

# Risk factors for pet evacuation failure after a slow-onset disaster

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**Objective**—To determine risk factors for pet evacuation failure during a flood.

**Design**—Cross-sectional survey.

**Sample Population**—203 pet-owning households in a flooded region.

**Procedures**—Persons under evacuation notice because of a flood were interviewed by use of a random telephone survey.

**Results**—102 households evacuated with their pets, whereas 101 households evacuated without their pets. Low pet attachment and commitment scores were significantly associated with a greater chance of pet evacuation failure. Risk of pet evacuation failure and lower attachment and commitment scores were also associated with pet management practices prior to the disaster, such as dogs being kept outdoors most of the time or owners not having carriers for their cats. More than 90% of owners made housing arrangements for their pets without assistance.

**Conclusions and Clinical Relevance**—Predictors of pet evacuation failure are usually present before a disaster strikes and are potentially modifiable. Mitigation of pet evacuation failure should focus on activities that reinforce responsible pet ownership and strengthen the human-animal bond, including socializing dogs, attending dog behavior training classes, transporting cats in nondisaster times, and seeking regular preventive veterinary care. Most pet owners are self-reliant in disasters, and this behavior should be encouraged. (*J Am Vet Med Assoc* 2001;218:1905–1910)

Disasters are extreme environmental events characterized by disruptions to social systems and services.<sup>1,3</sup> The consequences of disasters usually result from preexisting factors rather than conditions arising solely as a result of the disaster.<sup>4</sup> Pet abandonment is a major consequence of disasters,<sup>5</sup> and preexisting conditions may contribute to this phenomenon as well. Pet abandonment after the Oakland, California, firestorm in 1991 was associated with pets not having a collar identifying the owner's name and address and with young or sexually intact pets.<sup>5</sup> Owners who were regular clients of a veterinarian were less likely to lose their pets in the fire.<sup>6</sup> Risk factors for pet evacuation failure after a train derailment and the release of explosive gas

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have included a weak bond between the owner and pet, low levels of preparedness, owning many animals, and not having carriers to transport cats.<sup>7</sup> Therefore, standards of pet management prior to a disaster seem to predict owners' ability to provide for their pet when a disaster strikes. Knowledge of these pet ownership characteristics may lead to intervention programs that will reduce human and pet evacuation failure, because as many as 20% of household evacuation failures are attributed to pet ownership.<sup>8</sup>

The purpose of the study reported here was to identify risk factors for pet evacuation failure by comparing the characteristics of pet-owning households that evacuated from a flood without their pets with those of households that evacuated with their pets.

## Materials and Methods

**Description of the disaster**—Residents in Yuba County, California, were issued a voluntary evacuation notice by the local Office of Emergency Services on the morning of Jan 1, 1997, because of flooding.<sup>9</sup> The next day a levee broke, and a mandatory evacuation order was issued and remained in effect for 2 days. It was estimated that 64,000 people evacuated.

**Data collection**—A random-digit telephone survey of residents in Yuba County known to have been under evacuation notice was conducted in July 1997.<sup>9</sup> A commercial contractor<sup>9</sup> obtained information through a structured telephone interview.<sup>10</sup> The questionnaire was based on one used in a previous study<sup>7</sup> of pet evacuation. Each questionnaire targeted individual pet-owning households. For the purpose of this study, a household was defined by its human membership, and pets were defined as dogs or cats. Four screening questions were used to determine eligibility for inclusion in the study. These screening questions determined whether the respondent could represent the entire household, whether the household had been under an evacuation order and had evacuated, and whether there were pets of any type in the household. On the basis of the responses to these screening questions, eligible households were interviewed in further detail. Pet-owning households that evacuated were characterized as evacuating without or with their pets. Results of a study<sup>8</sup> of household evacuation during this disaster have been published elsewhere.

Detailed information was obtained by asking eligible respondents about the number and age of household members at the time of the evacuation. Further questions were designed to ascertain the evacuation behavior of each member of the household such as where they stayed and how far they traveled if they evacuated. Sociodemographic information was based on the head of the household and included the highest educational level, age, ethnic background, and household income.

