different level of utility. Given consumers are assumed rational each will choose the set of characteristics that maximizes their utility.

According to Adamowicz et al. (1998) the Choice Experiment method requires the creation of a hypothetical scenario in which the individual is asked to choose between realistically constructed options. The individual's decision is based on the bundle of different levels of attributes each option offers. They also suggest the inclusion of an opt-out choice within this choice set in order for the individual's response to have an element of '*real market behavior'* (Adamowicz et al., p. 23, 1998). In addition, the assumption of random utility theory, that individuals behave rationally when choosing between alternatives, is applied expecting the individuals to choose the option that offers them the highest utility (Garrod and Willis, 1999; Loureiro and Umberger, 2007). By deconstructing the situation in question down to its attributes, this method is able to convey the stated preferences of an individual depending on the change of the levels of these attributes (Garrod and Willis, 1999).

More specifically, the observed utility the individual, n, gains from each option, í, can be represented by:

$$\widehat{U}_{\acute{\imath}n} = \beta X_{\acute{\imath}n} \tag{1}$$

where$X_{\acute{\imath}n}$ denotes the attributes that each individual is presented in each option.

Given that the utility also has an unobserved random term, the overall utility equation can be rewritten as:

$$U_{\acute{\imath}n} = \widehat{U}_{\acute{\imath}n} + \varepsilon_{\acute{\imath}n} \tag{2}$$

As dictated by utility maximization, when the individual will be asked to choose between two alternatives, option í and option j, the probability to select í depends on the utility gained:

$$Prob(\acute{\imath}|C) = Prob\{\widehat{U}_{\acute{\imath}n} + \varepsilon_{\acute{\imath}n} > \widehat{U}_{jn} + \varepsilon_{jn};\ \acute{\imath} \neq j;\ \text{all } j, \acute{\imath} \in C\} \tag{3}$$

where C denotes the complete choice set. The estimation of the above equation needs to be done under a given assumption regarding the distributions of the error terms (Hanley et al., 1998). According to Hanley et al. (*ibid*), the most common assumption is that they are identically and independently distributed [IID] and follow the Gumbel distribution. Hence, the equation can be formed into the following expression which represents the Multinomial Logit Model:

$$Prob(\acute{\imath}|C) = \frac{exp(\beta X_{\acute{\imath}n})}{\sum_{j \in C} \exp(\beta X_{jn})} \tag{4}$$

In terms of quantifying the public's willingness to pay that is influenced by each attribute within the choice set, the ratio of each attribute's coefficient over the monetary value coefficient is calculated (Louriero and Umberger, 2007; Kerr and Sharp, 2009; Greene, 2012). This is interpreted as a change in value associated with an increase of the attribute by one unit.

More specifically, the ratio is given by the following function:

$$-\frac{\widehat{\beta}_{attribute}}{\widehat{\beta}_{monetary\ value}} \tag{5}$$

Choice Experiment Design

According to Hensher et al. (2005b) the Choice Experiment Design can be described as an eight stage process. In the first three stages the analyst is required to define the research question, to identify the associated attributes and their respective levels, and to determine the type of the design. In the following four stages, the researcher must create the choice sets,

generate the choice cards, and decide how choice cards will be distributed among respondents. The final eighth stage involves the construction of the survey instrument. This section will report this study's Choice Experiment Design based on Hensher et al. (*ibid*) process. The following Box 1 depicts the stages:

Box 1: Choice Experiment Design Stages (adapted from Hensher et al., *ibid*)

Stage 1: Problem Refinement
Stage 2: Stimuli Refinement
Stage 3: Experimental Design Consideration
Stage 4: Generation of Experimental Design
Stage 5: Allocation of Attributes to Design Columns
Stage 6: Generation of Choice Sets
Stage 7: Randomization of Choice Sets
Stage 8: Construction of Survey Instrument

Stage One:Problem Refinement

There are currently more than 105 animal welfare organizations in the UK dedicated to improving dog welfare. All organizations' operational and welfare activities are financed through the public's donations. Their annually reported voluntary income provides a strong indication that there is a proportion of the UK public that places high value on dog welfare. In the year 2011 more than £200 million were donated to animal welfare organizations that are predominately active in rescuing and in rehoming dogs.[1] All organizations have developed donation schemes in which they ask the public to finance their efforts. Therefore, the creation of the hypothetical scenario of this study was inspired by such programmes.

Four of the largest dog welfare organisations have developed sponsorship schemes in which they ask the public to contribute to their efforts in improving dog welfare. Battersea Dogs and Cats Home has various approaches to donate to their organization. Promoted on their website, people have the choice to donate £5 a month in order to sponsor a kennel space (Battersea Dogs and Cats Home, n.d.a), to support a dog for a day by paying the amount of £15.7 that is required for a dog's daily up-keeping or to support a dog for a week by paying the amount of

[1] This figure is calculated by the reported voluntary income of 46 animal welfare organizations. The reports were retrieved from the Charity Commission website: http://www.charitycommission.gov.uk. The reported voluntary income includes donations, legacies and sponsorships. In some rare cases it also includes grants.

£109.9 (Battersea Dogs and Cats Home, n.d.b). In addition, they have the option to donate any amount they believe to be suitable as a monthly or a one off donation (Battersea Dogs and Cats Home, n.d.c).

Blue Cross also has various options available for people to donate as a monthly or a one off contribution. They have initiated a £2 monthly sponsorship asking people to contribute to their efforts of pulling dogs out of Local Authority kennels before the seven day statutory period is over (Blue Cross, n.d.a). In addition, on a monthly basis they suggest the amounts of £3, £5, or £10 as well as accept any amount the donor believes to be suitable (Blue Cross, n.d.b). The Royal Society for the Prevention of Cruelty to Animals (RSPCA) has a similar monthly and one off donation scheme. On a monthly basis, they suggest a £3 and a £10 donation and also accept any amount thought suitable (RSPCA, n.d.b).

Dogs Trust provides two options for people to contribute. These include the option to donate any amount the individual donors believe to be suitable either on a monthly basis or as a one off contribution (Dogs Trust, n.d.a) and the option of sponsoring a specific dog at the cost of £1 per week (Dogs Trust, n.d.b). This particular sponsorship scheme allows people to choose which dog they wish to sponsor from a given gallery of dogs living in their rehoming centres including the option of a mystery dog.

In light of the above, the constructed hypothetical scenario was designed as a sponsorship scheme. According to Bennett (1996) the wording of the scenario must be done in an unbiased manner, providing adequate and specific information regarding the situation the respondents are asked to value. Therefore, the background information and the scenario given were the following:

The background information:

The UK has a reputation of being an 'animal lover nation' as almost half of its households own a pet. However, the country has a great number of stray dogs. The statistics reveal that Local Authorities collect over 100,000 dogs each year.

