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### Surveys of the Street and Private Dog Population Jamnagar, Gujarat, India

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# Surveys of the Street and Private Dog Population: Jamnagar, Gujarat India

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# Surveys of the street and private dog population

## Jamnagar, Gujarat

### India

October 2017

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Tamara Kartal and Dr Amit Chaudhari

## Executive Summary

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Humane Society International (HSI) conducted two dog population surveys in all 4 Zones of Jamnagar (human population of 609,613). One was a street dog survey and the other was a survey of the private (pet) dog population.

The survey generated an estimate of the street dog population of 25,768 dogs (4.23 street dogs per 100 people; 24.4 street dogs per km). Results from the household survey generated an estimate of the private dog population of 5,472 dogs (0.05 dogs per household).

Sterilization rates among private dogs was low and only 1 (5%) of the 20 recorded dogs was sterilized, leaving 95% of the dogs intact. Sterilization rates among street dogs was very low across all zones. Zones 2 (14.9%) and 4 (14.5%) had the lowest proportion of sterilized females. Zones 1 (21.8%) and 3 (18.8%) had slightly higher proportions of sterilized females but still not high enough to have an impact on the population growth.

The majority of private dogs (75%) had received a rabies vaccination in the last 12 months.

About 6% (0.06 bites per household) of households reported that someone in the household had experienced a dog bite in the last 12 months. This is more than half the number recorded (18,350 in 2016) by the Jamnagar Municipal Corporation.

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## Background

Jamnagar is a coastal town in the state of Gujarat (Image 1). It is the fifth largest city in Gujarat and has a human population of 609,613.

Image 1: Geographic location of Jamnagar, Gujarat (Google Maps)



Plans to implement a sterilization program in Jamnagar have existed since 2010. In 2016 the Jamnagar Municipal Corporation, together with local organizations, sterilized 5,000 street dogs, however the program stopped after a year. In September 2017 Humane Society International (HSI) and the Jamnagar Municipal Corporation (JMC) agreed to conduct a survey of the street and owned dog population to estimate the number of dogs in the JMC area. This document describes the methodology and results of the surveys, which may now be used in further discussions of a possible dog population management program organized jointly between HSI and JMC.

In planning any dog management project, it is essential that one obtains a baseline assessment of the street dog (and private dog) population before development and implementing a management program. These population estimates serve several important functions. First, a street dog population size estimate quantifies the scope of the “problem”. Second, quantifying the problem allows proposed implementers of a program to make an informed estimate of the resources and the timeline required to achieve the desired outcomes. Finally, the population estimates function as a yardstick against which to measure progress as the dog management program moves forward.

Baseline survey estimates establish a framework for the calculation of metrics that may be used to plan effective, feasible, and properly targeted strategies for reducing roaming dog population size, reducing or eliminating human and dog rabies cases (enables spot checks of vaccination rates), and reducing public health and nuisance costs over time.

## Survey Design and Methodology

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HSI conducted two surveys in Jamnagar, India in October 2017. A dog demographic and KAP (Knowledge, Attitude and Practices) survey, and a street dog survey. KAP surveys survey the private dog population as well as the attitudes and behaviours of humans in regards to dog demographics, the reproductive status of private dogs, the rate of dog bites and the relationship residents of Jamnagar have with their own private dogs and with street dogs.

Street survey objectives:

- Generate a reliable estimate of the relative and total dog population in Jamnagar
- Estimate the proportion of sterilized dogs in the street dog population
- Assess street dog welfare by tracking body condition score and skin conditions as a proxy measure

Private dog survey (KAP) objectives:

- Generate a reliable estimate of the private dog population
- Understand private dog demographics and population dynamics
- Estimate sterilization and vaccination rates among privately owned dogs
- Assess the level of responsible dog ownership
- Explore attitudes pertaining to the relationship between households and street dogs
- Assess knowledge about rabies and rabies prevention in case of a dog bite

### *Street Dog Survey*

To generate a dog abundance estimate (total dog population size) we created set routes, also called index or standard routes, in Google Maps along residential roads and highways but avoiding expressways (dogs tend to avoid these roads). Routes are marked with a starting (flag) and end point (police officer). For easy access, the routes are saved as KML files and stored in Google My Places, which can be accessed from smart phones (online and offline). A survey team, consisting of a driver and an observer mounted on motorcycles, conducted the surveys early in the morning during the dawn hours. The observer uses both the Google Maps app and the OSM Tracker app on a mobile phone. OSM tracker is an application that enables the observer to record a dog sighting and relevant specifics about a dog (female, male or unknown adult, sterile/notched female or sterile/notched male, pup, lactating) as well as recording welfare indicators such as skin problems and body condition scores (BCS1 to BCS5). These are saved together with GPS coordinates of the sighted dog. OSM Tracker produces a track record of all sighted dogs and their specifics along the route which was followed during the survey. The data is subsequently downloaded and stored in an Access database for analysis. The survey route was surveyed on two consecutive days, by the same survey team, to measure variability and power to detect change.

### *Dog demographics and KAP survey*

The survey was conducted using the smart phone app Epicollect5, which contained a prepared survey form for Jamnagar. Households were surveyed by a team of two trained surveyors using questionnaires about 15-25 mins in length. Questionnaires included or excluded questions depending on whether the household owned a dog or not. The survey sample size was set at a minimum of 385 households to reach a 95% confidence level. Inclusion criteria for households were:

- Person interviewed had to be over 18 years old and resident at the address

- In case of dog ownership, the interviewee had to be the main care taker or at least well informed about the dog or dogs in the household

Participants were asked to confirm their consent to be part of the study and had the option to opt-out before the interview started. Once questionnaires were completed, the completed forms were saved and uploaded to a cloud-based database by the surveyor.

Household surveys were conducted with a systematic random sampling method, which samples a portion of the total available households in the area. Following the same route that was created for the street dog survey, surveyors interviewed every tenth household. To remain consistent throughout the survey either the left or the right side of the street was surveyed. In case nobody was available at the tenth household, the ninth or the eleventh household was interviewed instead.

Systematic random sampling in comparison to simple random sampling is less susceptible to researcher error.

## Results

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### *Street dog survey*

All four zones of the city were surveyed following set routes. Zone 4 was divided into two parts with routes 4 A and B to account for the larger size of zone 4 compared to the other zones (Image 2 & 3).

Results of the survey are summarized in Table 1. Sterilization rates of females were very low in all zones. Zones 2 and 4 (A and B results combined) had the lowest proportion of sterilized females with only 14.9% and 14.5% respectively. Zones 1 and 3 had slightly higher proportions (21.8% and 18.8% respectively).

Poor welfare indicators, including skin conditions and body condition score, were low in all zones. Zone 1 had the highest percentage of dogs with a body condition score of 1 or 2 (1.9%) while Zone 2 had zero dogs with a low body condition score. Dogs with visible skin issues were present in all four zones. Zone 1 had the highest proportion with 2.8% and Zone 2 the lowest with only 0.1%.



