

## Assessing the Impact of Feeding Stray Dogs on Stray Dog–Related Issues: A Community–Based Study in Songkhla, Thailand

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### Abstract:

**Objective:** Increasing stray dog populations have transformed stray dog issues from a third–world problem to a global public health priority. This study aimed to determine factors related to feeding stray dogs and other factors that can impact stray dog–related issues.

**Material and Methods:** This community–based cross–sectional study was conducted in Songkhla, Thailand, from the 4<sup>th</sup> to the 29<sup>th</sup> of January 2021. Data was collected via phone interviews. Logistic regression was performed to measure the association between the independent variables and problems related to stray dogs.

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**Results:** Among 168 participants, 137 (81.5%) reported having experienced a negative impact in connection with problems caused by stray dogs. The most common problem was garbage scavenging (62.5%), which predominantly occurred between 18:00 and midnight. Feeding stray dogs was significantly associated with stray dog-related problems (odds ratio [OR]=3.94 with a 95% confidence interval [CI] 1.26–17.41).

**Conclusion:** Providing food to stray dogs causes problems and is also prohibited by law. It is important for media, community leaders, and other influential groups to create awareness and foster cooperation among communities to address this issue.

**Keywords:** dog-related problems, stray dogs, stray dog feeding, Thailand

## Introduction

Stray dogs are defined as dogs without owners<sup>1</sup>. Over 200 million stray dogs can be found globally, with an annual death toll of 55,000 due to rabies, and an additional 15 million individuals undergoing post-exposure treatment to prevent the disease<sup>2</sup>. Populations lead to a unique convergence of risk factors such as rabies, noise pollution, dog attacks, road accidents, hygiene, and other problems directly related to humans and the environment. Stray dogs have transformed from a third-world problem to a global public health priority<sup>3</sup>.

Stray dogs roam freely and find their food and shelter and breed without habitat control. A dog population study in Thailand in 2019 indicated that stray dogs accounted for 5.0% of the total dog population, with a total population of 109,123<sup>4</sup>. Stray dog problems are among the main public concerns and should be targeted in future efforts to discuss them with all relevant groups for a systematic and sustainable solution.

People feeding stray dogs are the number one obstacle in handling the problem of stray dog populations worldwide<sup>4</sup> because stray dogs depend on food given by people, and their source of sustenance tends to be food left for them or by direct feeding<sup>5</sup>. Feeding stray dogs in public places in Thailand is illegal and is a cause of major

public concern, with violators of this law facing a fine of at least 2,000 THB (approximately 57 USD)<sup>6</sup>.

Actions have been taken to reduce stray dogs' access to food waste from garbage bins around abattoirs, butcher shops, and market areas, as well as to protect garbage dumping grounds<sup>4</sup>. The "Rabies Act, B.E. 2535 (1992)" in Thailand focuses on preventing and controlling rabies, primarily concerning dogs. It mandates dog vaccinations, registration, and responsible ownership, while granting authorities the power to manage stray dogs to curb rabies spread. Stray dog issues might be influenced by this act, as it empowers authorities to address unvaccinated and unregistered dogs, potentially reducing the number of strays that could contribute to rabies transmission. Similarly, the "Act on the Maintenance of the Cleanliness and Orderliness of the Country, B.E. 2535 (1992)" addresses general public hygiene, waste management, and environmental tidiness, indirectly contributing to the overall management of stray animals by promoting a clean and safe environment. Stray dog problems could be mitigated through cleaner and more organized public spaces, discouraging their proliferation and fostering better living conditions for both animals and humans. This study aimed to determine the factors associated with stray dog-related problems and feeding stray dogs.

## Material and Methods

### Study design and study setting

This study employed a community-based cross-sectional design. Bangdan Village was chosen for the initial step of the pilot project because of its mixed urban-rural community and high performance among healthcare providers. This village is in the Khao Rupchang sub-district, Mueang district, Songkhla province, in southern Thailand. In 2023, the pet registry indicates that there are 13.8% stray dogs and 86.2% owned dogs out of a total of 9,315 dogs in Songkhla province.