The primary pet care provider was requested to answer for the household, or if this was not possible, the respondent was asked to answer on behalf of the primary pet care provider. Questions were designed to determine whether

households evacuated all, some, or none of their pets. Information also was gathered about reasons for not evacuating a pet, degree of prior household preparedness for the pets, level of perceived danger from the flood, and perceived priorities for human and animal care on the day of evacuation. Information was collected on the number and types of pets ( $\leq 2$  dogs and  $\leq 2$  cats), pets' age, number of years owned, pedigree, weight (dogs only), and whether the pet was licensed (dogs only). Other questions included whether the household had a carrier for the pet, whether the pet had received regular veterinary care in the year prior to the evacuation, where the pet usually lived, whether the pet required special feed or medication at the time of the flood, and where the pet stayed if it was evacuated. Two components of the human-animal bond, attachment<sup>11</sup> and commitment,<sup>12</sup> were measured.<sup>7</sup> The order of the questions used to measure attachment and commitment was randomized.

To evaluate representativeness of the sample population, sociodemographic information for Yuba County (ZIP codes 95901 and 95961) was obtained from the US Bureau of Census Web site (<http://www.census.gov/cdrom/lookup/859827897> and 888349417).

**Data analysis**—Differences in sociodemographic characteristics between the sample population and the population of Yuba County in the US Census were determined by subtracting the proportions of the study sample population for each age group, level of educational attainment, total household income, and ethnic background from those estimated on the basis of the census. Differences in pet ownership demographics between the sample population and a population in a national pet survey were determined by subtracting the proportions of households in the study sample from the proportions of dogs and cats in Yuba County estimated from the national pet survey.<sup>13</sup>

Households that failed to evacuate a pet (dog or cat) were the primary outcome of interest (dependent variable), whereas risk factors (predictor variables) included sociodemographic variables, pet management and husbandry variables, and attachment, commitment, and combined attachment and commitment scores. The measure of association between pet evacuation failure and each putative risk factor was expressed as the prevalence odds ratio (OR) and 95% confidence intervals (CI). Confidence intervals for the OR were obtained via likelihood-based techniques.<sup>14</sup> All statistical analyses were conducted by use of statistical software programs.<sup>b,c</sup>

Two-tailed *t*-tests were used to compare mean age of the head of the household, distance traveled to an evacuation site, number of pets, pets' age and weight, and pet attachment and commitment scores between households that evacuated pets and those that did not. The  $\chi^2$  test for homogeneity was used to compare categorical variables such as the motivation to evacuate, where household members stayed, period of evacuation, type of pet, pedigree of pet, and whether the pet received routine veterinary care in the year preceding the flood, usually lived indoors or outdoors, had a carrier, or required special feed or medication between households that evacuated their pets and households that did not. The  $\chi^2$  test for trend was used to analyze ordered categorical variables such as severity of the perceived threat of the flood and quartile scores of pet attachment and commitment. Results were considered significant for values of  $P < 0.05$ .

Potential risk factors for pet evacuation failure were initially examined in univariate unconditional logistic regression models for dogs and cats together and separately. Individual risk factors for pet evacuation failure and interactions between variables that were significant in univariate analysis at  $P < 0.20$  were considered in multivariate models.<sup>15</sup> Multivariate logistic regression models for pet evacuation were constructed by use of backward stepwise regression.<sup>16</sup>

The Pearson  $\chi^2$  statistic,<sup>17</sup> model deviance, and regression diagnostics were used to assess the fit of the final model. Variables were retained in the final multivariate models if  $P < 0.05$  or addition of a new variable changed the coefficients of variables already included in the model by  $> 10\%$ .<sup>18</sup> Potential outliers were defined as having a standardized deviance residual value  $> 3.0$ .<sup>16</sup> The attributable fraction for risk factors significantly ( $P < 0.05$ ) associated with pet evacuation failure was calculated by use of the method of Coughlin et al.<sup>19</sup> The adjusted OR for dog or cat evacuation failure from the multivariate logistic regression models was used to calculate the attributable fraction.

Prior to the study, a sample size was calculated that would provide 80% power with a type-I error rate of 5% to find a difference of at least  $5 \pm 1.3\%$  between pet evacuation rates<sup>20</sup> or to identify risk factors for pet evacuation failure that had an OR  $\geq 2$ . The study was approved by Purdue University's Committee on the Use of Human Research Subjects.

