American Journal of Epidemiology

Vol. 153, No. 7
Printed in U.S.A.

Human and Pet-related Risk Factors for Household Evacuation Failure During a Natural Disaster

Sebastian E. Heath,[1] Philip H. Kass,[2] Alan M. Beck,[3] and Larry T. Glickman[3]

This study characterized risk factors for household evacuation failure. A random digit dial telephone survey was conducted of 397 households in Yuba County, California, in July 1997, 6 months after residents had been under evacuation notice due to flooding. Case households failed to evacuate, whereas control households evacuated. The cumulative incidence of household evacuation failure was 19.4%. Fewer households with children (25.8%) failed to evacuate than households without children (45.9%, $p < 0.01$). More households with pets (20.9%) than households without pets failed to evacuate (16.3%, $p = 0.11$). With multivariate logistic regression, the risk of household evacuation failure was lower in households with children (odds ratio = 0.4, 95% confidence interval: 0.2, 0.8) compared with households without children. The risk of household evacuation failure increased in pet-owning households without children (odds ratio = 1.3, 95% confidence interval: 1.1, 1.5) compared with pet-owning households with children; the more pets a household owned, the higher the risk of household evacuation failure was. Impediments to pet evacuation, including owning multiple pets, owning outdoor dogs, or not having a cat carrier, explained why many households that owned pets failed to evacuate. Predisaster planning should place a high priority on facilitating pet evacuation through predisaster education of pet owners and emergency management personnel. *Am J Epidemiol* 2001;153:659–65.

aged; cats; child; disasters; dogs; natural disasters

Household evacuation failure rates have been as high as 30–70 percent in cresting floods (1), 5–10 percent along the shorefront where hurricanes were predicted to make landfall and up to 70 percent inland (2), and up to 12 percent in hazardous materials spills (3). The most consistent factor associated with household evacuation appears to be the presence of children (4, 5), while the factor most often associated with evacuation delay or failure has been the increasing age of persons in households (6).

Pet owners may not evacuate from a disaster area if they cannot take their animals with them (7–10). Particularly relevant to the evacuation of pet owners is the strength of the human-animal bond (a term used to describe the close relationship between humans and domestic species) (11), the perceived risk to the owners and their pets, the time and resources needed to evacuate animals, and facilities for the housing of evacuated animals (8, 9, 12). Public health regulations typically do not allow animals into public shelters (13). If owners anticipate being separated from their pets or being turned away from public shelters because of their pets, they may refuse to evacuate (14, 15). Because a large proportion (>50 percent) of US households owns pets, even a small effect of pet ownership may have a large impact in disasters.

The objective of this study was to characterize risk factors for household evacuation failure by comparing characteristics, attitudes, and resources of households that evacuated from an impending disaster with those that did not. Households in this study had at least 36 hours' advance notice to evacuate.

MATERIALS AND METHODS

Residents of Yuba County, California, were issued a voluntary evacuation notice on the morning of January 1, 1997, because of flooding (16). After a levee broke the following day, a mandatory evacuation order was issued and remained in effect for 2 days. A random digit dial population survey of residential telephones in Yuba County where residents were known to have been under evacuation notice was conducted in July 1997. A commercial contractor (Chilton Research Services, Radnor, Pennsylvania) obtained information through a structured interview. First, four screening questions were used to determine whether the respondent could represent the entire household, whether the household had been under an evacuation order, whether the household had evacuated, and whether there were pets of any type in the household. Second, on the basis of the responses to the

Received for publication December 8, 1999, and accepted for publication July 18, 2000.

Abbreviations: CI, confidence interval; OR, odds ratio; OR_{MH}, Mantel-Haenszel weighted odds ratio.

[1] Department of Veterinary Clinical Sciences, Purdue University School of Veterinary Medicine, West Lafayette, IN.
[2] Department of Population Health and Reproduction, School of Veterinary Medicine, University of California, Davis, CA.
[3] Department of Veterinary Pathobiology, Purdue University School of Veterinary Medicine, West Lafayette, IN.
Reprint requests to Dr. Sebastian E. Heath,1650 Harvard Street, NW, Apt. 210, Washington, DC 20009–3727 (e-mail: sebastian.heath@att.net).

screening questions, households under evacuation notice were placed into one of four groups. Questions were designed to ascertain the evacuation behavior of each member of the household. Two components of the human-animal bond, attachment (17) and commitment (18), were measured in households that owned pets; pets included dogs and cats only. Household evacuation failure was designated as the primary outcome of interest (dependent variable), while predictor variables for household evacuation failure included sociodemographic factors, household composition, perceived level of risk from the flood, pet-related factors, and pet attachment and commitment scores.

