HUMANE SOCIETY INTERNATIONAL

Dog and Cat Population Assessment

in the Urban Districts of La Paz, Bolivia

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Monitoring, Evaluation and Impact Assessment (MEIA) Program

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BACKGROUND

Humane Society International (HSI), the global arm of The Humane Society of the United States, has been conducting dog population surveys around the world for almost a decade under the MEIA (Monitoring, Evaluation and Impact Assessment) program. Through our thorough surveys we have informed and challenged dog management programs across Asia and Africa and have contributed significantly to the success of dog management programs from the local to national level. With the expertise in evidence-based program development and implementation, HSI's MEIA has provided monitoring and evaluation services to external and government run programs throughout Asia and Africa. We have developed the "one-dog-population" approach in which we acknowledge that street and owned dogs are not isolated populations but are interrelated and form one dog population governed by the human population and communities they live with. This assessment report serves a dual purpose of measuring and evaluating the impact of HSI's dog and cat sterilization program so far as well as establishing a baseline against which the new dog and cat welfare strategy in La Paz can be measured in the future.

There is increasing evidence that street dogs are very dependent on direct human food provision rather than garbage only for their nutritional needs. In at least some communities with large numbers of "street" dogs, the majority of street dogs are claimed to be "owned" by one or more residents (Butler & Bingham, 2000; Estrada, Vos, De Leon, & Mueller, 2001; Morters, et al., 2014). In principal, these dogs will be more accessible for vaccination and other services (WHO, 2005; Lembo, et al., 2010)

The use of animal birth control (ABC) programs alone and in concurrence with rabies vaccination has been promoted since the 1960s (apparently first suggested by Dr Chinny Krishna of the Blue Cross of India) as the method of choice for controlling dog populations and human rabies in urban areas. The World Health Organization (WHO, 2005) has accepted this approach for at least a decade and has criticized culling alone which has been shown to be unsuccessful (Windiyaningsih, Wilde, Meslin, Suroso, & Widarso, 2004; Morters, et al., 2013). In some cases (e.g. in Bali), culling is counterproductive because the sterilized and/or vaccinated dogs are killed while reproduction continues and vaccination thresholds are not maintained (WHO, 2015).

Reliable information on dog population demographics as well as the total dog population size is crucial to the planning and implementation of effective and evidence-based dog management programs. Baseline surveys further serve to estimate program costs, inform strategies, as well as to assess sterilization and vaccination coverage throughout the program's duration and across the program area. Several methods to estimate dog population densities are available, often consisting of a combination of questionnaire surveys and street counts, depending on the dog populations' demographics and the objectives of the programs.

SURVEY APPROACH AND OBJECTIVES

This document describes survey work that was conducted by HSI in La Paz to generate this baseline assessment, including door-to-door surveys of residents, which was conducted in April and May 2019. This report is intended to highlight the main design features of the survey and its most useful results.

The data gathered was used to generate a variety of metrics that were necessary to address the goals of this survey including those described in the Bolivia Dog and Cat Welfare Strategy.

Objectives included:

Dog density in La Paz (urban): By dividing the recorded dogs by the households surveyed, a per household dog density (dogs/HH) is obtained. Multiplied by the households in the district (last census data is from 2016) we estimate the dog population of the district surveyed. The same applies to the districts of the same poverty and human density category.

Dog ownership practices and attitudes: We recorded different questions pertaining to dog keeping practices and animal welfare as well as attitudes toward rabies vaccinations, sterilizations as well as acquisition and raising dogs.

Note: from here forward when we refer to La Paz, we are talking about the urban areas of La Paz excluding the two rural Macro-districts, Zongo and Hampaturi. We explored rural areas in Zongo (closest to the Urban areas) and realized that communities were too small (often not bigger than 10 households). Additionally, houses were spread across a very large area as well as difficult to access areas that made it impossible to cover these Macro-districts in this survey. Dogs, however, where present where people lived in the rural areas we visited.

BASELINE ASSESSMENT FOR LA PAZ' DOG AND CAT WELFARE STRATEGY

The Global Dog and Cat Welfare Strategy has three main departmental goals 1. Community Engagement, 2. Increase Spay/Neuter/Vaccination and 3. Veterinary Training. Each country or program has specific objectives, which are all currently or in the future monitored and evaluated. Below are the two goals and their objectives (taken from the Bolivia strategy document) as they directly pertain to the dog and cat population of La Paz. The third goal will be evaluated annually by the program managers based on veterinary trainings conducted by the team.

GOAL 1: COMMUNITY ENGAGEMENT

Bolivia objective: "By the end 2022, increase by 70% the amount of households that know about HSI's spay/neuter efforts".

GOAL 2: INCREASE SPAY/NEUTER/VACCINATION

Bolivia objective: "By the end 2024, increase by 50% the amount of households with pets that are spayed/neutered"

SURVEY METHODOLOGY

EXPLORATORY RESEARCH

Exploratory research improves the research design and helps to decide on data-collection methods. To explore the human-dog relationship and how dogs are perceived around La Paz, we conducted informal discussions and interviews with dog owners/households and shop owners. We explored e.g. the reasons why people keep dogs, how they keep them, asked if dogs appeared pregnant or sterilized, whether roaming dogs they encounter daily had an owner and whether they had heard of any rabies cases in humans or dogs.

Exploratory research, as it is qualitative in nature, does not give answers to how many people or how often something happens, however it gives the researcher of a never studied subject (in this case the dog population and dog-owner behaviour in La Paz) an indication as to why, how and when a behaviour occurs as well as who plays a role in shaping this behaviour.

KAP (KNOWLEDGE, ATITTUDE AND PRACTICES) SURVEY

SAMPLING DESIGN

Household surveys were conducted using a systematic random sampling method, which samples a portion of the total available households in the area. Systematic random sampling in comparison to simple random sampling is less susceptible to researcher error. Stratified-random sampling is a variant of random sampling that produces a more efficient return of representative, replicated data in environments that vary systematically over space in one or more critical respects. A short, informal review of stratified-random sampling can be viewed at https://en.wikipedia.org/wiki/_Stratified sampling, with more rigorous treatments available in Sutherland (2006) (pgs. 43 – 51) and Thompson (2002). There are many published studies that have used stratified random sampling for population studies; a few examples can be viewed in Sniff and Skoog (1964), Link and Sauer (1997), and Potvin et al. (2005). In short, this technique requires that the study area be divided into units, and that each unit be assigned to distinct categories, or strata, based on one or more factors that might influence dog density and distribution. Units to be sampled are then randomly selected within each stratum, and data from those samples are used to characterize the remainder of the units in that same stratum. For this survey, the stratification factors selected for La Paz were 1. Poverty and 2. human density hab/km^2, based on previous data collected by HSI indicating that dog density typically varies as a function of human density and geography.

A GIS data layer was obtained that defined the 21 district and 7 urban and 2 rural macro-district boundaries within La Paz, which were stratified by poverty and their human population density (Image 1 and Image 2). This resulted in nine distinct sampling strata from within which samples were selected. Out of the 21 districts we surveyed 8 districts (Image 3), which were randomly selected using MS Excel. In each of the districts we randomly set 8 survey points around which the survey team surveyed 50 households. The total number of interviewed households therefore amounted to 400 households for each district (confidence interval of 95% with an accepted margin of error of 5%). The only exception was Mallasa with 200 households (90% confidence interval, as the population and household number

in the district was low. We selected districts as the fundamental sampling units for the baseline survey and not macro-districts to account for the variations within districts.