Image 2: Jamnagar by zones (and wards)

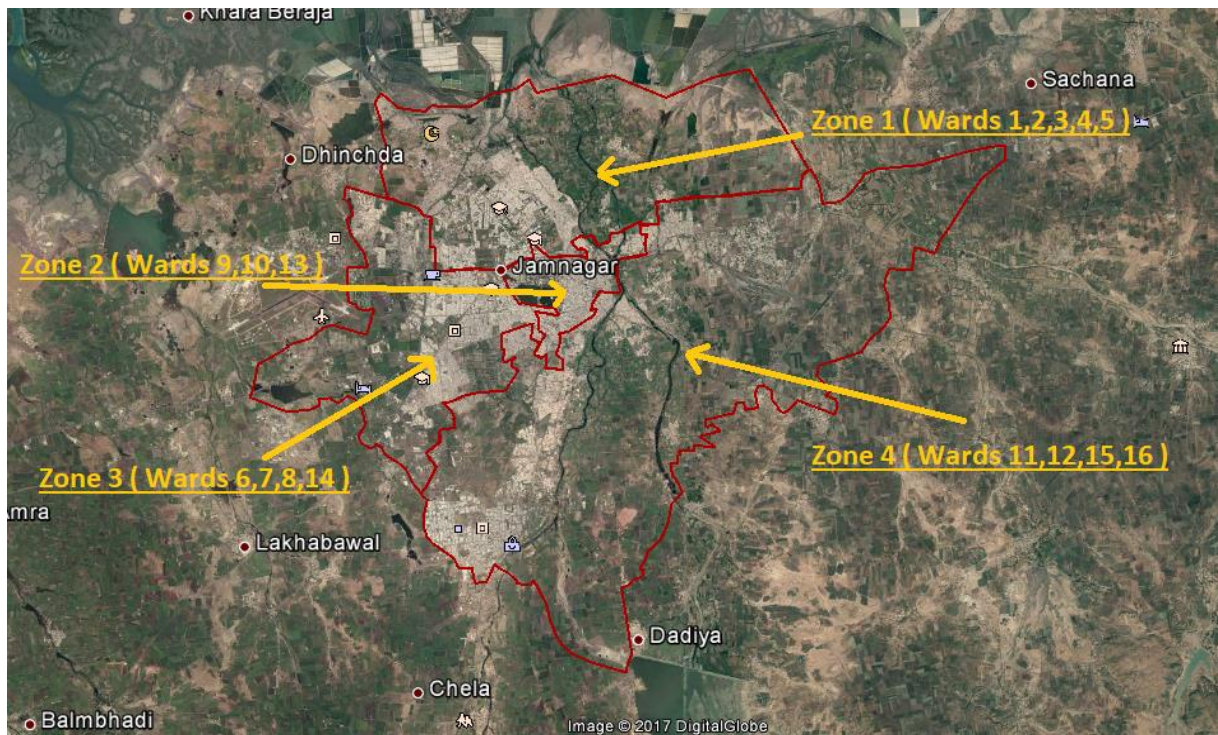


Image 3: Index routes by zone1-4 (A+B)