## Results

**Representativeness of population and sample**—Prevalence of household ownership of any type of pet in the screened population was 66.6% (575/863), compared with 63.7% predicted for California by use of a national survey of households.<sup>13</sup> Prevalence of dog and cat ownership among the 397 households interviewed in detail was 55.7% (221/397) and 40.6% (159/397), respectively. The 203 households that constituted the study sample owned 325 and 239 dogs and cats, respectively. One hundred ninety-six (95.6%) of these 203 households owned  $\leq 2$  dogs and  $\leq 2$  cats (total,  $\leq 4$  pets). Dog and cat ownership was most prevalent in households with children ( $\leq 18$  years of age), without seniors ( $\geq 65$  years of age), and with an income  $> \$35,000$ .

Several kinds of households in the study sample were underrepresented, compared with US Census Bureau data for Yuba County. These included households with adults  $> 18$  and  $< 65$  years of age ( $-3.4\%$ , which represents the difference between Yuba County survey and census data), adults with an educational attainment up to and including trade or vocational school ( $-14.9\%$ ), and households with a total income  $< \$25,000$  ( $-20.8\%$ ).

**Household evacuation**—In 863 screened households, 455 of 575 (79.1%) pet-owning households evacuated, compared with 241 of 288 (83.7%) households that did not own pets. In the study sample of 203 households, 140 of 156 (89.7%) dog- or cat-owning households indicated that they had stayed with friends or family, and 16 (10.3%) stayed at motels. One hundred thirty-one of 146 (89.7%) evacuated pets stayed at the same location as their owners. Ten (6.8%) pets stayed with friends or family but at a different location, and 5 (3.4%) were boarded at a kennel. Ninety-seven of 184 (52.7%) respondents had not experienced a prior evacuation, and 88 (47.6%) households indicated they did not have a disaster preparedness plan at the time of the evacuation.

One hundred twenty-three of 177 (69.5%) responses given by the 101 households that evacuated without their pets indicated owners thought they would not be gone long, whereas 93 (52.5%) had concerns for family safety, and 67 (37.8%) were not able to transport their pets (Table 1). Owners indicated that

Table 1—Reasons (No. of responses [%]) given by 81 dog owners and 91 cat owners for not evacuating their pets during a flood

Reason	Dogs	Cats
Owners thought they would not be gone for long	54 (66.7)	69 (75.8)
Greatest concern was for the safety of family members	38 (46.9)	55 (57.3)
Could not transport pet	36 (45.0)	31 (35.2)
Owners made arrangements for pets to stay	31 (38.3)	28 (29.2)
Could not catch pet	15 (18.5)	41 (43.6)
Instructed not to evacuate pet	24 (28.9)	21 (21.9)
Did not know where to take pet	4 (4.9)	3 (3.3)
Other	25 (31.3)	29 (30.2)

15 of 66 (22.7%) dogs and 41 of 53 (77.4%) cats were not evacuated because they could not be caught. Forty-five of 177 (25.4%) households indicated that they had been given specific instructions not to evacuate with their pets.

Perception of severity or risk of the flood was not associated with whether instructions were received about the need to evacuate pets, whether pets were actually evacuated, or where households stayed during the evacuation. Pet evacuation failure was not associated with any of the sociodemographic variables.

**Pet evacuation**—One hundred one of 455 (22.2%) screened pet-owning households that evacuated failed to take all of their dogs or cats. Sixty-four of these 101 (63.4%) households did not evacuate their pets or attempt to rescue them after they evacuated, whereas 37 (36.6%) attempted to rescue them later (23 [2.8%] during the voluntary evacuation period and 14 [13.9%] during the mandatory evacuation period). No injuries or deaths of dogs or cats were reported during the evacuation.

In the study sample, prevalence of pet evacuation failure increased with lower attachment score quartile ( $\chi^2$  trend,  $P = 0.01$ ), lower commitment score quartile ( $\chi^2$  trend,  $P = 0.07$ ), or lower combined attachment and commitment score quartile ( $\chi^2$  trend,  $P = 0.02$ ). Pet attachment and commitment scores were positively correlated ( $r = 0.27$ ; CI, 0.0 to 0.46). Households that evacuated their pets had significantly higher pet attachment score (mean  $\pm$  SD, 44.0  $\pm$  4.4) than did households that did not evacuate pets (mean  $\pm$  SD, 41.7  $\pm$  5.9).

Higher mean attachment scores were observed in households that had dogs only ( $P = 0.02$ ), a female pet-care provider ( $P = 0.02$ ), and household members willing to risk their lives to save pets ( $P = 0.01$ ). Higher pet attachment scores were also found for households in which the dogs ( $P = 0.03$ ) and cats ( $P = 0.02$ ) lived in the house and where pets slept on the owner's bed ( $P = 0.02$ ).