Image 1. Strata Poverty

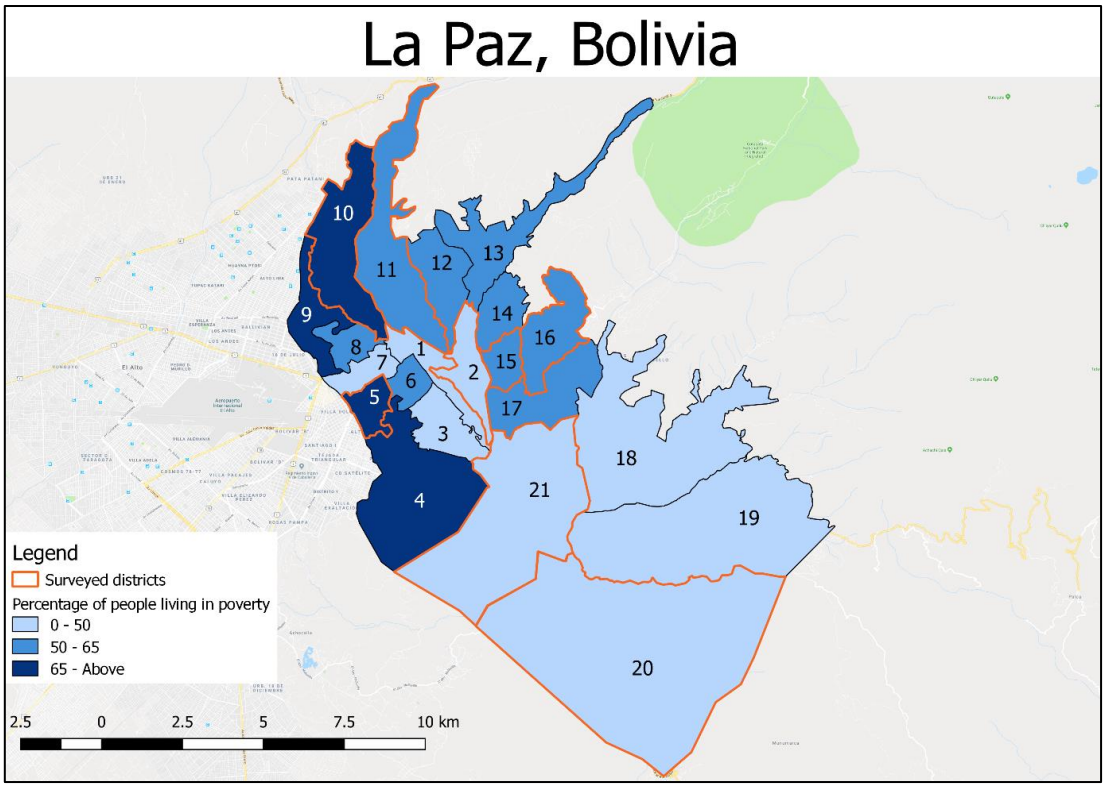


Image 2: Strata human density (Hab/Km Sq) for each urban district of La Paz

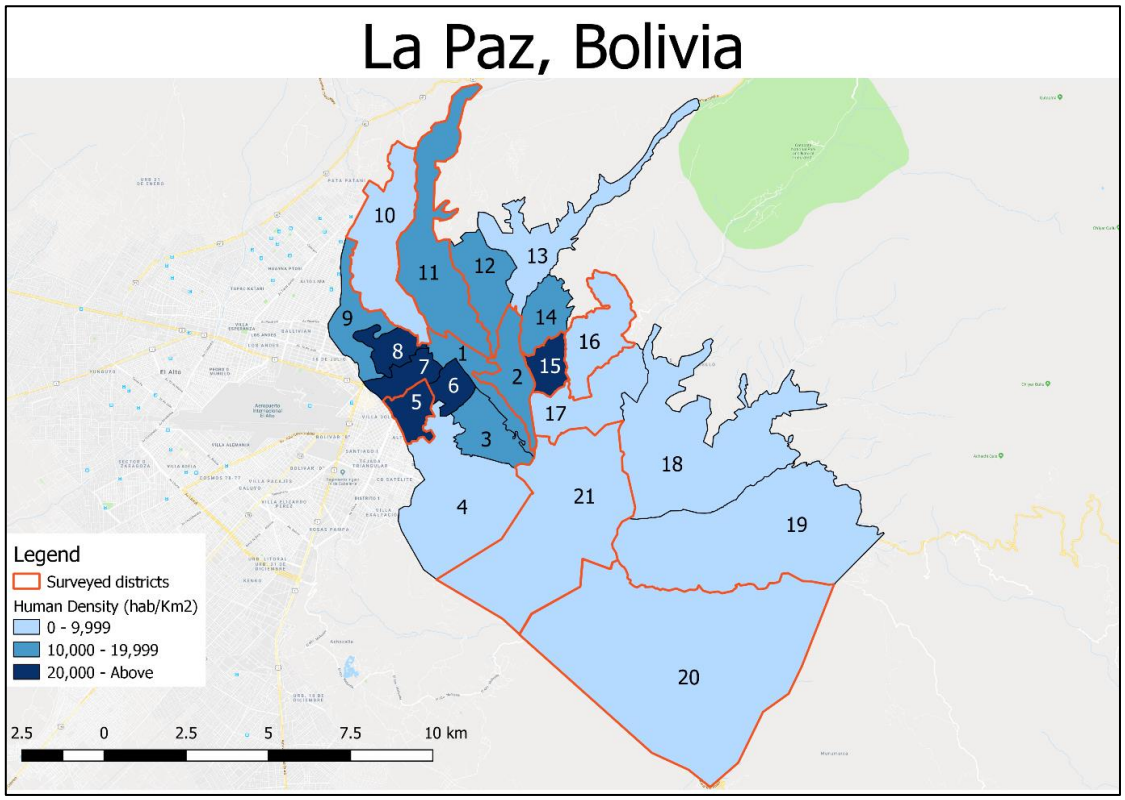
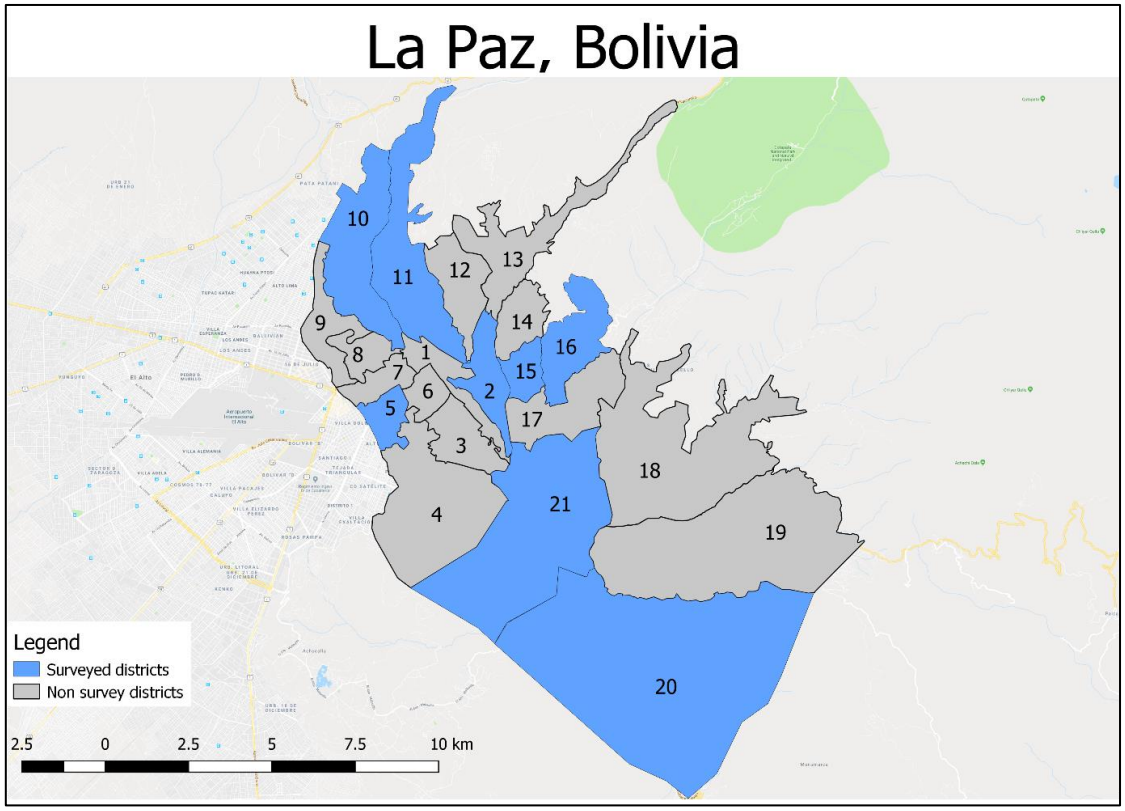


Image 3. Surveyed Districts (blue) in La Paz



SURVEY PROTOCOL

We used the La Paz census information from 2016, which was independently conducted by the municipality (Data source: The Municipal Secretariat of Planning for the Development of the Autonomous Government, http://sitservicios.lapaz.bo/cartillas/san-antonio.html).

To explore knowledge, attitude, and practices regarding owned and street dogs we designed a household questionnaire. The cross-sectional survey was conducted using the smartphone app Epicollect5, which contained a prepared survey form. 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. Inclusion criteria for households were:

1. The person being interviewed had to be over 18 years old and a resident at the address
2. In the case of dog ownership, the interviewee had to be the main caretaker 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 and at any time during the interview. Once questionnaires were completed, the completed forms were saved and uploaded to a cloud-based database by the surveyor.

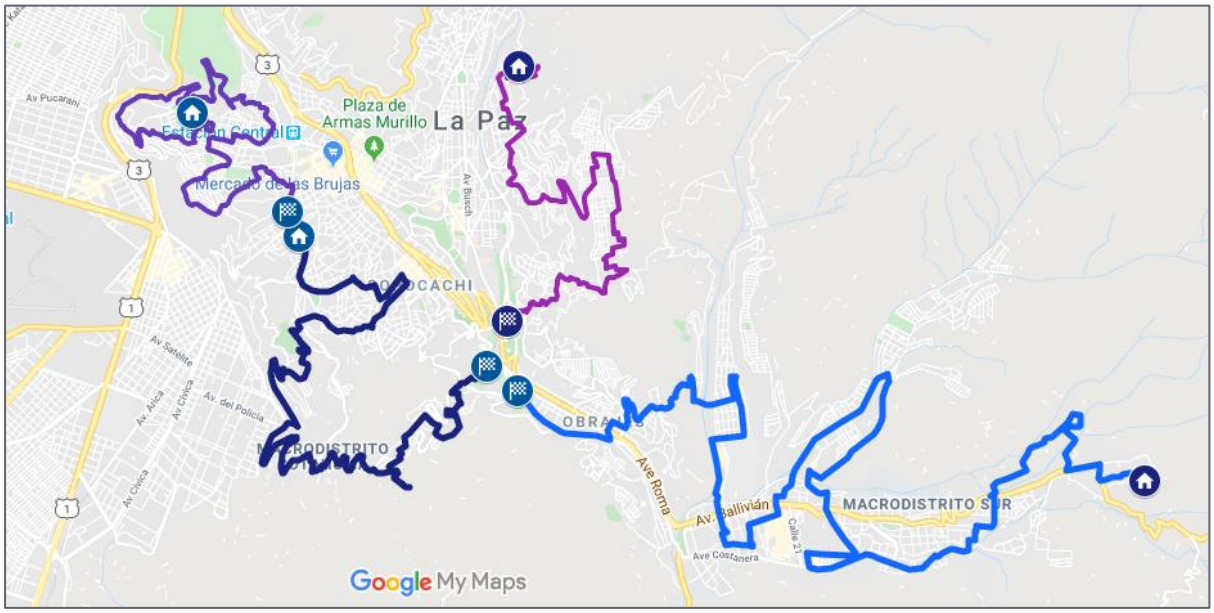
To remain consistent throughout the survey either the left or the right side of the street was surveyed, and households were selected following an interval of either every fifth or third (district 20 - Mallasa) household. In case nobody was available at the selected household, either the household before or after was surveyed instead.

ROAMING DOG SURVEY

SURVEY DESIGN

We designed four monitoring routes through four Macro-districts, which were identified by the program manager to measure the impact of the clinics in La Paz over time. The blue and purple lines (Image 4 below) are the monitoring routes, drawn in Google Maps by using the "draw a driving route" function. This ensures that the routes are unbiased and neither areas with a lot or fewer dogs are targeted or avoided. The flag icon indicates the survey start point and the home icon marks the end point of the survey.

Image 4: Four monitoring routes through the Macro-districts – Max Paredes, Sur, Cotahuma and San Antonio.



SURVEY METHOD AND PROTOCOL

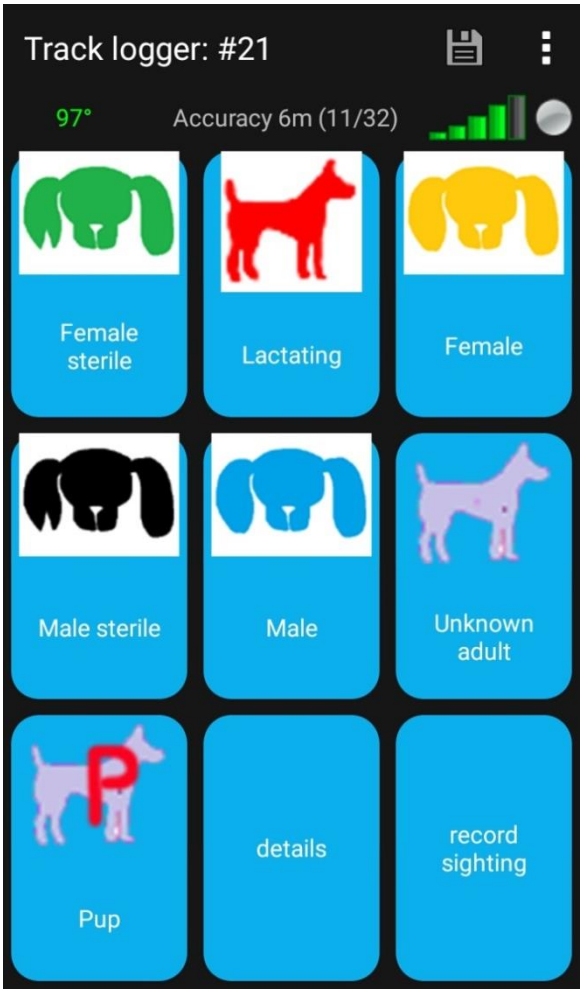
To generate an estimate of dogs per street kilometre we created set routes, also called index or standard routes, in Google Maps along residential roads and highways but avoiding express ways (dogs tend to avoid these roads). Routes are marked with a starting (flag) and end point (House) (Image4). For easy access, the routes are saved as KML files and stored in Google My Places, which can be accessed from smartphones (online and offline).

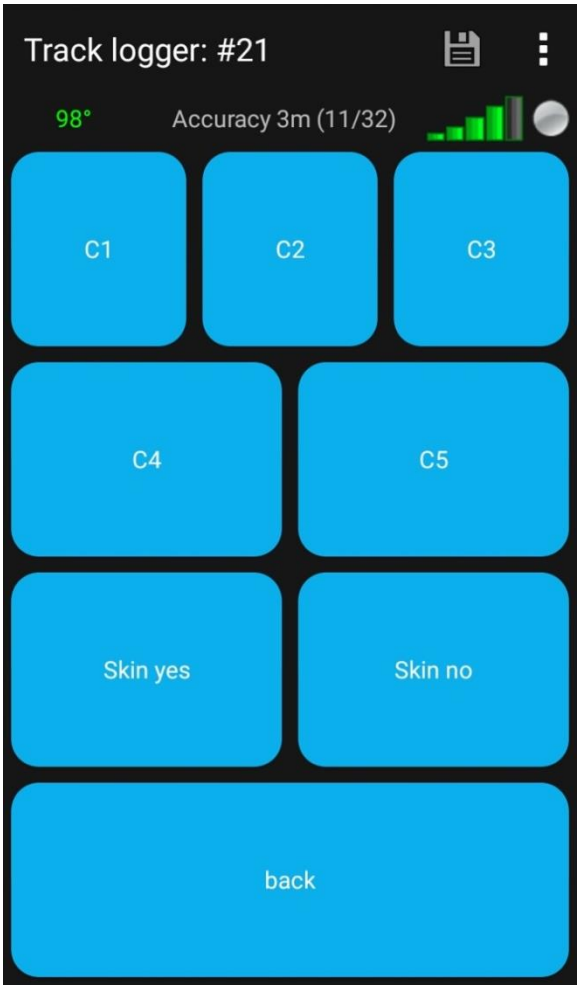
Following the dog counting protocols, the surveyor records all the roaming dogs visible on both sides of the survey route. A survey team, consisting of a driver and an observer in a car (or by foot), conducted the surveys early in the morning. The observer(s) used both the Google Maps app and the OSM 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 record welfare indicators such as skin problems and body condition scores (BCS1 to BCS5), which 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 routes in San Antonio and Sur were surveyed on two consecutive days, by the same survey team, to measure the accuracy and see if daily variations are high.

