

Supplementary Methods S1

1. Demographic and clinical data collection overview

Individual level data for every identified dog in Zenzele, South Africa, which includes all of the dogs reported in this study, were collected longitudinally by direct observation and household questionnaire between March 2008 and April 2014. Each dog was included in the study population (i.e. registered) immediately upon identification at its household and recorded by photograph (standardised dorsal and lateral views) and questionnaire. Puppies were recorded but not photographed and had a questionnaire completed until their third month of life. Thus, each dog in the study population was individually recognisable and monitored at its household for the remainder of the study period or until it was lost from the study area. Households were visited during door-to-door censuses undertaken every 3-4 months between March 2008 and April 2014. The first inter-census period was longer (~5 months). Between August 2008 and April 2011, all households with female dogs were revisited by the enumerators between all the censuses (to closely monitor reproduction). During each household visit, the same detailed information for each dog belonging to the household was collected by questionnaire, including house number, dog's name, age, gender, source, outcome (e.g. died, relocated) and health status; owners reported clinical signs they had observed during the previous 7 days and since the last visit based on a set of 19 pictures, each of a dog with a different clinical sign (see section 2 below). Each dog was examined by the primary researcher, a qualified veterinarian, during each census. Each dog was also examined by an enumerator during each census and revisit of households with female dogs. The presence or absence of ticks during each examination was recorded. Significant clinical signs observed at the time of blood sampling were also recorded. The date and age of dogs at acquisition was reported by owners and/or visually assessed by the primary researcher and/or enumerators, including from the dentition of puppies and juveniles (Dyce et al., 1987). Therefore, each dog was systematically assessed by trained enumerators about every 7-14 weeks between March 2008 and April 2011. The

same intensive monitoring of every dog in Zenzele continued from May 2011 until April 2014; however, during this period households with female dogs were not revisited between censuses and clinical signs were not assessed systematically (as described above). From May 2011 medical treatment received from the mobile veterinary services since the preceding census was recorded for each dog. Owner reported medical treatment received (including 'none') was verified against vaccination certificates and medical records in the owner's possession and the clinic's medical records. The same enumerators tracked the majority of the dogs throughout the study period and were familiar with the dogs.

2. Implementation of the questionnaire used to collect the demographic and clinical data

From March 2008 until April 2011, owners reported clinical signs they had observed in response to the following questions and a set of 19 pictures, each of a dog with a different clinical sign (listed below).

1. Has this dog had any of these problems the past 7 days? (SHOW PICTURES)
2. Has this dog had any other problems the past 7 days?
3. Has this dog had any of these problems since our last visit? (SHOW PICTURES)
4. Has this dog had any other problems since our last visit?

Pictures:

1. Coughing
2. Nasal discharge
3. Vomiting / retching
4. Diarrhoea
5. Dull / depressed
6. Shaking
7. Swollen stomach
8. Limping (including stiffness)
9. Cut / wound

10. Burn / scald
11. Bite
12. Swellings / masses
13. Straining (to pass stool or urine)
14. Jaundice or pale gums
15. Drooling
16. Sore eyes (uni- or bilateral)
17. Change in drinking (habits)
18. Change in eating (habits)
19. Bleeding from orifices

'Since the last visit' was generally since the census ~3-4 months prior for households with only male dogs; since the census or intervening revisit ~7-8 weeks prior for households with at least one female dog (questionnaires were completed for all dogs in these households); or, since being acquired for (new) dogs acquired since the previous household visit. Questions 3 and 4 were inadvertently not asked during the August 2008 census; however, clinical signs between March and August 2008 were checked during the subsequent household visit.

Further standardised questions were asked upon owners identifying clinical signs from the pictures. For example, if a dog had been coughing the following questions were asked:

- (i) When did it start / stop
- (ii) How many times per day
- (iii) Wet or dry
- (iv) Coughing anything up
- (v) Day or night or both

Charity-operated mobile veterinary services have been available in Zenzele from May 2011; therefore, during each census from May 2011 until the end of data collection in April 2014 each owner was asked: Has this dog had any medical treatment since our last visit?

If the dog had received medical treatment, all information in its vaccination certificate or medical records in the owner's possession was recorded; and the owner was asked further standardised questions about the treatment, including its:

- (i) Purpose (e.g. fracture repair, caesarean, treat 'tick fever' etc)
- (ii) Date/s
- (iii) Outcome (i.e. improved, no change, died etc), and
- (iv) Medicines given (dates dispensed and administered, drug or brand name, dose, expiration date, person/s who administered the medication)

The respondent was the person/s in the household that the householders collectively identified as most knowledgeable about the dog, which was not necessarily the owner. Respondents under 16 years of age were always interviewed with an adult present. The same respondent was generally interviewed at each time point. When the respondent was not available, the household was revisited at least once during the same survey (i.e. census or revisit) period to locate the respondent. The respondent and enumerator spoke in the language the respondent preferred. Given that several languages are spoken in Johannesburg, including English, the questionnaire was written in English and the accuracy of the various translations checked regularly with the multi-lingual enumerators throughout the study period.

Reference

Dyce, K.M., Sack, W.O., Wensing, C.J.G., 1987. Textbook of Veterinary Anatomy. Saunders, Philadelphia, USA.