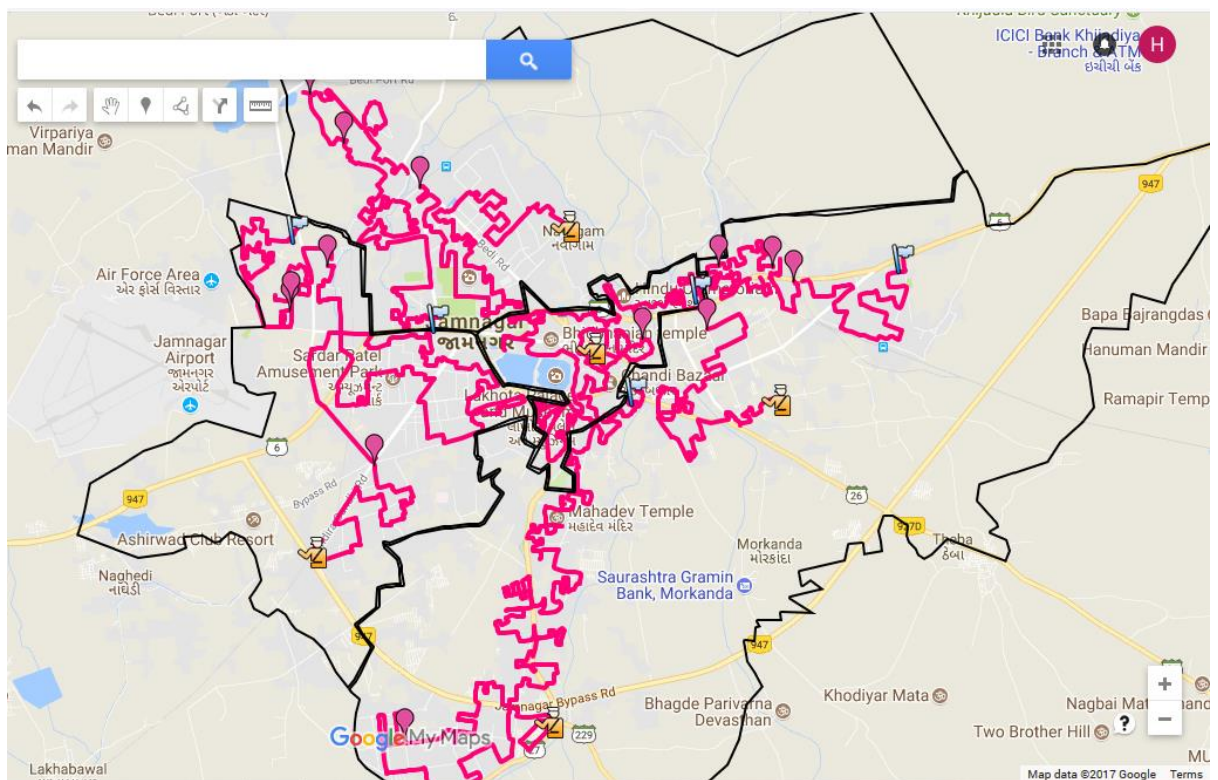




Table 1: Street dog survey results by sex and welfare indicators

<b>Zone Name</b>	<b>Date</b>	<b>Male</b>	<b>Female</b>	<b>Lactating</b>	<b>Male sterile</b>	<b>Female sterile</b>	<b>Total Sterilized</b>	<b>% Females sterilized</b>	<b>% Lactating</b>	<b>% visible skin condition</b>	<b>% Poor Body Condition Score (C1 &amp; C2)</b>	<b>Male:Female Ratio</b>
<b>1</b>	11/10/2017	112	99	9	38	30	68	21.7	6.52	3.1	2.1	
	11/11/2017	120	89	8	45	27	72	21.8	6.45	2.4	1.7	
	<b>Average</b>	<b>116</b>	<b>94.0</b>	<b>8.5</b>	<b>41.5</b>	<b>28.5</b>	<b>70</b>	<b>21.8</b>	<b>6.5</b>	<b>2.8</b>	<b>1.9</b>	<b>1.2 : 1</b>
<b>2</b>	11/11/2017	191	164	39	40	44	84	17.8	15.8	0.0	0.0	
	11/12/2017	169	171	31	59	27	86	11.8	13.5	0.2	0.0	
	<b>Average</b>	<b>180</b>	<b>168</b>	<b>35</b>	<b>50</b>	<b>36</b>	<b>85</b>	<b>14.9</b>	<b>14.7</b>	<b>0.1</b>	<b>0.0</b>	<b>0.96 : 1</b>
<b>3</b>	11/12/2017	166	153	13	36	33	69	16.6	6.5	1.7	1.2	
	11/13/2017	156	133	17	41	40	81	21.1	8.9	1.0	1.0	
	<b>Average</b>	<b>161</b>	<b>143</b>	<b>15</b>	<b>38.5</b>	<b>36.5</b>	<b>161</b>	<b>18.8</b>	<b>7.7</b>	<b>1.4</b>	<b>1.1</b>	<b>1.03 : 1</b>
<b>4A</b>	11/14/2017	94	78	11	23	14	37	13.6	10.7	2.3	1.4	
	11/15/2017	80	55	11	20	21	41	24.1	12.6	2.7	2.1	
	<b>Average</b>	<b>87</b>	<b>66.5</b>	<b>11</b>	<b>21.5</b>	<b>17.5</b>	<b>87</b>	<b>18.4</b>	<b>11.6</b>	<b>2.5</b>	<b>1.7</b>	<b>1.14 : 1</b>
<b>4B</b>	11/14/2017	152	116	18	33	15	48	10.1	12.1	0.3	0.0	
	11/15/2017	119	116	5	26	15	41	11.0	3.7	1.1	0.0	
	<b>Average</b>	<b>135.5</b>	<b>116</b>	<b>11.5</b>	<b>29.5</b>	<b>15</b>	<b>135.5</b>	<b>10.5</b>	<b>8.1</b>	<b>0.7</b>	<b>0.0</b>	<b>1.16 : 1</b>
<b>Jamnagar - all zones combined</b>		<b>1359</b>	<b>1174</b>	<b>162</b>	<b>361</b>	<b>266</b>	<b>313.5</b>	<b>16.6</b>	<b>10.1</b>	<b>1.3</b>	<b>0.8</b>	<b>1.07 : 1</b>

The percentage of lactating females was relatively high but not unusually high for the time of year as it was pup season in India when the survey was carried out. In Zone 2 14.7 % of the recorded female dogs were lactating and caring for pups, the highest among the zones. The lowest proportion of lactating females was in Zone 1 with 6.5%. As a result the number of pups on the street was very high as well. We recorded 9.4% pups in Zone 1, 7.9% in Zone 2, 8.9% pups in Zone 3, 10% pups in Zone 4.

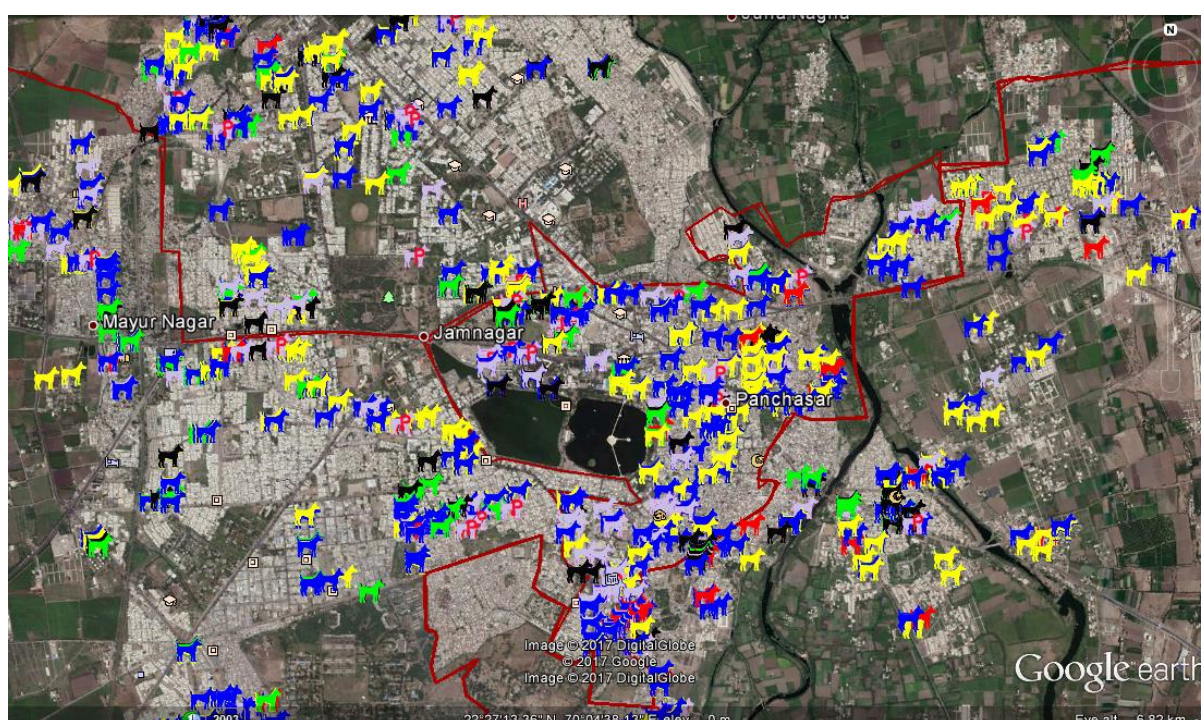
The observed density of dogs was 12.1 dogs per km, which would be the average number of dogs one would encounter walking a kilometre along the streets in Jamnagar. Extrapolated from our survey results (based on our street length calculations and assumed detectability of 0.46) we estimate a total dog population of 25,768 dogs in Jamnagar (Table 2), which translates to 4.23 dogs per 100 people or 24.4 dogs per km.

Table 2: Absolute and relative dog population estimates by zone

<b>Zone</b>	<b>Ward number</b>	<b>Dogs per km street</b>	<b>Total dog population estimate</b>	<b>Human Population</b>	<b>Dogs per 100 humans</b>
1	1,2,3,4,5	10.19	5022	178806	2.81
2	9,10,13	20.99	3799	105573	3.60
3	6,7,8,14	12.25	8280	162984	5.08
4	11,12,15,16	9.2	8667	162250	5.34
<b>Total</b>			<b>25768</b>	<b>609613</b>	<b>4.23</b>

GPS coordinates, collected with OSM tracker, enable us to map observed dogs and summarize the composition of the dog population visually (Image 4). Dog icon colours translate as follows: Green = Female sterilized (ear notch present), Yellow = Female unnotched, Red = Lactating, Black = Male sterilized (ear notch present), Blue = Male unnotched.

