

# My title\*

My subtitle if needed

Yimiao Yuan

April 14, 2024

First sentence. Second sentence. Third sentence. Fourth sentence.

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\*Code and data are available at: [https://github.com/YimiaoYuan09/Pet\\_Ownership\\_Impact](https://github.com/YimiaoYuan09/Pet_Ownership_Impact)

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## 1 Introduction

You can and should cross-reference sections and sub-sections. We use R Core Team (2023) and Wickham et al. (2019).

The remainder of this paper is structured as follows. Section 2....

## 2 Data

### 2.1 Data Source

In this report, I use data from a cross-sectional study of pet owners and non-pet owners in Bangladesh in 2020 as the primary dataset. The dataset uses both online and offline methods to collect data. The questionnaire was divided into two main sections including socio-demographic questions and depression assessment. The first section asked participants about their place of residence, age, gender, height, weight, lifestyle habits, pet ownership and other questions. The second part used the Patient Health Questionnaire 9 (PHQ-9) depression scale to measure depression. The PHQ-9 is scored according to the Primary Care Evaluation of Mental Disorders Patient Health Questionnaire (PRIME-MD PHQ), and is a reliable and accurate measure of the severity and significance of depression. A total of 280 responses were recorded in the dataset, including 140 pet owners and 140 non-pet owners.

### 2.2 Features

The original pet owners and non-pet owners dataset, which shows in Table 1, contains 280 responses and 19 variables.

1. id: the sequential serial number.
2. Group: the group of the respondent; numeric numbers starting from 0 correspond to options “Pet Owners” and “Non-Pet Owners” respectively.

3. Agegroup: the age group of the respondent; numeric numbers starting from 0 correspond to options “Less than 15 Years”, “15-25 Years”, “26-35 Years”, “36-45 Years”, “46-55 Years”, and “Greater than 56 Years”, respectively.
4. Gender: the gender of the respondent; numeric numbers starting from 0 correspond to options “Male” and “Female” respectively.
5. Marital: the marital status of the respondent; numeric numbers starting from 0 correspond to options “Married”, “Unmarried”, “Divorced”, and “Widowed”, respectively.
6. BMIStatus: the nutritional status of the respondent based on Body Mass Index (BMI); numeric numbers starting from 0 correspond to options “Under Weight”, “Normal Weight”, “Over Weight”, and “Obese”, respectively.
7. IncomeGroup: the respondent’s average monthly family income in Bangladeshi Taka (BDT); numeric numbers starting from 0 correspond to options “Less than 60000 BDT” and “Greater than 60000 BDT” respectively.
8. Occupation: the respondent’s occupation; numeric numbers starting from 0 correspond to options “Job Holder”, “Business”, “Homemaker”, and “Others”, respectively.
9. Religion: the respondent’s religion; numeric numbers starting from 0 correspond to options “Islam” and “Others” respectively.
10. Education: the education level of the respondent; numeric numbers starting from 0 correspond to options “Greater than 12 Years Schooling” and “Less than 12 Years Schooling” respectively.
11. Tobacco: whether the respondent is a smoker; numeric numbers starting from 0 correspond to options “Yes” and “No” respectively.
12. Alcohol: whether the respondent drinks alcohol; numeric numbers starting from 0 correspond to options “Yes” and “No” respectively.
13. Disability: the physical disability status of the respondent; numeric numbers starting from 0 correspond to options “Yes” and “No” respectively.
14. phqtotal: the total PHQ-9 Score of the respondent.
15. Depressionstatus: the depression status of the respondent; numeric numbers starting from 0 correspond to options “Depressed” and “Non-depressed” respectively.
16. DifficultyofWorking: the respondent’s difficulty in working, taking care of things or getting along with people with respect to PHQ-9 responses; numeric numbers starting from 0 correspond to options “Difficult” and “Not Difficult” respectively.
17. Typeofpet: the type of pets owned by respondent; numeric numbers starting from 0 correspond to options “Dog”, “Cat”, “Bird”, “Rabbit”, “Dog and Cat”, “Dog and Bird”, “Dog, Cat, Bird and Rabbit”, “Cat and Bird”, “Cat, Bird and Rabbit”, “Bird and Rabbit”, and “Others”, respectively.