Dogs are recorded in the mobile application OSM Tracker by tapping the relevant dog icons that were pre-set for the survey. The icons are designed in a distinctive way to avoid confusions among the dogs' categories (see below).

Image 5 & 6. Dog counting layout screen for OSM Tracker application





OSM Tracker requires no internet or phone signal at the time of recording, however it catches the GPS connection quickly once started and records each dog's location and details that are put in by the surveyor.

CAPTURE – RECAPTURE EXPERIMENT

The argument whether roaming dogs in La Paz are owned/roaming or true street dogs (meaning: no person claims ownership, dogs live permanently on the street and have not one caretaker) has persisted for a long time with little to no consent between stakeholders. Ownership types and the level of confinement of owned dogs vary greatly between countries and is usually a culturally rooted behaviour that can change over time (e.g. the US has changed over the past 40 years). Studies have shown that roaming owned and roaming street dogs are very difficult to distinguish (e.g. Bonnani & Cafazzo, 2014 and Morters et. al, 2014) using just observational studies. In this study we used a sight-resight method to explore whether street dogs were present in two identified high-dog density locations in La Paz. The two locations were chosen based on recommendations of the vet teams and the program coordinator, Alejandra.

The results and the analysis of this experiment will be shared in a separate publication. However, results show that only very few dogs were sighted on more than one resight occasion, and those were often traceable to an owner, who was working in a stall or lived above a store. Those dogs often also showed some form of owner identification, such as a sweater. True street dogs were likely not encountered and some of the dogs in the meat market area were reported to be seen for the first time by vendors, indicating that most dogs there were in fact not resident but visiting.

SURVEY DESIGN AND METHODOLOGY

The hypothesis was that street dogs occupy a home-range and will be mostly present in the street where they live. The two selected survey locations were very different in nature but both had a lot of human movement and were therefore ideal for comparisons. The first location was at a meat and food market and the second was at a cemetery. The survey team comprised of one photographer and four observers. The street surrounding the meat markets as well as the cemetery (we were not allowed to go into the cemetery) were searched for dogs at four different times throughout one day. Both the market and the cemetery were surveyed consecutively at the following times: **1**) Early morning between 6 am and 8 am, **2**) Morning hours between 10 am and 12 pm, **3**) Afternoon between 2 pm and 5 pm, and **4**) Between 9 pm and 10.30 pm.

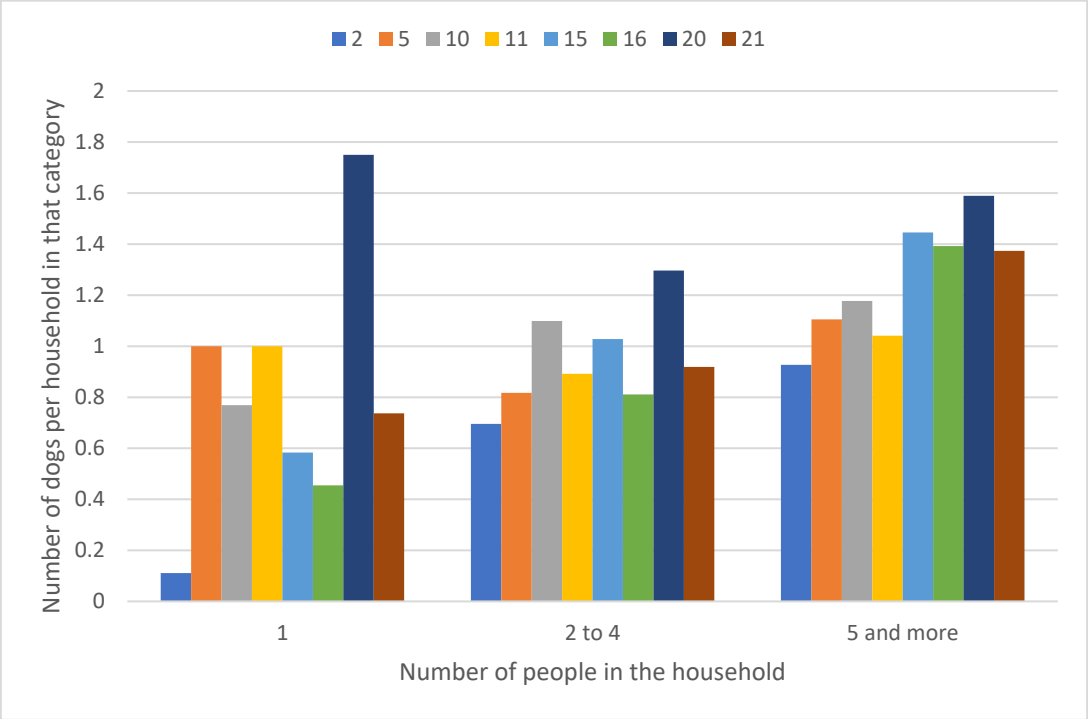
Photos of every dog encountered on the streets were taken and saved, with attempts made to get as many angles as possible of each dog to enable us to identify individuals by their unique markings, ear sets, etc. throughout the capture events. Photos from the survey locations were analysed separately after the capture-recapture survey day. Photos of each of the four capture events were compared and dogs were assigned unique codes.

DOG AND CAT POPULATION ESTIMATES

Owning dogs and cats in La Paz is common. Over half of the households we interviewed had a dog and over one third had a cat (see section below). Dog ownership as well as owning higher number of dogs was reportedly more common for larger families. The La Paz census from 2016 reports the percentage of larger and smaller households and we collected the same data in our survey to see whether there is a correlation between the size of the household (in numbers of residents) and the number of dogs they own.

It appears that there is a correlation between the number of dogs per household and the household size in terms of number of people living in that household. Only district 20 appears to have the reverse relationship, however it is a district with a different demographic structure as it has a very low density, low poverty and many of the houses are holiday homes and dogs are kept for different purposes, e.g. guard dogs

Chart 1. Household size category against average dogs per household for that category by district



We based our calculations of the total dog and cat population on this relationship and extrapolated from the different household densities to the entire population, using the census' percentage of households of the three categories, weighing them appropriately for the surveyed districts. We then clustered them into three "Poverty" categories, Poor, Medium and Rich and extrapolated to the rest of the districts that fell into the same category. **We estimate that there are 278,358 dogs and 182,588 cats in La Paz** (excluding the two rural districts). Details can be found in the tables in the appendix.

RESULTS AND DISCUSSION

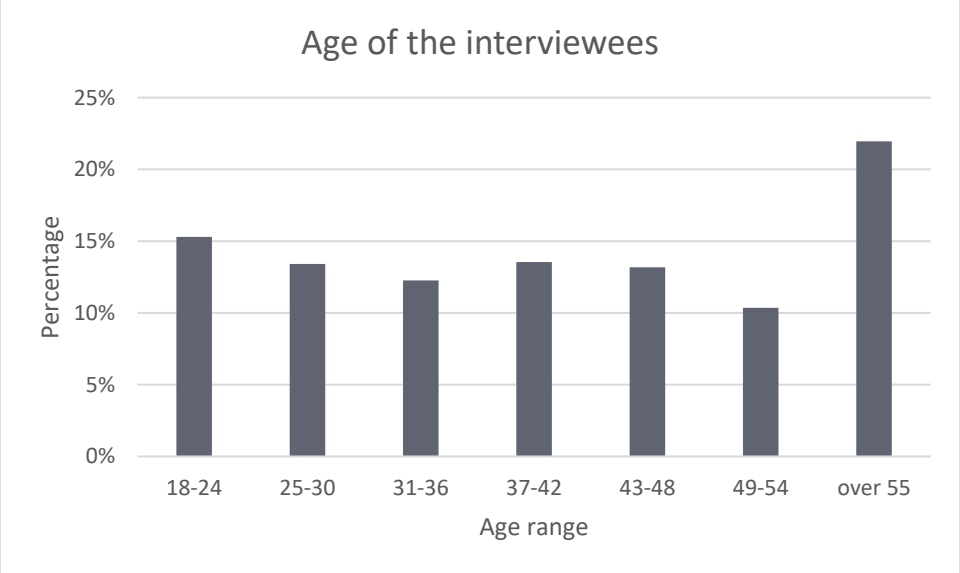
KAP SURVEY RESULTS

KAP or household surveys were conducted in the selected districts and the main results are discussed in this section. Limitations of the survey were that large apartment complexes were generally not accessible due to security systems and guards in place, which prevented surveyors from reaching households; and that response rates were low, which was explained to be due to Jehovah's Witnesses going around La Paz at the same time and people being wary of strangers knocking at their door.

DEMOGRAPHICS

We interviewed 2997 households across the surveyed districts. Over half (60%) were female interviewees and 40% were male. Age distribution (Chart 2) among interviewees was evenly distributed across the age ranges with an expected higher percentage of interviewees above 55 years old.

Chart 2. Age distribution among interviewees

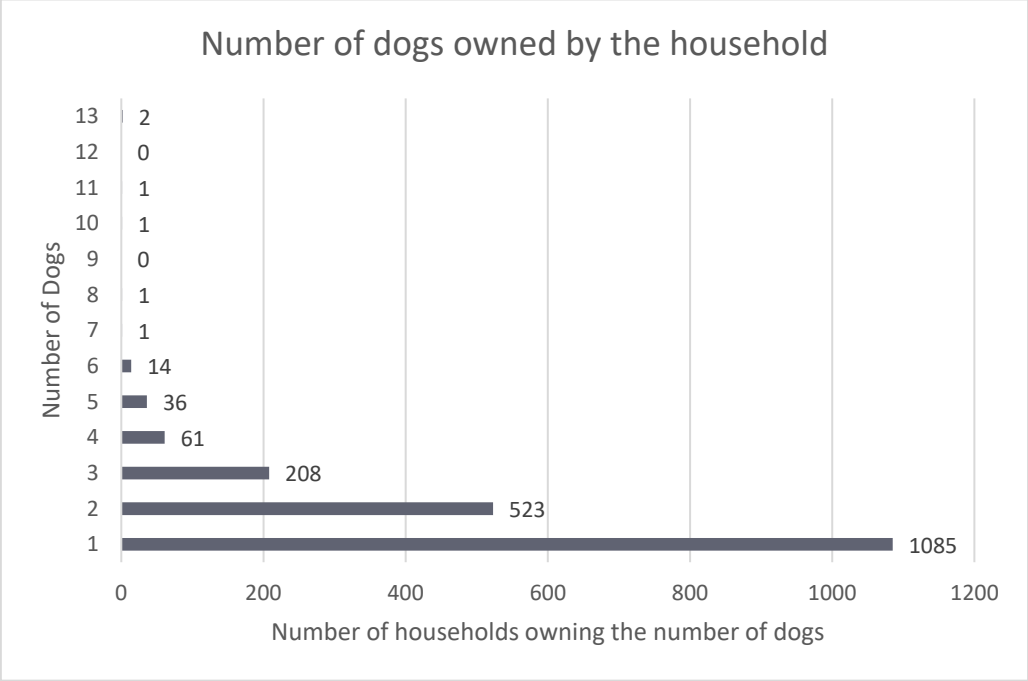


The vast majority lived in brick houses either exposed and red bricks (49%) or painted bricks (44%) and only 7% lived in houses made of Adobe. Those are indicators of the economic status of the household as red brick houses are considered a status symbol in La Paz and a sign that a family has "financially made it". The census also records those housing types as a socio-economic category. Further, most of the households had TV with cable (71%), another indicator of economic stability, which varies among districts.

HOUSEHOLD DOGS AND CATS

Most houses (64.6%, 1936) owned at least one dog and 37% (1120) of all households owned at least one cat at the time of the survey. Most cat owning households owned one cat (50.5%, 566), 28.9% (324) had two cats, 11.7% (131) had three cats and the remaining had more cats up to 16 (one household). 32.3% (362) of cat owners had all cats they owned sterilized whereas 50.1% (561) reported that none of their cats were sterilized.