Image 4: Observed dogs in all zones of Jamnagar



### *Private dog demographic and KAP (Knowledge, Attitude and Practices) Survey*

We interviewed 409 households, of which 19 (5%) owned a dog (Table 3). These 19 households owned 20 dogs which translates to 0.046 dogs per household. Extrapolated from this result we estimate a total private dog population of 5,472 dogs in Jamnagar (117,798 households in the city).

The majority of the survey participants were female (63%) and lived in a semi-detached house (65%). Participants had owned no other dogs in the last 12 months and kept dogs for two reasons, either for protection (3 HHs) or as a pet (16 HHs) (Table 4).

Table 3: Survey participant demographics

Human Demographics			Sample size: 409				
	Survey Participants		Housing type			Dogs per household	Private dog population estimate*
	Female	Male	Semi-detached house	Detached house	Apartment	0.046	5,472
Number	257	152	265	38	106		
Percentage	63%	37%	65%	9%	26%		
	Dog Owners		Number of dogs in the household				
	Yes	No	1 Dog	2 Dogs			
Number	19	390	18	1			
Percentage	5%	95%	94.7%	5.3%			

- Source: Census 2011; based on 117,798 households (excluding non-residents)

Table 4: Reasons for owning a dog and if other dogs lived in the household in the last 12 months

Owned other dogs in the last 12 months		Reasons for owning a dog		
	Yes	No	I want him/her to protect the property or crops	Pet/Companion
<b>Number</b>	0	19	3	16
<b>Percentage</b>	0%	100%	16%	84%

Table 5: No-dog owners' stated reason for not owning a dog

Reasons for not owning a dog						
	No need for a dog	I do not like dogs	I owned a dog but not currently	It is against my religious beliefs	I do not know	No space for a dog
<b>Number</b>	115	111	33	15	42	73
<b>Percentage</b>	30%	29%	8%	4%	11%	19%

Only 8% (33) of the “no-dog owning” participants had owned a dog in the past (Table 5). Therefore, only 13% of Jamnagar households have private dogs now or have had them in the past.

## Private Dog Demographics

The majority of private dogs were male (70%, 14 dogs) and 65% were between the age of 1 and 6. Only 15% were older than 6 years. Most dogs were either gifts from someone within Jamnagar (45%) or were purchased within Jamnagar from an unspecified source (35%). Only 2 dogs (10%) were acquired from a breeder or pet shop.

## Responsible Dog Ownership Practices

### Sterilization

Ninety percent (18) of the recorded dogs were intact and only 1 dog was sterilized. One owner would be willing to sterilize the dog for a small fee. Reasons given for not sterilizing their dogs and the unwillingness to sterilize them in the future (even when offered free) included: unnecessary (38.9%), too dangerous for the dog (16.7%), fear the dog would become lazy (16.7%), and the wish to have puppies from the dog (11.1%). Education campaigns will be needed to encourage dog owners to embrace sterilization.

## Litters by private female dogs

There were 6 female dogs of which one was sterilized while one female had had a litter in her life. This dog was five years old at the time of the survey.

## Vaccination

Seventy-five percent (15) were vaccinated against rabies in the last 12 months. Of the five remaining dogs, three owners would have their dogs vaccinated free of charge (2) or for a small fee (1) and two dog owners would not allow their dogs to be vaccinated. Three owners explained that their dogs were not vaccinated because they did not think it was necessary, one could not touch the dog and another was not sure why the dog was unvaccinated.

Rabies vaccinations should be repeated annually. To explore if dog owners knew when and how frequently rabies vaccines should be administered to their dog, we asked in which month the dog was vaccinated and when the dog needed to be vaccinated again. Thirty-three percent (5) were not sure when their dog was last vaccinated and 43% (6) were not sure when their dog needed their next vaccine. Five of the six were both unsure when the dog had been vaccinated and when the dog needed its next vaccination. Only one person knew when the dog received the vaccine but did not know when the dog needed to be revaccinated. The remaining dog owners seemed to be somewhat aware of the vaccination interval, however most thought that the vaccine would be due a month later from the previous vaccination month.

## Visiting a veterinarian in the last 12 months

Twelve of the nineteen dog owning households had not visited a veterinarian in the previous 12 months while seven did visit a veterinarian. This begs the question where some of the vaccinated dogs received their reported vaccinations.

## Confinement of dogs throughout the day

Exploring confinement practices of private dogs is challenging as questions are readily misinterpreted and respondents are either genuinely uncertain about the level of control they provide to their dogs on a regular basis or respondents are nervous about admitting that the level of control is low to non-existent. Therefore, the interviewee was asked about confinement at specific times (at the time of the interview as well as during the night).

The survey was conducted between 10 am and 6 pm during the day when it was still light outside. The majority had their dogs inside the house (14) while two (2) had their dogs tethered outside in an area that was uncontrolled (e.g. no fencing) and unsupervised. One (1) had the dog tethered in a fenced in yard and one had their dogs loose in a completely fenced yard. Similarly, fifteen (15) kept their dogs inside the house with them at night, two dogs were tethered either in an uncontrolled or fenced-in yard, one dog was allowed to roam on the streets and 2 dogs were confined in a shed/barn or cage outside the family home.

The majority (15) allowed their dog to have access to all rooms in the family home. Two (2) allowed their dogs to be in all rooms but the kitchen, one (1) allowed the dog to be in a different room in the house and two (2) never allowed their dogs to be in the house.

Additionally, we asked about the tethering of dogs outside the house. Fifty-five percent (55%) said that they never tether their dog outside unsupervised, whereas 45% said



sometimes. Forty-five percent (45%) of dog owners said that their dog is allowed to roam free at times and the majority (55%) said that their dog is never allowed to roam.

