

# My title\*

My subtitle if needed

Yimiao Yuan

April 9, 2024

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

## Table of contents

<b>1</b>	<b>Introduction</b>	<b>2</b>
<b>2</b>	<b>Data</b>	<b>2</b>
2.1	Data Source . . . . .	2
2.2	Features . . . . .	2
2.3	Methodology . . . . .	2
2.4	Data Analysis . . . . .	3
<b>3</b>	<b>Model</b>	<b>3</b>
3.1	Model set-up . . . . .	6
3.1.1	Model justification . . . . .	6
<b>4</b>	<b>Results</b>	<b>6</b>
<b>5</b>	<b>Discussion</b>	<b>6</b>
5.1	First discussion point . . . . .	6
5.2	Second discussion point . . . . .	7
5.3	Third discussion point . . . . .	7
5.4	Weaknesses and next steps . . . . .	7
	<b>Appendix</b>	<b>8</b>
<b>A</b>	<b>Additional data details</b>	<b>8</b>

---

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

<b>B Model details</b>	<b>8</b>
B.1 Posterior predictive check . . . . .	8
B.2 Diagnostics . . . . .	8
<b>References</b>	<b>9</b>

## 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

### 2.2 Features

### 2.3 Methodology

Table 5: 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 6: 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

pet_group	age_group	gender	bmi_status	depression_status	pet_type
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