Chart 3. Number of dogs per household against the number of households owning that many dogs



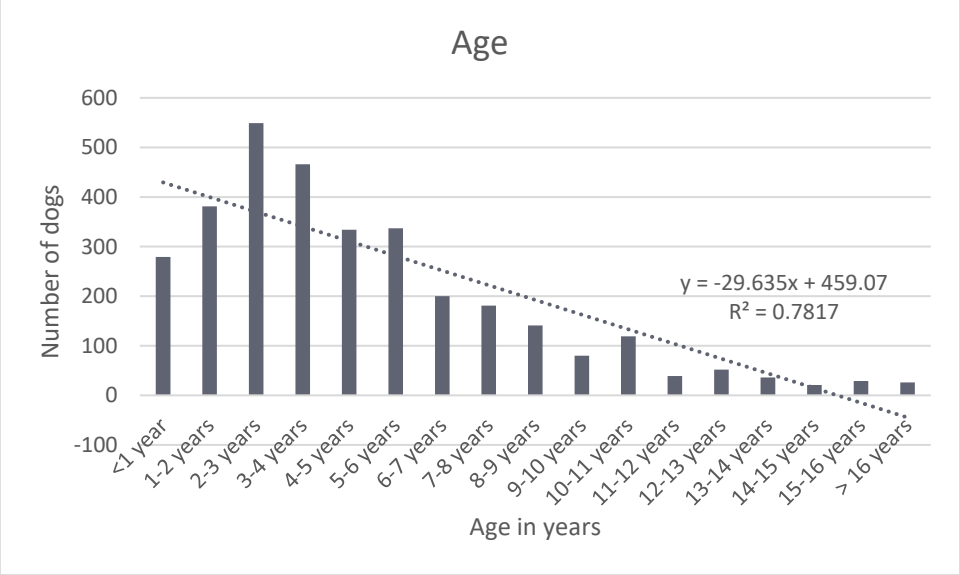
DOG DEMOGRAPHICS

We asked dog owners (1936) to provide more information about their dogs (3273). Further, surveyors were trained to assess common visible welfare issues, body condition score and skin issues, as well as to record whether the dog wore a collar and if the dog was available (e.g. not roaming the streets) to look at, at the time of the interview.

In the following paragraphs we will discuss dog demographics by the districts we surveyed. While some of the indicators are animal based, they are governed by human behaviour/choice, e.g. sterilization status of dogs is completely dependent on the caretakers' efforts to get them to a vet and/or ability to pay for the surgery. Therefore, our sample sizes are within the 95% confidence level for all but district 20, which is in the 90% confidence level, for KAP surveys and results are presented by district or overall.

The age structure (chart 4) of the dog population indicators a medium turn over with more dogs being between 1 and 5 and fewer reaching the senior age groups above 7.

Chart 4. Dogs' age distribution

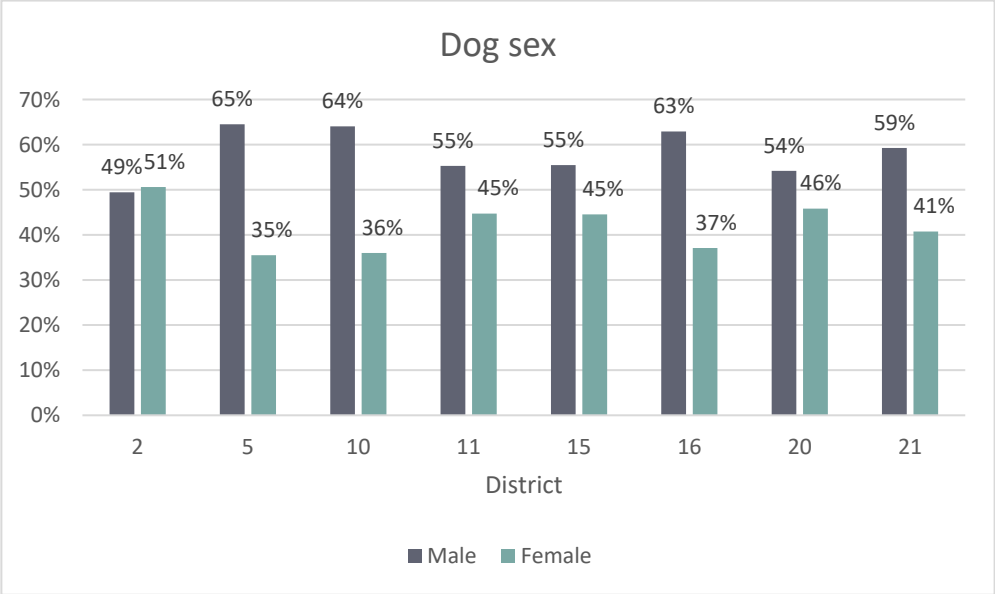


Across all districts male dogs were preferred over females (Chart 5). Only in district 2 male and female dog numbers were almost equal (Table 1).

Table1: Female:Male ratio of owned dogs recorded in the survey per district

District	2	5	10	11	15	16	20	21
Male:Female	0.98 :1	1.82 : 1	1.78 : 1	1.24 : 1	1.25 : 1	1.70 : 1	1.18 : 1	1.45 : 1

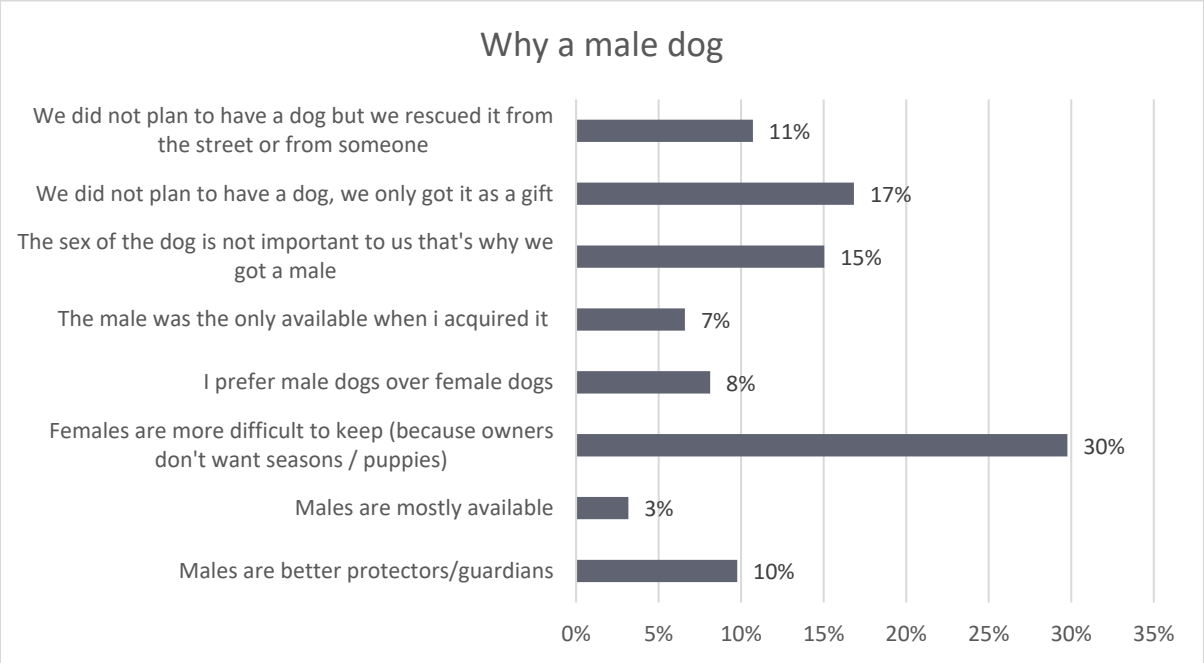
Chart 5: Proportion of male and female dogs per district



Anecdotally female puppies are culled at birth as they are not as easy to sell or adopted by families. We explored this preference and asked dog owner why they chose to own a male dog. While about a third of male-dog owners reported to have no preference, they were also dog owner who were more or less accidental dog owners. 30% reported that they chose a male dog because they are

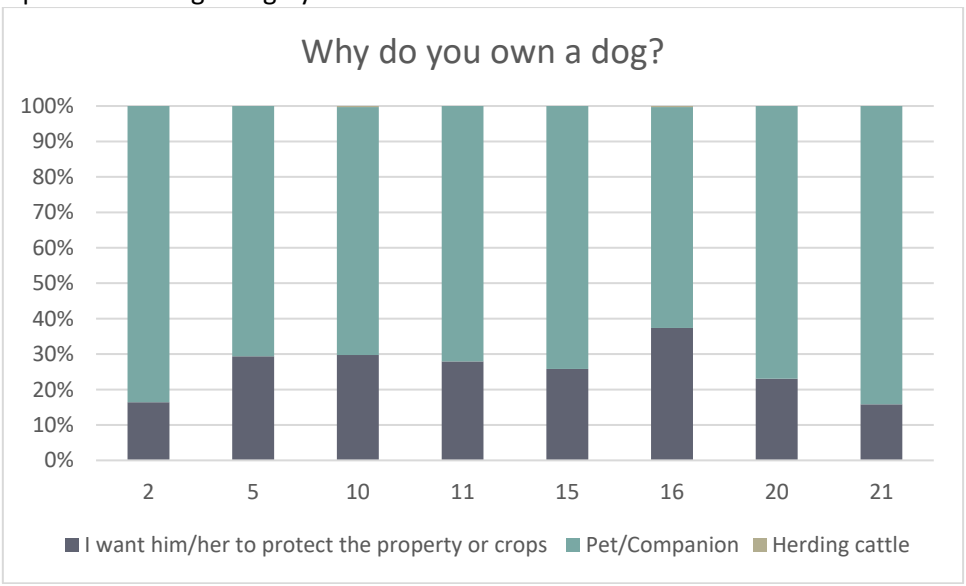
easier to keep in terms of heats and puppies, 8% preferred males and only 10% said that they are better watchdogs. Another 10% reported that male dogs are mostly available and therefore they owned one.
While it appears that not only do people prefer to own males, there seems to also be a preference to gift them. With a changing culture around reproduction control there should be a shift towards more females in the population.

Chart 6. Reason for owning a male dog



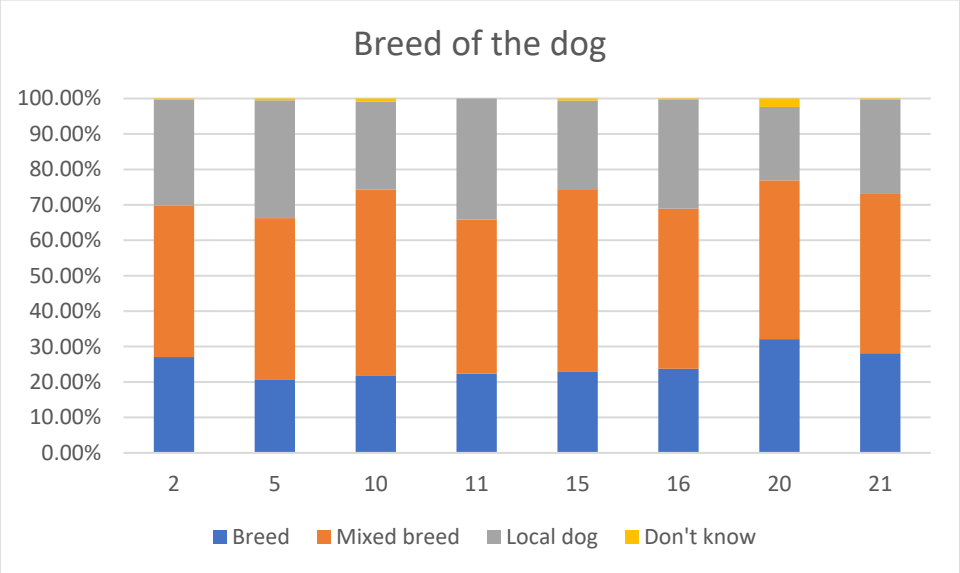
The most common reason for owning a dog was to keep it as a pet, across all districts. Security was another reason why people owned dogs, in district 16 about a third owned a dog for protection and only one household in district 10 and one in district 16 owned a dog because they used it to herd livestock.

