Factors affecting the annual total number of pet dogs and the changes in the pet dog population in Britain over the last decade

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Introduction

- Pet dogs are the world's ***most popular*** mammal species kept as companion animals.
- The total global population -- 175 million *(Hughes & Macdonald, 2013)*
- **Benefit**: improve physical and mental health
- **Disadvantage**: source of zoonotic infection
- Local pet dog population size and influencing factors-- rabies control strategies and the veterinary field

Aims of this report

- Identify the factors that affect the annual total pet dog population size.
- Find out how the pet dog population size has changed in the UK over the past decade.

Hypothesis

1. The ***average annual cost of raising a dog*** and ***the annual number of households without children*** are the affected factors of the total pet dog number
2. The population size in the UK will ***increase*** yearly

Method

- Collect and extrapolate data from **Statista 2023** (www.statista.com)
- The annual total pet dog number is the sum of **ten common pet dogs**' annual registration numbers in the UK from 2011 to 2021
- **A multiple regression model** --- Investigate factors affecting UK annual pet dog population size
- **Variance Inflation Factor (VIF)** with threshold = 3 --- Remove variables with strong multicollinearity
- **Scale ()** --- multiple continuous explanatory variables are on different scales
- A time series graph --- Investigate the changes in the size of the pet dog population

Results

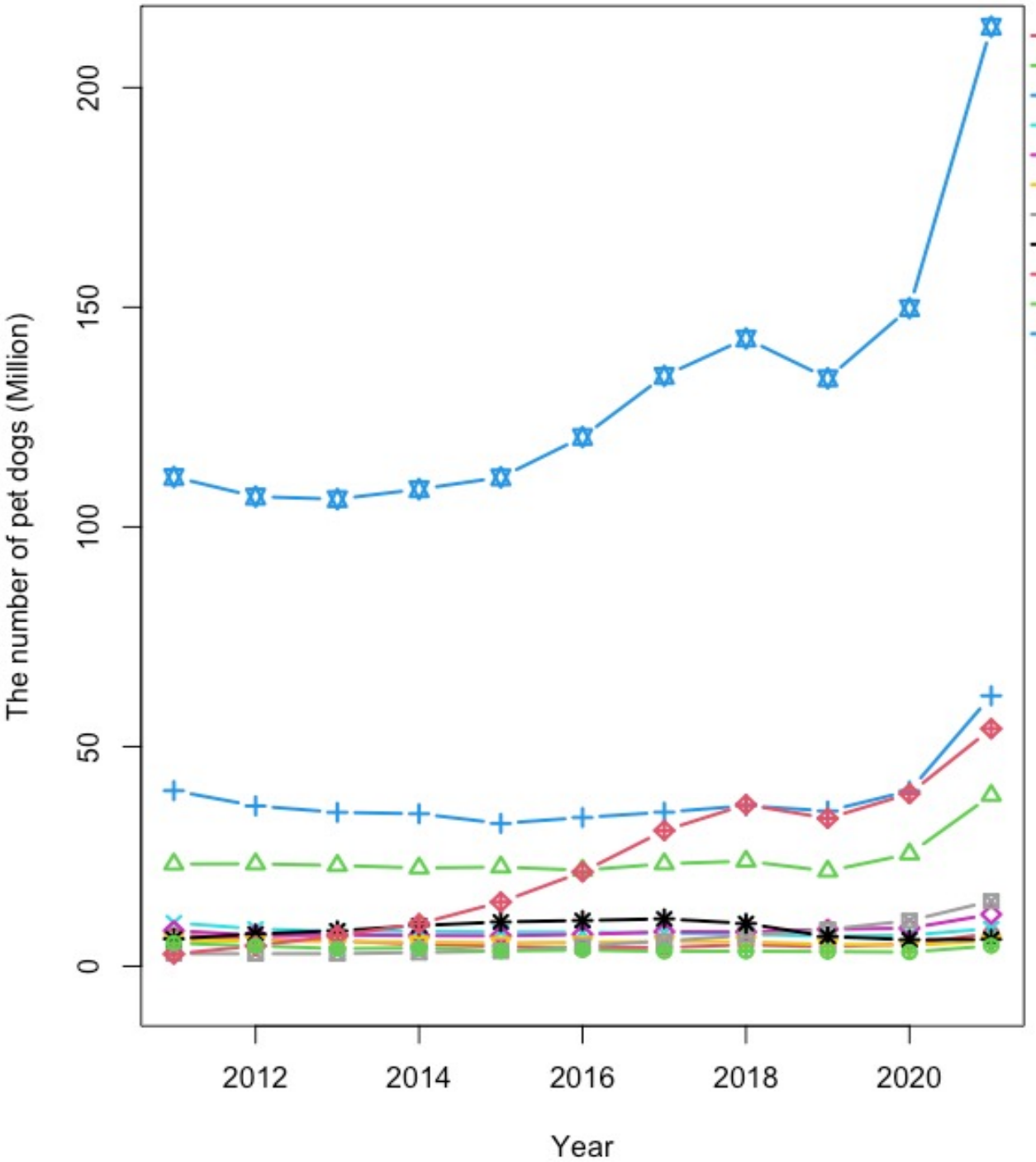
Table 1. Summary of the multiple regression model with total pet dog number as the response variable

