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Report on Owned Dog Population Survey In Lingayen, Philippines

Tamara Kartal
Humane Society International

Lynne U. Sneddon
University of Liverpool

Amit Chaudhari
Humane Society International

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Report prepared by: Tamara Kartal and Jamie Sneddon

Survey data analysis: Dr. Amit Chaudhari

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INTRODUCTION

The Philippines is among the Southeast Asian countries that has a long-standing problem with rabies. About 200 people die of rabies each year in the Philippines, and most are attributed to dog bite cases (Deray, 2015). The sources of infection of more than 95% of human rabies cases worldwide have been reported to be domestic dogs (Cleaveland, *et al.*, 2006). Focusing on the main source rather than the human population, is therefore, the best strategy to eliminate rabies. The World Health Organization (WHO) recommends covering at least 70% of the existing domestic dog population with rabies vaccination in the shortest time possible (WHO, 2015). Experts and epidemiologists also recommend maintaining the population immunity above this critical level for at least twelve months, which also interrupts the transmission of rabies among the target population (Coleman & Dye, 1996; Cleaveland, *et al.*, 2003; Hampson, *et al.*, 2009; Morters, *et al*., 2013).

Campaigns to eliminate rabies in the Philippines by the year 2020 were launched by the national and local governments in the country to align with the ASEAN goal. Different sectors of the government involving the animal health industry have started to work hand in hand with the private sector, the non-government organizations, as well as with the human health industry as represented by the Department of Health (DOH). Almost all local government units (LGUs) in the Philippines now have their own programs against rabies, including mass vaccination drives, information and education campaigns, personnel trainings, spay and neuter projects, and impounding, to support the national goal. Without proper planning, coordination, and execution, these efforts are virtually ineffective against the fast-spreading rabies. Therefore, emphasis must be put on devising a good plan through tools such as a reliable dog population survey that is less constraining in terms of time, effort, and money. An accurate domestic dog population estimate is useful in planning and estimating cost and time needed to finish projects for rabies control, in managing mass vaccination campaigns, and in evaluating vaccination coverage afterwards. In the Philippines, however, most LGUs rely on the estimated dog population derived from the human population, which is just 10% of the human population. In provinces, cities, municipalities, and towns with various terrain and demography, coupled with varying human behavior and human-dog interactions, this estimate is highly unreliable. Having the wrong estimate leads to setting wrong goals for mass vaccinations, which will most likely lead to lower vaccination coverage than the recommended level of 70% of the dog population.

OBJECTIVES

The objectives of the owned dog population survey conducted in Lingayen were to:

1. To generate an estimate of the owned dog population in Lingayen
2. To establish a baseline in Lingayen to complement and improve the existing dog population management and rabies control programs

METHODOLOGY

The surveys were conducted after the dog population survey training facilitated by HSI in partnership with the city veterinary office of Lingayen. The survey utilized two applications for Android smart phones that are downloadable for free from the Google Play store. These are Google Maps (Google Corporation) and OSM Tracker for Android™ (Nicolas Guillaumin).

The trainees were taught how to design the survey, dividing the area into wards and randomly selecting which areas to be surveyed, as well as setting up the smart phones and the apps, and how to use the apps during the survey. They were also given tips on how to ask questions to get the most honest answers from the interviewees. After the day-long lectures and hands-on practice surveys, the actual survey was then done by HSI staff and the Lingayen city veterinary office personnel.

The sample size was determined using the free online sample size calculator, Raosoft®. Household sample size required to be surveyed per barangay varied from 40 to 240. This was dependent on the barangay's population density, and the number and spatial distribution of households. Depending on the spatial distribution of the barangay as viewed from the satellite image of the map, sample selection was set to every 3rd, 5th, or 10th household.