## Dog bites and Rabies Prevention

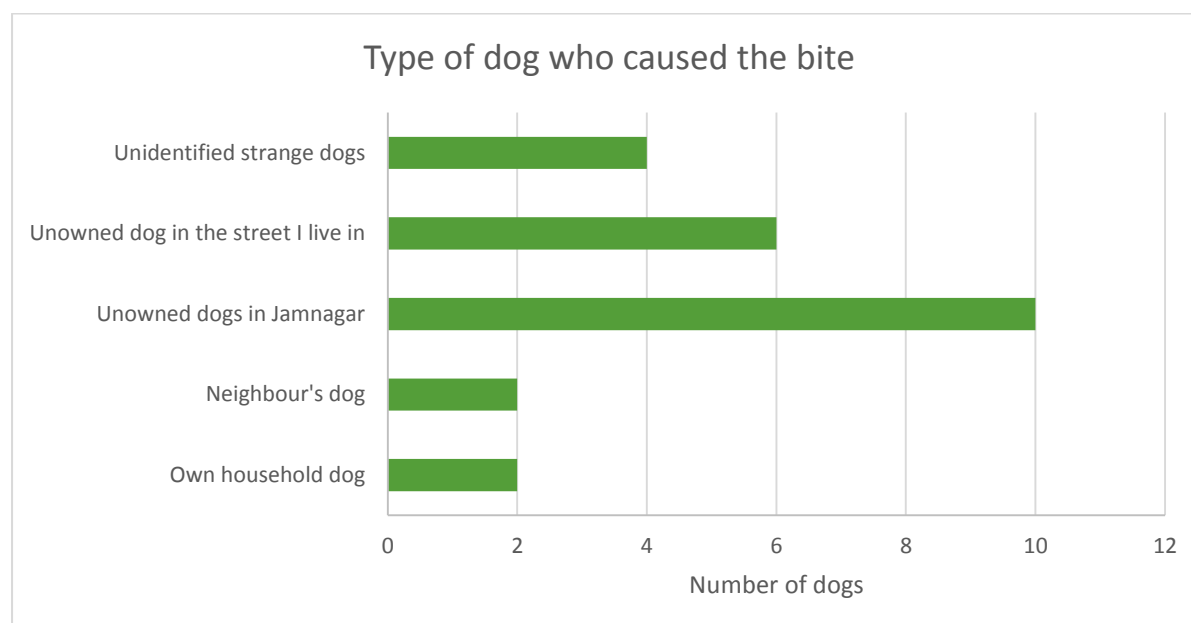
In general, households experienced a low incidence of dog bites with 6% reporting that one of the household members had experienced a dog bite in the previous 12 months (Table 6).

Table 6: Dog bites in the last 12 months.

Has anyone in the household been bitten by a dog in the last 12 months in Jamnagar?		
	Yes	No
<b>Number</b>	24	369
<b>Percentage</b>	6%	94%

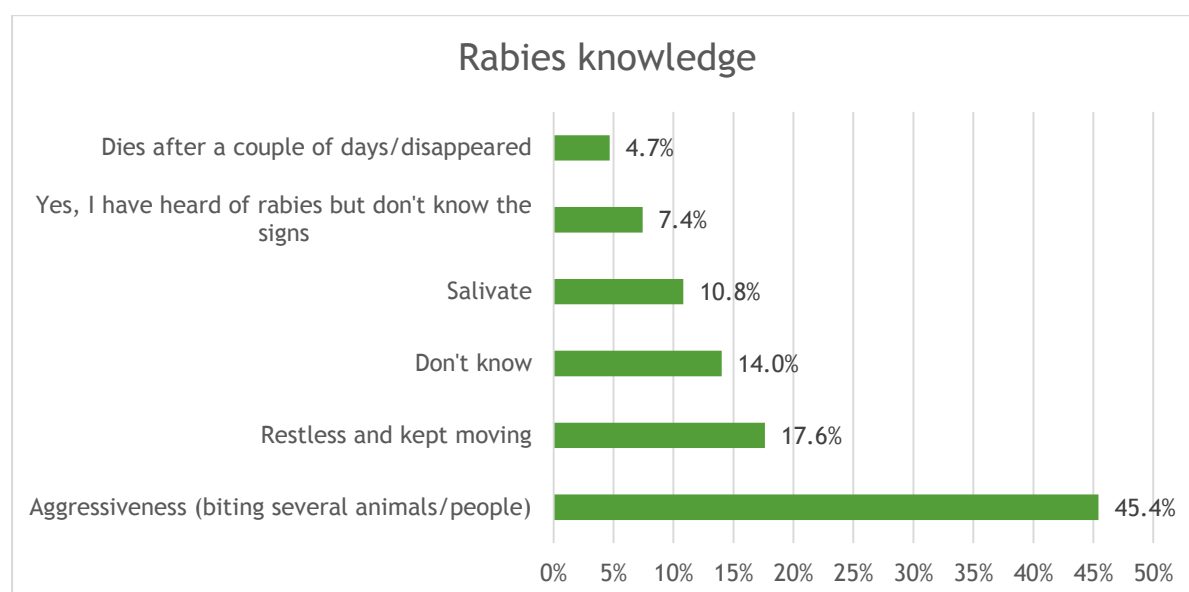
Most of the recorded dog bites were caused by dogs that were considered unowned (Figure 1). 41.7% (10) were unowned dogs in Jamnagar, 25% (6) unowned dogs in the street the person lived in and 16.7% (4) unidentified strange dogs. Private dogs were only responsible for 16.6% (4) of the dog bites, of which 2 were caused by the own household dog and 2 by a neighbour's dog.

Figure 1: Dogs who caused the dog bites



Rabies was generally well known (Figure 2). Only 14% did not know about rabies and 7% had heard of rabies but did not know what symptoms to look for.

Figure 2: Rabies knowledge



Survey participants were generally aware how to treat a dog bite, with 41% of all interviewees following the right procedure. Only 6.4% would treat a wound with home remedy and 0.5% would treat the wound according to its severity (Table 7).

Table 7: Wound care

What would you do if you or someone in your household gets bitten by a dog?						
Wash the wound with water and see what happens	Wash the wound with water and go to the hospital later	Wash the wound with soap and water and go to the hospital immediately	Depending on the size of the bite, treat it at home	Put a bandage on it and go to the hospital	Home remedy	Just go to the hospital
1	35	161	2	45	25	124
0.3%	8.9%	41.0%	0.5%	11.5%	6.4%	31.6%

## Human-Dog Relationship: With private and street dogs

We increasingly collect data indicating that street dog populations and private dog populations are not separate or totally independent from each other (see e.g. Morters et al., 2014<sup>1</sup>). In fact, both are actively sustained by the human community they live in and their population dynamics are usually a result of human choices rather than purely a result of reproductive capacity (puppies will have a higher chance of survival when humans feed and care for them). The difference between the private and street dog populations is often only the level of confinement individual dogs receive. There are hints that the level of confinement/control increases following the implementation of large scale sterilization and vaccination programs. Confinement/control of dogs should be monitored over time as an indicator for a changing human-dog relationship.

<sup>1</sup> Morters, M. K., McKinley, T. J., Restif, O., Conlan, A. J., Cleaveland, S., Hampson, K., Whay, H.R., Damriyasa, I. & Wood, J. L. (2014). The demography of free-roaming dog populations and applications to disease and population control. *Journal of Applied Ecology*, 51(4), 1096-1106.

## Perception of street dog density and previous dog management

Most interviewees (49%, 192) reported that they see about 4-6 dogs in their streets in the early morning hours. About 26% (103) see 0-3 dogs, 20% (78) see 7-10 dogs and only 5% (20) see more than 10 dogs in their street.

When asked how they felt about the number of dogs on their street, the majority of respondents (65%) were not concerned about the number of dogs in their street and felt that there were not too many nor too few. Twenty-three percent (23%, 65) even thought that there were too few dogs on their street and another 2% (6) thought that there were far too few dogs on their streets. Only 10% (27) felt that there were too many dogs in their streets.