The unit of study was defined as a "household" because all human members of a household usually exhibit the same evacuation behavior (4, 19, 20). On the basis of screening questions, four household groups were defined: 1) evacuated and owned pets ($n = 203$); 2) evacuated and did not own pets ($n = 50$); 3) did not evacuate and owned pets ($n = 100$); and 4) did not evacuate and did not own pets ($n = 44$). The measure of association between evacuation failure and each putative risk factor was expressed as the odds ratio and 95 percent confidence interval. Confidence intervals for the regression coefficients were estimated by using the maximum likelihood estimators (21). All statistical analyses were conducted using SAS version 6.12 (22) and Epi-Info 6.04 (23) statistical software programs.

The representativeness of the sample population was determined by comparing sociodemographic information for the same area obtained from the US Bureau of Census. Two-tailed t tests were used to compare continuous data, and the χ^2 test for homogeneity or Fisher's exact test was used for categorical variables. The χ^2 test for trend was used to analyze ordered categorical variables. Results were considered statistically significant at $p < 0.05$.

Potential risk factors for household evacuation failure were initially examined in univariate logistic regression models for all households and separately for those with and those without dogs or cats. The risk of household evacuation failure was also estimated in analyses stratified by the presence of children (those aged <19 years) and seniors (those aged >64 years) and ownership of a dog or cat. The Mantel-Haenszel weighted odds ratio was used to summarize the risk of evacuation failure across strata.

Multivariate logistic regression models for dog- or cat-, dog-, and cat-owning households were constructed separately by using backward stepwise regression (24). Assessment of the fit of the final model was made by examining the Pearson χ^2 statistic (25), model deviance, and regression diagnostics. Age of the head of household was treated either as a continuous variable or as a categorical variable by using age groups formed by the 50th, 75th, or 95th percentiles.

A sample size was calculated prior to the study that would provide 80 percent power with a type I error rate of 5 percent to find a difference of at least 5 percent ± 1.3 percent between household evacuation rates (26) or to identify risk factors for household evacuation failure that had an odds ratio of more than 2.0 (23). The use of human subjects was approved by Purdue University, West Lafayette, Indiana.

RESULTS

A total of 1,153 telephone contacts were made, of which 290 (25.2 percent) were excluded because the persons contacted refused to participate or said that they had not been placed under an evacuation notice. Of the remaining 863 willing and eligible participants, 397 (46.0 percent) were interviewed in detail until the sample size target for the four evacuation behavior groups was reached. After 12 respondents refused to complete the survey, the remaining 454 (52.6 percent) were confirmed to have been under evacuation notice, but were asked only whether they had evacuated or owned pets of any type.

Of the 397 households surveyed, 381 (96.0 percent) behaved similarly, in that they either evacuated (59.7 percent) or failed to evacuate (36.2 percent) as units. Therefore, an entire household was considered to be the appropriate unit of analysis for this study. There were no statistically significant differences between the proportion of households with and that without children ($p = 0.08$), seniors ($p = 0.46$), or pets ($p = 0.77$) that evacuated in the voluntary versus mandatory evacuation periods.

On the basis of telephone screening questions of 863 households, 167 (19.4 percent) failed to evacuate (table 1). A total of 120 (20.9 percent) of 575 households with pets and 47 (16.3 percent) of 288 households without pets failed to evacuate ($p = 0.11$).

In the detailed interview part of the study 110 (76.4 percent) of 144 households that did not evacuate said they failed to leave because the threat of the flood was not severe enough, 11 (7.6 percent) indicated that they wished to protect property, and two (1.4 percent) said they had received conflicting evacuation messages.

