

Population characteristics and neuter status of cats living in households in the United States

Karyen Chu, PhD; Wendy M. Anderson, JD; Micha Y. Rieser, MA

Objective—To gather data on cats living in US households, document their neuter status, and identify demographic characteristics associated with neuter status.

Design—Cross-sectional, random-digit-dial telephone survey.

Sample Population—1,205 adults in the continental United States contacted between April 24, 2007, and May 14, 2007.

Procedures—Information was gathered by means of computer-assisted telephone interviews. Multivariate logit analysis was used to identify demographic characteristics significantly associated with neuter status.

Results—383 of 1,205 (31.8%) respondents reported having at least 1 cat at the time of the survey, yielding an estimated population of 82.4 million cats living in 36.8 million US households. Overall, 680 of 850 (80.0%) cats were reportedly neutered. Of the 371 neutered female cats, 303 (81.7%) had reportedly been neutered before having any litters. Proportion of cats that were neutered differed significantly across annual family income groups, with 96.2% (231/240) of cats in households with annual family incomes \geq \$75,000 being neutered, 90.7% (231/254) of cats in households with annual family incomes between \$35,000 and \$74,999 being neutered, and only 51.4% (123/239) of cats in households with annual family incomes $<$ \$35,000 being neutered.

Conclusions and Clinical Relevance—Findings suggested that a high percentage (80.0%) of cats living in households in the United States were neutered and that annual family income was the strongest predictor of whether cats in the household were neutered. The present study did not attempt to address stray and feral cats, which represent a substantial but unknown percentage of the total US cat population. (*J Am Vet Med Assoc* 2009;234:1023–1030)

A consensus seems to exist that it is desirable to increase the proportion of cats in the United States that are neutered, and a growing number of jurisdictions are enacting legislation in an attempt to effectuate this policy objective. However, limited empirical data exist to inform legislative choices. Not surprisingly, therefore, existing legislation varies widely both with respect to the actors targeted and the mechanisms employed. Some jurisdictions, for example, have enacted laws mandating that all owners of cats neuter their animals unless they purchase a permit to own or breed sexually intact animals.¹ Others require cat owners to purchase licenses for their cats but charge differential fees for neutered or sexually intact cats.^{2,3} Some jurisdictions have opted for incentives, instead of owner sanctions, to raise neuter rates by, for instance, using public funds to offset the costs of neuter surgery for low-income residents.^{4–6} A number of jurisdictions, meanwhile, have targeted animal control facilities and shelters, requiring them to neuter animals prior to adoption.^{7–9}

The lack of information on population characteristics, including neuter status, of cats living in households in the United States makes it impossible to predict the effectiveness of these or other legislative approaches. The purpose of the study reported here therefore was to

From Alley Cat Allies Inc, 7920 Norfolk Ave, Bethesda, MD 20814. The views expressed in the article are those of the authors and do not necessarily represent the views of Dr. Chu's employer, the Federal Deposit Insurance Corporation. Address correspondence to Dr. Chu.

ABBREVIATIONS

CI	Confidence interval
OR	Odds ratio

gather data on cats living in US households, document neuter status of those cats, and identify demographic characteristics of respondents (eg, gender, age, annual family income, and education level) associated with neuter status. The study was conducted as a random-digit-dial telephone survey with participants chosen to be representative of the population of the continental United States.

Materials and Methods

Survey design—The survey consisted of a cross-sectional, random-digit-dial telephone survey of respondents living in the continental United States. Computer-assisted telephone interviews were conducted by Harris Interactive, a professional survey firm, between April 24, 2007, and May 14, 2007.

The sampling frame for the survey was households in the continental United States with at least 1 landline telephone number. The sample selection process began with a directory of 64 million household telephone numbers that were screened to ensure that area codes were correct and exchanges were valid (for US telephone numbers, the first set of 3 numbers is the area code, the second set of 3 numbers is the exchange, and the final

set of 4 numbers is the block). Validated telephone exchanges and blocks that contained ≥ 1 listed residential telephone number were then used to create the random-digit-dial database from which the sample was drawn. Telephone numbers in the random-digit-dial database were further tagged to indicate whether they were listed, available (ie, unlisted or unassigned), assigned to a business, or protected, and telephone numbers used for the survey were selected from the database of numbers tagged as listed or available. Numbers used in the survey were drawn from all eligible blocks in proportion to the block density of listed telephone households, excluding business and protected numbers. The sample was stratified by all counties in the continental United States in proportion to each county's share of the sampling frame. The sample was screened after selection to identify and remove nonworking numbers.

