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Uncovering The Frequency of Canine Mammary Tumor Prevalence in Veterinary Clinical Complex- A Simple Random Sampling Method

Nolan Dias[1], Pura Yaro Semy[1], Sahil Sudhir Gimhavanekar[1], Vidhi Barche[1], Asit Jain[2], M. S. Thakur[2], Randhir Singh[1] , Babita Das[1]
[1] Department of Veterinary Surgery and Radiology
[2] Department of Animal Genetics and Breeding
College of Veterinary Science And A.H. , Jabalapur
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Abstract: *Simple random sampling is a widely used sampling technique in quantitative research employing survey instruments. It is particularly effective in homogeneous and uniformly selected groups. This method ensures every participant has an equal opportunity to be part of the study, relying solely on chance for selection. While simple random sampling offers advantages such as impartiality, representativeness, and equal probability for the population, it can be time-consuming, lacks a publicly available list of participants, and faces challenges with diverse and widely dispersed populations*.

Introduction

Selecting a representative sample from a larger population is crucial in scientific research, especially in quantitative investigations. The sampling strategy employed significantly impacts the accuracy and reliability of research outcomes. Simple random sampling (SRS) stands out due to its simplicity and fundamental principles, making it one of the most basic and popular sampling methods.

Population and Sample

In research, the term "population" refers to the entire group of people or objects sharing similar traits and of interest to the researcher. However, due to constraints like time, cost, and accessibility, studying the entire population is often impractical. Therefore, researchers opt to study a sample—a subset of the population. For instance, in a study aiming to understand the dietary habits of university students nationwide, while all students constitute the population, surveying all of them would be unfeasible. Instead, a representative sample is chosen.

Importance of Sampling

The significance of sampling cannot be overstated. Proper sampling ensures that the sample size is adequate for the research objectives. An excessively large sample wastes resources, while a too-small sample lacks statistical power and can yield inaccurate results.

Simple Random Sampling (SRS)

Simple random sampling is a probability sampling technique where each member of the population has an equal chance of being selected. This method is considered the gold standard for ensuring that the sample represents the population accurately, enabling broad and objective application of findings.

The selection process for simple random sampling can utilize various methods such as computer-generated random numbers, random number tables, or lotteries. The key feature of SRS is the equal probability of selection for every member of the population, minimizing selection bias. It is most effective in homogeneous populations where members share similar characteristics, ensuring accurate and reliable results.

However, in heterogeneous populations with diverse characteristics, simple random sampling may not always produce a representative sample. In such cases, stratified sampling—where the population is divided into homogeneous subgroups before sampling—may be more appropriate.

Advantages and Disadvantages

Simple random sampling offers several advantages:

- Unbiased Selection: Each person has an equal chance of being selected, ensuring the sample reflects the population fairly.
- Minimization of Confounding Effects: Randomization helps reduce the impact of known and unknown confounding variables, enhancing the study's internal validity.
- Generalizability: Properly conducted SRS allows findings to be applied to the entire population, expanding the scope of research application.

Despite its benefits, simple random sampling has drawbacks:

- Implementation Challenges: It can be challenging to implement, especially with large populations, requiring significant time and resources to compile a comprehensive population list and ensure a truly random selection process.
- Issues with Heterogeneous Populations: SRS may not adequately capture the diversity of attributes in populations with high variability. In such cases, advanced sampling techniques like stratified sampling may be more suitable.
- Sampling Error: Random selection introduces a margin of error between the sample statistic and the actual population parameter, particularly impactful in large, variable populations, potentially compromising result accuracy.

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Procedure for Selection

Several approaches can be employed for implementing the selection process in simple random sampling.

- Lottery Method: Assigning a unique number to each population member, writing these numbers on slips of paper, mixing them thoroughly, and then randomly selecting.
- Random Number Tables: Pre-generated lists of random integers used to select sample members by matching with the population list.
- Computer-Based Techniques: Advanced technology uses computer programs to generate random numbers, ensuring an efficient and truly random selection process, even for large populations.

Practical Application

Simple random sampling finds extensive application in various disciplines, especially in survey research and quantitative investigations. Examples include:

- Survey Research: Used to gauge beliefs, behaviours, or characteristics of groups, ensuring that chosen respondents accurately represent the population's opinions.
- Health Studies: Utilized in epidemiological research to investigate disease prevalence across different regions, ensuring a representative sample.
- Educational Research: Employed to study various aspects of educational systems, ensuring random selection of schools or students to maintain objectivity
- At the Dept of Veterinary Surgery and radiology, CVSc & AH, Jabalpur, we received a total of around 34 tumour cases during the period of 1st January 2024 to 31st June 2024.
- To calculate the prevalence of mammary tumour cases we took the help of excel and applied random sampling function.