Table 1: Preview of the raw pet owners and non-pet owners dataset

(a)

id	Group	Agegroup	Gender	Marital	BMIStatus	IncomeGroup	Occupation
141	1	2	1	1	1	0	3
142	1	1	0	1	2	0	0
143	1	4	0	1	1	0	3
144	1	2	1	0	3	0	2
145	1	1	0	1	2	0	0

(b)

Religion	Education	Tobacco	Alcohol	Disability	phqtotal	Depressionstatus
0	0	1	1	1	1	1
0	0	1	1	1	2	1
0	0	0	1	0	13	0
0	0	1	1	1	9	1
0	0	1	1	1	0	1

(c)

DifficultyofWorking	Typeofpet	MonthGroupofhavingPets	Purposeofpets
0		NA	
0		NA	
1		NA	
1		NA	
1		NA	

18. MonthGroupofhavingPets: the amount of time pet owners spend living with their pets; numeric numbers starting from 0 correspond to options “Less than 75 Months” and “Greater than 75 Months” respectively.
19. Purposeofpets: the purpose of pet owners living with their pets; numeric numbers starting from 0 correspond to options “Companion/Friend” and “Others” respectively.

## 2.3 Data Measurement

.....Todo.....

Table 2: Preview of the cleaned pet owners and non-pet owners dataset

pet_group	age_group	gender	bmi_status	depression_status	pet_type
non-pet owners	26-35 years	female	normal weight	non-depressed	NA
non-pet owners	15-25 years	male	over weight	non-depressed	NA
non-pet owners	46-55 years	male	normal weight	depressed	NA
non-pet owners	26-35 years	female	obese	non-depressed	NA
non-pet owners	15-25 years	male	over weight	non-depressed	NA

Table 3: Statistics summary of the cleaned pet owners and non-pet owners dataset

pet_group	age_group	gender	bmi_status	depression_status	pet_type
non-pet owners:140	less than 15 years : 0	male :117	under weight : 28	depressed : 89	cat : 93
pet owners :140	15-25 years :126	female:163	normal weight:149	non-depressed:191	dog : 13
NA	26-35 years :142	NA	over weight : 75	NA	dog, cat : 12
NA	36-45 years : 7	NA	obese : 28	NA	cat, bird: 9
NA	46-55 years : 3	NA	NA	NA	bird : 5
NA	greater than 56 years: 2	NA	NA	NA	(Other) : 8
NA	NA	NA	NA	NA	NA's :140