Six dialing attempts were made for each telephone number in the sample. Interviewers surveyed a single adult (ie, ≥ 18 years old) resident in each responding household. At the beginning of the survey, the adult respondent in each household was selected on the basis of the following order of priority: the youngest adult male at home, then the youngest adult female at home, then the next youngest adult male at home, then the next youngest adult female at home, and so forth. As the sample was collected, the order of priority was changed to achieve desired proportions of respondents of various ages and both genders. The target sample size of 1,200 completed interviews was selected to limit the maximum sampling error to $\pm 3\%$ with 95% confidence.

Survey questionnaire—Survey questions were developed by Alley Cat Allies in conjunction with a research team from Harris Interactive; questions were reviewed by a Harris Interactive survey design team before the survey was conducted. There was no focus group testing of survey questions, although pretesting of the survey did result in modifications to the structure of several questions.

The complete survey consisted of several sections with differing objectives. The present report focuses on 7 questions from sections that gathered information about cats living in respondents' households and 4 questions from the section that gathered demographic information.^a

Survey respondents were asked whether they currently had any cats living in their household. Respondents who responded affirmatively were then asked additional questions to determine the following information: number of cats of each sex, neuter status of each cat, whether each female cat had ever had a litter, and the source of cats in the household. The exact wording for possible choices for source of cats in the household was "from one of your cats having kittens," "from a breeder," "from a pet store," "from a rescue group," "from an animal pound or shelter," "from a friend or family member," "from a veterinarian," "as a stray," and "from an advertisement in a newspaper." If none of these choices were applicable, respondents could volunteer their own answers. Respondents with multiple cats could select multiple sources.

Respondents with at least 1 neutered cat were asked their reasons for having had their cats neutered.

The exact wording of answer choices that were offered included "it's healthier for my cat," "to avoid unwanted litters," "to prevent cat from roaming," "to prevent cat from fighting," and "to eliminate spraying." Respondents could also volunteer a different answer and were allowed to select multiple answers.

Respondents with at least 1 sexually intact cat were asked why they had not had their cats neutered. The exact wording of answer choices that were offered included "you plan to or might breed your cat," "the procedure costs too much," "you do not believe in neutering male cats," "you do not believe in spaying female cats," "there are no veterinary clinics available," "a female cat will be better off having 1 litter first before being spayed," and "no reason or hadn't thought about getting your cat neutered." Respondents could also volunteer a different answer and were allowed to select multiple answers.

Information on sex, neuter status, and whether female cats had had a litter was obtained for each cat, whereas information on sources of cats and reasons for neutering or not neutering was collected on a household level and not tied to individual cats within households. The survey did not collect information on the ages of cats in the households.

Demographic information on respondents that was obtained included gender, age, annual family income, and education level.

Analysis of survey results—Survey results for mean number of cats per household were extrapolated to calculate the estimated population of household cats in the continental United States on the basis of estimated numbers of households reported by the US Census Bureau.¹⁰

All survey results were weighted on the basis of sampling weights, where sampling weight for each respondent was calculated as the inverse of the probability that a particular respondent would be selected.¹¹ Sampling weights reflected the fact that the probability any particular individual would be selected to participate was not the same for all individuals living in the continental United States and were adjusted as necessary to ensure that the sample was representative of the adult population of the continental United States with respect to age, gender, education, race or ethnicity, region, and income, as reported by the US Census Bureau.¹² Sampling weights were also adjusted to account for an oversampling of 202 women in the survey; this oversampling was done for reasons unrelated to sections of the survey described in the present report.

Data analysis—Data are reported as weighted proportions of survey responses. Data were analyzed by means of multivariate binomial logit analysis. Factors for gender, age, annual family income, and education level of the respondent were included as explanatory factors in every multivariate logit model that was analyzed, along with other factors specific to the analysis being conducted. For categorical factors with > 2 categories, the logit analysis was run twice with a different category used as the reference category each time so that differences among all categories could be assessed.

Two separate analyses were conducted to identify possible significant relationships between household

demographic variables and cat neuter status. The first analysis examined the effects of household demographic variables and cat sex on the probability of each cat having been neutered, while the second analysis was conducted at the household level, analyzing whether all cats in a household had been neutered.

Because information on sources of cats and reasons for neutering or not neutering was collected on a household level, analyses incorporating these factors were conducted only at the household level. Analyses of sex, neuter status, and whether female cats had had a litter were conducted at the individual cat level, with clustered SEs used to account for the presence of multiple cats in some households.