One of the most common practices worldwide in managing stray dogs is putting them to sleep. In the UK, Local Authorities keep each unclaimed dog available for adoption for seven days. If not adopted or transferred to a private animal welfare organization the dog is put to sleep even if fit and healthy. Over 7% of Local Authorities intake of dogs is put to sleep each year, meaning that about 20 dogs are put down each day.

There is a significant cost in keeping stray dogs alive until they can be rehomed. Under the current UK policy, it is estimated that it costs £7.54 per day for each dog. So each additional dog kept by your Local Council for 1 year could increase the budget annually by approximately £2,750.

The hypothetical scenario:

To reduce the number of healthy adoptable dogs that are being put to sleep each year, Local Authorities would need to raise the necessary funds for their upkeep. These funds would be asked to be contributed by you (the public). You would be, hypothetically, asked to make a payment on a monthly basis that would be used to prolong the kennel stay of a stray dog of your choice. The dog would remain in the kennels until it is re-homed and there would be no other commitment in terms of time, etc. required from your end. In the case of the supported dog being subsequently adopted, the payment would be transferred to another dog of your choice.

With respect to the payment vehicle, it was decided to present two payment methods. Half of the respondents were presented with a Voluntary Contribution payment method and the other half of the respondents were presented with a Mandatory Council Tax Charge payment method. The Voluntary Contribution payment method permitted the examination of people's willingness to pay (WTP) to contribute for a more humane stray dog management under a voluntary regime while the Mandatory Council Tax Charge payment method allowed the investigation of people's willingness to pay under a mandatory regime.

The Choice Experiment Method has been widely employed in the environmental valuation literature and it is supported that its complicated design reduces strategic bias (Burton, 2010). Nonetheless, the expected outcome would be that those presented with the Voluntary Contribution payment method would be willing to contribute more than those presented with a Mandatory Council Tax Charge. This notion concurs with the comment of Bennett et al. (2012) that people do not favour increases in government taxation. Hence, it is expected that the two payment methods will provide an upper and lower limit of what people would be willing to contribute for improving UK stray dog management.

Stage Two: Stimuli Refinement

In this stage Hensher et al. (2005b) categorize the identification of the attributes and their respective levels. According to Garrod and Willis (1999) the selection of the attributes and their levels is a crucial element in designing the experiment. Greiner and Ballweg (2013) state that all attributes and their levels deemed as important in people's decision making must be identified in order to provide an accurate estimation of their effect. Alpizar et al. (2001)

report that a study conducted by Mozotta and Opaluch (1995) revealed that the optimum design of the option should not exceed more than five attributes as it could complicate the task and, consequently, have a negative impact on the quality of the data collected. Taking this under consideration when identifying the attributes, the characteristics included were five attributes and the monetary value.

The attributes that were identified as most important were extracted from the results of Siettou et al (2014) and from the literature on alternative policies of stray dog management (see Jöchle, 1991; Sturla, 1993; Lane, 1998; Frank and Carlisle-Frank, 2007; RSPCA, 2010). These attributes and their levels were then discussed and tested through a focus group, a pilot study conducted online and a presentation held at the 87th Agricultural Economics Society in order to validate their most appropriate levels.

According to Siettou et al (2014) the characteristics identified as significant in influencing consumer choice when selecting a shelter dog included: age, size, pedigree (whether the dog was of purebred or cross breed status), coat length, medical condition, friendliness (towards children, other dogs, and other companion animals), behaviour and training. However due to the mentioning of '*healthy adoptable dogs*' in the wording of the hypothetical scenario, one may assume that the dogs in question have no medical condition, are friendly towards children, other dogs and other companion animals, do not exhibit any aggressive behaviour and are not in need for training. For this reason, the attributes of medical condition, friendliness, training and behaviour were dropped from the present study. In addition, coat length was not included as an attribute for brevity reasons. Hence, the dog characteristics inserted into the choice experiment were those of age, size and pedigree.

Given that one of the present study's aim was to examine whether people are interested in reducing the UK euthanasia rate via alternative policies, it was decided to include attributes that are associated with such policies that are an alternative to euthanasia. The most prevalent alternative policies discussed in the literature are those of sterilization, micro-chipping, dog licensing and the investment in public education regarding animal welfare. In the UK only microchipping and sterilization are currently practised, with micro-chipping being recently imposed as mandatory. For these reasons, this study's Choice Experiment also included the attributes of whether or not the dogs were microchipped, and whether or not the dogs were neutered or spayed.

The final set of attributes were therefore a total of six: three dog characteristics (age, size and pedigree); two alternative methods for stray dog management (microchipping, sterilization); and the assigned monetary value of people's contribution. These particular attributes were chosen in order to investigate (1) whether people had a specific preference in the dog's characteristics (age, size, pedigree) and (2) whether they had a preference in a current alternative policy aiming in reducing the stray dog population.

Once the attributes were finalized, their respective levels needed to be constructed. The attribute of the age of the dog was constructed as a dichotomous variable having two levels; those of a younger dog between the ages of eight weeks old and of two years old, and of an older dog from two years old or older. The literature on dog adoptions from animal shelters has indicated that age is a significant factor in an adopters' decision on choosing a dog and has a negative effect on a dog's likelihood of being adopted; as age increases the likelihood of being adopted is reduced (Siettou et al, 2014). Hence, it is expected that this attribute will affect people's decision on whether they will contribute in improving the stray dog management in the UK and it is expected to have a negative effect indicating that younger dogs will be preferred over older ones.

The size of the dog has also been indicated by the literature as having a significant effect on the likelihood of a dog being adopted with smaller dogs appearing as most(Siettou et al, 2014). Therefore it is expected that it will affect people's choice in contributing towards a more humane stray dog management. This attribute was assigned four levels indicating whether the dog was of a small, medium, big or large frame.

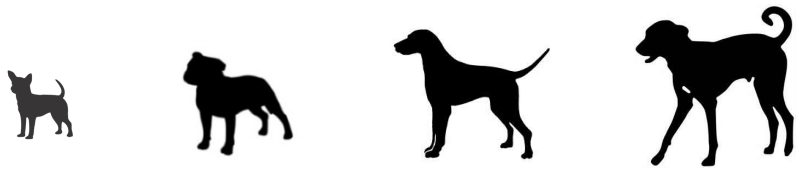
According to the results of Siettou et al (2014), the likelihood of a dog being adopted from an animal welfare organization is increased if a dog is of purebred status. This outcome indicates that the results of the Choice Experiment could also indicate that people's choice may be affected by the pedigree status of a dog. This attribute was constructed as a dummy variable depicting whether a dog was of pure breed or cross/mixed breed status.