### Population and sample

The community has a total population of 3,026 people, comprising 1,423 males and 1,603 females. There are 921 households. According to our phone interview methodology, the source population was restricted to 1,229 people (40.6% of the total population) from 533 households. Convenience sampling was used to select contact participants from each household. There was good spatial distribution of our participants compared with the general population distribution.

### Data collection and instruments

In line with the coronavirus disease 2019 (COVID-19) situation during the study, trained interviewers conducted phone interviews while maintaining physical distancing. The survey was conducted using structured questionnaires from the 4<sup>th</sup> to the 29<sup>th</sup> of January 2021. The data were collected and validated using the 'KoBoToolbox,' software<sup>7</sup>. The data were cleaned and checked for consistency and accuracy.

#### 1. *Dependent variable: stray dog-related problems*

A stray dog was defined as one not under the direct control of a person or not prevented from roaming.

The types of stray dogs are categorized as follows: a) free-roaming, owned dogs not under direct

control or restriction at any particular time; b) free-roaming dogs with no owner; c) feral dogs: domestic dogs that had reverted to a wild state and are no longer directly dependent upon humans for reproduction.

#### *The problems were divided into six categories:*

-Noise pollution<sup>8</sup> was defined as: "Have you ever heard dogs barking in the last 12 months?" (Answer: Yes/No) and "If Yes, during what time of the day?" (Answer: 00.00-06.00/06.00-12.00/12.00-18.00/18.00-24.00)

-Garbage scavenging<sup>9</sup> was defined as: "Have you ever witnessed stray dogs scavenging trash cans in the last 12 months?" (Answer: Yes/No), and "If Yes, during what time of the day?" (Answer: 00.00-06.00/06.00-12.00/12.00-18.00/18.00-24.00)

-Traffic accident<sup>10</sup> was defined as: "Have you ever experienced stray dogs running in front of a car in the last 12 months?" (Answer: Yes/No) and "If Yes, during what time of the day?" (Answer: 00.00-06.00/06.00-12.00/12.00-18.00/18.00-24.00)

-Being harmed<sup>11,12</sup> was defined as "Have you ever got bitten by stray dogs in the last 12 months?" (Answer: Yes/No) and "If Yes, during what time of the day?" (Answer: 00.00-06.00/06.00-12.00/12.00-18.00/18.00-24.00)

-Unpleasant odor<sup>13</sup> was defined as: "Have you ever encountered a problem of unpleasant odors from stray dogs?" (Answer: Yes or No)

-Destructive behavior<sup>14</sup> was defined as: "Have you ever had your possessions destroyed by stray dogs?" (Answer: Yes or No)

#### 2. *Primary independent variable: feeding stray dogs*

Feeding stray dogs is defined as giving food to them<sup>15</sup>. In our study, we inquired about the frequency of stray dog feeding by asking, "Have you ever fed stray dogs in the last 12 months?" (Answer: Yes/No) and "If Yes, how

often?" (Answer: 1–5 times per year / 5–10 times per year / more than 10 times/year).

### 3. Other independent variables

This study considered several independent variables for our analysis. "Age" represents the participant's age at the time of the interview, measured in years. "Length of stay" reflects the duration of the participant's residency at their current location, measured in years. "Sex" denotes the self-reported gender of the participant. Additionally, we assessed "Owning pets" by asking participants whether they owned any pets, including dogs, at the time of the interview, with responses categorized as "Yes" or "No".

### Statistical analysis

Descriptive data are presented as frequencies, percentages, medians, and interquartile ranges (IQR). The proportions were visualized using heat maps. Darker colors indicate larger proportions. Binary logistic regression analysis was performed to measure the association between the independent variables and problems related to stray dogs. Univariate analysis was performed to identify potential independent variables. Regarding the multivariate analysis, potential independent variables ( $p$ -value $<0.2$  as per univariate analysis) were included in the initial model. Manual backward stepwise refinement was performed on the final model. R software version 3.5.3 was used to analyze the data. Statistical significance was set at  $p$ -value $<0.05$ .