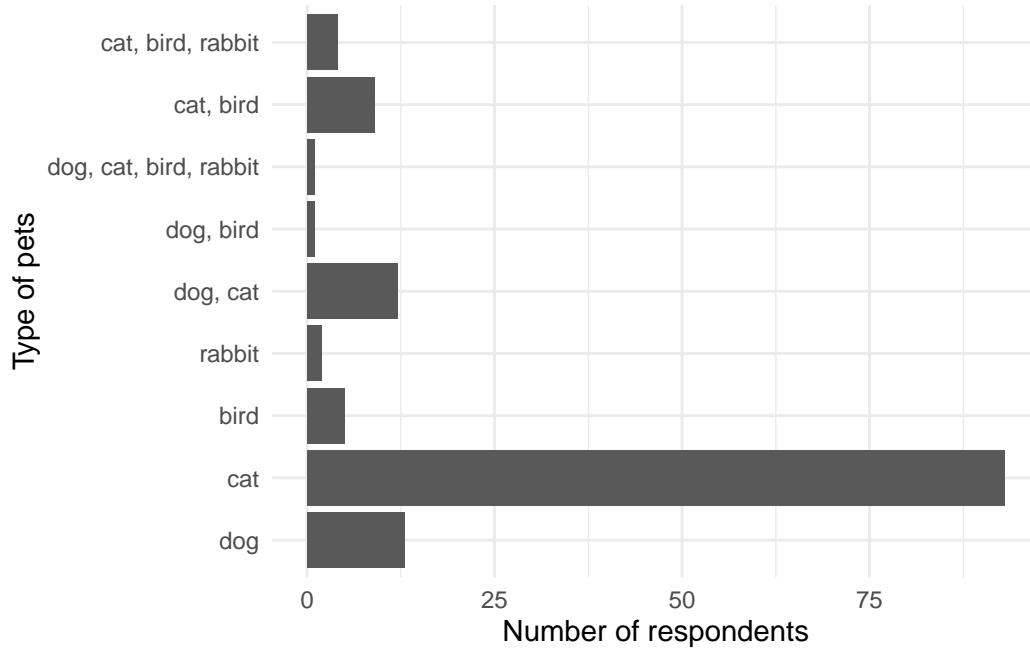


Figure 1: The distribution of pet species

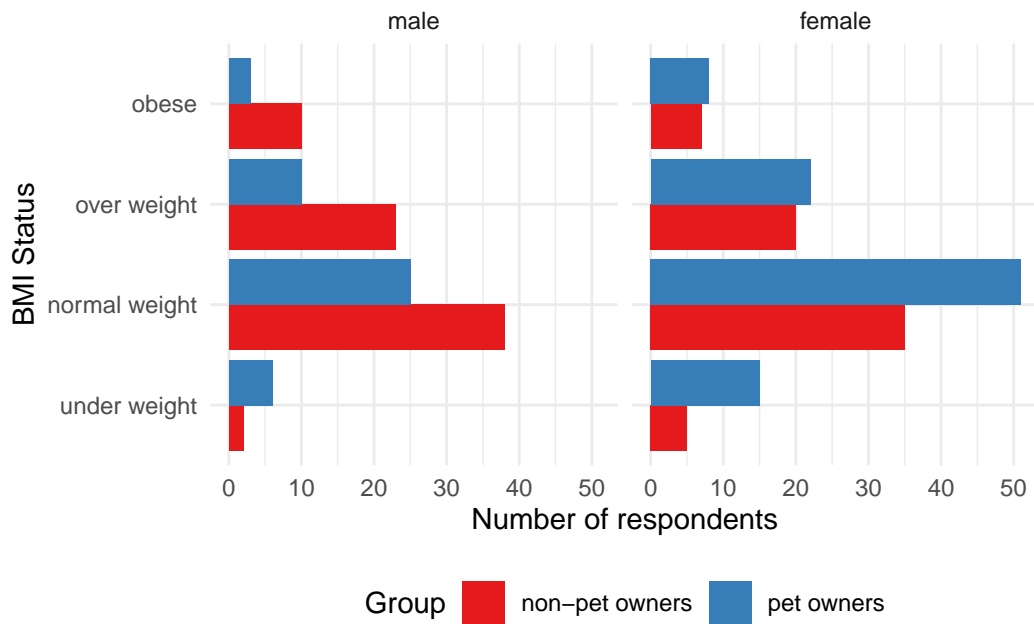


Figure 2: The relationship between BMI status and pet ownership by gender

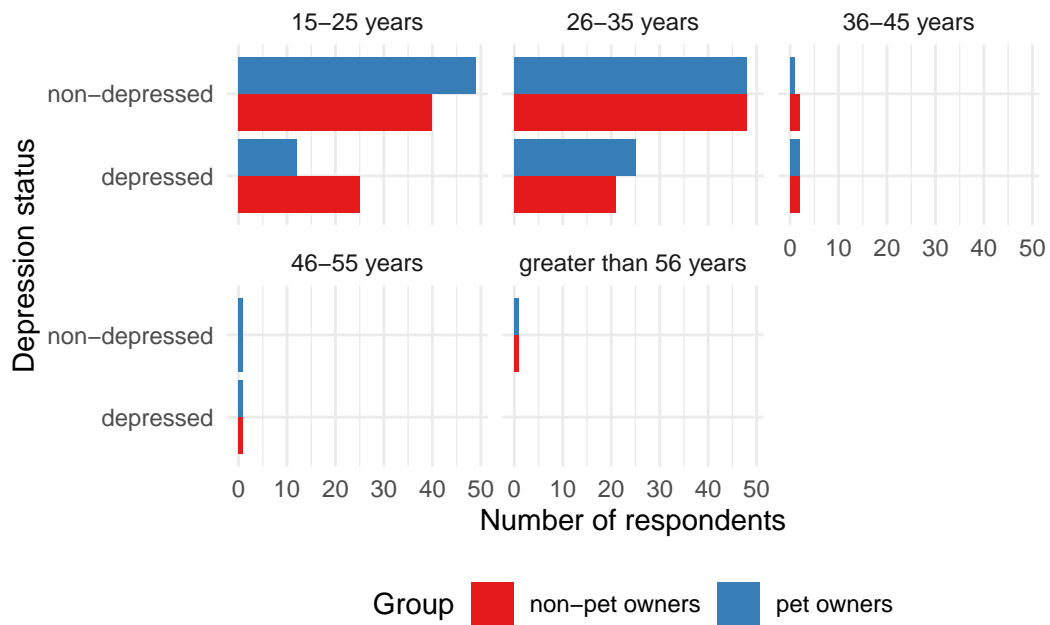


Figure 3: The relationship between depression status and pet ownership by age group