Regarding the attributes associated with policies that serve as an alternative to euthanasia, microchipping and sterilization, the literature has indicated that people are in favour of microchipping dogs (Defra, 2013) and hence, it is expected that it will positively affect their willingness to contribute. This attribute was constructed as a dummy variable having the

levels of whether or not microchipped. According to an analysis by Frank (2004) investing in spaying and neutering programmes appears to yield more effective results in the long run in managing the stray and unwanted dog population in comparison to other methods of management. To our knowledge, the literature has yet to produce studies examining whether the public is in favour of such a policy. However, due to being a humane approach in managing the stray dog population, it is expected that it will have a positive effect on people's willingness to pay. Similar to the previous attribute, this was constructed as a dichotomous variable indicating whether or not the dog was sterilized.

The monetary values were created to depict the monthly contribution fee people would be willing to pay in order to contribute to a more humane management of the UK stray dog population. It was constructed as a continuous variable coded as actual values in order to estimate the public's willingness to contribute based on the other attributes. The final values ascribed were those of £2, £5, £8, £12, and £15. These levels were determined after conducting a focus group and a pilot study. The following Box 2 reports the attributes and their respective levels.

Box 2: Final Attributes and their levels.

Age	Two levels: • a younger dog between the ages of 8 weeks old to 2 years old • an older dog from 2 years old or older.
Size	Four levels:  a small dog a medium dog a big dog a large dog
Pedigree	Two levels: • a purebred • a mixed/cross breed
Neutered/Spayed	Two levels: • Neutered/spayed • Not neutered/spayed
Micro-chipped:	Two levels: • Micro-chipped • Not micro-chipped
Monthly Contribution	Five levels: £2, £5, £8, £12, £15

Stage Three: Experimental Design Consideration

This stage includes the type of the experimental design. Hensher et al. (2005b) suggest that an unlabeled experiment has the benefits of complying with the IID assumption and of avoiding the need to use all sets of alternatives. The present study has employed an unlabeled design using only a fraction of the total number of alternative combinations of the attributes. The alternatives used were blocked into four segments to avoid respondent fatigue (Louviere et al., 2001). Each respondent was presented with the alternatives of only one block and, as a result, the study was in need of four different respondents to complete all given alternatives.

In addition, only main effects were used. Main effects are defined as the independence of the effect that each attribute has on the choice variable from all other attribute effects (Hensher et al., 2005b).

Hence, the utility function for the nth individual choosing option í in a choice set of t could be written as:

$$U_{int} = \beta_{1n}Age_{int} + \beta_{2n}Small\ sized_{int} + \beta_{3n}Medium\ sized_{int} + \beta_{4n}Big\ sized_{int} + \beta_{5n}Pedigree\ status_{int} + \beta_{6n}Sterilized_{int} + \beta_{7n}Microchipped_{int} + \beta_{8n}Monthy\ Contribution_{int} + e_{int}$$

Where β_{in} are the utility coefficients and e is the error term, which is assumed to be IID.

Stage Four: Generation of Experimental Design

Given that the design selected was with the use of only main effects, the generation of the design needed only to include the chosen attributes and their respective levels without the need of including interactions of them.

Stage Five: Allocation of Attributes to Design Columns

In this stage the question of the Choice Experiment's design is raised in terms of attribute allocation. Based on the attributes and respective levels described, a D-optimal efficient design was generated (Scarpa and Rose, 2008) assuming a Multinomial Logit functional form. An efficient design is defined as one that generates parameters with the lowest possible standard errors (ChoiceMetrics, Pty Ltd.). The measure employed to minimize the 'inefficiency' in the design was the D-error which for simplicity reasons employs the

determinant of the asymptotic variance covariance matrix of a single respondent (*ibid*). Therefore the design with the lowest D-error produces a design that is anticipated to yield lower variances and covariances (Scarpa and Rose, 2008) and is called a D-optimal efficient design.

Stage Six: Generation of Choice Sets

In this stage Hensher et al. (2005b) identify the need to effectively present the respondents with the relative attributes and their levels. This is done through the construction of the choice sets upon which they will be asked to base their decision. All choice sets were generated by using NGENE (Version 1.1), a specialized software for creating choice experiments (ChoiceMetrics, Pty Ltd.). Each choice card generated included two alternative options and a no choice option, representing the status quo. The respondents were presented with seven choice cards, of which the seventh was a repetition of the second card viewed.

Stage Seven: Randomization of Choice Sets

Hensher et al. (2005b) have raised concerns regarding the process undertaken by respondents when completing the survey. They suggest that there may be a difference in the preferences revealed due to either fatigue issues, respondents may get bored towards the end of the process or due to learning issues, respondents may need time to understand the process of the experiment. For this reason, it is advised to randomize the order of the choice cards within each block showing the respondents the same choice sets but in a different order. Hence, for the present study it was decided to randomize the choice sets within each block.

Stage Eight: Construction of Survey Instrument

The final stage identified by Hensher et al. (2005b) is the construction of the survey instrument. They point out that it is a common practice to provide the respondents with an example choice task in order to reduce any learning issues when undertaking the survey. In addition, they also point out that the researcher could make clear that each choice card should be treated independently from the rest. The construction of the survey for the present study included both. Box 3 provides the aforementioned clarifications given to respondents.

Box 3: Choice Task example.

You will now be presented with a set of 7 choice cards, in which your task is **to indicate your preferred option in each card.**

- Each card contains 2 options for you to choose plus a no choice option
- Each option describes a specific dog with a given set of characteristics plus your monthly contribution
- For each card, you only need to select one option.
- The cards are unrelated, **please treat each card independently**.

An **example** of how the choice card is designed with all the information is shown below:

Thisis the informatio n on which you will be asked to base your decision.

	Option A	**Option B**	**Option C**
Age	2 years old or older	2 years old or older	No choice
Size	Big	Small	
Pedigree	Purebred	Mixed breed	
Neutered/Spayed	No	Yes	
Micro-chipped	Yes	No	
Monthly contribution	£ 5	£8	
Please choose one option	□	✓	□

Specifically, in the above example **Option B** was preferred which is a dog older than 2 years old, small in size, of mixed breed pedigree, has been neutered or spayed but has not been micro-chipped, and the monthly contribution is at £8.