## Results

### Demographic characteristics of participants who reported problems from stray dogs

Among the 168 participants, 99 provided information on their age. The median age was 42.6 (IQR, 27.6–58.7) years (Table 1). In each age group, the number of participants who reported experiencing stray dog-related problems was greater than those who reported no issues. The most concerning problem in all age groups was garbage

scavenging (80–89.5%). Participants' median length of stay was 28 years (IQR, 10–50).

According to the results, approximately 80% of the male and female participants had encountered problems with stray dogs. Most female participants were concerned about the problem of garbage scavenging (77.3%), while the male participants were more concerned about noise pollution (85%).

Interestingly, participants who were dog feeders also faced problems with stray dogs (93.2%), the most common of which were garbage scavenging (82.9%), noise pollution (73.2%), and unpleasant odors (48.8%). Approximately 80% of both pet and non-pet owners face problems with stray dogs.

### Time distribution of stray dog-related problems

In this study, 137 of the 168 respondents (81.5%) were bothered by problems caused by stray dogs (Table 2). The most common problem troubling respondents was garbage scavenging (62.5%), followed by noise pollution (57.1%) and unpleasant odors (40.5%).

Figure 1 presents the proportions of events during different time periods. From 18.00 to midnight was the most common time the problems occurred, such as noise pollution, garbage scavenging, and traffic accidents related to stray dogs. Over half of the noise pollution and garbage-scavenging events occurred during this period. Reports of being harmed by stray dogs mainly occurred between 12 am and 6 pm, accounting for 45.5% of cases.

### Influencing factors for problems related to stray dogs

Table 3 shows the results of the multivariate analysis of the influencing factors and problems caused by stray dogs. Feeding stray dogs was significantly associated with the self-reports of stray dog-related problems (odds ratio [OR]=3.94, with 95% confidence interval [CI] 1.26–17.41).