## 2.4 Data Analysis

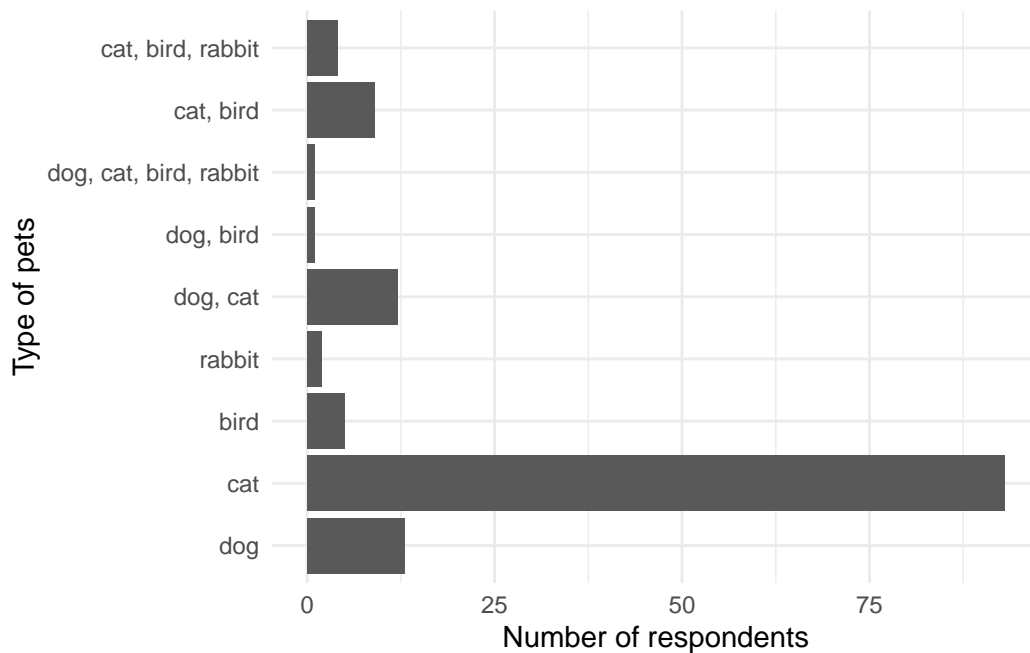


Figure 1: The distribution of pet species

## 3 Model

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

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

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

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

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

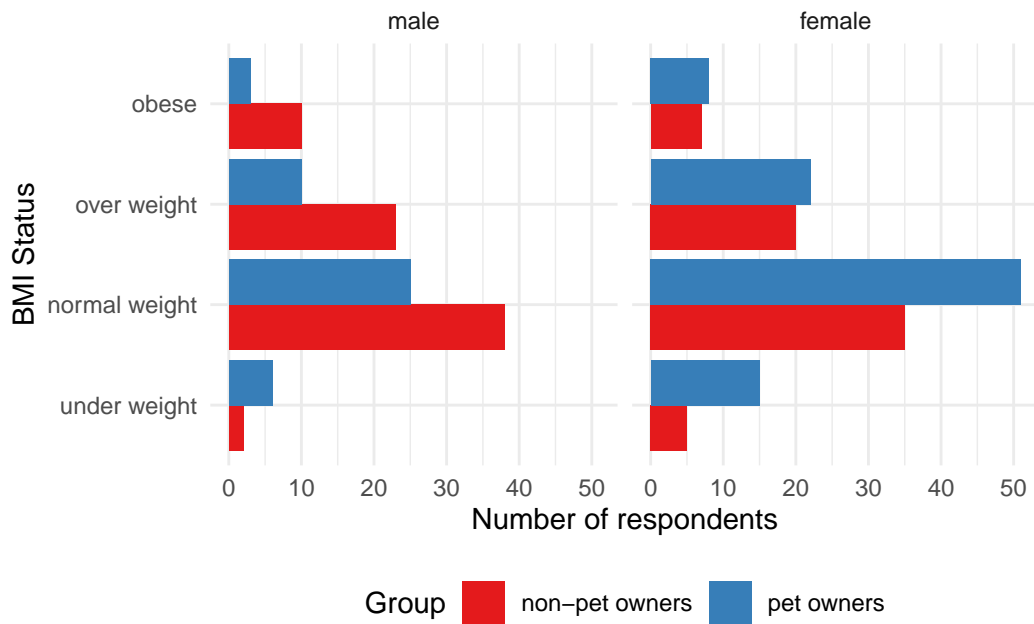


Figure 2: The relationship between BMI status and pet ownership by gender

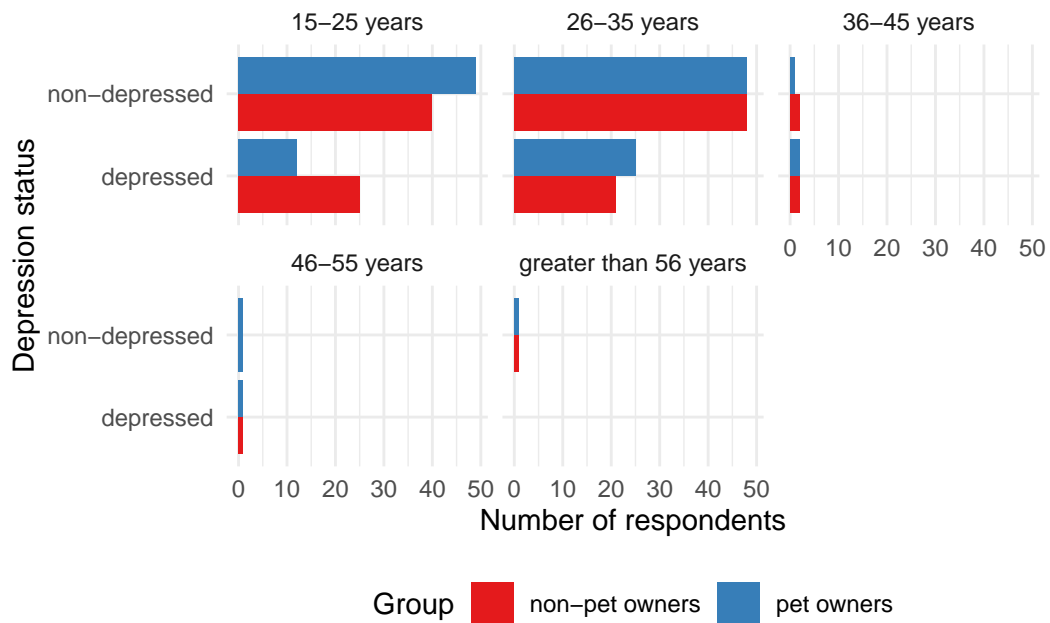


Figure 3: The relationship between depression status and pet ownership by age group

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.

$$y_i | \mu_i, \sigma \sim \text{Normal}(\mu_i, \sigma) \tag{1}$$

$$\mu_i = \alpha + \beta_i + \gamma_i \tag{2}$$

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

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

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

$$\sigma \sim \text{Exponential}(1) \tag{6}$$

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`.

#### 3.1.1 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  $\theta$ .

## 4 Results

Our results are summarized in Table [7](#).

## 5 Discussion

### 5.1 First discussion point

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

Table 7: Explanatory models of flight time based on wing width and wing length

First model	
(Intercept)	1.12 (1.70)
length	0.01 (0.01)
width	−0.01 (0.02)
Num.Obs.	19
R2	0.320
R2 Adj.	0.019
Log.Lik.	−18.128
ELPD	−21.6
ELPD s.e.	2.1
LOOIC	43.2
LOOIC s.e.	4.3
WAIC	42.7
RMSE	0.60

## 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>.