All analyses were performed with standard software.^b Values of $P < 0.05$ were considered significant.

Results

Sample size—A total of 1,205 interviews were completed.

US household cat population—Overall, 383 of the 1,205 (31.8%; 95% CI, 28.3% to 35.5%) respondents reported living with at least 1 cat at the time of the survey (Table 1), with mean number of cats living in these respondents' households being 2.24 (95% CI, 2.00 to 2.49). Five (0.4%) respondents did not provide any information on whether they had cats living in their households. The remaining 817 (67.8%) respondents reported that they did not have any cats living in their households at the time of the survey. When responses

were extrapolated to the population of the continental United States, number of cats living in US households at the time of the survey was estimated to be 82.4 million, with an estimated 36.8 million households having cats living in them.

Neuter status—Information on neuter status was provided for 850 cats, of which 680 (80.0%) were reportedly neutered (Table 2). Multivariate logit analysis with factors for respondent demographic variables (ie, gender, age, annual family income, and education level) and cat sex indicated that the percentage of male cats that were neutered (304/371 [81.9%]) was not significantly different from the percentage of female cats that were neutered (375/476 [78.7%]). Overall, 303 of 371 (81.7%) neutered female cats reportedly had been neutered before they had had any litters. Multivariate logit analysis of cat-level data with factors for respondent demographic variables and clustered SEs to account for multiple cats per household did not reveal any significant demographic factors associated with the likelihood that a cat would have a litter before being neutered.

Annual family income was the demographic variable most strongly related to neuter status, with 96.2% (231/240) of cats in households with annual family incomes \geq \$75,000 reportedly being neutered, 90.7% (231/254) of cats in households with annual family incomes between \$35,000 and \$74,999 reportedly being neutered, and only 51.4% (123/239) of cats in households with annual family incomes $<$ \$35,000 reportedly being neutered. Multivariate logit analysis of cat-level data indicated that cats in households with annual family incomes $<$ \$35,000 were significantly less likely to be neutered than were cats in the 2 other annual income categories (Table 2) but that the odds of cats in households with annual family incomes between \$35,000 and \$74,999 being neutered was not significantly different from the odds for cats in households with annual family incomes \geq \$75,000. Respondent age was also related to neuter status, with cats living in households of respondents \geq 60 years old (137/153 [89.7%]) significantly more likely to be neutered than cats living in households of respondents between 18 and 39 years old (250/349 [71.6%]).

On a household basis, most respondents indicated that all cats in the household were neutered (311/378 [82.3%]), with lesser percentages indicating that none of the cats in the household were neutered (50/378 [13.2%]) or that some cats in the household were neutered (17/378 [4.5%]; Table 3). Similar to results for cat-level analyses, multivariate logit analysis of household-level data (households with all cats neutered vs households with at least 1 sexually intact cat) indicated that respondents with annual family incomes $<$ \$35,000 were significantly more likely to have at least 1 sexually intact cat in their household than were respondents with annual family incomes \geq \$75,000 (Table 4) and that respondents with annual family incomes $<$ \$35,000 were significantly more likely to have at least 1 sexually intact cat in their household than were respondents with annual family incomes between \$35,000 and \$74,999. There was no significant difference between households with annual family incomes between \$35,000 and \$74,999 and households with annual family incomes \geq \$75,000. Respondents between

Table 1—Demographic characteristics of individuals who responded to a survey concerning population characteristics of cats living in households in the United States.

Factor	No. (%) of respondents	No. (%) of respondents with cats
All respondents	1,205 (100)	383 (100)
Gender		
Female	626 (51.9)	230 (60.0)
Male	579 (48.1)	153 (40.0)
Age (y)		
18–39	471 (39.1)	156 (40.8)
40–59	440 (36.5)	146 (38.2)
\geq 60	294 (24.4)	80 (21.0)
Annual family income		
$<$ \$35,000	292 (24.3)	90 (23.6)
\$35,000–\$74,999	327 (27.1)	114 (29.9)
\geq \$75,000	333 (27.6)	110 (28.8)
Not reported	253 (21.0)	68 (17.7)
Education level		
High school graduate or less	539 (44.7)	169 (44.2)
Technical or vocational training or some college	323 (26.8)	108 (28.1)
College graduate or post-graduate study	313 (25.9)	99 (25.8)
Not reported	31 (2.6)	7 (1.9)

Data are reported as weighted proportions of survey responses; sampling weights were adjusted as necessary to ensure that the sample was representative of the adult population of the continental United States with respect to age, gender, education, race or ethnicity, region, and income, as reported by the US Census Bureau.¹²

Table 2—Neuter status of cats reported by individuals who responded to a survey concerning population characteristics of cats living in households in the United States.