When asked whether the number of dogs on the streets had changed in the last 12 months, 35.4% (139) thought that it had stayed about the same, 26.5% (104) thought the number had decreased, 19.8% (78) thought the number had increased and 18.3% (72) did not know or did not pay attention to the number of dogs.

Opinions on how street dogs should be managed were very diverse (Figure 3). Half the interviewees did not feel that there is a need to manage street dogs (46.8%, 184) in Jamnagar. They did not perceive them as a problem or have the feeling the dogs needed help. Others (14.5%, 57) would like to do something to decrease the number of dogs but do not know the best way to go about it, whereas 6.1% (24) support a CNVR (Catch, Neuter, Vaccinate and Return) approach. A minority 20.9% (82) would like to see no dogs on the streets no matter the method used.

Figure 3: Do you think street dogs should be managed and if so how?



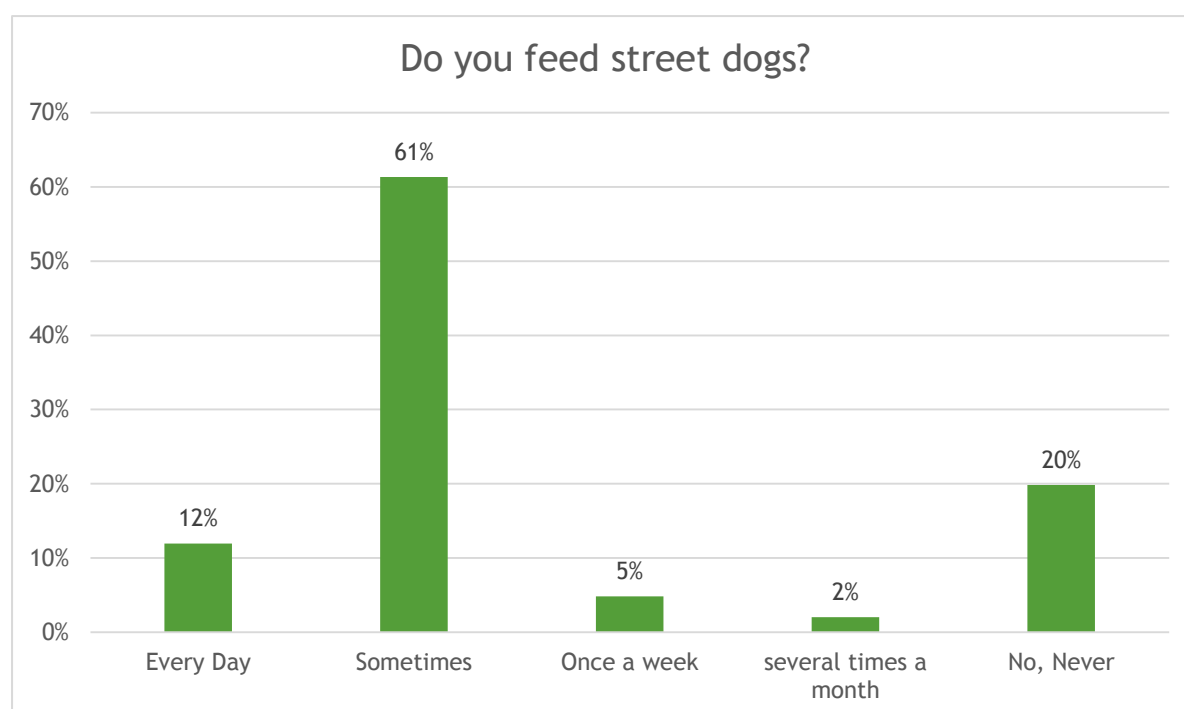
Although, the Jamnagar Municipal Corporation had sterilized 5,000 street dogs in 2016 only 16% (62) reported that they are aware of past street dog management efforts in the area where they live.

### Positive interactions with street dogs

The questionnaire included several questions on the level of interaction and the care respondents devoted to street dogs.

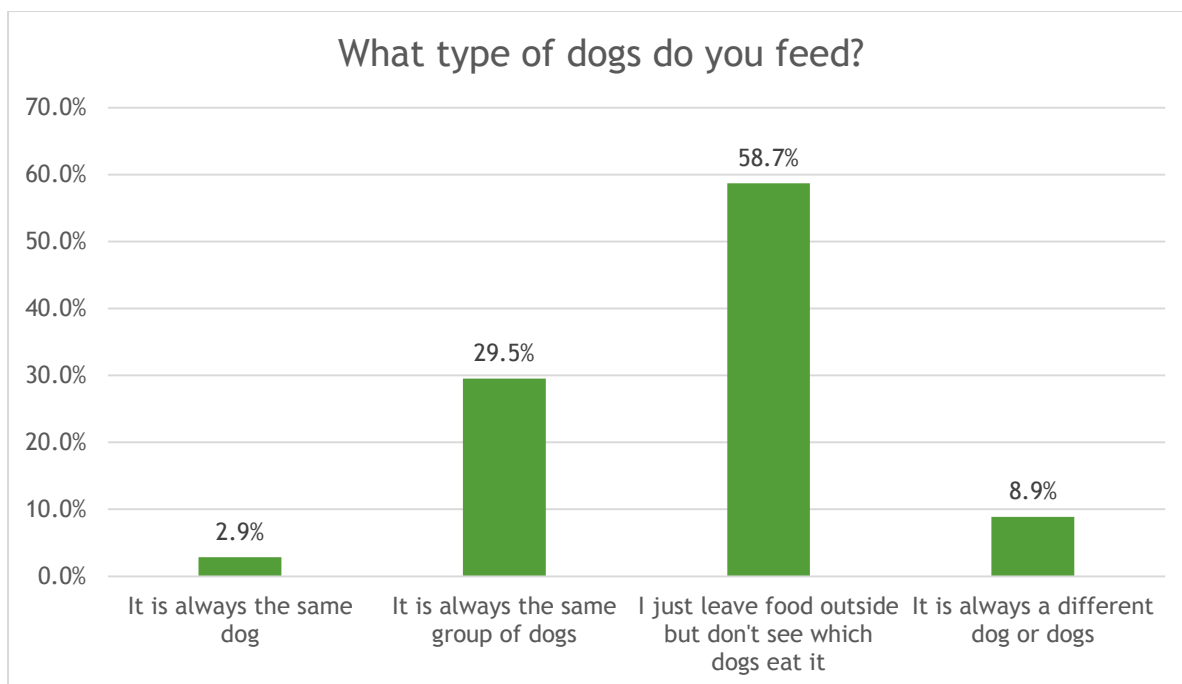
The majority of interviewees fed street dogs more or less frequently (12% - daily, 61% - occasionally or more frequently). Only 20% (78) never fed street dogs (Figure 4).