A systematic random sampling method was utilized for this survey. The group was divided into teams consisting of two people. For the actual survey, each team was assigned to different barangays, with some barangays requiring two or three teams each. Each team was assigned a barangay to survey, with 2 to 5 pre-marked survey points per team. These survey points were to serve as guides for each team to avoid overlapping areas with other teams, and to avoid going out of the set boundaries for each barangay of the city. The teams were to survey a set number of households per survey point by randomly selecting each household using a pre-assigned and fixed interval of every 3rd, 5th, or every 10th household.

The teams also followed a rule of counting households on one side only (left or right), to avoid selection bias. The surveyors also walked in a zigzag pattern, going through smaller streets as well as the major streets, to cover a larger portion of the survey area which is

more varied and randomly selected, and therefore, a better representative of the households in each barangay.

The following information was obtained during the household survey: number of dog-owning households, number of dogs per household, sex of the owned dogs, rabies vaccination status of the dogs and willingness of the owners to have their dogs vaccinated against rabies (if not yet vaccinated).

After each day of the survey, the data collected by each team was extracted from each phone and were analysed thereon. Each team's information from each barangay covered were checked for any errors to assure the accuracy of the survey. The numbers obtained for each barangay was derived from the resulting values of each representative barangays.

RESULTS AND DISCUSSION

This study has resulted in values of mean dog distribution ranging from about 24 to 32 dogs per 100 humans. This is significantly higher than the previously estimated 10% of the human population that the LGUs based their programs on.

It is estimated from this study that there are 29,377private dogs in Lingayen.

An accurate estimate of the dog population is crucial in eliminating rabies, because the recommended control measures focus on the saturation of the dog population with vaccination. The 10% estimate becomes inaccurate especially in cities with highly varying human demography. An accurate estimate helps in planning a good strategy based on priority areas, and appropriations of manpower and other resources. Also, an inaccurate estimate, especially when being much less than the actual population, leads to a lesser target number, therefore in reality, not reaching the recommended 70% despite all the efforts.

Table 1. Summary table of the owned dog population survey in Lingayen

Barangay human density category (Humans per Hectare)	**% Dog-owning HH**	**Average Dogs per HH**	**Dog per dog-owning HH**	**Owned dog population**	**Human population**	**Dogs per 100 humans**
Low Density(1-10 hp per ha)	69	1.39	2.0	8166	25301	32.3
Medium Density (11-30 hp per ha)	73	1.38	1.91	9636	30077	32.0
High density (31> hp per ha)	57	1.04	1.83	11575	47900	24.2
Total				**28377**	**103278**	
Average	**66.33**	**1.27**	**1.91**	**9,792**	**103,278**	**29.5**

*HH = household

The data from Low Density Barangays was delivered from surveys of 13 barangays, Medium Density from 11 barangays& High Density from 8 barangays, adding up to 32 barangays.

Table 2. Summary table of the owned dog population survey in low density barangays

Barangay	Population (2015)	Land Area (Square meter)	Hectare	HH	Density	Human Density / 100 hectare	Dogs per 100 Human Ratio	Total Dog Population
Dorongan	329	737905	73.7905	77	4.459	445.9	32.3	106
Talogtog	641	1254231	125.4231	149	5.111	511.1	32.3	207
Estanza	4088	7936941	793.6941	951	5.151	515.1	32.3	1320
Rosario	2106	3876408	387.6408	490	5.433	543.3	32.3	680
Wawa	1840	3086279	308.6279	428	5.962	596.2	32.3	594
Sabangan	1484	2354961	235.4961	345	6.302	630.2	32.3	479
Bantayan	1181	1812130	181.213	275	6.517	651.7	32.3	381
Malimpuec	3669	5051830	505.183	853	7.263	726.3	32.3	1185
Basing	2770	3224818	322.4818	644	8.590	859.0	32.3	895
Tumbar	1847	1969574	196.9574	430	9.378	937.8	32.3	597
Dulag	1654	1762327	176.2327	385	9.385	938.5	32.3	534
Aliwekwek	1437	1517809	151.7809	334	9.468	946.8	32.3	464
Malawa	2255	2313359	231.3359	524	9.748	974.8	32.3	728