The questionnaire was constructed in such a way as to elicit people's views on pet overpopulation and their willingness to contribute to support a more humane stray dog management that will lead to a reduction of the euthanasia rate. It was grouped into eight sections starting with a section in which some socio-demographic questions were asked in order to ensure that the survey sample was a UK population representative sample. This then was followed by some preliminary warm up questions regarding their connection with dogs and their knowledge of the current situation, i.e. what characteristics they consider important in selecting a pet dog, whether they were aware that healthy dogs were being put to sleep if not rehomed, etc. Then, background information regarding the current UK stray dog situation was given along with the hypothetical scenario. This was followed by the example of the choice task. In the following section, respondents were divided into two groups and asked to

complete the choice tasks. The next section included some follow up questions in order to understand how respondents chose a particular choice option. In the seventh section the respondents were asked to answer questions regarding policies on managing the stray population and the final section included some further socio-demographic questions. A copy of the questionnaire is available upon request.

2.2 Data

The questionnaire was formatted in an internet survey format via a professional online survey provider 'Toluna' (uk.toluna.com). The project required 500 complete questionnaires from a UK representative sample. The quota for the UK representative sample was based on age, excluding individuals younger than the age of eighteen, on occupation, excluding students and on whether respondents were dog owners. This was required in order to obtain a UK representative sample of individuals that are eligible to pay council tax and also to comply with the statistics given by the Pet Food Manufacturers Association (PFMA) and existing literature (see Murray et al., 2010) that 25 per cent to 30 per cent of households in the UK own dogs. This was sought due to the notion that dog owners are more sensitive to dog welfare issues than non-dog owners because of their daily interaction with their own pet. In economic theory terms, dog owners may be inclined to respond to the choice task ascribing both use and non-use value due to the companionship enjoyed from their own pet. Therefore, by keeping the percentage on the UK representative level we avoid any bias or difference in willingness to pay interpretation that may arise from this issue.

From the 500 people that completed the survey, the respondents were split between females (51 per cent) and males (49 per cent), with the average age and household income being 38 years of age and £24,000, respectively. A little over a half (58.6 per cent) of the respondents reported to being married and one third (33.6 per cent) reported to have dependent children in their households. Complying with the UK representative statistics, 30.4 per cent owned a dog, with the majority of them owning one dog (23.2 per cent). A little over a half (58 per cent) of the respondents reported that they had donated to an animal welfare organization while only a small percentage (8.2 per cent) reported of volunteering at an animal welfare organization. Summary statistics are given in Table 1.

Table 1: Summary statistics of sample's socio-demographic variables (N=500)

Variable	Description	Percentage	N
Gender	Male	49.00%	245
	Female	51.00%	255
Age	< 18	0.00%	0
	18-25	14.00%	70
	26-35	19.40%	97
	36-45	21.80%	109
	46-55	21.00%	105
	56-66	17.80%	89
	> 66	6.00%	30
Income	Less than 5,000	4.60%	23
	5,000 to 9,999	8.00%	40
	10,000 to 14,999	11.20%	56
	15,000 to 19,999	10.80%	54
	20,000 to 24,999	9.20%	46
	25,000 to 29,999	10.80%	54
	30,000 to 34,999	10.00%	50
	35,000 to 39,999	4.00%	20
	40,000 to 44,999	5.20%	26
	45,000 to 49,999	3.20%	16
	50,000 and above	11.80%	59
	Undisclosed	11.20%	56
Education	Basic school education	25.80%	129
	A-levels or equivalent	17.00%	85
	Further educational	19.20%	96
	University	26.00%	130
	Higher University	11.00%	55
	Undisclosed	1.00%	5
Marital status	Single	39.80%	199
	Married/partnership	58.60%	293
	Undisclosed	1.60%	8
Dependent children	Yes	33.60%	168
	No	66.40%	332
Owned dog	Yes	30.40%	152
	No	69.60%	348
Currently own dog(s)	1 dog	23.2%	116
	2 to 3 dogs	7.00%	35
	4 or more dogs	0.20%	1
Volunteered	Yes	8.20%	41
	No	91.80%	459
Donated	Yes	58.00%	290
	No	42.00%	210

In order to accommodate the two payment methods included in the present study, the Voluntary Sponsorship Scheme and the Mandatory Council Tax Charge, the sample was split in half keeping the percentage of dog owners at the UK representative level of 30 per cent for each sample and the age variable as close to the UK representative level as possible. The following Table 2 and Table 3 include socio-demographic statistics for the two groups.

Table 2: Summary statistics of the socio-demographic variables of the Voluntary Payment Sample (N=250)

Variable	Description	Percentage	N
Gender	Male	46.80%	117
	Female	53.20%	133
Age	< 18	0.00%	0
	18-25	13.60%	34
	26-35	20.40%	51
	36-45	21.20%	53
	46-55	22.40%	56
	56-66	16.80%	42
	> 66	5.60%	14
Income	Less than 5,000	5.60%	14
	5,000 to 9,999	8.40%	21
	10,000 to 14,999	9.20%	23
	15,000 to 19,999	10.00%	25
	20,000 to 24,999	8.80%	22
	25,000 to 29,999	9.60%	24
	30,000 to 34,999	10.80%	27
	35,000 to 39,999	4.80%	12
	40,000 to 44,999	5.60%	14
	45,000 to 49,999	3.20%	8
	50,000 and above	10.40%	26
	Undisclosed	13.60%	34
Education	Basic school education up	28.00%	70
	A-levels or equivalent	18.00%	45
	Further educational	18.00%	45
	University undergraduate	26.40%	66
	Higher University	8.40%	21
	Undisclosed	1.20%	3
Marital status	Single	42.40%	106
	Married/partnership	56.00%	140
	Undisclosed	1.60%	4
Dependent children	Yes	34.80%	87
	No	65.20%	163
Owned dog	Yes	30.00%	75
	No	70.00%	175
Currently own dog(s)	1 dog	72.00%	54
	2 to 3 dogs	26.67%	20
	4 or more dogs	1.33%	1
Volunteered	Yes	6.00%	15
	No	94.00%	235
Donated	Yes	58.00%	145
	No	42.00%	105

Table 3: Summary statistics of the socio-demographic variables of the Mandatory Council Tax Charge Payment Sample (N=250)