**Table 1** Demographic characteristics of study participants who reported problems from stray dogs (n=168)

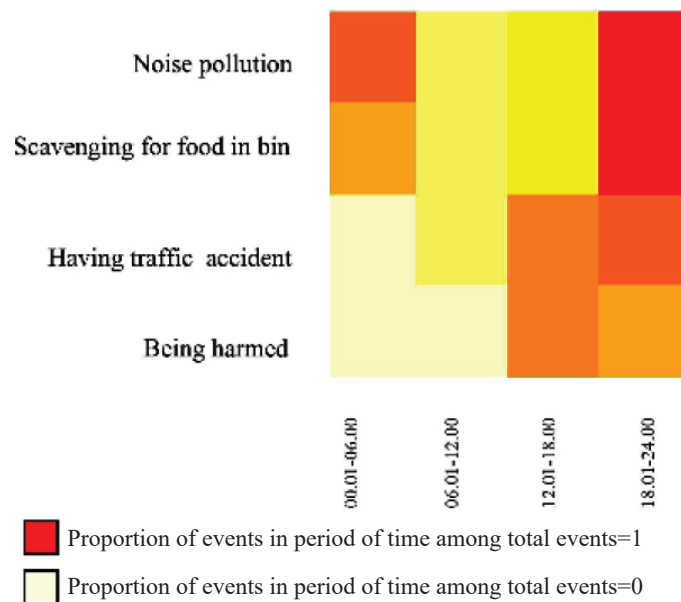
Factors	Encounter with any stray dogs-related problems, n (row%)		p-value	Specific stray dogs-related problems, n (row%)								
	Total (n=168)	No (n=31)		Yes (n=137)	Having traffic accidents	Being harmed	Unpleasant odor	Destructive behavior	Noise pollution	Garbage scavenging		
Age (years)												
Median (IQR)	43.6 (23.8, 60.7)	44.3 (20.4, 60.4)	42.6 (27.6, 58.7)	0.85 <sup>a</sup>	35.4 (21.7, 55.4)	39.6 (19.3, 61.3)	40.6 (27.7, 56.7)	31.9 (21.9, 53.3)	43.2 (27.7, 58.5)	45.6 (28.1, 60.9)		
<20		4/19 (21.1)	15/19 (78.9)	0.42 <sup>b</sup>	3/15 (20.0)	4/15 (26.7)	8/15 (53.3)	6/15 (40.0)	10/15 (66.7)	12/15 (80.0)		
20-60		7/55 (12.7)	48/55 (87.3)		4/48 (8.3)	5/48 (10.4)	23/48 (47.9)	10/48 (20.8)	32/48 (66.7)	35/48 (72.9)		
>60		6/25 (15.0)	19/25 (85.0)		3/19 (15.8)	3/19 (15.8)	8/19 (42.1)	3/19 (15.8)	13/19 (68.4)	17/19 (89.5)		
Length of stay (years)												
Median (IQR)	28.0 (10.0, 50.0)	30 (14.5, 47)	28 (10, 50)	0.72 <sup>a</sup>	25.0 (10.0, 61.8)	30.0 (17.8, 59.8)	29.5 (16.2, 51.0)	38.0 (25.0, 56.8)	30.0 (17.8, 55.2)	26.0 (10.0, 46.0)		
<20		6/28 (21.4)	22/28 (78.6)	0.91 <sup>b</sup>	4/22 (18.2)	5/22 (22.7)	7/22 (31.8)	1/22 (4.5)	15/22 (68.1)	20/22 (90.9)		
20-60		19/106 (17.9)	87/106 (82.1)		6/87 (5.7)	12/87 (13.8)	47/87 (54.0)	25/87 (28.7)	62/87 (71.3)	65/87 (74.7)		
>60		6/34 (17.6)	28/34 (82.4)		8/28 (28.6)	5/28 (17.9)	14/28 (50.0)	8/28 (28.6)	19/28 (67.8)	20/28 (71.4)		
Sex												
Male		11/51 (21.6)	40/51 (78.4)	0.64 <sup>b</sup>	13/40 (32.5)	7/40 (17.5)	20/40 (50.0)	12/40 (30.0)	34/40 (85.0)	30/40 (75.0)		
Female		20/117 (17.1)	97/117 (82.9)		5/97 (5.2)	15/97 (15.5)	48/97 (49.5)	22/97 (22.7)	62/97 (63.9)	75/97 (77.3)		
Feeding stray dogs				0.04 <sup>a*</sup>								
Yes		3/44 (6.8)	41/44 (93.2)		4/41 (9.8)	6/41 (14.6)	20/41 (48.8)	14/41 (34.1)	30/41 (73.2)	34/41 (82.9)		
No		28/124 (22.6)	96/124 (77.4)		14/96 (20.3)	16/96 (19.8)	48/96 (50)	20/96 (20.8)	66/96 (68.8)	71/96 (74.0)		
Own pets												
Yes		14/83 (16.9)	69/83 (83.1)	0.75 <sup>b</sup>	8/69 (11.6)	13/69 (18.8)	35/69 (50.7)	18/69 (26.1)	48/69 (69.6)	55/69 (79.7)		
No		17/85 (20.0)	68/85 (80.0)		10/68 (14.7)	9/68 (13.2)	33/68 (48.5)	16/68 (23.5)	48/68 (70.6)	50/68 (73.5)		

IQR=interquartile range, <sup>a</sup> Mann-Whitney U test, <sup>b</sup> chi-square test; between factor and problem report, \*p-value<0.05

