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Impact of demographic characteristics in pet ownership: Modeling animal count according to owners income and age

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ABSTRACT

Pet owner characteristics such as age, gender, income/social class, marital status, rural/urban residence and household type have been shown to be associated with the number of owned pets. However, few studies to date have attempted to evaluate these associations in Brazil. Accordingly, the aim of this study was to evaluate the association between age and income of owners and the number of owned dogs and cats in a Brazilian urban center. Pinhais, metropolitan area of Curitiba, Southern Brazil, the seventh largest city in Brazil, was chosen for this study. Questionnaires were administered door-to-door between January and February 2007 and data were analyzed by zero-inflated negative binomial (ZINB) models. A total of 13,555 of 30,380 (44.62%) households were interviewed. The majority (62.43%) of households reported having one or more dogs, with one or two dogs being the most common (29.97% and 19.71%, respectively). Cat ownership per household was much lower ($P = 0.001$) than dog ownership, with 90% of the households reported having no owned cats. ZINB analyses indicated that income is not associated with the number of both dogs and cats among households that have pets. However, households from higher income categories were more likely to have dogs (but not cats) when compared to the lowest income category ($P < 0.05$), contradicting a common belief that the poorer the family, the more likely they have pets. Certain age categories were significantly associated with the number of dogs or cats in households that have pets. In addition, most age categories were significantly associated with having dogs and/or cats ($P < 0.05$). In conclusion, our study has found that age but not household income is associated with the number of dogs or cats in households that have pets; higher income households were more likely to have dogs when compared to low-income households.

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1. Introduction

In recent years, several studies have been conducted in Southern and Southeastern Brazil in an effort to estimate the number of owned dogs and cats in urban centers (Serafini et al., 2008; Nunes et al., 1997; Lima Júnior, 1999; Dias, 2001; Paranhos, 2002; Dias et al., 2004; Alves et al., 2005). These estimates have been used to accurately plan and monitor government investments in public health services, such as rabies and animal control. Besides being lower than estimates of the World Health Organization for developing countries, human:dog ratios vary greatly among different areas of the country (3:1–13:1 for owned dogs) (Serafini et al., 2008; Nunes et al., 1997; Lima Júnior, 1999; Dias, 2001; Paranhos, 2002; Dias et al., 2004; Alves et al., 2005). The same variation has been observed among different owned cat populations (7:1–86:1 for owned cats); however, fewer studies have been undertaken on them cats when compared to dogs (Paranhos, 2002; Dias et al., 2004; Garcia, 2009). It is likely that various demographic and socioeconomic characteristics of the human population in different regions may be associated with and influence the number of owned dogs and cats.

Human demographic and socioeconomic characteristics associated with the number of owned pets have been extensively investigated worldwide (Endenburg et al., 1990; Leslie et al., 1994; Downes et al., 2009; Murray et al., 2010). Although the evaluated variables and associations differ greatly among studies, factors such as age, gender, income/social class, marital status, rural/urban residence and household type may be associated with pet ownership (Marx et al., 1988; Endenburg et al., 1990; Leslie et al., 1994; Downes et al., 2009). Similar studies in Brazil are scarce; household type was recently found to be associated with the number of owned dogs and cats in a Brazilian urban center (Serafini et al., 2008). In this previous study, family income was suggested as responsible for differences in human:pet ratios among neighborhoods (Serafini et al., 2008). Since data on income and age of the human population may be routinely accessed by the Brazilian Department of Population Demographics, the objective of this study was to evaluate the association between these variables and the number of owned dogs and cats per household in an urban center.

2. Materials and methods

2.1. Study site

Pinhais city is part of Curitiba County, capital of Paraná State, southern Brazil, the 7th most populated city in Brazil with a total of 3.16 million people within the metropolitan area. At the time of the sampling, Pinhais had approximately 117,166 inhabitants (IBGE, 2010) distributed in 30,680 households in 15 neighborhoods. There were only three 4-story apartment building complexes (complexes 1, 2 and 3 had nine, ten and five 4-story buildings, respectively); the remaining households were houses (R. Lacerda, personal communication, Department of Urban Planning, Pinhais City Hall).

2.2. Questionnaires

Questionnaires were administered door-to-door between January and February 2007 by trained health agents of the Center of Zoonosis Control (CCZ) of Pinhais City as part of a non-related study (National Dengue Prevention Program). All houses were visited. Regarding the three apartment building complexes, one apartment in each of the 24 4-story buildings was randomly chosen to be interviewed and counted as a household unit. All visits occurred during work hours (08:00 AM–5:00 PM). Questions asked per household for this study included the age of each household member, household income, and number of dogs and cats. Age information of household members was recorded as 6 independent variables (<1, 1–<10, 10–<20, 20–<30, 30–<40, ≥40 years old). Interviewees were asked the age of every person living in the household. The interviewers then recorded the number of people in each age variable for each household. Based on the Brazilian monthly minimum wage (MW) of R$380.00 (U$182.17) at the time, income was divided in 4 categories (<1, 1–<2, 2–<4 and ≥4 MW). Pet ownership was defined as claiming a dog or cat as one's or family's own instead of just having a pet in the household at the time of the study. Pet ownership was assessed irrespective of where the pets were kept (such as house, backyard, barn) or if they were allowed to roam or kept indoor or outdoor. Data was recorded per household and organized in Excel sheets separated by neighborhoods.

2.3. Statistical analysis

Initial analysis of the data indicated that the distributions of dogs and cats per household were severely right skewed for all neighborhoods and overall (Supplement 1). Therefore, median and ranges of owned dogs and cats in each neighborhood were calculated as descriptive statistics. A non-parametric method (Kruskal–Wallis) was used to test the hypothesis of equal distribution. A post hoc multiple comparison test of the number of pets/household between neighborhoods was performed using the SAS macro KW_MC (Elliott and Hynan, 2011). This macro is a convenient way to perform multiple comparisons analysis for non-normally distributed data. It is designed to implement Dunn's multiple comparison procedure (Dunn, 1964) in cases of unequal sample sizes or when ties are present. Using this procedure, a q statistics was calculated based on the standard errors (SE) for the comparison between two groups (Zar, 2010) and A type 1 error of 0.05 was used.

About 38% and 90% of the households had no dogs or cats, respectively. In addition to this excess of zeros, an overdispersed distribution of the data was also observed; mean count and variance were 1.18, 1.83 and 0.17, 0.51 for dogs and cats per household, respectively. Therefore, these distributions are unlikely to fit classical or zero-inflated Poisson distributions (PD). Although ignoring the over-dispersion may not impact the parameters estimates, standard errors may be underestimated and result in inaccurate *p*-values. On the other hand, assuming PD for a count data with negative binomial distribution may lead to inconsistent parameter estimates. Zero-inflated