A total of 102 (50.7 percent) of 201 households that owned pets perceived the threat of the floods to be very dangerous compared with 16 (32.7 percent) of 49 households without pets ($p = 0.02$). The level of perceived threat was

TABLE 1. Evacuation behavior of households that were under an evacuation notice due to a flood in Yuba County, California, in January 1997

Household characteristic	Failed to evacuate		Evacuated		p value
	No.	%	No.	%	
Owned pets					
Yes	120	71.9	455	65.5	
No	47	28.1	241	34.6	0.11
Total*	167	100	696	100	
Children present†					
Yes	49	34.0	141	55.7	
No	95	66.0	112	44.3	<0.01
Total‡	144	100	253	100	
Seniors present§					
Yes	48	33.3	67	26.5	
No	96	66.7	186	73.5	0.15
Total‡	144	100	253	100	

* Number of households screened by telephone calls ($n = 863$).
† Children are persons aged <19 years.
‡ Households interviewed in detail ($n = 397$).
§ Seniors are persons aged >64 years.

highest in pet-owning households without children compared with pet-owning households with children ($p < 0.01$). Of 38 pet-owning households without children that evacuated, 34 (89.5 percent) had evacuation plans that included the care of their pets. Of 50 households without pets that evacuated, 40 (80.0 percent) stayed with friends, family, or at a hotel/motel compared with 156 (76.9 percent) of 203 pet-owning households that evacuated ($p = 0.63$). Nine (18.0 percent) of 50 households without pets that evacuated stayed at public shelters compared with 32 (15.7 percent) of 203 households that owned pets ($p = 0.70$). No households without pets stayed in a vehicle, at a campground, or at "other" locations, whereas 15 (7.4 percent) of 203 households with pets used such accommodations ($p = 0.04$).

Six (1.6 percent) of 375 dogs and eight (3.3 percent) of 242 cats in the study bit, scratched, or injured a person during the evacuation period or when the pet was later rescued. Eight (57.1 percent) of these injuries occurred while pets were being evacuated. Four were caused by pets whose owners did not evacuate (four of 14, 28.6 percent), while two were caused by pets whose owners evacuated, but left their pets at home.

The univariate analyses identified the following factors associated with an increased risk of household evacuation failure: higher educational attainment of the head of household (odds ratio (OR) = 1.8, 95 percent confidence interval (CI): 1.1, 2.8), increasing age (in years) of the head of the household (OR = 1.02, 95 percent CI: 1.01, 1.03), and an increasing number of dogs (OR = 1.5, 95 percent CI: 1.2, 1.9) or cats (OR = 1.2, 95 percent CI: 1.0, 1.4). In contrast, the presence of children in a household decreased the risk of evacuation failure (OR = 0.4, 95 percent CI: 0.2, 0.8). The decreased risk associated with children was not statistically related to the number of children or to their ages. The risk of household evacuation failure was not statistically associated with pet attachment or commitment scores or with pet attachment or commitment score quartiles (data not shown).

Analyses of the risk of evacuation failure associated with the presence of children stratified by the presence of seniors in the household (Mantel-Haenszel weighted odds ratio (OR_{MH}) = 0.7, 95 percent CI: 0.6, 0.9), dog ownership (OR_{MH} = 0.8, 95 percent CI: 0.6, 1.0), or cat ownership (OR_{MH} = 0.8, 95 percent CI: 0.6, 1.0) consistently indicated that the likelihood of evacuation failure was reduced only in households with children as opposed to those without. Pet ownership was not a significant risk factor for evacuation failure of households with seniors.

The multivariate model for estimating the risk of evacuation failure for all 397 households included the presence of children and seniors, the number of dogs and/or cats, the educational attainment of the head of household, and the household income. The risk of evacuation failure in all households was significantly higher in households with an increasing number of dogs or cats (OR = 1.3, 95 percent CI: 1.1, 1.5), but it was significantly lower in households with children (OR = 0.4, 95 percent CI: 0.2, 0.7).

A multivariate analysis of the risk of evacuation failure in 278 households with either dogs or cats included the presence of children and seniors, the level of educational attainment of the head of household, and an interaction between the total number of dogs and cats and the presence of children. The risk of evacuation failure was decreased in households with children that also owned pets, but the risk of evacuation failure in households without children progressively increased with an increasing number of dogs or cats owned (table 2).

