Novel method accurately predicts the number of cats owned by households in Wales

Llywodraeth Cynulliad Cymru
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CATS PROTECTION

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SUMMARY: Data from a large (n=4549) survey were used to derive estimates for the number of cats owned by households in Wales in 2009-2010 using four different methods, including a novel method based on the 2008 Welsh Index of Multiple Deprivation (WIMD). It was possible to assess the accuracy of three methods, by comparing actual and predicted numbers of cats owned in a random sample of 10% of the dataset, using models constructed from a the remaining 90% of the dataset. All three methods predicted the number of cats owned with a high level of accuracy.   These results demonstrate that the WIMD can be used to predict cat ownership, which will be of particular relevance to those wishing to use postcode data to predict cat ownership in different areas of Wales.

BACKGROUND

• Different methods have been used to estimate the number of cats and dogs the UK (Westgarth *et al.,* 2007; Downes *et al.,* 2009; Murray *et al.,* 2010); however in the absence of a gold standard it is difficult to assess the accuracy of these methods.

• Previously reported methods use predictor variables that are available from census records, in order that predictions of cat and dog ownership can be made. This study investigated a novel method of predicting cat and dog ownership, by using the 2008 Welsh Index of Multiple Deprivation (WIMD 2008).

• The WIMD 2008 is a relative measure of deprivation at the small area level in Wales (Figure 1). WIMD is constructed from eight different factors related to deprivation with the following weightings (Welsh Assembly Government, 2010):

Income (23.5%)	Employment (23.5%)	
Education, skills and training (14%)	Health (14%)	Geographical access to services (10%)
Community safety (5%)	Housing (5%)	Physical environment (5%)

• The Welsh Assembly Government (WAG) conducted a face-to-face survey of a sample of 4559 Welsh households during 2009-2010.

Welsh Index of Multiple Deprivation 2008
Overall Index of Multiple Deprivation   **Figure 1**
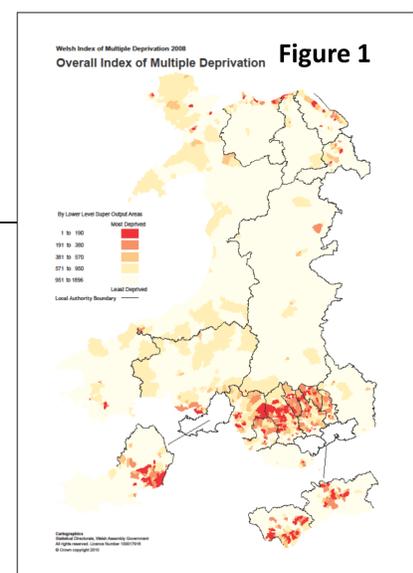
AIMS OF THE STUDY

1. To estimate the number of cats owned by households in Wales using four different methods

2. To compare the accuracy of these four methods.

Method 1: Simple method of extrapolation
The mean number of cats owned within the study sample was multiplied by the total number of Welsh households (n=1,338,811) to produce an estimate of the size of the pet cat population in Wales.

Method 2: Model-based approach. Using number of people in household as a predictor.
SPSS was used to fit a linear regression model to the data. Five categories were used (1, 2, 3, 4, 5 or more people in the household). For each category estimates of the average number of cats and the standard errors were constructed (Table 1).   Estimates were then combined into a weighted sum based on the number of Welsh households in each of the 5 household sized categories to estimate the total population of pet cats in Wales.

Method 3: Model-based approach. Using Welsh Index of Multiple Deprivation (WIMD) as a predictor.
The same approach was used, as described for Model 2. However, instead of using the number of people in the household, two categories of WIMD 2008 were used in the model (Table 2); households in the 40% most derived areas of Wales and households in the 60% least deprived areas of Wales. These two categories resulted in the best model fit.

Method 4:   WAG predictions.
The figure for pet cat population in Wales is based on the actual number of cats per household in the study sample, grossed to the total number of households in Wales, adjusted for sampling weights.

Table 1: Based on complete dataset (n=4549)

No. of people in household	Coefficient	Standard Error
1	0.174	0.017
2	0.210	0.015
3	0.316	0.027
4	0.352	0.031
5 or more	0.402	0.045

Table 2: Based on complete dataset (n=4549)

WIMD 2008 of household	Coefficient	Standard Error
40% most deprived	0.207	0.015
60% least deprived	0.253	0.013

Table 3: RESULTS	Estimated number (95% CI) of pet cats in Wales Complete dataset (n=4549)	Estimated number (95% CI) of pet cats in Wales 90% of data randomly selected (n=4094)	Estimated number (95% CI) of cats in 10% of data (n=455) excluded from original dataset 107 cats owned by households
Method 1 (Mean no. of cats/household)	314,391 (288,803-339,979)	314,264 (287,178-341,351)	107 (98-116)
Method 2 (No. of people in household)	337,346 (311,113-363,579)	336,426 (308,589-364,264)	108 (99-117)
Method 3 (WIMD 2008)	315,833 (290,226-341,440)	315,760 (288,654-342,866)	107 (98-116)
Method 4 (WAG predictions)	344,564 (319,140-369-988)	n/a	n/a

DISCUSSION:
Methods 1-3 were able to predict the number of owned cats with a high level of accuracy, as demonstrated in Table 3.
The use of WIMD 2008 to predict pet ownership is a new finding which has potential uses in many areas as it is not dependent upon data collected from individual households. Potential areas of use include: identifying areas which are more likely to own higher numbers of cats which will be of interest to managers of vet practices, pet shops and feline welfare charities. Further use of the data to include density of the owned feline population may also be useful in predicting areas where the risk of feline infectious disease transmission is greatest.

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