Higher pet commitment scores were associated with households that had dogs only ( $P = 0.01$ ), dogs that were licensed at the time of the evacuation ( $P = 0.04$ ), dogs that had visited a veterinarian in the year before the evacuation ( $P = 0.02$ ), or carriers for their cats ( $P = 0.02$ ). Higher commitment scores were also associated with households in which pets slept on the owner's bed ( $P = 0.04$ ) and in which members were willing to risk their lives to save pets ( $P = 0.02$ ). Pet attachment and commitment scores were not consistently associated with household income, educational

attainment, or ethnic background of the head of the household

**Dog evacuation**—One hundred eight of 203 (53.2%) households in the study sample owned dogs. Fifty-six of 108 (51.9%) dog-owning households failed to evacuate all of their dogs. Thirty of these 56 (53.6%) households attempted to rescue their dogs later, and 26 (46.4%) left their dogs unattended until they returned 2 to 4 days after the initial evacuation. Thirty-one of 56 (55.4%) households that evacuated without their dogs had made arrangements with persons who refused to evacuate to take care of their dogs. Forty-four of 96 (45.8%) dogs that were not evacuated were later rescued. Fifty-two of 325 (16.0%) dogs were neither rescued nor evacuated.

Thirty-five of 86 (40.7%) households with 1 dog evacuated their dog. In households with more than 1 dog, 7 of 22 (31.8%) households evacuated a second dog. Many similarities existed between dogs that were evacuated and those that were not. These included age of the dogs (6.5  $\pm$  4.3 vs 5.6  $\pm$  4.0 years;  $P = 0.09$ ), length of time the dogs had been owned (6.0  $\pm$  4.1 vs 5.3  $\pm$  3.8 years;  $P = 0.16$ ), weight of the dogs (49.4  $\pm$  33.4 vs 44.4  $\pm$  33.1 lb;  $P = 0.24$ ), and mean number of cats owned (1.1  $\pm$  1.6 vs 0.9  $\pm$  1.5 cats;  $P = 0.33$ ).

Results of multivariate analyses indicated a significantly increased prevalence of dog evacuation failure associated with households in which the dogs lived outdoors (OR, 5.8; CI, 2.1 to 16.3) or that had multiple dogs (OR, 4.5 for each additional dog owned; CI, 1.6 to 12.5). The attributable fraction of dog evacuation failure among dog-owning households associated with outdoor dogs was 15.1%.

**Cat evacuation**—Ninety-two of 203 (45.2%) households in the study sample owned cats. Forty-five of 92 (48.9%) cat-owning households failed to evacuate all of their cats. Of these 45 households, 31 (68.9%) later attempted to rescue them, and 14 (31.1%) left their cats unattended until they returned 2 to 4 days after the initial evacuation. Twenty-seven of 45 (60.0%) households that evacuated without their cats had made arrangements with persons who refused to evacuate to take care of them. Thirty-one of 96 (32.3%) cats that were not evacuated were later rescued. Sixty-five of 239 (27.2%) cats were neither evacuated nor rescued.

Twenty-three of 50 (46.0%) households with a single cat evacuated the cat. In households with more than 1 cat, 19 of 42 (45.2%) households evacuated a second cat. There were no significant differences between cats that were evacuated and those that were not with respect to age (5.4  $\pm$  4.0 vs 5.7  $\pm$  4.4 years;  $P = 0.66$ ) or number of years owned (4.9  $\pm$  3.7 vs 5.5  $\pm$  4.3 years;  $P = 0.35$ ).

Multivariate analyses revealed that a significantly increased prevalence of cat evacuation failure was associated with households that did not have cat carriers (OR, 14.3; CI, 1.3 to 160.7). Risk for cat evacuation failure was significantly decreased in cat-owning households that also owned dogs (OR, 0.4; CI, 0.2 to 0.7). The attributable fraction of cat evacuation failure among cat-owning households associated with not having cat carriers was 9.6%.