TABLE 2. Risk of evacuation failure for 278 pet-owning households in Yuba County, California, that were affected by floods in January 1997

Household composition	Crude OR*	Failed to evacuate		Evacuated		Adjusted OR†	95% CI*	*p* value
		No.	%	No.	%			
No children‡								
No. of pets§								
1¶	1.0	14	23.7	27	37.5	1.0	0.5, 3.5	0.60
2	1.2	16	27.1	26	36.1	1.3	0.7, 9.2	0.16
3	2.1	12	20.3	11	15.3	2.5	0.8, 66.7	0.07
>3	4.1	17	28.8	8	11.1	7.4		
Total		59	100	72	100			
Children‡								
No. of pets								
1	0.2	4	12.5	42	36.5	0.1	0.0, 0.6	0.05
2	0.6	10	31.3	35	30.4	0.3	0.1, 1.1	0.07
3	0.2	2	6.3	20	17.4	0.1	0.0, 0.6	0.01
>3	1.7	16	50.0	18	15.7	0.4	0.0, 3.1	0.35
Total		32	100	115	100			

* OR, odds ratio; CI, confidence interval.

† Adjusted for variables in the model plus educational attainment of the head of the household, presence of seniors, and a total number of dogs or cats—child interaction term. Risk factors not shown were not significant at $p < 0.10$. Pearson $\chi^2 = 298.5$; df = 265; $p < 0.01$.

‡ Children are persons aged <19 years.

§ p (χ^2_{trend}) (households without children)) < 0.01.

¶ Reference category.

The multivariate model for estimating the risk of evacuation failure for 216 households that owned dogs indicated that the risk of evacuation failure increased with an increasing number of dogs (OR = 1.6, 95 percent CI: 1.2, 2.6) and an increasing number of cats (OR = 1.5, 95 percent CI: 1.2, 1.9) (table 3). The risk of evacuation failure was significantly lower in households with children (OR = 0.4, 95 percent CI: 0.2, 0.7). A comparison of the multivariate models using different groupings for age of the head of household, children, and seniors consistently indicated that the risk of evacuation failure was not associated with the age of the head of household or the presence of seniors.

The multivariate model for estimating the risk of evacuation failure for 161 households that owned cats indicated that the risk increased significantly with an increasing number of dogs (OR = 2.3, 95 percent CI: 1.6, 3.4), in households without carriers for the cats (OR = 3.3, 95 percent CI: 1.1, 10.2), and for households where the head of the household had a higher level of education (OR = 3.1, 95 percent CI: 1.4, 7.2). Risk of evacuation failure was significantly lower in cat-owning households that had children (OR = 0.2, 95 percent CI: 0.1, 0.4) (table 4). A comparison of the multivariate models using different groupings for the age of the head of household, children, and seniors consistently indicated that the risk of evacuation failure in households that owned cats was not associated with the age of the head of household or the presence of seniors.

DISCUSSION

The risk of evacuation failure in households without children was apparently twice that for households with children. The reduced risk of evacuation failure in households with children was independent of the age of the head of the household or the presence of seniors. In other studies, evacuation rates of households with children were also higher than those for households without children (5, 27, 28) and have been attributed to children being frightened and wanting to leave immediately (20) or to adults anticipating more potential harm to children than to themselves (28).

In this study, there was an increased risk of evacuation failure in households with seniors, but this association was not statistically significant. Nonetheless, considerable resources may often be required to evacuate seniors. In disasters, reasons given in other studies for lower evacuation rates for

TABLE 3. Risk factors for human evacuation failure of 216 dog-owning households in Yuba County, California, that were affected by floods in January 1997

Risk factor	Crude OR*	Failed to evacuate		Evacuated		Adjusted OR†	95% CI*	*p* value
		No.	%	No.	%			
No. of dogs‡	1.8					1.6	1.2, 2.6	<0.01
No. of dogs§								
1	1.0	32	41.0	81	58.7	1.0		
>1	1.9	46	59.0	57	41.3	2.7	1.2, 5.9	0.02
Total		78	100	138	100			
No. of cats‡	1.4					1.5	1.2, 1.9	<0.01
No. of cats§								
0	1.0	31	40.0	85	61.6	1.0		
≥1	2.2	47	60.3	53	38.4	2.7	1.5, 5.0	<0.01
Total		78	100	138	100			
Children present¶								
No	1.0	48	61.5	51	37.0	1.0		
Yes	0.4	30	38.5	87	63.0	0.4	0.2, 0.7	<0.01
Total		78	100	138	100			
Dogs lived outdoors								
No	1.0	51	65.4	33	23.9	1.0		
Yes	1.7	27	34.6	105	76.1	1.3	0.6, 2.8	0.54
Total		78	100	138	100			
Dogs licensed								
Yes	1.0	61	78.2	114	82.6	1.0		
No	2.2	17	21.8	24	17.4	1.1	0.8, 2.4	0.83
Total		78	100	138	100			