Chart 7. Purpose of owning a dog by district



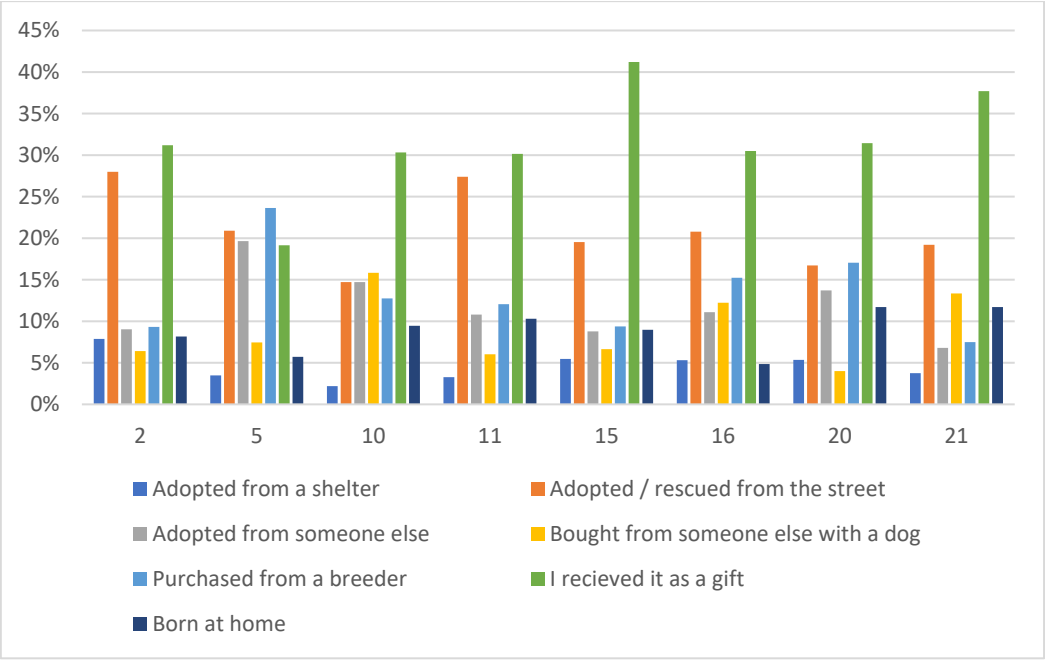
Breed dogs, including the local breed, was popular among interviewees (Chart 8) and made up about half of all dogs across all districts. Only a few people were not able to tell us whether their dog was a breed dog or not.

Chart 8. "What breed is this dog?" by district



Acquisition of a dog should be a well-thought through decision. The below chart shows that around a third of all dogs, on average, were received as gifts, many were adopted from the street but also bought from breeders.

Chart 9. "Where did you get your dog from?" by district



CONFINEMENT OF DOGS

There is a lot of reporting bias when owners are asked whether their dog is allowed to roam or not. As this is one of the key indicators of improving responsible dog ownership, we explored this behaviour by asking about the dog at three different times in a 24-hour period. In the below table we can see that in different districts dogs were kept very differently. In district 2 most of the dogs (91.9%) were inside the house and 3.5% confined in a yard at the time of the interview, whereas in district 20 only 25.1% were inside and 69.9% were confined in a yard. The most free-roaming dogs at the time of the interview were in district 16, where 17.3% were out and roaming and 27% were in the yard of the house but the yard was not confining the dog.

Table 2. "Where is the dog right now?" by district

District	2	5	10	11	15	16	20	21
Roaming or loose on the street (including sleeping in front of the house)	4.1%	19.6%	8.6%	15.1%	7.8%	17.3%	0.7%	2.8%
Tethered/leashed outside in unfenced area	0.0%	0.2%	0.4%	0.0%	0.4%	0.5%	0.3%	0.0%
Inside the house	91.9%	78.4%	51.8%	78.4%	83.4%	31.1%	25.1%	85.5%
Inside a shed/barn/kennel	0.0%	0.0%	0.0%	0.0%	0.2%	2.5%	0.0%	0.0%
Confined in yard (completely fenced in and restrains the dog)	3.5%	1.2%	27.2%	5.3%	5.9%	21.7%	69.9%	10.5%
In yard but yard is not fully fenced in	0.6%	0.5%	12.1%	1.3%	2.3%	27.0%	4.0%	1.2%

The below chart summarizes and shows the average proportions of households that reported when the dog would be allowed to roam. While the majority reported that the dog is never allowed outside (combined 65%), there are other dog owner who allow their dogs to go outside at some point during the day. Early mornings appear to be a more common time to let the dog out if the dog is not always allowed to roam.

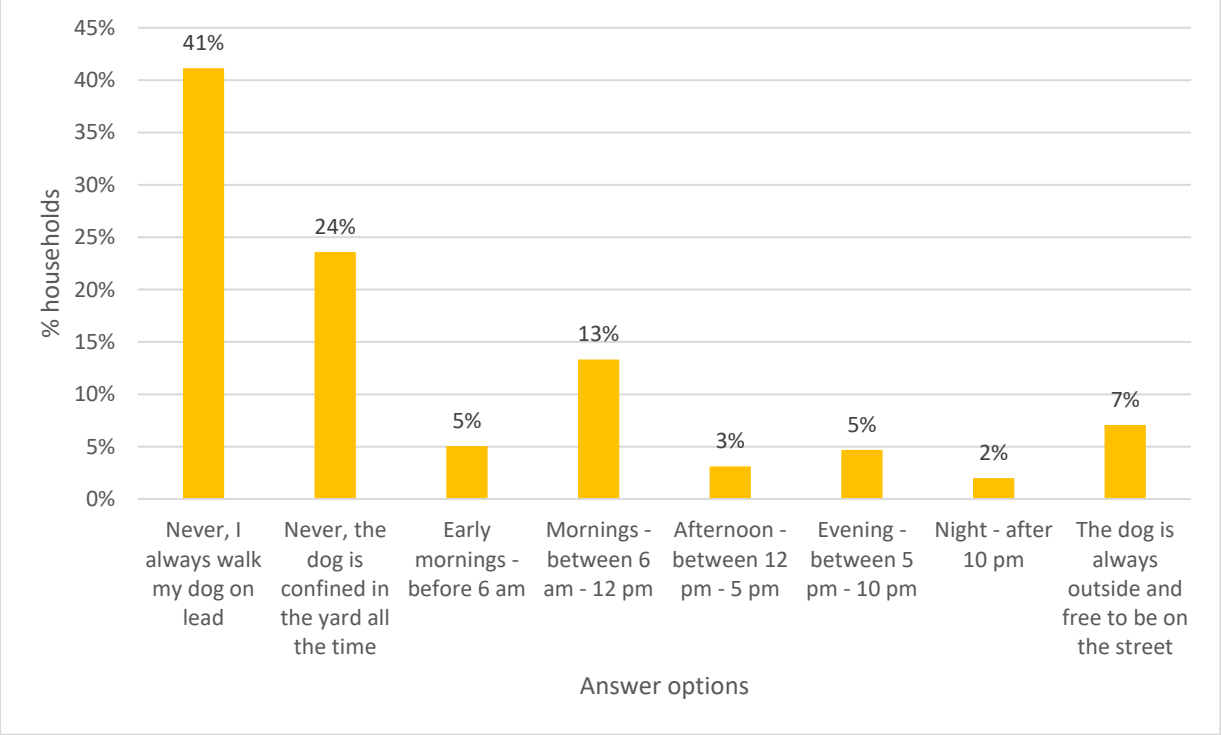
There are, however, large variations between the districts. District 10, as shown in the below table, has the most reported dogs (16%) who are always allowed to roam. District 10 and district 5 reported the lowest proportion of dog owning households who never let their dogs roam, 45% and 44% respectively.

Table 3." At what time do you give your dog the freedom to walk alone outside?" by district

District	2	5	10	11	15	16	20	21
Never, I always walk my dog on lead	57%	36%	21%	61%	41%	35%	32%	45%
Never, the dog is confined in the yard all the time	23%	8%	24%	12%	18%	25%	47%	31%
Early mornings - before 6 am	3%	4%	9%	4%	8%	4%	5%	3%
Mornings - between 6 am - 12 pm	6%	17%	20%	10%	18%	12%	9%	14%
Afternoon - between 12 pm - 5 pm	2%	7%	3%	2%	2%	5%	1%	2%
Evening - between 5 pm - 10 pm	4%	18%	5%	2%	2%	5%	1%	0%

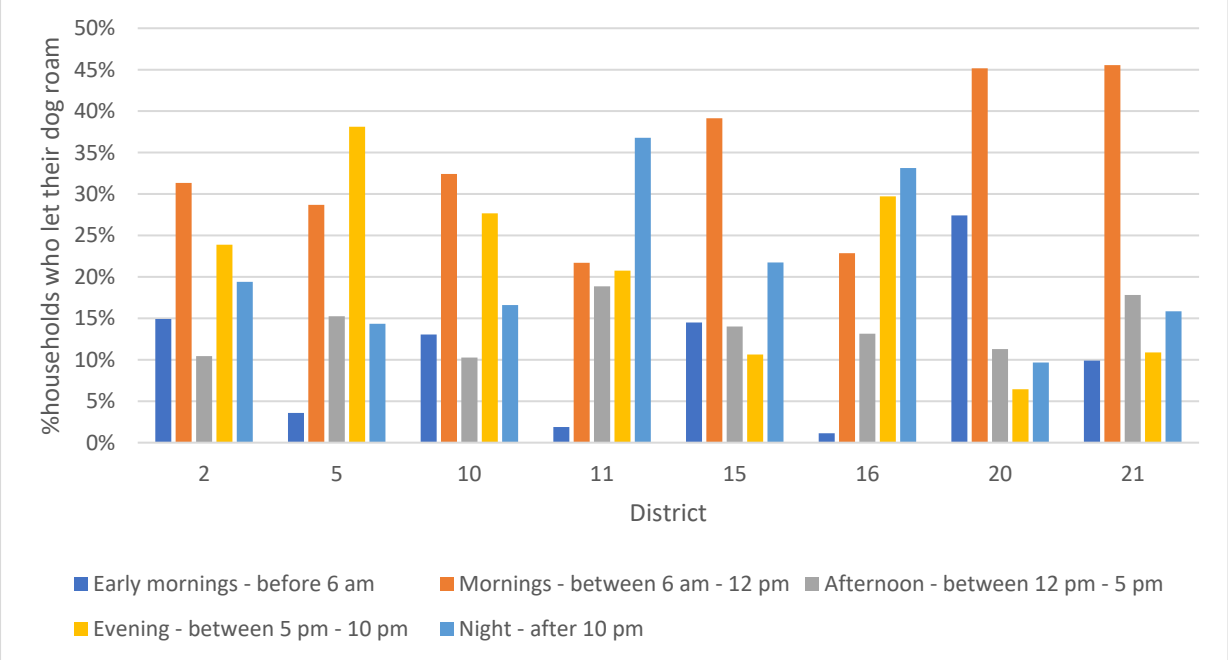
Night - after 10 pm	2%	2%	2%	1%	5%	1%	1%	1%
The dog is always outside and free to be on the street	2%	6%	16%	8%	5%	13%	4%	2%

Chart 10. Overall behaviour whether dog owners let their dogs roam across all surveyed districts



The owners who reported to let their dogs free were asked at what time their dog would come back and as to be expected peak times for dogs to come home are mornings and evenings, however this also varies between districts as much as the owners behaviour to let the dogs out (Chart 11).

Chart 11. “At what time is s/he coming home?” by district



DOG CARE

As one of the Key objectives of the program is to increase the percentage of sterilized dogs in La Paz, we will discuss the results of the dog care related questions by district, including the sterilization information. However, we report data on other indicators because sterilizations are only one aspect of responsible dog ownership behaviour.

Sterilization rates varied between districts with district 2 reporting the most sterilized dogs. HSI veterinary partner clinics had the most impact around the district they are in and appear to have limited reach to other districts.