*HH = household

Table 3. Summary table of the owned dog population survey in medium density barangays

Barangay	Population (2015)	Land Area (Square meter)	Hectare	HH	Density	Human Density / 100 hectare	Dogs per 100 Human Ratio	Total Dog Population
Quibaol	2766	2604616	260.4616	643	10.620	1062.0	32	885
Lasip	1970	1683310	168.331	458	11.703	1170.3	32	630
Domalandan Center	2178	1855136	185.5136	507	11.740	1174.0	32	697
Namolan	2507	1969574	196.9574	583	12.729	1272.9	32	802
Domalandan East	2394	1806596	180.6596	557	13.251	1325.1	32	766
Balangobong	1412	944874	94.4874	328	14.944	1494.4	32	452
Capandanan	2399	1598168	159.8168	558	15.011	1501.1	32	768
Domalandan West	2940	1567852	156.7852	684	18.752	1875.2	32	941

Matalava	2827	1329919	132.9919	657	21.257	2125.7	32	905
Naguelguel	3051	1408758	140.8758	710	21.657	2165.7	32	976
Baay	5633	2053824	205.3824	1310	27.427	2742.7	32	1803

*HH = household

Table 4. Summary table of the owned dog population survey in high density barangays

Barangay	Population (2015)	Land Area (Square meter)	Hectare	HH	Density	Human Density / 100 hectare	Dogs per 100 Human Ratio	Total Dog Population
Libsong East	6176	1474334	147.4334	1436	41.890	4189.0	24.2	1495
Poblacion	12238	2872527	287.2527	2846	42.604	4260.4	24.2	2962
Pangasipan North	7336	1667332	166.7332	1706	43.998	4399.8	24.2	1775
Maniboc	7670	1688809	168.8809	1784	45.417	4541.7	24.2	1856
Libsong West	4994	1065596	106.5596	1161	46.866	4686.6	24.2	1209
Pangapisan Sur	1887	386447	38.6447	439	48.829	4882.9	24.2	457
Balococ	2283	422660	42.266	531	54.015	5401.5	24.2	552
Tonton	5316	928456	92.8456	1236	57.256	5725.6	24.2	1286

*HH = household

Based on the results, it was estimated that an average of only about 40% of the owned dogs are vaccinated against rabies. For high density barangays, vaccination coverage was higher with 45.0% of the owned dogs surveyed vaccinated compared to low density barangays with 37.0%, probably because it was easier for the provincial veterinary and municipal agriculture staff to reach high density barangays than in more rural areas wherein the households are dispersed and far apart from each other.. Most rural areas have limited access to private veterinary clinics, and have difficulty going to the province's veterinary office. Even when the veterinary office conducts mass vaccinations per barangay, some remote households are hard to reach and sometimes inaccessible because of factors such as weather and road accessibility. The results suggest that the recommended 70% vaccination saturation has not been achieved in Lingayen, and better planning and effective implementation are required to improve the vaccination coverage.