* OR, odds ratio; CI, confidence interval.
† Adjusted for variables in the model plus presence of seniors and level of education of the head of the household. Other risk factors not shown were not significant at $p < 0.10$. Pearson $\chi^2 = 217.1$; df = 208; $p < 0.01$.
‡ Continuous variable, used in the current model.
§ Categorical variable, not used in the current model, but included in the table for comparison.
¶ Children are persons aged <19 years.

TABLE 4. Risk factors for human evacuation failure of 161 cat-owning households in Yuba County, California, that were affected by floods in January 1997

Risk factor	Crude OR*	Failed to evacuate		Evacuated		Adjusted OR†	95% CI*	*p* value
		No.	%	No.	%			
No. of dogs‡	2.1					2.3	1.6, 3.4	<0.01
No. of dogs§								
0	1.0	12	20.0	45	44.6	1.0		
≥1	3.2	48	80.0	56	55.4	5.6	2.3, 13.7	<0.01
Total		60	100	101	100			
No. of cats‡	1.1					1.0	0.8, 1.2	0.72
No. of cats§								
1	1.0	22	36.7	57	56.4	1.0		
>1	2.2	38	63.3	44	43.6	1.6	0.6, 3.9	0.34
Total		60	100	101	100			
Children present¶								
No	1.0	39	65.0	38	37.6	1.0		
Yes	0.5	21	35.0	63	62.4	0.2	0.1, 0.4	<0.01
Total		60	100	101	100			
Educational attainment of head of household								
≤ high school	1.0	19	31.7	51	50.5	1.0		
> high school	2.5	41	68.3	50	49.5	3.1	1.4, 7.2	0.01
Total		60	100	101	100			
Cats had carriers								
Yes	1.0	42	70.0	88	87.2	1.0		
No	2.5	18	30.0	13	12.9	3.3	1.1, 10.2	0.03
Total		60	100	101	100			
Cat had been to a veterinarian within 1 year of evacuation								
Yes	1.0	42	70.0	87	86.1	1.0		
No	2.7	18	30.0	14	13.9	2.5	0.8, 8.0	0.11
Total		60	100	101	100			

* OR, odds ratio; CI, confidence interval.
† Adjusted for variables in the model plus seniors. Risk factors not shown were not significant at $p < 0.10$. Pearson $\chi^2 = 146.5$; df = 153; $p < 0.01$.
‡ Continuous variable, used in the current model.
§ Categorical variable, not used in the current model, but included in the table for comparison.
¶ Children are persons aged <19 years.

households with seniors include having smaller social support networks, being less agile, being surrounded with irreplaceable items (29), and trying to avoid going to shelters (30).

Owning pets appeared to be the most significant reason why households without children failed to evacuate. For every additional dog or cat owned, such households were nearly twice as likely to fail to evacuate compared with pet-owning households with children. In these childless households, pet owners were apparently willing to jeopardize their lives to stay with their pet(s). To overcome the high risk of evacuation failure in households that own pets, facilitation of pet evacuation should become a higher priority in evacuation planning than is currently the case. Owners should be made aware of the need to evacuate their pets from disasters so that they can take appropriate actions to overcome the challenges associated with pet and, therefore, household evacuation failure.

An increased risk of evacuation failure in households that owned dogs was associated with a greater number of dogs and cats and with outdoor dogs, suggesting that some dog owners failed to evacuate because of logistic difficulties. Outdoor dogs may take longer to catch, or they may be used for guarding, hunting, and working. Such dogs may be less socialized and not tolerant of the confinement needed for transportation or housing indoors, and they may be more aggressive toward people and other animals. Public safety could be improved during evacuations by providing dog leashes, cages, leather gloves, vehicles, and instructions or

assistance for the safe handling and transportation of such animals.