## 2.4 Methodology

## 2.5 Data Analysis

# 3 Model

The goal of our modelling strategy is twofold. Firstly,...

Here we briefly describe the Bayesian analysis model used to investigate... Background details and diagnostics are included in [Appendix B](#).

## 3.1 Model set-up

Define  $y_i$  as the number of seconds that the plane remained aloft. Then  $\beta_i$  is the wing width and  $\gamma_i$  is the wing length, both measured in millimeters.

$$y_i|\pi_i \sim \text{Bern}(\pi_i) \tag{1}$$

$$\text{logit}(\pi_i) = \alpha + \beta_1 \times \text{pet ownership}_i + \beta_2 \times \text{age}_i + \beta_3 \times \text{BMI}_i \tag{2}$$

$$\alpha \sim \text{Normal}(0, 2.5) \tag{3}$$

$$\beta_1 \sim \text{Normal}(0, 2.5) \tag{4}$$

$$\beta_2 \sim \text{Normal}(0, 2.5) \tag{5}$$

We run the model in R (R Core Team 2023) using the `rstanarm` package of Goodrich et al. (2022). We use the default priors from `rstanarm`.

## 3.2 Model Justification

We expect a positive relationship between the size of the wings and time spent aloft. In particular...

We can use maths by including latex between dollar signs, for instance  $\theta$ .

## 3.3 Model Implication

# 4 Results

Our results are summarized in [Table 4](#).

Table 4: Explanatory models of flight time based on wing width and wing length

	First model
(Intercept)	0.70 (0.27)
pet_group	pet owners 0.42 (0.27)
age_group	26-35 years -0.16 (0.27)
	36-45 years -1.30 (0.83)
	46-55 years -1.65 (1.34)
	greater than 56 years 18.80 (16.50)
bmi_status	obese 0.45 (0.49)
	over weight 0.08 (0.31)
	under weight -0.72 (0.45)
Num.Obs.	280
R2	0.059
Log.Lik.	-169.659
ELPD	-179.8
ELPD s.e.	7.3
LOOIC	359.7
LOOIC s.e.	14.6
WAIC	358.0
RMSE	0.46



## **5 Discussion**

### **5.1 First discussion point**

If my paper were 10 pages, then should be at least 2.5 pages. The discussion is a chance to show off what you know and what you learnt from all this.

### **5.2 Second discussion point**

### **5.3 Third discussion point**

### **5.4 Weaknesses and next steps**

Weaknesses and next steps should also be included.

## Appendix

### A Additional data details

### B Model details

#### B.1 Posterior predictive check

In `?@fig-ppcheckandposteriorvsprior-1` we implement a posterior predictive check. This shows...

In `?@fig-ppcheckandposteriorvsprior-2` we compare the posterior with the prior. This shows...

Examining how the model fits, and is affected  
by, the data

Figure 4: `?(caption)`

#### B.2 Diagnostics

`?@fig-stanareyouokay-1` is a trace plot. It shows... This suggests...

`?@fig-stanareyouokay-2` is a Rhat plot. It shows... This suggests...

Checking the convergence of the MCMC  
algorithm

Figure 5: `?(caption)`

## References

- Goodrich, Ben, Jonah Gabry, Imad Ali, and Sam Brilleman. 2022. “Rstanarm: Bayesian Applied Regression Modeling via Stan.” <https://mc-stan.org/rstanarm/>.
- R Core Team. 2023. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.
- Wickham, Hadley, Mara Averick, Jennifer Bryan, Winston Chang, Lucy D’Agostino McGowan, Romain François, Garrett Golemund, et al. 2019. “Welcome to the tidyverse.” *Journal of Open Source Software* 4 (43): 1686. <https://doi.org/10.21105/joss.01686>.