Figure 4: Proportion of respondents feeding street dogs



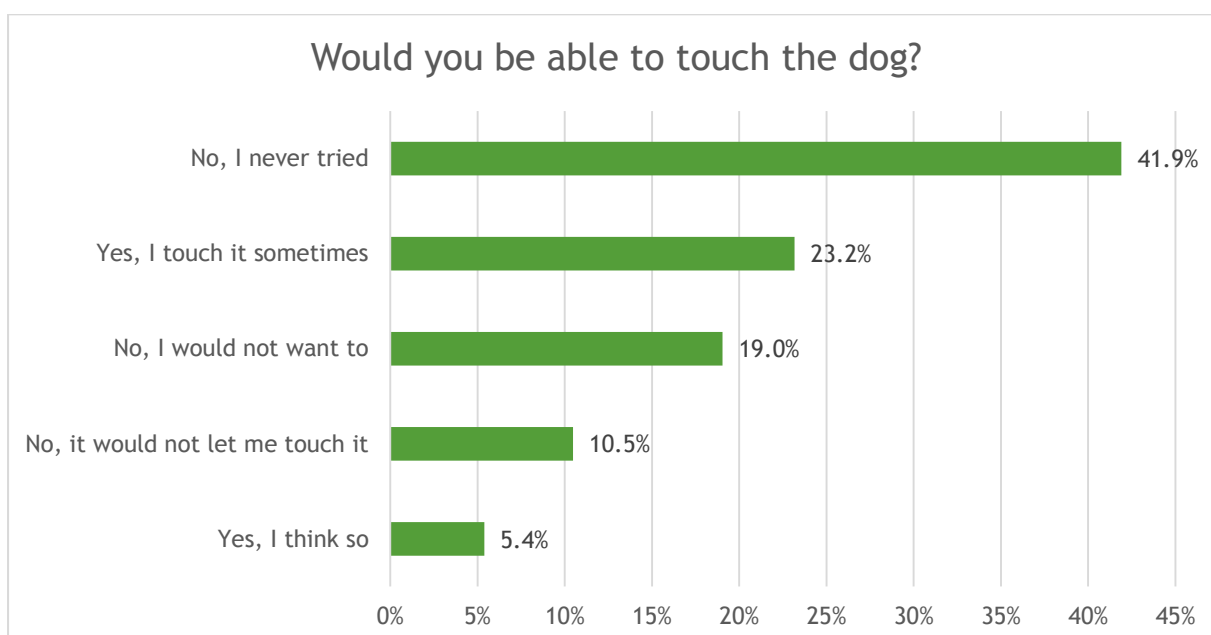
Over half (58.7%, 185) just left food outside for dogs to eat while 29.5% (93) fed specific groups of dogs and 2.9% (9) fed a particular dog (Figure 5).

Figure 5: What kind of dog or dogs are they?



Dog feeders commonly reported that, beyond providing food, they do not touch or pet the dog (Figure 6). However, 23.2 % (73) reported that they sometimes touch the dog or dogs they feed and another 5.4% (17) think they could touch the dog if they wanted to. Only 19% (60) explicitly said that they would not want to touch the dog.

Figure 6: Level of interaction



The interviewee was asked if s/he or other members of the household, including children, ever interacted with street dogs in any of the stated ways (Figure 7). A quarter of the households did not interact at all with street dogs (27.8%, 189).



Figure 7: Do you, your children or other members of the household ever interact with street dogs in the following ways?

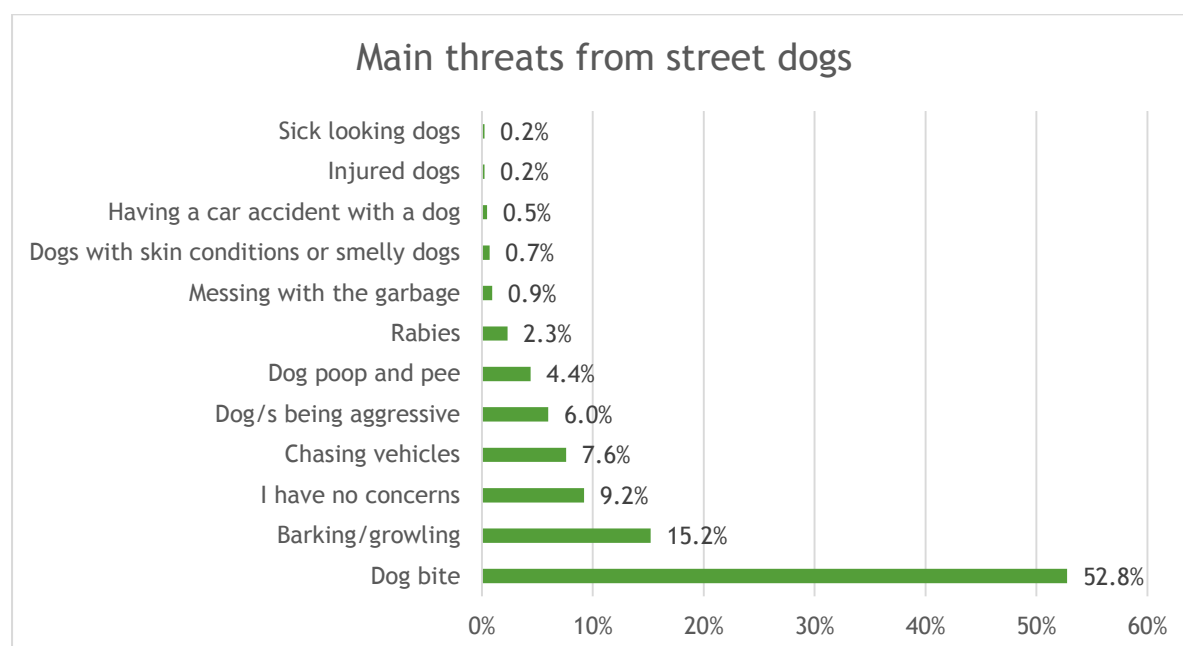


### Negative interactions with street dogs

Many interviewees felt that they were threatened relatively often by street dogs (42.5%, 167) and 7.1% (28) always felt threatened. However, 12.2% (48) never felt threatened, 14.8% (58) rarely felt threatened and 23.4% (92) only sometimes.

By far the most common concern in these circumstances, in which the interviewee felt threatened, was getting bitten by a street dog (52.8%, 229), followed by feeling threatened by barking or growling street dogs (15.2%, 66). Although rabies is a fatal disease most interviewees did not mention rabies as a concern, only 10 out of 409 participants said that they are afraid of rabies in situations they feel threatened by street dogs (Figure 8).

Figure 8: In these circumstances, what would you consider threatening or concerning about the street dogs?



## Attitudes towards street dogs

To quantify attitudes of interviewees regarding street dogs and street dog management, the questionnaire included 6 Likert items with five answer options, from strongly agree, agree, don't know/neutral, disagree to strongly disagree. The results are summarized in figure 9 and table 8.