Variable	Description	Percentage	N
Gender	Male	51.20%	128
	Female	48.80%	122
Age	< 18	0.00%	0
	18-25	14.40%	36
	26-35	17.60%	44
	36-45	22.80%	57
	46-55	19.60%	49
	56-66	19.20%	48
	> 66	6.40%	16
Income	Less than 5,000	4.00%	10
	5,000 to 9,999	8.00%	20
	10,000 to 14,999	12.80%	32
	15,000 to 19,999	11.60%	29
	20,000 to 24,999	9.60%	24
	25,000 to 29,999	12.00%	30
	30,000 to 34,999	8.80%	22
	35,000 to 39,999	3.20%	8
	40,000 to 44,999	4.80%	12
	45,000 to 49,999	3.20%	8
	50,000 and above	13.20%	33
	Undisclosed	8.80%	22
Education	Basic school education up	24.00%	60
	A-levels or equivalent	16.00%	40
	Further educational	20.40%	51
	University undergraduate	25.60%	64
	Higher University	13.20%	33
	Undisclosed	0.80%	2
Marital status	Single	37.60%	94
	Married/partnership	60.80%	152
	Undisclosed	1.60%	4
Dependent children	Yes	32.00%	80
	No	68.00%	170
Owned dog	Yes	30.00%	75
	No	70.00%	175
Currently own dog(s)	1 dog	57.20%	143
	2 to 3 dogs	42.80%	107
	4 or more dogs	0.00%	0
Volunteered	Yes	10.40%	26
	No	89.60%	224
Donated	Yes	57.20%	143
	No	42.80%	107

When comparing the two samples, it is evident that the Voluntary Sponsorship Scheme sample has 1.6 per cent more participants that earn more than £30k, 2 per cent more participants under the age of 35 and more females. Both samples have the same percentage of people that have donated while the sample for the Mandatory Council Tax Charge has a 4 per cent higher rate for people volunteering.

The final data used for each model were determined by the number of respondents that gave meaningful responses. Due to the project paying respondents to complete the survey, it is highly likely that some did not engage with the choice task but rather selected the no choice option in order to collect their survey fee fast. For this reason, any respondent that had selected no choice options for all choice cards was dismissed from the analysis. This led to a final data set of 343 respondents. Of these 164 had been presented with the Voluntary Contribution payment method and 179 had been presented with the Mandatory Council Tax Charge payment method.

3. Results

The present study employed two Multinomial Logit Models for the two payment methods that were used for the same hypothetical scenario. This allowed investigating people's willingness to pay by the use of two different payment methods both targeting to reduce euthanasia rates.

The results of the Multinomial Logit Models revealed that the age of the dog and the monthly contribution were the most important factors in people's decision making and in the case of the Voluntary Contribution payment method the pedigree of the dog was also an important factor.

In the case of the Mandatory Council Tax Charge payment method the factors that were found to be statistically significant at the one per cent level of significance were those of a dog's age and the amount they were asked to contribute on a monthly basis. As expected people revealed that they preferred to support a younger dog and preferred to contribute with a smaller amount. In addition, the alternative specific constant (ASC) appeared to be statistically significant at the one per cent level of significance and to be negative indicating that people preferred the no-choice option. This could be due to people preferring the current

approach in managing the stray dog population as they would not be charged an additional amount on their council tax.

In the case of the Voluntary Contribution payment method the factors that were found to be statistically significant were those of a dog's age, a dog's pedigree status and the monthly contribution, with age and monthly contribution being statistically significant at the one per cent level of significance and pedigree being statistically significant at the five per cent level of significance. As expected the age of the dog and the monthly contribution appeared to have a negative effect on people's decision making with people preferring younger dogs and smaller amounts. Regarding a dog's pedigree, the regression revealed that people preferred cross/mixed breed dogs over purebred. This is an interesting finding that could potentially indicate people's knowledge of the fact that purebred dogs are more likely to be rescued by animal welfare organizations or be adopted out once the seven day statutory period has expired and therefore are willing to keep cross/mixed breed dogs alive to have a chance to be adopted.

Similar to the Mandatory Council Tax Change payment method, the alternative specific constant (ASC) appeared to be statistically significant at the one per cent level of significance and to be negative indicating that people preferred the no-choice option. This result could mean that people prefer the current approach in managing the stray dog population over a Voluntary Contribution as perhaps they believe such a scheme could not have a significant impact on the reduction of the euthanasia rate. The results of both the Mandatory Council Tax Charge payment method and the Voluntary Contribution payment method are summarized in the following Table 4.

Table 4: The results of the MNL for the Tax and the Voluntary Payment method.

Variables	Tax		Voluntary	
	Coefficients	St. Errors	Coefficients	St.Errors
ASC	-2.08***	0.29	-1.98***	0.29
Age	-0.3***	0.11	-0.35***	0.10
Size: small	0.08	0.14	0.23	0.14
Size: medium	-0.06	0.20	0.12	0.20
Size: big	-0.2	0.18	0.01	0.19
Pedigree: Purebred	-0.06	0.10	-0.23**	0.10
Neutered/Spayed: Yes	0.01	0.10	-0.06	0.10
Microchipped: Yes	0.03	0.10	0.005	0.10
Monthly Contribution	-0.14***	0.02	-0.14***	0.02
Log Likelihood	-1216.665		-1156.355	
Sample size	1253		1148	

Note. ***, **, *, Significance at 1%, 5%, 10% level.

With respect to estimating people's willingness to pay, the Delta method of the Wald procedure available on the NLOGIT econometric software (Greene, Economic Software, Inc.) was employed. People's willingness to pay under a Mandatory Council Tax Charge payment method was estimated at £2.14 per month with the age of the dog being statistically significant at the one per cent level of significance. It appears that people would be willing to pay this amount on a monthly basis to keep a younger dog alive after the seven day statutory period ends.

The results of the Delta method of the Wald procedure for the Voluntary Contribution payment method revealed that the age, the size and the pedigree of the dog had a statistically significant willingness to pay outcome. Age and pedigree were found to be statistically significant at the one per cent level of significance while size was found to be statistically significant only at the 10 per cent level of significance.

This procedure indicated that people are willing to pay £2.54 for a younger dog, £1.64 for a small dog and £1.65 for a cross/mixed breed dog. If added up people would overall be willing to pay £5.83 on a monthly basis for a small young cross/mixed breed dog to be kept alive in Local Authority kennels beyond the seven day statutory period.

As expected, the results of the willingness to pay under a mandatory regime, that of the Mandatory Council Tax Charge payment method yielded a lower amount than under a

voluntary regime, that of a Voluntary Contribution payment method. Hence, the results of the Multinomial Logit Models have identified the upper and lower limit of £2.14 - £5.83 of what people are willing to contribute for improving UK stray dog management. These results are summarized in the following Table 5.

Table 5: MNL: Willingness to pay for the Tax and the Voluntary Payment method.

Choice Attributes	**Tax**		**Voluntary**	
	Coefficient	95% Confidence Interval	Coefficient	95% Confidence Interval
Age	-2.14***	(-3.36, -0.916)	-2.54***	(-3.78, -1.29)
Size: small	-	-	1.64*	(-0.17, 3.45)
Pedigree	-	-	-1.65***	(-2.91, -0.40)

Note. ***, **, *, Significance at 1%, 5%, 10% level.