## Discussion

Pet evacuation failure is a common threat to the safety and well-being of pets in disasters. Results of this study are in agreement with those reported for pet evacuation after a rapid-onset disaster because of a hazardous chemical spill.<sup>7</sup> In both studies, pet evacuation failure was significantly associated with low pet attachment and commitment scores, dogs living primarily outdoors, and not having cat carriers. Also, low pet attachment and commitment scores were associated with pets that required no special feed or medication, pets that had not visited a veterinarian in the year prior to the evacuation, and dogs that were not licensed. It appears, therefore, that owners who failed to evacuate their pets from disasters had formed a weaker bond with them and provided a lower standard of care prior to the disaster, compared with owners who evacuated their pets. The similar risk factors for pet evacuation failure in this study and in the rapid-onset disaster in Wisconsin in March of 1996 also suggest that owners' behavior towards their pets is independent of the rate of onset of a disaster, geographic location, and seasonal weather conditions.<sup>7</sup> This is consistent with numerous sociologic studies of disasters in which common adverse consequences of disasters were attributed to preexisting conditions.<sup>4</sup>

Pet abandonment is common in disasters.<sup>21-28</sup> The proportion of dogs and cats that were neither evacuated nor rescued in this study and a study of the rapid-onset disaster<sup>7</sup> is similar to the annual turnover rate of dogs and cats in the pet population in the United States,<sup>29</sup> the proportion of animals brought to 12 shelters in a national survey,<sup>30</sup> and the proportion of abandoned pets admitted to humane shelters following extensive damage to homes in a disaster.<sup>5</sup> The similar characteristics of households that abandon pets in disasters and those that relinquish pets at other times suggest there is a subpopulation of owners who are poorly committed to their pets. Disasters may simply accelerate the process of pet abandonment among this group of pet owners.

The similarity between risk factors for evacuation failure in this and other disaster studies,<sup>5,7,31,d</sup> as well as the similarity to risk factors for pet relinquishment to shelters at times other than disasters,<sup>32,33</sup> suggests a common underlying mechanism for pet evacuation failure and relinquishment. Pet evacuation failure and relinquishment generally reflect a low level of pet care by owners, as indicated by having animals that are more likely sexually intact and without personal identification. Because disasters are rare, attempts to reduce pet evacuation failure in disasters may be most effective if combined with more common programs that promote animal well-being, such as those aimed at reducing pet relinquishment. Emergency management personnel, mass care providers, veterinary associations, and humane groups should encourage responsible pet ownership at all times to reduce the risk of pet evacuation failure and pet relinquishment. Efforts to overcome pet evacuation failure and pet relinquishment should strive to improve the human-animal bond and target a pet's health by emphasizing neutering, permanent identification, and regular veterinary care long before a disaster strikes.

There may be other commonalities between pet evacuation failure and relinquishment. Results of another study<sup>30</sup> indicated that an owner's lack of knowledge about animal husbandry was predictive of pet relinquishment. Similarly, owners with poor knowledge of animals' needs and unrealistic expectations of their pets' needs during disasters may be less likely to evacuate their pets. Also, dogs<sup>32</sup> and cats<sup>33</sup> that were acquired at no cost were at higher risk of relinquishment to animal shelters in nondisaster times. Therefore, it may be useful to obtain information regarding whether an owner's knowledge of pet care and the cost of acquiring a pet are predictive of pet abandonment in disasters. If lack of knowledge predicts pet abandonment and relinquishment, consideration should be given to whether these pets should be returned to their original owners without educating owners regarding responsible pet ownership.

Dogs that were usually kept outdoors were found to be at higher risk of evacuation failure. These dogs may be more difficult for an owner to catch, transport, or house than indoor dogs. Evacuation of packs of sled dogs caused logistic problems for dog owners and emergency management personnel in Alaska during wildfires in 1998.<sup>34</sup> Therefore, emergency management personnel should include animal control officers in evacuation assistance teams. These professional animal care providers are usually able to handle most types of dogs or may suggest practical solutions to facilitate dog evacuation. In our study, outdoor dogs that were not evacuated had been kept outdoors most of the time and not just during the evacuation. This finding is contrary to the myth that owners deliberately tie their dogs outside before evacuating.<sup>35</sup>

In this evacuation and the evacuation during a hazardous chemical spill,<sup>7</sup> most owners were self-reliant and took care of their pets without additional assistance. Most households that evacuated with their pets stayed with friends or family. This finding is consistent with results of other studies in which the proportion of pet owners' and other evacuees<sup>36</sup> that stayed in shelters during an evacuation was low. In this and another study<sup>7</sup> of pet evacuation failure, relatively few pet owners housed their pets at boarding kennels. This may indicate scarce kennel space at the time of the evacuation. Alternatively, the relatively long advance warning time in the disaster reported here may have encouraged self-reliance among pet owners and allowed them to make arrangements with friends or family. Self-reliance appears to be increased by providing as much advance notice as possible of the need to evacuate pets. Self-reliance should be encouraged and is probably the most practical solution for housing a large number of pets in large-scale disasters.