Table 4. Sterilization status of the dog and who's services they used by district

District	2	5	10	11	15	16	20	21
Is this dog sterilized?								
Yes	43%	23%	20%	34%	28%	30%	31%	36%
Who sterilised the dog								
Vet Sur Team (HSI Partner)	18%	9%	1%	12%	19%	23%	1%	3%
Dogtora Vet Veterinaria (HSI Partner)	1%	12%	0%	4%	0%	0%	0%	0%
Dr. Pet Veterinaria (HSI Partner)	0%	3%	0%	6%	0%	3%	0%	9%
HSI vet clinic (Participant does not remember which one)	4%	11%	1%	1%	1%	8%	0%	3%
Government Veterinary Hospital	14%	9%	3%	10%	24%	3%	11%	5%
Don't Know	7%	8%	4%	5%	7%	11%	1%	12%
Private Veterinarian	51%	40%	84%	45%	47%	43%	83%	59%
Sterilization campaign	5%	10%	7%	17%	2%	9%	4%	9%

Owners, who owned intact dogs were asked why they chose not to have their dog sterilized and the vast majority across the districts reported that the procedure was either not necessary or too dangerous. Only very few reported that they were planning to have puppies with their dogs (Table below)

Table 5. Sterilization status of the dog and why the owner chose to not have it sterilized

District	2	5	10	11	15	16	20	21
Is this dog sterilized?								
No	56%	77%	79%	65%	71%	70%	69%	63%
Why haven't you sterilized this dog?								
Not necessary	52%	39%	54%	44%	58%	54%	62%	43%
Too dangerous for the dog	12%	17%	21%	13%	7%	5%	4%	11%
I can't handle/leash or pick up the dog	1%	1%	1%	4%	0%	4%	2%	1%
I don't have time	16%	12%	8%	18%	12%	5%	18%	16%
I want to have puppies/want to breed with it	5%	1%	2%	2%	3%	3%	1%	7%
I don't want the dog to become lazy	1%	1%	0%	1%	0%	1%	0%	1%

I want the dog to protect my property	0%	0%	0%	3%	0%	0%	0%	0%
It is against my religious believes	1%	0%	0%	0%	0%	0%	0%	1%
It is too expensive	3%	19%	3%	3%	7%	9%	1%	3%
Don't know	4%	4%	5%	2%	8%	8%	6%	12%
I/we did not know that sterilization is possible	3%	3%	3%	3%	2%	7%	3%	6%
I do not have space at home for the postoperative care	0%	0%	0%	1%	0%	0%	0%	1%
I use contraceptive injection	2%	3%	2%	5%	1%	4%	2%	0%

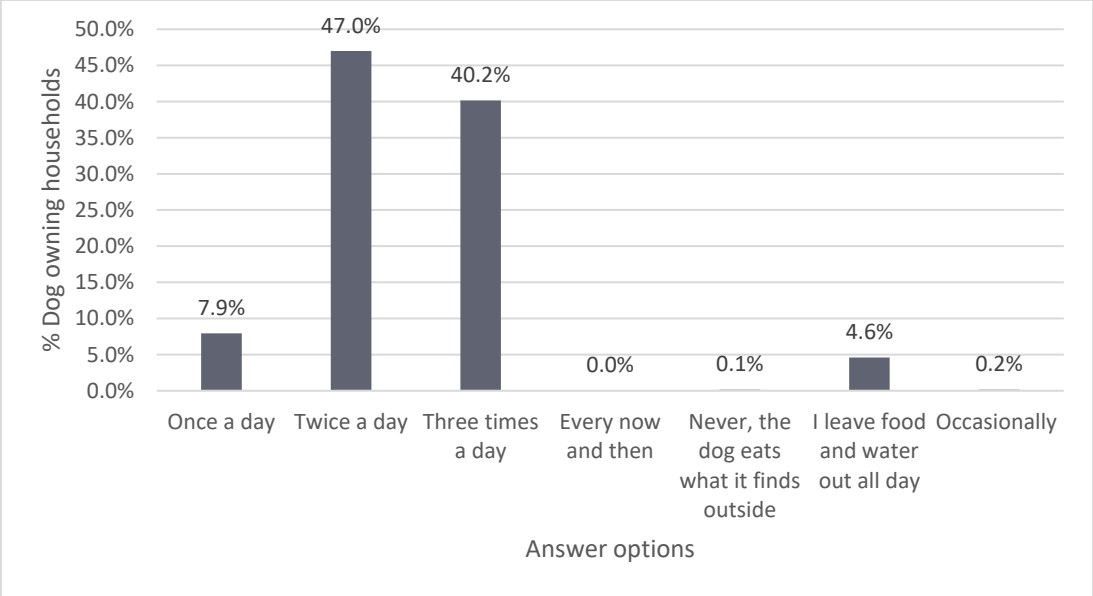
As this survey shows, people are aware of rabies and are only somewhat informed of the signs, however, it is not the biggest concerns interviewees had in regard to roaming dogs. Hence, making sure that the owned dog population provides a herd immunity is import, especially as rabies is on the rise in Bolivia and our veterinary volunteers (conducting this survey) report that the reporting system in the country has not worked well in terms of diagnosis and rabies eradication in recent years.

Table 6. Vaccination status of the dog and by whom it was vaccinated in the past 12 months

District	2	5	10	11	15	16	20	21
Was this dog vaccinated against RABIES in the last 12 months?								
Yes	97%	84%	94%	94%	94%	90%	96%	96%
By whom was the dog vaccinated against rabies?								
Free vaccination campaign	62%	78%	81%	72%	81%	84%	66%	67%
Vet Sur Team (HSI Partner)	2%	2%	0%	2%	3%	2%	0%	0%
Dogtora Vet Veterinaria (HSI Partner)	0%	3%	0%	1%	0%	0%	0%	0%
Dr. Pet Veterinaria (HSI Partner)	0%	0%	0%	1%	0%	0%	0%	2%
Private Veterinarian	34%	13%	19%	24%	15%	13%	34%	30%
HSI vet clinic (Participant does not remember which one)	1%	3%	0%	0%	1%	1%	0%	0%
I don't know	0%	0%	0%	1%	0%	1%	0%	1%

Across all surveyed districts dog owners regularly fed dogs daily. Only a small percentage of owners reported to leave food and water out all day. Almost no dogs were left out to scavenge for food.

Chart 12. Feeding practices among interviewees



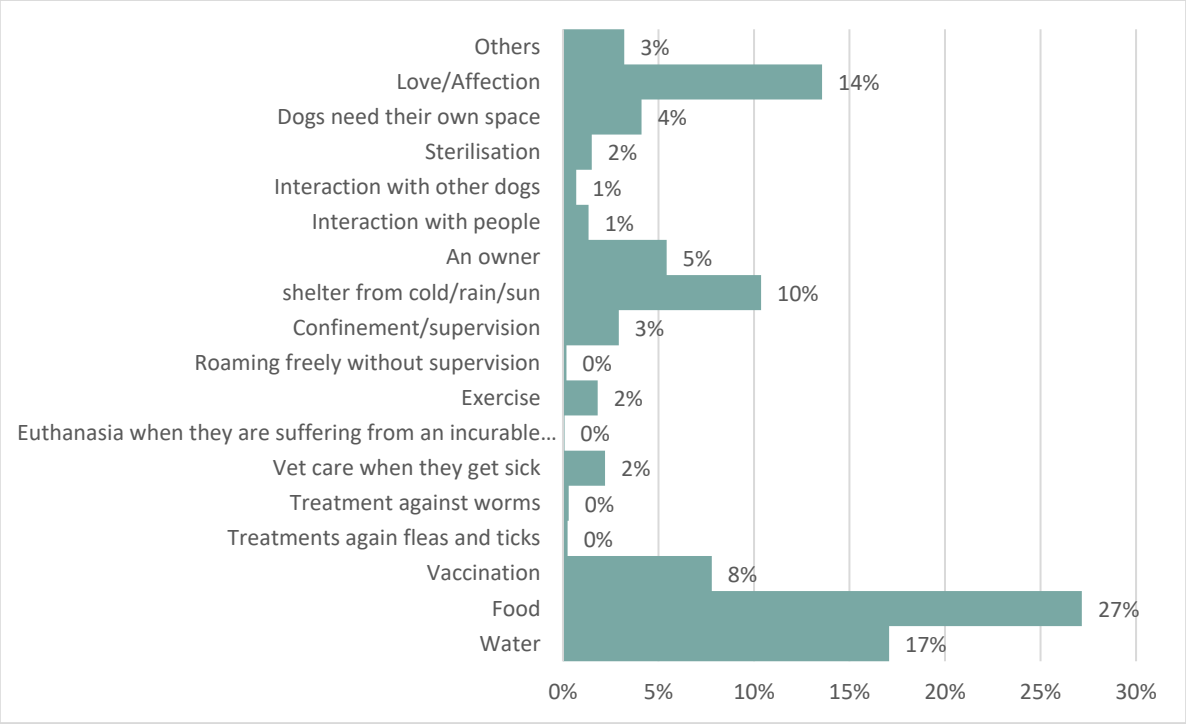
Dogs were in general not provided with regular veterinary care. In some districts (5, 11 and 16) only about a third of the dogs had seen a veterinarian in the past 12 months, however many dog owners reported that they had dewormed their dogs in the past 6 months.

Table 7. Whether dogs had seen a veterinarian in the past 12 months and had been dewormed in the past 6 months.

Was this dog dewormed in the last 6 months?								
District	2	5	10	11	15	16	20	21
Yes	68%	41%	55%	50%	59%	33%	65%	73%
No	31%	55%	42%	47%	39%	65%	31%	25%
Don't know	1%	4%	3%	3%	2%	2%	4%	2%
Has the dog visited a veterinarian in the last 12 months?								
District	2	5	10	11	15	16	20	21
Yes	72%	37%	48%	31%	58%	31%	63%	67%
No	27%	58%	50%	68%	40%	68%	34%	32%
Don't know	1%	4%	2%	1%	2%	1%	3%	1%

When asked “What do you think are the most important things that owned dogs need to have access to?” (Chart 13) the most common answer was food (27%), followed by water (17%) and then love/affection (14%). Interviewees were allowed to give multiple answers.

Chart 13. What do owners consider most important for dogs to have access to



QUALITATIVE ASSESSMENT OF THE OWNED DOGS' WELFARE

Almost all our surveyors were veterinarians, veterinary students or veterinary nurses and were familiar with dog conditions, however we used the ICAM body condition score training tools to prepare the surveyor group to assess the dogs they recorded. On average most dogs that were assessed were in a healthy body condition.

- 0% Body condition score 1 - emaciated
- 5% Body condition score 2 - thin
- 32% Body condition score 3 - ideal
- 7% Body condition score 4 - fat
- 1% Body condition score 5 - obese
- 56% Dog not visible/present

Skin issues often remain untreated and hence are a welfare indicator for both street and owned dogs. Surveyors assessed whether there were visible skin issues. Skin issues were a minor issue in the dogs that were recorded, and this seems to match the observations on the streets as well.

- 44% No visible skin issue
- 4% Visible skin condition (includes matted coat)
- 52% Dog not visible/present

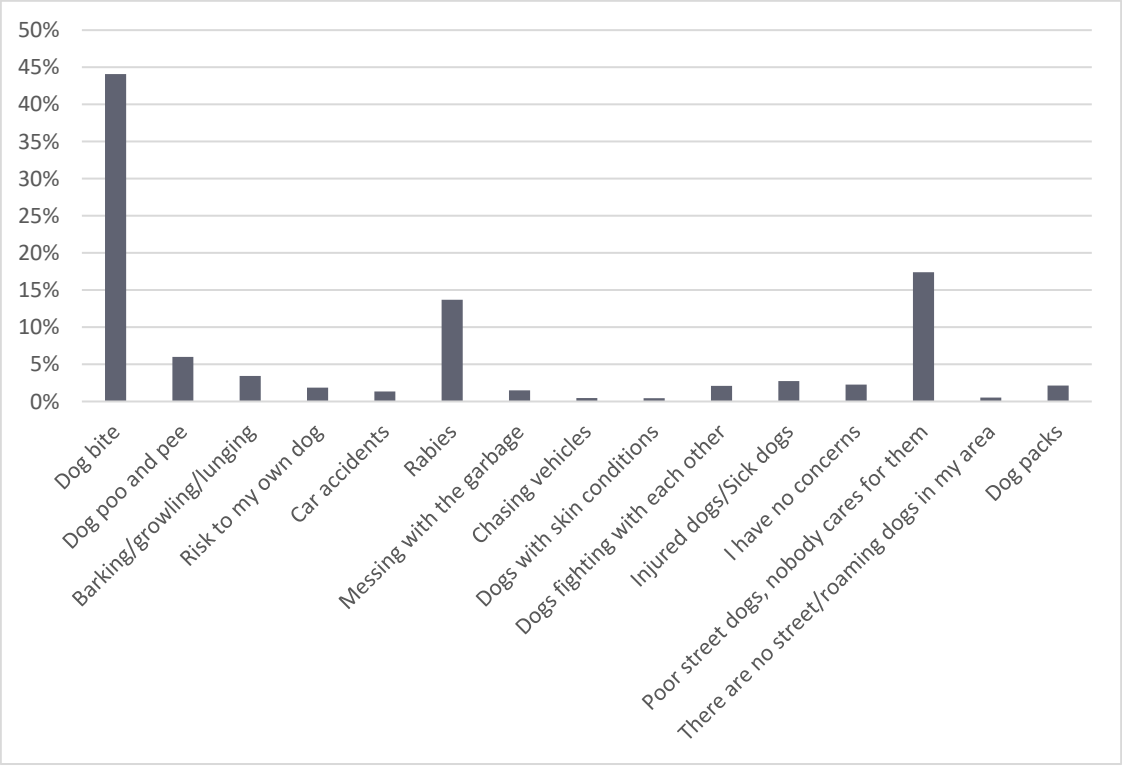
We also recorded whether the dog wore a collar or other identification that would tell a stranger that the dog had an owner. On average only 19% of the dogs that were available for assessment wore a collar, making it very difficult to distinguish them from unowned dogs if they are roaming the streets.