**Table 2** The percentage of each problem from stray dogs affecting respondents within the past year (n=168)

Problems	Affected (n/total, %)	Time (n/total, %)			
		00.01–06.00	06.01–12.00	12.01–18.00	18.01–00.00
Garbage scavenging	105/168 (62.5)	40/105 (38.1)	20/105 (19.0)	22/105 (21.0)	76/105 (72.4)
Noise pollution	96/168 (57.1)	47/96 (49.0)	15/96 (15.6)	19/96 (19.8)	70/96 (72.9)
Unpleasant odors	68/168 (40.5)	NA	NA	NA	NA
Destructive behaviors	34/168 (20.2)	NA	NA	NA	NA
Being harmed	22/168 (13.1)	1/11 (9.1)	1/11 (9.1)	5/11 (45.5)	4/11 (36.4)
Causing traffic accidents	18/168 (10.7)	1/12 (8.3)	2/12 (16.7)	5/12 (41.7)	6/12 (50.0)
Any problems above	137/168 (81.5)	NA	NA	NA	NA

NA=data not available



**Figure 1** Heat map of dog-related problems by time period. Darker red colors indicate higher proportions

Other factors (i.e., sex, length of stay, and owning pets) showed no statistically significant associations.

**Methods used to deal with stray dogs**

When asked how they dealt with stray dog problems, half of the participants said they chose to retreat or walk

away (Table 4), followed by ignoring the dogs (19.8%), making eye contact with them (10.9%), or using commands to keep them back (8.6%). Other methods (i.e., preparing to attack, befriend, and throwing objects) were also used by a small number of participants (less than 5%).

**Table 3** Results of multivariate analysis of risk factors related to stray dog problems within the previous year (n=168)

Factor	Adjusted OR (95% CI)
Sex (ref.=Male)	
Female	1.24 (0.52–2.85)
Length of stay (years) (ref.=<20)	
20–60	1.09 (0.35–3.01)
>60	1.26 (0.34–4.63)
Pet (ref.=No)	
Yes	1.02 (0.45–2.33)
Feeding (ref.=No)	
Yes	3.94 (1.26–17.41)*

OR=odds ratio, CI=confidence interval, ref.=reference, \*p-value<0.05

**Table 4** Strategies employed by participants to address stray dog problems (n=168)

Method	n (%)
Retreat or walk away	81 (50.0)
Ignore	32 (19.8)
Make eye contact	17 (10.9)
Command to stay back	14 (8.6)
Throw objects	2 (1.1)
Prepare to attack	8 (4.9)
Befriend (a stray dog)	8 (4.9)

## Discussion

### Principal findings and relation to other studies

This study showed that there was a significant positive association between stray dog feeding and incidents of related problems. In contrast, no significant association was identified among other factors (i.e., sex, age, length of stay, and owning pets). The most common problems were garbage scavenging and noise pollution, which accounted for more than 50% of the problems. More than 50% of the problems were found mainly during 18.01–00.00. Half the participants dealt with stray dog problems by retreating or walking away from them.

In the current study, consistent with previous studies, feeding stray dogs was associated with all problems related to stray dogs. For example, a study in the USA found an association between stray dog feeding and increased bite incidents<sup>25</sup>. A comparative study in Nepal and Japan<sup>16</sup> showed that food availability enhanced the survival rate of stray dogs and led to larger stray dog populations, which caused increased problems, such as noise pollution and garbage scavenging<sup>10</sup>. Our findings could potentially be attributed to the following factors: firstly, individuals might face an elevated risk due to more frequent and direct interactions with dogs. Secondly, this could be influenced by their residence, frequent walks, or work settings in areas with higher concentrations of these dogs. Other factors (i.e., sex, age, length of stay, and owning pets) were not significantly associated with the dog problems of concern. However, previous studies found significant sex and age differences in bite incidences, with males and children being the most affected<sup>17</sup>. This contrast could be attributed to differences in data collection and sampling techniques. The current study did not include certain age groups because the phone interviews did not include children, and most interviewees were women.

Based on our results, garbage scavenging was the most prevalent stray-dog-related problem. A previous study found that dogs are scavengers that primarily receive carbohydrate-rich food from humans and that their food source is typically garbage bins<sup>28</sup>. The second most common problem was noise pollution, which was in line with previous findings in Australia that revealed that barking annoys many people in urban communities and is the most frequently reported problem to many local councils<sup>29</sup>.