More than 30% of households in our study that evacuated without their pets made arrangements with persons who had refused to evacuate to take care of them. Although this may appear to offer a solution to pet evacuation failure, it was only effective in this incident because little damage was done to homes. However, the actual threat of extensive flooding was great; if the Marysville levees had broken when the town was completely surrounded by floodwater, the

whole town would have been submerged under several feet of water in < 20 minutes.<sup>9</sup> Any designated animal care providers who had not evacuated could have died along with the pets. Allowing care providers in the evacuation zone under these circumstances would only be acceptable if animals in the evacuation zone could not otherwise be moved, and if the care providers could be evacuated rapidly should a high risk for injury or death arise. This situation may develop when large numbers of animals are housed in confinement, such as on farms and in zoos. Animals not evacuated and threatened by injury or death, as would have occurred in Marysville if a levy had broken, may have to be euthanized to prevent trauma or fatalities. Evacuation of animals is, therefore, the most humane approach for animals threatened by disaster.

If an environment is dangerous to humans as indicated by a mandatory evacuation, it must also be considered life-threatening for animals. This raises the question of whether an owner who intentionally fails to evacuate an animal in a disaster is guilty of animal neglect. If emergency managers advise owners not to evacuate animals, or if owners decide themselves not to evacuate their animals, these parties could be held legally responsible for animal injury. A substantial percentage (25.4%) of households indicated that emergency managers had given them inappropriate instructions concerning what to do with their pets. This corroborates many anecdotal reports that emergency management officials commonly advise people to leave their pets behind.<sup>37</sup> After a scaffolding collapse and evacuation in New York, emergency management officials were prosecuted for advising people to leave their pets behind and for later preventing pet rescues.<sup>38</sup> Generally, emergency managers advise citizens to evacuate themselves and do not make specific recommendations regarding personal property, including pets. Recommending what to take and what to leave during an emergency evacuation is arbitrary, presents unpredictable legal burdens on emergency management personnel, and could adversely affect public safety. Clearly, neither allowing all pet rescues nor complete prohibition of pet rescues can be recommended as a comprehensive solution that ensures public and animal safety in disasters. We suggest that in a future emergency, managers advise pet owners to evacuate with their pets and emphasize that owners are ultimately responsible for their pets' care and housing.

Approximately 30% of respondents in our study who did not evacuate their pets indicated they could not catch them, had no idea how to transport them, or did not know where to take them. In some communities, "pet-friendly" shelters have been established in an attempt to improve human and pet evacuation rates. However, the extent to which joint accommodations for owners and pets are used in evacuations is not known. Results of other studies<sup>31,d</sup> suggest that the public commonly brings abandoned animals to pet-friendly shelters where they then compete for space, personnel, and resources allocated for other purposes. Municipal or county departments of animal control, not emergency management agencies or public shelter operators, are generally responsible for abandoned animals.

Pet evacuation failure is the most prevalent threat to the safety and well-being of pets in disasters. Approximately 50% of dogs and cats are not evacuated by their owners. The high rate of pet evacuation failure in disasters indicates considerable potential to increase evacuation rates of dogs and cats. Pet evacuation failure appears to be independent of the rate of onset, geographic location, and weather conditions at the time of disaster, as well as socio-demographic factors. Potentially modifiable risk factors for pet evacuation failure are usually present before a disaster strikes and include low pet attachment and commitment of owners, dogs living outdoors, and not having carriers for cats.

<sup>a</sup>Chilton Research Services, Radnor, Pa.

<sup>b</sup>SAS, SAS Institute Inc, Cary, NC.

<sup>c</sup>Epi Info 6.02, Center for Disease Control and Prevention, Atlanta, Ga.

<sup>d</sup>Stephens JM, Kass PH, Hart LA. *Factors associated with dogs and cats being reunited with owners after the 1997 Arboga flood in California*. MPVM thesis, Department of Population Health and Reproduction, University of California, Davis, Calif, 1998.

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