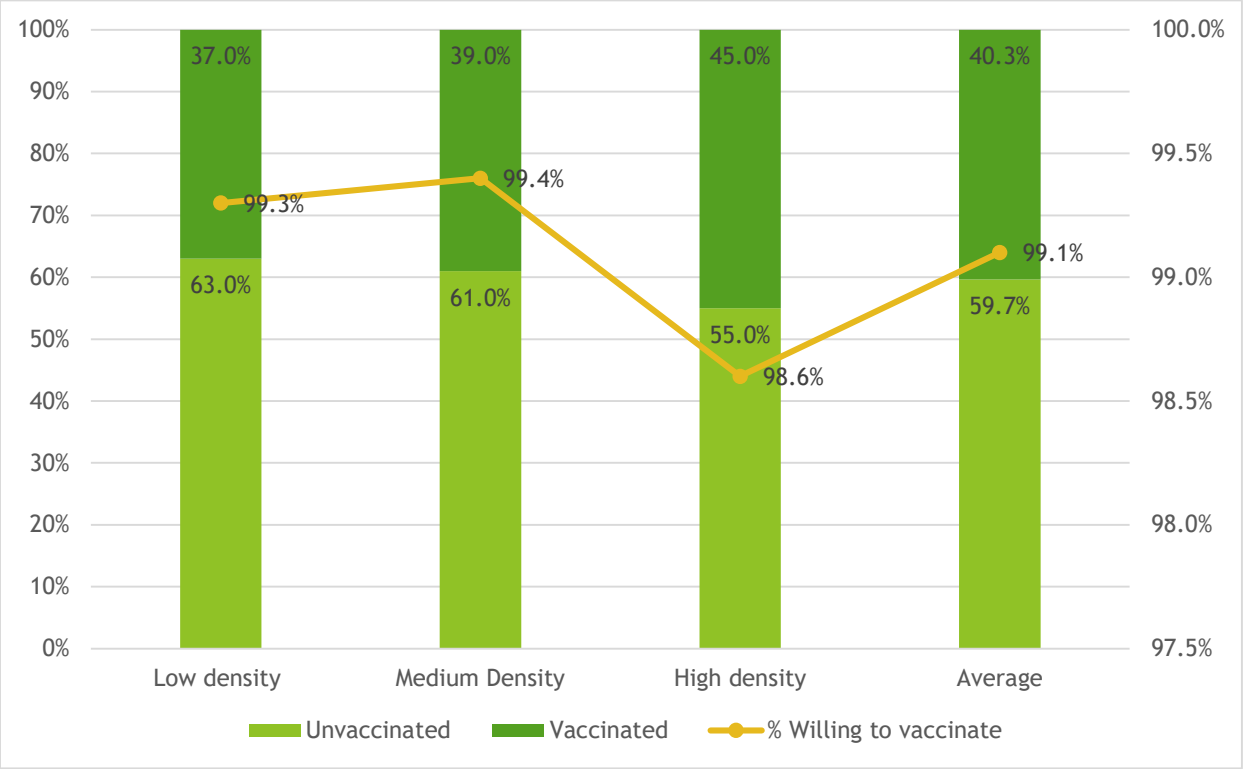
Table 5. Summary table of dogs vaccinated against rabies and the willingness of owners for their dogs to be vaccinated.

Density Category	Current rabies vaccination status (% coverage)	% Willing to vaccinate
Low	37.0	99.3
Medium	39.0	99.4
High	45.0	98.6
Average*	40.33*	99.1*

The recommended vaccination coverage of 70% has been established to be adequate in rabies elimination programs worldwide (Hampson, *et al*., 2009; Lapiz, *et al*., 2012; Townsend, *et al*., 2013) and has been shown to prevent major rabies outbreaks in about 96.5% of instances (Coleman & Dye, 1996; Cleaveland, *et al*., 2003).

The willingness of the owners of unvaccinated dogs to have their dogs vaccinated against rabies ranged from 98.6% to 99.4%, with an average of 99.1%. These high percentages can be credited to the efficiency of the information drives conducted by the veterinary and agriculture offices. This also confirms that many people are aware of the dangers of rabies, but somehow not all owners are able to bring their dogs for vaccination, or there are many factors affecting in reaching the target of 70% vaccination coverage. This information may be useful in the planning of the mass vaccination drives in the future.

Figure 1. Vaccination coverage of dogs in Lingayen, and % willingness of the owners to have their unvaccinated dogs to be vaccinated against rabies.



The results of the survey showed that about an average of 48.07% of the dog population is male, and about 51.93% is female.

Surgical sterilization of dogs helps in controlling the population (especially if females are specifically targeted), and it is the more effective and humane way than impounding and culling. Removal of the dogs alone is considered ineffective because it does not have a significant impact on reducing the population densities of dogs (WHO, 2005). Furthermore, the complex interactions between dogs and humans makes the culling of free-roaming dogs ineffective regardless of the relationship between host density and the incidence of rabies (Morters, *et al*., 2013).

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