Similar to problems associated with households that own dogs, logistical problems encountered in catching and transporting cats may be a principal reason why some households that owned cats failed to evacuate. The increased risk of evacuation failure associated with a lack of cat carriers indicates that activities involving the transportation of cats before a disaster, such as visits to a veterinarian, boarding facility, or friends, may contribute to effective evacuation of cat-owning households during a disaster.

Apparently, households that act responsibly toward pets in general also act responsibly in disasters, as reflected by the positive association between a higher level of pet care and household evacuation. For example, a lower risk of evacuation failure was associated with the following indicators of a higher level of pet care: dogs that lived indoors or were licensed, cats that had carriers or had visited a veterinarian, and dogs and cats that required special feed or medication (data not shown).

Pet attachment and commitment scores were not statistically associated with human evacuation failure and, therefore, are not useful predictors of household evacuation behavior. In contrast, low pet attachment (p (χ^2_{trend}) = 0.01) and commitment (p (χ^2_{trend}) = 0.07) score quartiles were positively associated with pet evacuation failure (31).

Similar to evacuees in other studies (32, 33), most (67.2 percent) evacuees stayed with friends and other family members, while only a few (16.3 percent) stayed at public shelters. Similar low rates of sheltering have been reported in response to hurricanes (34). Households that owned pets apparently had greater difficulty finding accommodations than did households without pets. About 7.4 percent of the households that owned pets stayed in their cars, at campgrounds, or at other accommodations during the evacuation. This suggests that having to find alternative accommodations for pets in a prolonged evacuation forces a significant lifestyle change on some households and could in some cases even lead to temporary homelessness. To provide better accommodations for pet owners and to increase evacuation rates for such households, some areas of the United States are experimenting with "pet-friendly" public shelters in disasters (14). However, there are no data to prove that pet-friendly shelters will increase evacuation rates of pet owners. Pet-friendly shelters may also make pet owners less self-reliant, placing the responsibility for the care of animals on shelter operators.

Pet-owning households that evacuated perceived the threat of the flood to be more severe than did those without pets that evacuated. The rate of household evacuation was also higher in pet-owning households that perceived the threat of the disaster to be higher than did pet-owning households that thought the threat was low. Future studies should investigate whether increased public awareness before an evacuation of the need to evacuate pets can increase evacuation rates in pet owners.

In conclusion, evacuations from disasters are more successful among households with children, but this is not associated with the age of other household members. In pet-owning households without children, the risk of evacuation failure nearly doubled with every additional dog or cat owned. Therefore, pet ownership can be a significant threat to public and animal safety in disasters. The major obstacles to evacuating pets appear to be logistic, resulting from an inability to transport pets. Only a few pet owners were concerned that they could not find accommodations for themselves and their pets. On the basis of the high prevalence of dog and cat ownership in the United States, if all pets could be evacuated from disasters, the evacuation rate of households that own pets would be increased considerably. Therefore, programs intended to improve public and animal safety in disasters should encourage and facilitate pet evacuation at the time of household evacuation and encourage responsible pet ownership at other times.

The results of this study were similar to others, in that households evacuated as a unit (4, 35) and households with children were more likely to evacuate than were those without children (5, 30). The additional finding that pet ownership is associated with household evacuation failure is important, and a better understanding of this relation should improve public and animal safety in future disasters.

ACKNOWLEDGMENTS

Funded in part by the Mari Fendric Hulman Charitable Trust.

REFERENCES

1. Gruntfest E, Huber C. Status report on flood warning systems in the United States. Environ Manag 1989;13:279–86.
2. Baker EJ. Hurricane evacuation behavior. Int J Mass Emerg Disasters 1991;9:287–310.
3. Burton I, Victor P, Whyte A. The Mississauga evacuation. Toronto, Canada: University of Toronto, Institute for Environmental Studies, 1981.
4. Quarantelli EL. A note on the protective function of the family in disasters. Marriage Fam Living 1960;22:263–4.
5. Bourque LB, Russell LA, Goltz JD. Human behavior during and immediately after the earthquake. In: Bolton PA. The Loma Prieta, California, earthquake of October 17, 1989—public response. US Geological Survey Professional Paper 1553-B. Washington DC: US GPO, 1993:B3–22.
6. Vogt BM. Issues in nursing home evacuations. Int J Mass Emerg Disasters 1991;9:247–65.
7. Vogt BM, Sorensen JH. Evacuation research: a reassessment. Oak Ridge, TN: Oak Ridge National Laboratory, 1992. (publication no. ORNL/TM-11908).
8. Deeb BD. The pet-person bond during wartime. Am Kennel Gazette 1985;August:60–7.
9. DeLorenzo RA, Augustine JJ. Lesson in emergency evacuation from the Miamisburg train derailment. Prehosp Disaster Med 1996;11:270–5.
10. Nelson CE, Kurtz A, Hacker G. Hurricane evacuation behavior: lessons from Elena. Public Affairs Reporter 1988;2:1–3.
11. Beck AM, Meyers MN. Health enhancement and companion animal ownership. Ann Rev Public Health 1996;17:247–57.
12. Heath SE, Hooks J, Marshall KE, et al. Participation of veterinarians in disaster management. J Am Vet Med Assoc 1997;210:325–8.

