

2024 IM²C

Picking the Perfect Pet



Background

Throughout history, humans and animals have coexisted, relying on each other for aid and comfort. From offering companionship, to serving as hunting partners or providing other manual labor, our connection with animals runs deep. Recent estimates suggest that more than half of people worldwide have a pet of some kind in their household,^[1] from the more conventional dogs and cats to birds, rodents, and even the more exotic **species** such as snakes and amphibians. Whether they walk, fly, swim, or crawl; furry, feathered (or scaled) friends continue to support and comfort people across the globe.

During the height of the COVID-19 pandemic, countries and regions around the world saw a substantial increase in the number of **households** with pets,^{[2][3]} highlighting the comfort and companionship pets offer in challenging times. The surge in pet ownership, however, also underscored the complexities of pet-human relationships. Unprepared or uninformed new owners often lead to pets being returned to shelters or abandoned,^{[4][5]} contributing to the substantial number of stray animals across the world. This leads to potentially difficult living situations for the animal while also posing health risks to humans and other animals.^{[6][7]}

Your Task:

The **International Mission for the Maintenance and Care of Animals (IMMC-A)**, an organization concerned with the well-being of all potential pets, is asking your team to help them develop a quantitatively focused approach to pet ownership that benefits both animals and humans. More specifically, the IMMC-A needs your assistance in building mathematical models to determine which households are prepared to own a pet, how many households are pet-ready, and to forecast future pet ownership.

The IMMC-A acknowledges the diverse range of animals considered pets across different cultures, including species traditionally seen as farm or work animals in some countries/regions. This diversity presents unique challenges in defining what constitutes a pet. Therefore, your team will need to establish a clear definition of 'pet' that will inform your analysis and modeling.

1. **Warm up (with cats).** Develop a mathematical model that can be utilized by an animal shelter, pet store, or similar entity to evaluate a household's readiness for cat ownership. In other words, your model needs to be able to receive information from a given household and determine if the household is prepared to own a cat.
[Please note that the IMMC-A values user-friendly models. Thus, to promote utilization, your model cannot require more than ten input factors from a household. Justification of your team's choices will play an important role in your model's viability. Additionally, you should create a diagram that clearly explains your model's decision-making process.]
 - a. What does a cat-ready household 'look like'? Validate your model's ability to capture the diversity of households that could have a cat as a pet. Provide at least three examples of households that qualify for cat ownership in a country/region of your choosing and at least three that do not qualify. Be sure to choose examples that highlight the factors, or combination of factors, that your model associates most readily with households that qualify for cat ownership.
 - b. Assess your model on a broader scale (and/or adjust it if necessary) by using it to determine the current number of households that are prepared to own a cat in *three* countries/regions of your choosing.
2. **Generalize your model** from question #1 (i.e., re-use, adjust or alter as needed) so that it still accepts ten (or fewer) inputs but now returns output that addresses a household's pet preparedness for cats as well as *four additional pet species* of your choice.
 - a. Demonstrate your model's utility by reviewing the pet preparedness of at least six households located in the same country / region you originally considered in question #1a. You may choose to analyze the same households you used earlier, but make sure to discuss the significance of the examples you've chosen to highlight.
 - b. Some households possess multiple pets. How does your model address this situation?
3. **The future of pet ownership.** Using your previous model(s) as a tool for *potential* pet ownership, project future pet demographics. Specifically, develop a mathematical model that projects pet ownership and retention (i.e., pets kept in their original household) in five, ten and 15 years by pet species. Consider the same three countries/regions you identified in question #1b and the same five pet species (cats plus your four pet choices) you used in question #2.

Your PDF submission should consist of:

- One-page Summary Sheet.
- One-page *Letter to the Decision Makers* with your recommendation.
 - Write a one-page letter to the Directors of the IMMC-A with your recommendation for how potential pets should be matched with humans and why this will result in a positive change in the overall health of domesticated animals and people worldwide. The IMMC-A Directors are familiar with the problem of having many homeless former pets and crowded animal shelters (and have just read your Summary Sheet so do not restate or repeat this). They are interested in a humane solution that promotes pet ownership but decreases pet abandonment. Keep in mind that the purpose of the letter is to provide essential information to the decision makers, communicating key details of your full recommendation as stated in your solution paper.

- One-page Table of Contents.
- Your complete solution. Twenty pages (maximum) communicating essential aspects of your solution.
- Reference List.
- [AI Use Report](#) (if used).
- The following items do not count toward the 23-page limit: Reference List and Appendices (including [AI Use Report](#)).

Note: There is no specific required minimum page length for a complete IM²C submission. We permit the careful use of AI such as ChatGPT, although it is not necessary to create a solution to this problem. If you choose to utilize a generative AI, you must follow the [IM²C AI use policy](#). This will result in an additional AI use report that you must add to the end of your PDF solution file and does not count toward the 23 total page limit for your solution.

Your PDF submission paper must be typed and in English using A4, margins at least 1.5cm (OR) Letter, margins at least 0.6in with at least 12-point font size. For detailed information about IM²C submission guidelines and the general expectations for each portion of your solution please review the [Full Submission Guidelines](#).

Glossary

- A **household** is classified as either:
 - (a) A one-person household, defined as an arrangement in which one person makes provision for his or her own food or other essentials for living without combining with any other person to form part of a multi-person household or
 - (b) A multi-person household, defined as a group of two or more people living together who make common provision for food or other essentials for living.^[8]
- A biological **species** is a group of living organisms that can reproduce with one another in nature and produce fertile offspring.

References

- [1] *Man's best friend: Global pet ownership and feeding trends*. GfK.com (2016, November 22). <https://www.gfk.com/insights/mans-best-friend-global-pet-ownership-and-feeding-trends>
- [2] *Pets and the Pandemic: A social research snapshot of pets and the people in the COVID-19 era*. Animal Medicine Australia. (2021, August 16). https://animalmedicinesaustralia.org.au/wp-content/uploads/2021/08/AMAU005-PATP-Report21_v1.41_WEB.pdf
- [3] *New Pet Population Data released*. ukpetfood.org (2021, March 22). <https://www.ukpetfood.org/resource/pfma-releases-latest-pet-population-data.html>
- [4] Wollaston, S. (2021, December 1). *Rescue me: why Britain's beautiful lockdown pets are being abandoned*. The Guardian. <https://www.theguardian.com/lifeandstyle/2021/dec/01/rescue-me-why-britains-beautiful-lockdown-pets-are-being-abandoned>