4. People's Perceptions on the Issue of the Dog Overpopulation Problem.

Apart from the Choice Experiment the survey also included questions investigating the public's perceptions on the issue of dog overpopulation and its management. More specifically the aim was firstly to elicit the relationship of the respondents with companion animals, secondly to investigate people's views on dog adoption and the dog overpopulation problem, and thirdly to examine people's views on policies that are an alternative to euthanasia.

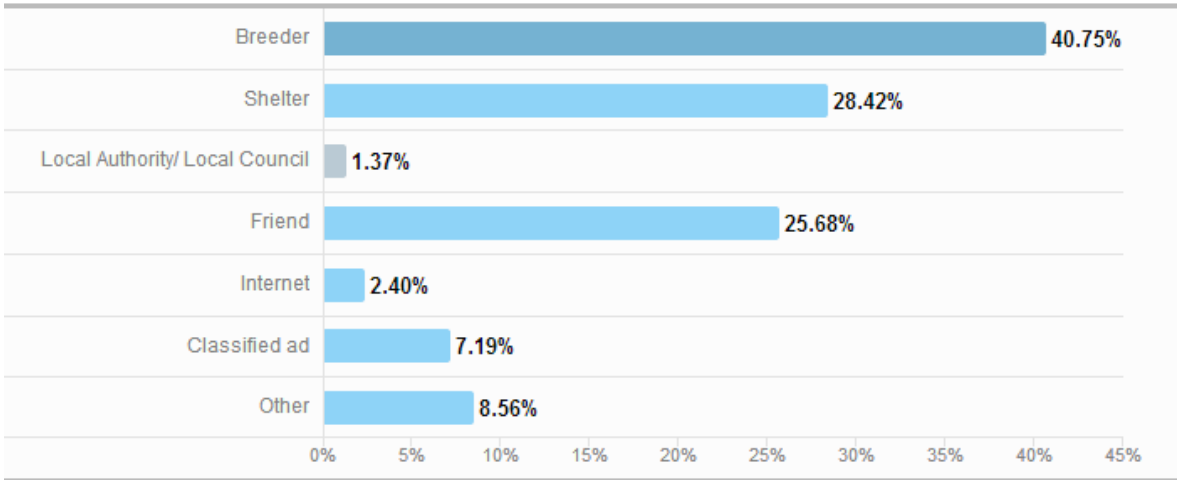
The relationship with companion animals.

The statistics obtained from the survey provide a clear indication that the UK public has a longstanding emotional bond with companion animals. From the 500 people that completed the survey 77.4 per cent were current pet owners; 152 respondents owned a dog (30.4 per cent), 136 respondents owned a cat (27.2 per cent) and 99 respondents reported owning another animal species (19.8 per cent). Regarding dogs, 292 respondents (58.4 per cent) have reported having owned a dog either currently or in the past. Approximately half of the total sample (45 per cent) reported owning a dog in the past. From current dog owners, 76.32 per cent reported owning one dog, 23.03 per cent reported two or three dogs and a mere 0.66 per cent reported of owning four or more dogs.

When asked about the outlet of obtaining their dog, the majority indicated that they had bought their dog from a breeder (40.75 per cent) followed by adopting their dog from a shelter (28.42 per cent) and obtaining their dog through a friend (25.68 per cent). Additional

outlets were those of the internet, classified ads, Local Authorities or other outlets (overall 19.52 per cent). These results are illustrated in figure 1. These statistics do not concur with the statistics given by the PFMA as they had reported that for 2008 the leading outlet was rescue centres (32 per cent) followed by friends (25 per cent) and breeders (16 per cent) (PFMA, 2011). But they do provide an insight on the percentages revealed of the pedigree of the dogs of the respondents where 47.95 per cent indicated that they owned a purebred dog, 42.63 per cent owned a crossbreed and 9.59 per cent owned both.

Figure 1: From whom did you obtain your dog?



Source: Own compilation

It is noteworthy that the lowest percentage outlet was that of the Local Authorities with just 1.37 per cent of the respondents obtaining a dog from them. The fact that only four out of 292 current and previous dog owners obtained their dogs from Local Authorities is insightful information. It is a clear indication that Local Authorities are in need of promoting or making known that dogs in their kennels are available and suitable for adoption in order to attract more potential adopters. This could greatly affect the fate of stray dogs and lead to a significant reduction of the euthanasia rate as the public would become aware that dogs are also available through this outlet.

People's views on dog adoption and the dog overpopulation problem.

The survey included questions aiming to gain information on people's decision making while considering obtaining a dog and their views on the current management of the stray dog population.

a. Views on dog adoption.

In order to examine people's views on dog adoption, they were asked if they would consider adopting a homeless dog from a shelter. The statistics revealed a slight favour in considering adopting a shelter dog with 57.8 per cent of the respondents giving a positive answer. However, when respondents that indicated that they would consider adopting a dog (288 respondents) were asked if they would consider adopting a Staffordshire Bull Terrier only 42 per cent answered yes. In addition, all respondents were asked whether they were aware of which dogs were characterized as 'status dogs' but only 30.8 per cent gave a positive answer.

b. Views on the dog overpopulation problem

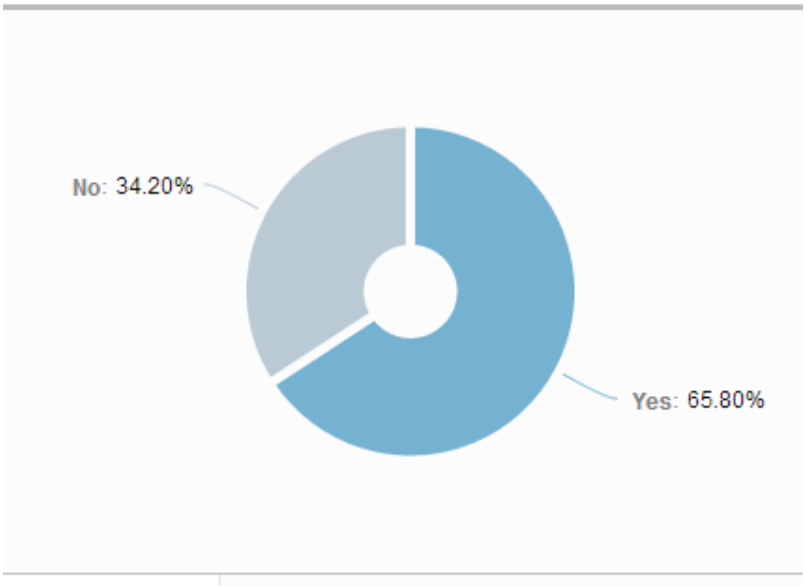
In order to elicit people's views on stray dog management and the overpopulation problem, the survey initially asked current and previous dog owners whether they had had their dog gone missing; only 21.92 per cent responded that their dog had indeed gone missing. From these, 40.62 per cent were reunited with their dogs due to personal search, 20.31 per cent were reunited because the finder contacted them, 15.62 per cent were reunited with the help of the police, 12.5 per cent were reunited with the help of Local Authorities, 7.81 per cent were reunited by an alternative method and 15.62 per cent reported that their dogs were never found.