Date	Case no	Age	Sex	tumor type
03-01-2024	9941	6yr	F	mammary tumor
04-01-2024	9975	8yr	F	Liphoma
09-01-2024	10085	8yr	F	mammary tumor
18-01-2024	10447	10yr	F	mammary tumor
31-01-2024	10948	11yr	F	Tumor on stiffle
01-02-2024	10914	11yr`	F	thoracic region tumor
02-02-2024	10850	4yr	F	intrabdominal testis tumor
06-02-2024	11204	13yr	F	mammary tumor
08-02-2024	11327	7yr	F	mammary tumor
08-02-2024	11327	8yr	F	mammary tumor
12-02-2024	11413	13yr	F	Eyelid Mass
13-02-2024	11511	10yr	M	Eyelid Mass
13-02-2024	11438	7yr	M	Eyelid Mass
28-02-2024	12202	8yr	F	mammary tumor
29-02-	12219	5yr	F	mammary tumor

2024				
05-03-2024	12409	8yr	M	perinal hernia
06-03-2024	12444	10 m	F	tumor on vetebrae
07-03-2024	12509	4yr	M	pelvic tumor
14-03-2024	12645	11yr	F	mammary tumor
18-03-2024	12841	12yr	F	mammary tumor
02-04-2024	14	2yr	F	Eyelid Mass
04-04-2024	17389	12yr	F	tumor of thorax region
12-04-2024	415	7yr	M	Eyelid Mass
30-04-2024	1020	10yr	M	Eyelid Mass
02-05-2024	1148	5yr	F	subcutenous tumor of head
09-05-2024	1380	11yr	M	growth excision on forelimb
13-05-2024	1552	5yr	M	interdigital tumor
31-05-2024	3136	8yr	F	tumor of forelimb
03-06-2024	3250	8yr	M	Eyelid Mass
14-06-2024	3672	8yr	F	mammary tumor
18-06-2024	3778	2yr	F	mammary tumor
20-06-2024	3859	4yr	M	oral tumor
25-06-2024	3513	9yr	M	subcutenous tumor
21-06-2024	14024	14yr	F	mammary tumor

Table no. 1: Total number of tumors excised from January 2024- June 2024

All tumor surgeries were documented in a table, and an Excel formula was utilized to process the data. The dataset was reorganized to identify the top 15 surgeries as outlined below:

- The surgery data was located in cells E2.
- In cell F2, the formula =RAND() was inputted and extended down to cell F35.
- By utilizing the sorting function in Excel, the data was sorted based on values in column F in ascending order, and the top 15 rows were chosen

Date	Case no	Age	sex	tumor type	Random sampling
20-06-2024	3859	4yr	M	oral tumor	0.029832905
13-02-2024	11511	10yr	M	Eyelid Mass	0.044987812
14-03-2024	12645	11yr	F	***mammary tumor***	0.09332821
08-02-2024	11327	7yr	F	***mammary tumor***	0.12522379
06-03-2024	12444	10m	F	tumor on vetebrae	0.154664063
29-02-2024	12219	5yr	F	***mammary tumor***	0.156015658
21-08-2024	14024	14yr	F	***mammary tumor***	0.181495181
28-02-2024	12202	8yr	F	***mammary tumor***	0.213612203
13-05-2024	1552	5yr	M	interdigital tumor	0.219983408
04-04-2024	17389	12yr	F	tumor of thorax region	0.247425648
09-05-2024	1380	11yr	M	growth excision on forelimb	0.290664197
13-02-2024	11438	7yr	M	Eyelid Mass	0.30728564
18-03-2024	12841	12yr	F	***mammary tumor***	0.368998831
25-06-2024	3513	9yr	M	subcutenous tumor	0.423192372
02-05-2024	1148	5yr	F	subcutenous tumor of head	0.451551337

Table no 2: 15 cases after random sampling

Out of a random sample of 15 cases, 6 were found to be mammary tumor cases. Therefore, the prevalence of mammary tumors among the cases received at the Department of Veterinary Surgery is calculated as follows:

Prevalence = (6 / 15) x 100 = 40%.

This figure shows that during the study period, the prevalence of mammary tumors among the canine tumor patients treated at the Department of Veterinary Surgery and Radiology was 40%.

Conclusion

Simple random sampling is a valuable technique for obtaining objective and representative samples from populations. Its simplicity and equal chance of selection make it ideal for certain research contexts, particularly in homogeneous populations. Researchers must, however, carefully consider the limitations of simple random sampling despite its advantages. For diverse and widely distributed populations, alternative sampling techniques like stratified sampling or cluster sampling may be more appropriate to ensure representative samples and reliable research outcomes.

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