Coefficient	**Estimate ± SE**	**t-value**	**95%CI**	**p-value**
(Intercept)	130.82 ± 1.67	78.58	[126.74, 134.89]	<0.05 ***
Scale(Cost per dog)	-18.25 ± 2.22	-8.23	[-23.68, -12.82]	<0.05 ***
Scale(households without children)	2.03 ± 2.11	0.96	[-3.13, 7.19]	0.37
Scale(households with children)	32.86 ± 2.13	15.47	[27.66, 38.05]	<0.05 ***
scale(GDP per capita)	5.43 ± 2.20	2.47	[0.05, 10.82]	<0.05 *
Model equation: Total number (million) = 130.82 - 18.25* scale (Cost)+ 32.86 * scale (households with children) + 5.43 *scale (GDP)				

- The model explains a statistically significant and substantial proportion of variance (F-value= 108.4, df = (3, 7), p-value<0.01) with an adjusted R^2 of 0.97
- The annual number of households without children has no significant effect (p-value =0.37)
- The predictive power of households with children coefficient is relatively **reliable** (t-value = 15.47)
- The reliability of the GDP coefficient is **low** (t-value =2.47).

Total number (million) = 130.82 - 18.25* scale (Cost)+ 32.86 * scale (households with children) + 5.43 *scale (GDP) ± e

- Every 1SD increase in the annual number of child-rearing households
  --- the annual total number of pet dogs ***increase*** by **32.86 million**
- Every 1SD increase in the annual cost of raising a dog
  --- the annual total number of pet dogs ***decrease*** by **18.25 million**
- Every 1SD increase in the per capita GDP
  --- the annual total number of pet dogs ***increase*** by **5.43 million**



- British's pet dog population size changed from 2011 to 2021
- The blue line with five-star represents the total pet dog number
- Levelled off from 2011 to 2015
- Downward trend from 2018 to 2019
- Increase sharply from 2019
- **Labrador Retrievers** are the most popular pet dogs in the UK
- The number of **bulldogs** has increased dramatically since 2014

Discussion

- ***The results partly support the first hypothesis***
- The **negative** relation between the annual average cost per dog and pet dog population size
- Other factors: GDP, the number of households with children **rather than** those without children
- Households with children are **more likely** to have dogs:

  1. Bring children necessary **companionship** *(Franti & Kraus, 1974)*
  2. Important for children's **emotional development**, such as self-esteem and compassion *(Poresky, 1996)*

- ***The results do not support the second hypothesis***
- In addition to explanatory variables, **specific events** that occurred in the year will also affect.
- England legislated that all pet dogs must have microchips in 2016 -- **Increasing**
- Covid-19 in 2020 --- **Increasing**

Pet dogs can protect against the negative psychological and physical effects of lockdowns (Holland et al., 2021)

Limitation

- The **small** amount of data and sample size (only eleven data for each independent variable)

  ------ Leading to **poor** reliability and validity *(Faber & Fonseca, 2014)*

- The number of registered dogs in just **ten kinds** does **not** represent the total number of the pet dog

  ----- There are even many **unregistered** dogs

Future

- Check the reliability and generality of the conclusions or use a **large sample size** from different sources
- **Other affected factors** include annual human psychological state, annual average earning, education level etc.
- **Other countries**, such as Europe, Asia
- The relation between explanatory variables (causal relationships)
- **Predict** the future pet dog population size by modelling

Essential for the formulation of public health policies, animal disease control and stray dog population management

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