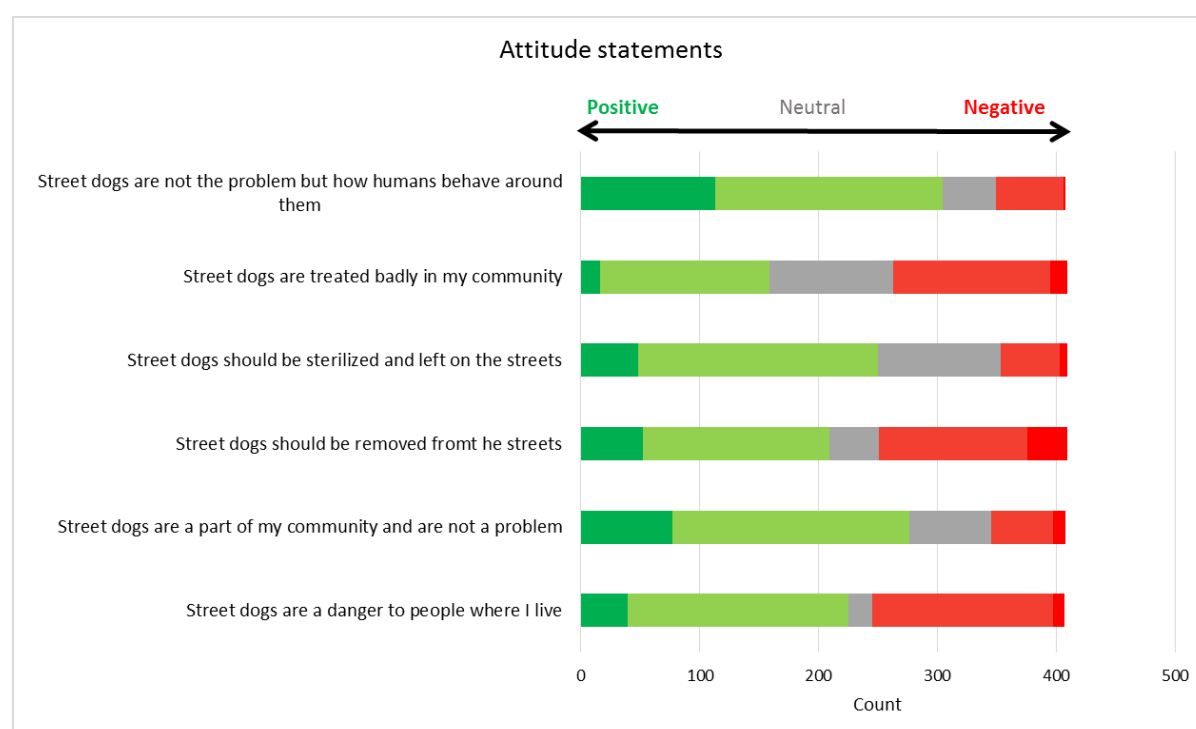
A composite mean attitude score can be calculated for each respondent by appointing numerical values to the answers to generate a mean score, however its usefulness is questionable on a number of issues including the assumption that there are equal differences between answer choices. We refrain from such analysis but compare the statements instead.

How answers were distributed for each statement as percentages can be found in table 8, which generally shows that most interviewees do not think that dogs are intrinsically the problem (statement 2 & 6). However, there seems to be a division among interviewees whether street dogs should be removed (38.7% agreed and 51.1% disagreed that they should be removed) as well as whether dogs do pose a threat to the community (39.6% said dogs are dangerous and 55.0% disagreed). Overall, however, interviewees seemed to agree that sterilization and release should be the dog management method, the vast majority (61.1%) agreed and only 13.7% disagreed with this statement while 25.2% did not know.

Table 8: Percentage of responses for each attitude statement (Note: Statement 1 and 3 are negative).

	1. Street dogs are a danger to people where I live	2. Street dogs are a part of my community and are not a problem	3. Street dogs should be removed from the streets	4. Street dogs should be sterilized and left on the streets	5. Street dogs are treated badly in my community	6. Street dogs are not the problem but how humans behave around them
<i>Strongly Agree</i>	2.4%	18.8%	8.1%	11.7%	3.9%	27.6%
<i>Agree</i>	37.2%	48.7%	30.6%	49.4%	35.0%	46.7%
<i>Don't know</i>	4.9%	16.9%	10.3%	25.2%	25.4%	11.0%
<i>Disagree</i>	45.5%	12.7%	38.4%	12.2%	32.3%	13.9%
<i>Strongly Disagree</i>	9.5%	2.7%	12.7%	1.5%	3.4%	0.5%
<i>Number of responses</i>	407	408	409	409	409	408

Figure 13: Attitude statement responses colour coded for whether interviewees responded positively (strongly agree and agree) = green, neutral (I do not know) = grey or negatively (disagree and strongly disagree) = red, towards street dogs. (Note: Question 1 and 3 were reversely interpreted because the statement was negatively worded)



## Discussion and Recommendations

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Private ("owned") dog populations have long been ignored in discussions of street dog population management. First, there is a widely held assumption that there are relatively few private dogs in India. Second, it is assumed that private dogs and street dogs are two separate non-interacting populations. As a result of several recent surveys in India, HSI now reports that dog demographic and KAP surveys show that not only should private and street dogs be considered as interacting communities (both are dependent on human behaviour, control and food/water provision), but also that the private dog population in Jamnagar is substantial (about 20% of the size of the street dog population).

This has multiple implications for sterilization and vaccination programs.

Private dogs need to be included in dog population management programs. They likely contribute to the street dog population because their litters are reared under relatively close human supervision and food provision and because a large number (about two-thirds) of them roam the streets with street dogs. The rate of abandonment of private dogs and pups from private dogs has not been determined but it is likely that street dogs are recruited from the private dog population.

The sterilization rate among private dogs in Jamnagar was low and the willingness of owners to have their intact dogs sterilized was also low. Street dogs benefited from the sterilization program in 2016 and there was a higher proportion of sterilized dogs in all zones (average of 16.6% females sterilized) compared to the private dog population. This survey, however, indicates that sterilization efforts should target both private and street dogs.

Confinement/control of private dogs is an important issue when dog management programs aim to reduce the number of roaming dogs and aim to control rabies. Campaigns need to be planned carefully to prevent secondary welfare issues both for public health and for dogs. For example, if confinement of dogs is promoted without proper guidance, it may lead to an increase in tethered dogs which would be an undesirable outcome (for both dog welfare and the bite risk for humans – tethering increases the bite risk).

On average 6% of the households reported experiencing a dog bite in the previous 12 months but this number should steadily decline over time once the new dog management program is implemented.

The attitude statements show that Jamnagar is a dog friendly place with a lot of people living in harmony with street dogs, regarding them as part of their community (67.5%) and also caring for street dogs (12% feed dogs daily and 61% sometimes). It is recommended that responsible pet ownership campaigns should build on this relatively positive human-dog relationship through programs promoting the advantages of sterilization and vaccination, as well as promote rabies awareness and prevention.