13. American Red Cross. Animals in American Red Cross disaster or evacuation shelters. Disaster services notice 161. Arlington, VA: American Red Cross, 1996.
14. Florida Animal Disaster Planning Advisory Committee. Guidelines for developing a community animal disaster plan for people with special needs. Sarasota, FL: Sarasota County Department of Emergency Management, 1998.
15. Garrity TF, Stallones L, Marx MB, et al. Pet ownership and attachment as supportive factors in the health of the elderly. Anthrozoös 1990;3:35–44.
16. Remembering the flood of 1997. Appeal-Democrat Supplement. February 1997.
17. Johnson TP, Garrity TF, Stallones L. Psychometric evaluation of the Lexington attachment to pets scale (LAPS). Anthrozoös 1990;5:160–75.
18. Staats S, Miller D, Carnot MJ, et al. The Miller Rada commitment to pets scale. Anthrozoös 1996;9:88–94.
19. Drabek TE. Social processes in disaster: family evacuation. Soc Problems 1969;16:336–47.
20. Drabek TE. Families in disaster: reactions and relatives. J Marriage Family 1968;30:443–5.
21. Hosmer DW, Lemeshow S. Applied logistic regression. New York, NY: Wiley Interscience Publications, 1989:25–35.
22. SAS Institute, Inc. SAS statistical program software. Cary, NC: SAS Institute, Inc, 1997.
23. Epi Info 6.02. Atlanta, GA: Centers for Disease Control and Prevention, 1997.
24. Neter J. Multivariate statistical analysis. New York, NY: Harcourt, Brace & Co., 1989.
25. Selvin S. Practical biostatistical methods. Belmont, CA: Wadsworth Publishing Company, 1994:396–8.
26. Borenstein M, Cohen J. Statistical power analysis: a computer program. Hillsdale, NJ: Lawrence Erlbaum Associates, 1988.
27. Cutter S, Barnes K. Evacuation behavior and Three Mile Island. Disasters 1982;6:116–24.
28. Fischer HW, Stine GF, Stoker BL, et. Al. Evacuation behavior: why do some evacuate, while others do not? A case study of the Ephrata, Pennsylvania (USA) evacuation. Disaster Prev Manag 1995;4:30–6.
29. Penning-Rowsell E, Euroflood II. Technical annex 14: Evacuation. Flood hazard research center. Middlesex, England: Middlesex University, 1996.
30. Friedsam HJ. Older persons in disaster. In Baker GW, Chapman DW, eds. Disasters: theory and research. New York, NY: Basic Books, 1962.
31. Heath SE, Voeks SK, Glickman LT. Epidemiological features of pet evacuation failure in a rapid onset disaster. J Am Vet Med Assoc (In press).
32. Dynes RR. The disaster event and community stress. In: Dynes RR. Organized behavior in disaster. Lexington, MA: Heath Lexington Books, 1970:50–82.
33. Perry RW, Lindell MK, Greene MR. Evacuation experiences and the evacuation planning process. In: Perry RW, Lindell MK, Greene MR, eds. Evacuation planning in emergency management. Lexington, MA: Lexington Books, 1981:121–50.
34. Quarantelli EL, Dynes RR. When disaster strikes it isn't much like what you've heard and read about. Psychology Today 1972;February:67–70.
35. Drabek TE. Shall we leave? A study on family reactions when disaster strikes. Emerg Manag Rev 1983;1:25–9.