Garbage scavenging occurred, and noise pollution was most likely to be found, between 18.01–00.00. This confirms previous findings<sup>18</sup> that dogs appear to be much more active at night and sleep during the day, resulting in the highest prevalence of stray dog-related problems



at night. The noise pollution findings were consistent with a survey of public attitudes towards barking dogs in New Zealand, which found that due to the unavailability of people during the day, there were fewer noise pollution reports during the period between 06.00–18:00.

### **Limitations, implications, and future research**

Our study had several limitations. Our study was conducted in a specific area and had a small sample size. But this was only an initial step in the context of the pilot project. The most significant restriction was that the study only had a one-month duration, and together with the COVID-19 pandemic leading to poor generalizability. Furthermore, because of the COVID-19 pandemic, phone interviews were used to collect data, and the data received may have been incorrect, with low internal validity. The researchers in this study tried to overcome this problem by administering interviewer training to increase the effectiveness of phone interviews in obtaining the most accurate data. This study highlighted the association between stray dog feeding and problems encountered. Although feeding stray dogs is an illegal practice in Thailand, the respondents' moral inclination to view feeding stray dogs as virtuous may have introduced bias. This under-reporting limitation should be considered, urging careful interpretation of results and acknowledging the challenge of accurately capturing the prevalence of this illegal practice.

This study is the first step in evaluating the factors related to stray dog problems, particularly the practice of feeding stray dogs, in Thailand. This study found that over half of the participants were bothered by problems caused by stray dogs. Moreover, feeding stray dogs was significantly associated with stray dog-related problems.

We hope that our study will contribute to creating awareness about the consequences of feeding stray dogs, and that this will support community policymakers by

motivating multi-sector cooperation. Combatting prevalent stray dog issues like nighttime garbage scavenging and noise pollution in the community requires targeted actions, such as encouraging responsible pet ownership through awareness campaigns, designating controlled feeding spots to deter strays, and implementing secure waste disposal measures to prevent scavenging. Increase nighttime patrols to discourage feeding and address noise disturbances. Enforce noise regulations and promote neutering programs to manage the population. Establish green spaces with waste facilities for controlled interactions. Collaborate with local clinics for spaying/neutering. Regularly monitor and adjust strategies, fostering a harmonious coexistence between residents, strays, and pets in nighttime Thailand. Furthermore, the collected data may support community efforts to tackle stray dog-related problems such as waste management issues. We recommend that further research is undertaken as per the following suggestions:

Increasing the sample size and widening the study area will provide more information and improve generalizability. Enhancing data collecting procedures. Unlike face-to-face interviews, body language cannot be perceived via phone interviews. Asking more personal questions about factors that may be related to stray dog-related problems, such as religion and attitudes towards feeding stray dogs. Collect more details about each problem, especially those impacting the community.

### **Conclusion**

Our results indicate that feeding stray dogs was significantly associated with stray dog-related problems. However, other factors such as sex, length of stay, and owning pets showed no statistically significant associations. Garbage scavenging was a most common problem. Half the participants chose to retreat or walk away while dealing with stray dogs.



### Author contributions

All the authors contributed equally to the conceptualization, methodology, validation, formal analysis, investigation, data curation, and writing of the manuscript, including original draft preparation, review, and editing.

### Institutional review board statement

The Human Research Ethics Committee (HREC) of the Faculty of Medicine, Prince of Songkla University approved the study protocol (REC. 64–167–9–2).

### Informed consent statement

Regarding the phone interviews, our staff team informed all participants about the identity of the investigator, the objective of the phone call, and interview details (i.e., approximate time, topics, and data confidentiality). The staff asked the participants for verbal consent before data collection. All methods, including verbal consent, were performed following the ethical standards of our university, local legislation, and the 1964 Declaration of Helsinki.

### Data availability statement

Data and materials can be provided by the corresponding author upon request.

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### Conflict of interest

The authors declare no conflicts of interest.

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