When a respondent indicated that they found their dog with the help of Local Authorities, the cost of retrieving their pet was asked. It was revealed that 62.5 per cent of those responded that the fee was affordable, 25 per cent responded that it was too expensive while 12.5 per cent reported that they were not charged.

One of the methods of Local Authorities managing the stray dog population is putting to sleep the dogs that have not been adopted or rescued from private animal welfare organizations after the seven day statutory period expires. Respondents were asked whether they were aware that healthy homeless dogs were put to sleep if not re-homed. The majority (65.8 per cent) revealed that they were aware of this situation. When asked how concerning it was that at least 7,000 dogs were put to sleep in the UK each year 50.2 per cent indicated that it was of grave concern, 26.6 per cent indicated that it was of moderate concern, 12.4 per cent indicated that it was of mild concern and only 10.8 per cent indicated that it was of no concern. When asked whether they supported the current practice of putting to sleep dogs that have not been re-homed, the majority (69 per cent) opposed it. Therefore, these statistics

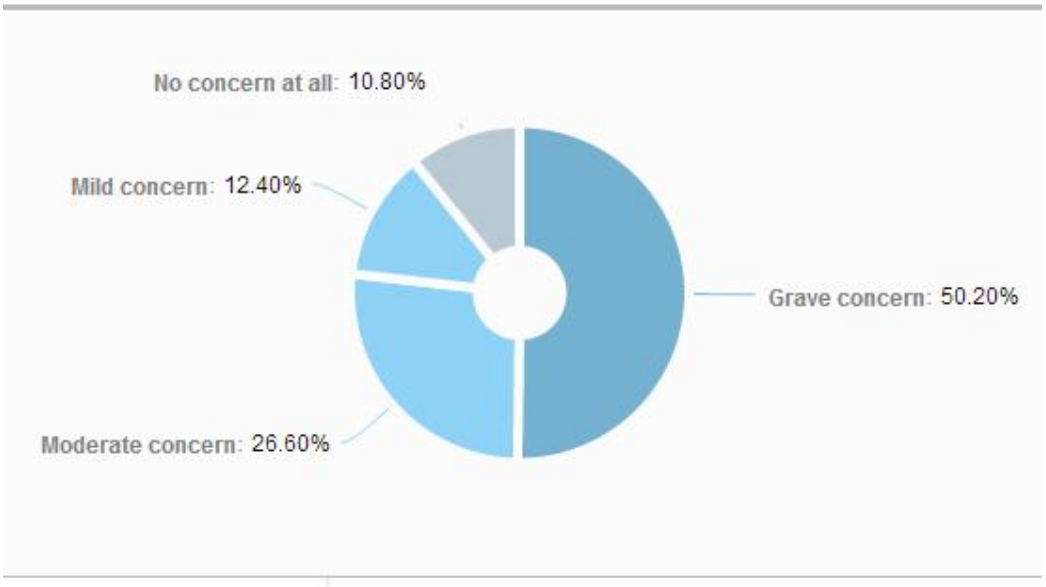
are a strong indication that the UK public is aware of the current situation and is concerned about it. These statistics are illustrated in the following Figures 3-4.

Figures 3: Were you aware that healthy dogs that are not re-homed are being put to sleep? (N=500)



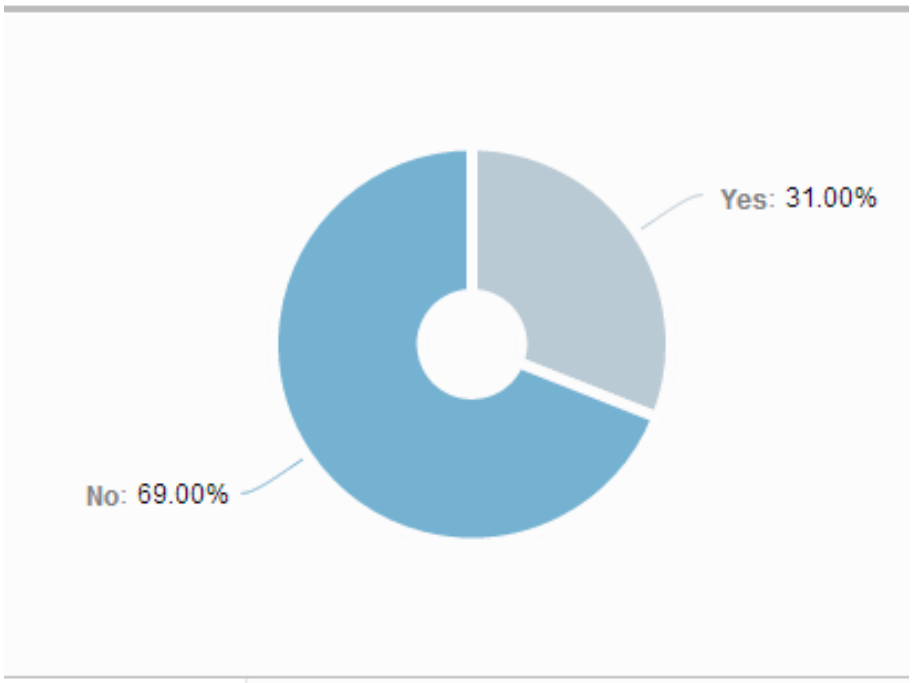
Source: Own compilation

Figure 4: At least 7000 dogs are put down each year in the UK. Do you think this number is of: (N=500)



Source: Own compilation

Figure 5: Do you support the current practice of putting dogs to sleep that have not been re-homed? (N=500)



Source: Own compilation

People's views on policies that are an alternative to euthanasia.