- 19% Yes
- 34% No
- 47% Dog not visible/present

RELATIONSHIP AND PROBLEMS WITH STREET DOGS

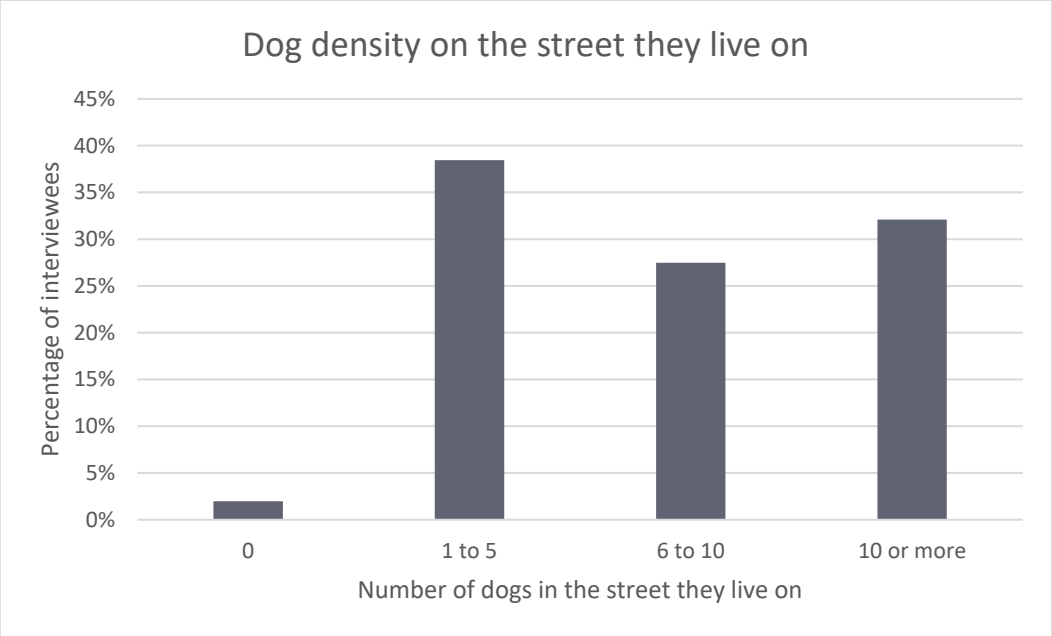
Almost half of all interviewees (51%, 1522) reported that within a week they sometimes feel threatened by street dogs, compared to 32% (973) who reported to never feeling threatened and 17% (502) who always feel threatened. When asked what they found most concerning about living in a city with street dogs, three things were dominantly reported (Chart 14); Dog bites by 44.1%, the concern that nobody cares for the poor street dogs by 17.4% and Rabies by 13.7%. Interestingly there were more people concerned for the welfare of street dogs as there were people concerned about rabies. Dog bites are globally the biggest concern among people living in cities with street dogs and that is similar in La Paz.

Chart 14. "What do you find most concerning, if at all, about living in a city with roaming dogs?"



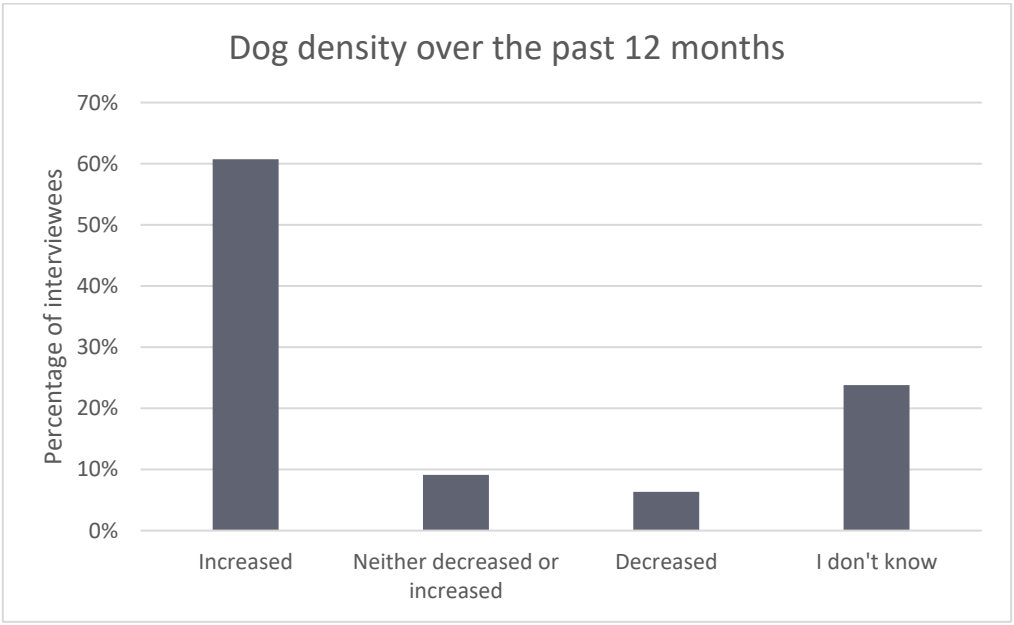
Perceived dog density among interviewees varied and almost nobody lived on a street without any dogs (only 2%). About a third each reported to have one to five dogs, five to ten dogs or more than ten dogs on the street they lived on (Chart 15).

Chart 15. “On an average day, how many dogs would you say are roaming on the street you live in?”



Many interviewees (61%, 1817) felt that the number of dogs had increased over the past 12 months, 24% (712) felt it had stayed the same and only 9% (273) reported that they felt that the number had decreased (Chart 16).

Chart 16. “Over the last 12 months, do you think there has been a change in the number of roaming dogs in your community, and if so, in what direction?”



Overall, some interviewees were aware of people in their neighbourhood, who had puppies in the past 12 months (20%, 606) and 22% (668) reported to know of people in their neighbourhood who had abandoned puppies in the last 12 months.

Only about a third of all interviewees never fed or provide water to roaming dogs, while the rest regularly provide food or water to dogs:

- 14% Every day
- 42% Sometimes
- 4% Once a week
- 8% Several times a month
- 32% No, never

RABIES AND DOG BITES

Surveyors were trained to know all signs of rabies and asked interviewees whether they knew the signs of rabies in dogs. The results show that the decades of rabies elimination campaigns in Bolivia have had an effect, but most people knew only some or no signs of rabies. Future campaigns should focus on educating the public about the signs of rabies and how to report rabies.

- 20.8% Yes, knew all the signs
- 50.7% Knew some of the signs but was not sure
- 28.6% Did not know the signs or signs were incorrect

In contrast, most of the interviewees were aware how to treat a dog bite wound correctly:

- 81.8% Wash the wound with soap and water and go to the hospital
- 10.4% Just wash the wound
- 2.3% Home remedy
- 5.3% Don’t know
- 0.2% Local healer

In comparison to other places globally, a high percentage of households reported dog bites in the past 12 months in La Paz:

- 19.6% Yes
- 78.7% No
- 1.7% Don't know

Dog bites are more often reported in young children, however in La Paz dog bites seem to have occurred across all ages and gender almost equally and surprisingly more females than males:

- 15% Female 0-14 years
- 20% Female 15-28 years
- 22% Female over 28 years
- 9% Male 0-14 years
- 16% Male 15-28 years
- 18% Male over 28 years

Dog bite rates indicate a high risk of rabies transmission and the need for bite prevention initiatives addressing reasons why dog bites occur so frequently.
While the media often claims that street dogs are the main public health risk in terms of dog bites, statistics from countries with substantial owned dog populations show that owned dogs are often a

major contributor. The same appears to be the case in La Paz, where only 28.5% of reported dogs bites in the past year were caused by street dogs that had no owner and 21.2% by unknown dogs:

- 8.9% Our own dog
- 41.6% Neighbour's dog
- 28.5% It was a street dog, free roaming on the street and I know it has no owner
- 21.2% Unknown dog

ATTITUDES

Attitudes regarding dogs and street dog management was mixed but overall positive towards a humane approach. The vast majority thinks that the street dog situation is not well handled (89%) and they think roaming dogs should be sterilized (88%), however only 31% would be willing to remove and euthanise street dogs, 10% were not sure and 55% disagreed with this approach.

Table 8. summary of level of agreement across all surveyed districts

	Agree	Don't know	Disagree
I like all dogs	74%	5%	21%
Dog population management is handled adequately	7%	4%	89%
Street/Roaming dogs should be sterilised	88%	7%	5%
Street/Roaming dogs are a part of my community and don't bother me	58%	7%	34%
Street/Roaming dogs should be removed and euthanised	31%	10%	59%

ROAMING DOG SURVEY RESULTS

The total number of dogs recorded on the six survey days were 1326 adult dogs of which 56 were identified as female, 517 as male and 753 as unknown. There were an additional 2 puppies. Which translates on average to 14.4 dogs/km in Max Paredes, 6.4 dogs/km in Sur, 20.7 dogs/km in San Antonio and 12.9 dogs/km in Cotahuma (Table 9).

Table 9. Survey route length and dogs count per Kilometer in surveyed Macro-districts of La Paz

Macro district	Total Dog count	Survey Route Length (KM)	Dogs/Km
Max Paredes	187	13	14.4
Sur	149.5	23.4	6.4
San Antonio	311	15	20.7
Cotahuma	220	17	12.9

The female to male ratio was extremely skewed towards males (table below). Male dogs are in general easier to identify, however the protocol was strictly followed that only dogs who can clearly be identified as male or female are recorded as such and all other dogs as unknown. Hence, there is an extreme preference for males on the street, which we confirmed qualitatively in our observational strolls. It is possible that owned male dogs are allowed to roam more often than females.

There are no visible markers for sterilized dogs, hence only a few males were recorded as sterilized due to missing testicles. Welfare indicators skin and body condition score were recorded and only two dogs had skin issues.