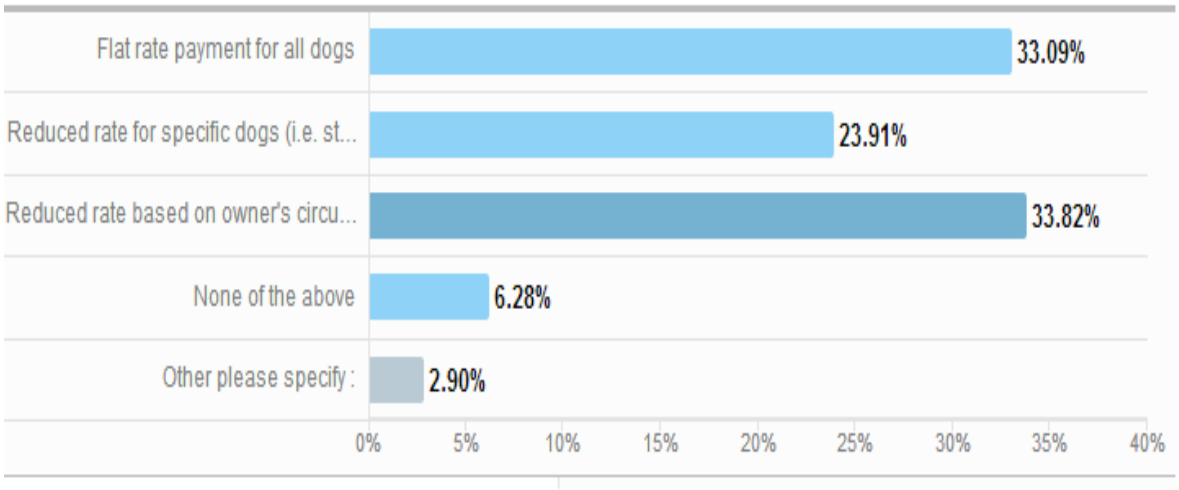
Given the public would be the source of financing any policy that would serve as an alternative to euthanasia, the survey included questions seeking to elicit the respondents' views on the most popular, as recommended by animal welfare organizations and researchers, alternative policies. These policies include microchipping, neutering and spaying, dog licensing and investing in responsible dog ownership education.

One of the most important policies discussed in the literature is the compulsory micro-chipping for all dogs. This policy has just recently been introduced in the UK with the law stating that all dogs must be microchipped by April 6th, 2016 (Defra, 2013). When asked whether compulsory microchipping would help regulate the stray dog population 77 per cent of the respondents agreed. The percentage remained similar (67.8 per cent) when they were asked to indicate useful policies in managing the stray and unwanted dogs. Although the majority agreed that it would prove useful these results do not concur with the results of the Defra consultation (2013) that revealed that 96 per cent of their respondents were in favour of some form of compulsory microchipping.

Another alternative policy presented in this survey was a sterilization policy of neutering or spaying. When respondents were asked whether neutering and spaying should be compulsory for all pets not owned for breeding purposes, 79.4 per cent agreed to it and when asked to indicate useful policies in managing the stray dog population, 58.8 per cent indicated mandatory spaying/neutering as useful.

Dog licensing is an alternative policy that has received mixed reviews by the research and animal welfare community. According to this survey's results, 82.8 per cent of the respondents appeared to be in favour of an introduction of a dog licensing scheme and 70 per cent indicated that it would be useful in managing stray and unwanted dogs. From those who indicated a positive answer, 33.09 per cent indicated that a flat rate for all dogs would be the most appropriate licensing fee policy, 23.91 per cent indicated that a reduced rate for specific dogs (i.e. senior dogs, sterilized dogs) would be the most appropriate licensing fee policy, 33.82 per cent indicated that a reduced rate based on owners circumstances (i.e. senior citizens, disabled) would be the most appropriate licensing fee policy, 6.28 per cent said none of the above and 2.9 per cent stated another licensing fee policy as most appropriate (i.e. nominal or no charge, charge based on breed with higher fee for 'status' dogs, reduced rate for additional dogs). These are illustrated in Figure 6.

Figure 6: Which type of dog licensing policy would you support? (N=414)



Source: Own compilation

Another popular alternative policy is investing in public education promoting responsible dog ownership. When asked, 80.4 per cent of the respondents agreed that the Government should

invest in educating the public on responsible dog ownership. However, when asked to indicate whether it would be a useful policy in managing stray and unwanted dogs, only 53.4 per cent of the respondents selected it. Perhaps this result indicates that other policies are perceived as having a more effective result in the short run.

Lastly, respondents were asked to reveal their views on breeders' license. Currently the requirements of a breeder's license include owning at least five breeding dogs producing a total of five or more litters per year. Respondents were asked if they believed that stricter breeder's license requirements should be put into place in order to regulate the birth of unwanted puppies that are contributing to the population of stray and unwanted dogs. This statement was supported by 82 per cent of the respondents. In addition, when asked to indicate useful policies in managing stray and unwanted dogs, 62.8 per cent indicated stricter breeder's license requirements.

5. Conclusion

The present survey was designed to investigate whether people are concerned about the stray dog population and whether they are willing to contribute to improving their current management. The results revealed that the UK public has an emotional bonding with companion animals and is concerned about their fate. According to the findings the UK public is aware of the current stray dog management and the majority is aware that healthy homeless dogs are being put to sleep if they are not rehomed and believe that this is of grave or moderate concern. In addition, the survey revealed that the majority of the respondents are opposed to the current euthanasia policy.

Regarding alternative policies aiming to regulate and mitigate the dog overpopulation issue, respondents appeared to be very keen in the presented policies. All policies received a high positive response rate. The policy that accumulated the highest positive response was that of dog licensing as 82.8 per cent were in favour of such a policy. The most prominent dog licensing fee policy was that of a flat rate for all and a reduced rate based on owners' circumstances (i.e. senior citizens, disabled). The re-introduction of a dog licensing in the UK could potentially be a vehicle that could promote responsible dog ownership, track dog owners and strays, and raise additional funds that could be used for managing stray dogs. In addition, all other presented policies also received high positive rates indicating that if imposed they would be perceived as being useful. It is noteworthy that the policy of

mandatory spaying or neutering dogs not owned for breeding purposes received a 79.4 per cent positive response.

In order to investigate whether people would be willing to contribute to improving the current management a Choice Experiment was employed. The choice task given to respondents asked whether they would be willing to pay on a monthly basis to extend the current seven day statutory period which would subsequently lead to a reduction of the euthanasia rate. Two payment methods were constructed, that of a Voluntary Contribution and of a Mandatory Council Tax Charge and each was presented to half of the respondents. The methodology employed to analyze their responses was the Multinomial Logistic Regression Model. The study revealed that people are willing to pay £5.83 per month for small cross/mixed breed dog under the Voluntary Contribution regime and £2.14 per month for a young dog under the Mandatory Council Tax Charge regime.

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