Table 10. Welfare indicators of free roaming dogs in surveyed Macro-districts of La Paz

Macro-District	Date	% Sterilized Male	Male/s per one female	% Pups	% Lactating	Dogs with skin Problem	Dogs with body score C1/C2
Max Paredes	5th April 2019	**0.0**	8.8	1.1	0.0	2	0.0
Sur	3rd April 2019	**3.3**	10.2	0.0	0.0	0	0.0
	5th April 2019	**2.0**	5.1	0.0	0.0	0	0.0
	Average	**2.7**	7.0	0.0	0.0	0	0.0
San Antonio	8th April 2019	**0.0**	8.8	0.0	7.7	0	0.0
	9th April 2019	**0.8**	13.2	0.0	0.0	0	0.0
	Average	0.4	10.6	0.0	4.5	0	0.0
Cotahuma	9th April 2019	0.0	10.2	0.0	0.0	0	0.0

Table 11. Summary of the street survey results in terms of numbers and composition of the dog population

Macro-District	Date	Female	Female sterile	Lactating	Male	Male sterile	Pup	Unknown adult	Total Count	Total Known	Total Sterilized	Total Female	Total Male
Max Paredes	5th April 2019	9	0	0	79	0	2	97	187	88	0	9	79
Sur	3rd April 2019	6	0	0	59	2	0	85	152	67	2	6	61
	5th April 2019	10	0	0	50	1	0	86	147	61	1	10	51
	Average	8	0	0	54.5	1.5	0	85.5	149.5	64	1.5	8	56
San Antonio	8th April 2019	12	0	1	115	0	0	186	314	128	0	13	115
	9th April 2019	9	0	0	118	1	0	180	308	128	1	9	119
	Average	10.5	0	0.5	116.5	0.5	0	183	311	128	0.5	11	117
Cotahuma	9th April 2019	9	0	0	92	0	0	119	220	101	0	9	92

RECOMMENDATIONS

Sterilization rates are very low at this point (district 2 has the highest rate with 43%) and the majority of sterilizations are performed in private veterinary clinics. It can be assumed that the dog owners who had their dogs sterilized were highly motivated and decided to have their dogs sterilized, given that most did not use an incentive program but had the surgery done at full price. However, the low numbers also indicate a large potential to reach the project goals by 2024. Interviewees reported that the main reason for not having their dogs sterilized was that it was perceived as "not necessary" and only a small percentage of dog owners reported that they believed it was "too dangerous for the dog". Hence, responsible dog ownership and awareness campaigns could increase HSI program's impact in La Paz. To achieve both project goals, we suggest a combination of a targeted public campaign, an increase in visibility of the HSI Logo (e.g. HSI logos next to the clinic logos outside the clinics, if possible) as well as targeted community engagement programs in identified communities.

Campaigns could potentially build upon already existing and changed behaviour within La Paz, e.g. the collective movement to provide shelter (dog houses made of any material) as well as feed and provide (fresh!) water to roaming dogs in fixated bowels in places along the streets. Better garbage control in downtown La Paz resulted in suffering/emaciated dogs that were searching for food. Interviewees reported that the communities came together to help the dogs on the streets and started to build shelters, provide water and food bowels and provide for the roaming dogs. This is an excellent example of an already changing human-dog relationship within La Paz and the changed behaviours should be used to build upon.

PROGRAM MONITORING AND EVALUATION

Following established protocols, monitoring and evaluation surveys are conducted by the survey teams, which were trained at baseline. The MEIA team provides annual Skype sessions and leads these surveys remotely (including uploading the data into the database) together with on the ground program managers/coordinators. In La Paz both the program Manager Alejandra Tellez Pericon and Diana Rodriguez were trained and conducted the baseline surveys with us. Future monitoring surveys should be coordinated by either one of them on the ground together with us remotely. WhatsApp groups are set-up for each project and remain active during survey periods.

Impact assessments are larger in scope and might involve other tools (e.g. participatory meetings) to assess the impact of the program and should ideally be at the same time when household surveys are repeated (every 2 years). The MEIA team joins the field teams for trainings, baseline and impact assessments. Impact assessment reports are provided every two years, after the implementation of a community engagement program.

Street Dog Surveys

Location: Sur, Cotahuma, Max Paredes and San Antonio

Method: Street dog count and assessment

Frequency: Annual

Time: May

Survey track number: 4

Notes: It should be noted that we surveyed each route on multiple days, however we did not include days on which the rain was significant in Sur and Cotahuma were not included because dogs tend to be fewer on the streets when it rains, and results are skewed. Future monitoring surveys should be conducted on days that have similar whether and survey data should be rejected when it was raining during the survey for longer periods of time.

Household Survey

Location: La Paz City

Method: Questionnaire

Frequency: Every 2-3 years

Time: Around the same time as the baseline assessment (if possible)

Notes: Household surveys on the city level should be conducted every 2-3 years, as they are labour intensive. Further, human behaviour change on the population level is not to be expected immediately.

Community Engagement

Location: Communities we work in

Method: TBC

Frequency: TBC

Time: TBC

Notes: Once a community engagement strategy is prepared, a monitoring and evaluation plan should be established at baseline and conducted throughout the program on the community level. Depending on the type of intervention different data collection methods can be used.

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APPENDIX

DOG ESTIMATES BY DISTRICT

21								
Person per HH	Number of HH	DOHH **	Total dogs	Dog Per HH	Dogs per DOHH	% HH *	Total Houses	Dog Population
1	19	11	14	0.736842	1.272727	5.6	864	637
2 to 4	185	108	170	0.918919	1.574074	57.7	8905	8183
5 and more	174	139	239	1.373563	1.719424	36.7	5664	7780
5								
Person per HH	Number of HH	DOHH	Total dogs	Dog Per HH	Dogs per DOHH	% HH*	Total Houses	Dog Population
1	2	1	2	1	2	5.6	836.92	837
2 to 4	137	79	112	0.817518	1.417722	51.9	7756.455	6341
5 and more	256	176	283	1.105469	1.607955	42.5	6351.625	7022
10								
Person per HH	Number of HH	DOHH	Total dogs	Dog Per HH	Dogs per DOHH	% HH*	Total Houses	Dog Population
1	13	6	10	0.769231	1.666667	1	85.61	66
2 to 4	172	117	189	1.098837	1.615385	56	4794.16	5268
5 and more	203	149	239	1.17734	1.604027	43	3681.23	4334
16								
Person per HH	Number of HH	DOHH	Total dogs	Dog Per HH	Dogs per DOHH	% HH*	Total Houses	Dog Population

1	11	4	5	0.454545	1.25	7.1	571.905	260
2 to 4	148	81	120	0.810811	1.481481	50.8	4091.94	3318
5 and more	186	136	259	1.392473	1.904412	42.1	3391.155	4722
2								
Person per HH	Number of HH	DOHH	Total dogs	Dog Per HH	Dogs per DOHH	% HH*	Total Houses	Dog Population
1	9	1	1	0.111111	1	11	1413.94	157
2 to 4	184	77	128	0.695652	1.662338	61	7840.94	5455
5 and more	123	72	114	0.926829	1.583333	28	3599.12	3336
15								
Person per HH	Number of HH	DOHH	Total dogs	Dog Per HH	Dogs per DOHH	% HH*	Total Houses	Dog Population
1	12	4	7	0.583333	1.75	8.6	945.312	551
2 to 4	107	64	110	1.028037	1.71875	60	6595.2	6780
5 and more	184	140	266	1.445652	1.9	31.4	3451.488	4990
11								
Person per HH	Number of HH	DOHH	Total dogs	Dog Per HH	Dogs per DOHH	% HH*	Total Houses	Dog Population
1	18	12	18	1	1.5	5.7	1402.257	1402
2 to 4	203	108	181	0.891626	1.675926	59.5	14637.6	13051
5 and more	339	219	353	1.041298	1.611872	34.8	8561.148	8915
20								
Person per HH	Number of HH	DOHH	Total dogs	Dog Per HH	Dogs per DOHH	% HH*	Total Houses	Dog Population
1	8	11	14	1.75	1.272727	7.3	149.942	262

2 to 4	108	77	140	1.296296	1.818182	55.9	1148.186	1488
5 and more	173	129	275	1.589595	2.131783	36.8	755.872	1202

CAT ESTIMATES BY DISTRICT

10								
Person per HH	Number of HH	HHOC	Total Cats	Cats Per HH	Cats per COHH	% HH*	Total Houses	Cat Population
1	13	2	3	0.230769	1.5	1	85.61	20
2 to 4	172	64	111	0.645349	1.734375	56	4794.16	3094
5 and more	203	77	139	0.684729	1.805195	43	3681.23	2521
16								
Person per HH	Number of HH	HHOC	Total Cats	Cats Per HH	Cats per COHH	% HH*	Total Houses	Cat Population
1	11	3	4	0.363636	1.333333	7.1	571.905	208
2 to 4	148	50	116	0.783784	2.32	50.8	4091.94	3207
5 and more	186	86	196	1.053763	2.27907	42.1	3391.155	3573
2								
Person per HH	Number of HH	HHOC	Total Cats	Cats Per HH	Cats per COHH	% HH*	Total Houses	Cat Population
1	9	0	0	0	0	11	1413.94	0
2 to 4	184	57	106	0.576087	1.859649	61	7840.94	4517
5 or above	123	35	61	0.495935	1.742857	28	3599.12	1785
15								
Person per HH	Number of HH	HHOC	Total Cats	Cats Per HH	Cats per COHH	% HH*	Total Houses	Cat Population
1	12	3	5	0.416667	1.666667	8.6	945.312	394
2 to 4	107	35	58	0.542056	1.657143	60	6595.2	3575

5 or above	184	75	152	0.826087	2.026667	31.4	3451.488	2851
11								
Person per HH	Number of HH	HHOC	Total Cats	Cats Per HH	Cats per COHH	% HH*	Total Houses	Cat Population
1	18	7	12	0.666667	1.714286	5.7	1402.257	935
2 to 4	203	69	140	0.689655	2.028986	59.5	14637.6	10095
5 or above	176	79	174	0.988636	2.202532	34.8	8561.148	8464
20								
Person per HH	Number of HH	HHOC	Total Cats	Cats Per HH	Cats per COHH	% HH*	Total Houses	Cat Population
1	8	1	1	0.125	1	7.3	149.942	19
2 to 4	108	32	49	0.453704	1.53125	55.9	1148.186	521
5 or above	81	27	52	0.641975	1.925926	36.8	755.872	485

ESTIMATES FOR THE REMAINING DISTRICTS

District	Strata Poverty/Human density	Total HH in district	Dog Per HH (by Category)	Dogs per DOHH	% HH*	Total Houses	Est Dog Population	Cats per HH	Est Cat population
Rich									
7	13	18783	0.806	1.375	8	1503	1210	0.111	167
			0.918	1.679	58.2	10932	10038	0.476	5202
			1.336	1.850	33.8	6349	8483	0.656	4165
19	11	15705	0.806	1.375	7.3	1146	924	0.111	127
			0.918	1.679	62.7	9847	9042	0.476	4686

			1.336	1.850	30	4712	6295	0.656	3091
3	12	11963	0.806	1.375	12.1	1448	1166	0.111	161
			0.918	1.679	57.9	6927	6360	0.476	3296
			1.336	1.850	30	3589	4795	0.656	2355
18	11	11311	0.806	1.375	7.2	814	656	0.111	90
			0.918	1.679	71.9	8133	7468	0.476	3870
			1.336	1.850	20.9	2364	3159	0.656	1551
1	12	11479	0.806	1.375	8	918	740	0.111	102
			0.918	1.679	69.5	7978	7326	0.476	3797
			1.336	1.850	22.5	2583	3451	0.656	1695
Medium									
17	21	9939	0.732	1.500	7.1	706	516	0.512	361
			0.897	1.688	50.8	5049	4531	0.686	3462
			1.238	1.819	42.1	4184	5182	0.956	4000
14	22	10245	0.732	1.500	7.6	779	570	0.512	399
			0.897	1.688	66.1	6772	6077	0.686	4643
			1.238	1.819	26.3	2694	3337	0.956	2576
6	23	12306	0.732	1.500	7.9	972	711	0.512	498
			0.897	1.688	66.4	8171	7333	0.686	5602
			1.238	1.819	25.7	3163	3917	0.956	3024
8	23	13775	0.732	1.500	13.6	1873	1371	0.512	960
			0.897	1.688	65.7	9050	8121	0.686	6205
			1.238	1.819	20.7	2851	3531	0.956	2726

12	22	14477	0.732	1.500	5.6	811	593	0.512	415
			0.897	1.688	60.7	8788	7886	0.686	6025
			1.238	1.819	33.7	4879	6042	0.956	4664
13	21	15552	0.732	1.500	6.2	964	706	0.512	494
			0.897	1.688	62.6	9736	8736	0.686	6675
			1.238	1.819	31.2	4852	6009	0.956	4639
Poor									
4	31	15605	0.800	1.714	6.3	983	786	0.267	262
			0.977	1.541	54.9	8567	8373	0.741	6349
			1.139	1.612	38.8	6055	6897	0.909	5502
9	32	15439	0.800	1.714	6.3	973	778	0.267	259
			0.977	1.541	61.2	9449	9235	0.741	7002
			1.139	1.612	32.5	5018	5716	0.909	4560
						Total	178065.5	Total	115657
				Total Dog Population estimate		278,358	Total Cat Population estimate		182,588

* %HH = percentage Households of the total households for this category (categories are 1-person household, 2-4 person household and 5 or above person household)

** DOHH = Dog Owning Household