Factor	No. of cats	No. (%) neutered	OR (95% CI)	P value	OR (95% CI)*	P value*
Gender						
Female	549	439 (79.9)	0.483 (0.198–1.177)	0.109	Referent	NA
Male	300	241 (80.2)	Referent	NA	2.070 (0.850–5.044)	0.109
Age (y)						
18–39	349	250 (71.6) ^a	4.403 (1.428–13.570)	0.010	1.597 (0.592–4.310)	0.354
40–59	348	293 (84.2) ^{a,b}	2.757 (0.946–8.036)	0.063	Referent	NA
≥ 60	153	137 (89.7) ^b	Referent	NA	0.363 (0.124–1.057)	0.063
Annual family income						
< \$35,000	239	123 (51.4) ^a	26.046 (6.919–98.044)	< 0.001	9.022 (2.315–35.167)	0.002
\$35,000–\$74,999	254	231 (90.7) ^b	2.887 (0.633–13.167)	0.170	Referent	NA
≥ \$75,000	240	231 (96.2) ^b	Referent	NA	0.346 (0.076–1.580)	0.170
Education level						
High school graduate or less	376	261 (69.5)	1.960 (0.618–6.220)	0.253	1.347 (0.517–3.508)	0.542
Technical or vocational training or some college	254	216 (84.8)	1.456 (0.401–5.289)	0.568	Referent	NA
College graduate or post-graduate study	209	195 (92.9)	Referent	NA	0.687 (0.189–2.496)	0.568
Sex of cat						
Female	476	375 (78.7)	1.456 (0.731–2.897)	0.284	Referent	NA
Male	371	304 (81.9)	Referent	NA	0.687 (0.345–1.367)	0.284

Data are reported as weighted proportions of survey responses for 850 cats, of which 680 (80.0%) were neutered; sampling weights were adjusted as necessary to ensure that the sample was representative of the adult population of the continental United States with respect to age, gender, education, race or ethnicity, region, and income, as reported by the US Census Bureau.¹² For some factors, values do not sum to 850 because respondents did not provide information on annual income, education level, or neuter status of their cats.

*The logit analysis was run twice with a different category used as the reference category each time so that differences among all categories could be assessed.

NA = Not applicable.

^{a,b}Within each factor, values with different letter superscripts were significantly ($P < 0.05$) different.

Odds ratios were calculated by means of multivariate logit analysis that included factors for gender, age, annual family income, education level of respondents, and sex of cats; SEs were clustered to account for multiple cats in individual households. Odds ratios represent the odds that cats were not neutered, compared with the odds for cats in the reference category.

Table 3—Neuter status as a function of household characteristics reported by individuals who responded to a survey concerning population characteristics of cats living in households in the United States.

Factor	No. of households	No. (%) with all cats neutered	No. (%) with some cats neutered	No. (%) with no cats neutered
All respondents	378	311 (82.3)	17 (4.5)	50 (13.2)
Gender				
Female	229	191 (83.4)	14 (5.9)	24 (10.7)
Male	149	120 (80.6)	3 (2.3)	26 (17.2)
Age (y)				
18–39	153	113 (74.1)	11 (7.0)	29 (19.0)
40–59	146	127 (87.1)	5 (3.7)	13 (9.2)
≥ 60	79	71 (89.2)	1 (1.2)	8 (9.6)
Annual family income				
< \$35,000	87	47 (53.7)	9 (10.9)	31 (35.5)
\$35,000–\$74,999	113	105 (93.2)	3 (2.5)	5 (4.3)
≥ \$75,000	110	104 (94.2)	5 (4.3)	2 (1.6)
Education level				
High school graduate or less	166	123 (74.2)	10 (5.7)	33 (20.1)
Technical or vocational training or some college	106	92 (87.4)	2 (1.6)	12 (11.0)
College graduate or post-graduate study	99	90 (90.9)	6 (5.8)	3 (3.3)

Data are reported as weighted proportions of survey responses. Sampling weights were adjusted as necessary to ensure that the sample was representative of the adult population of the continental United States with respect to age, gender, education, race or ethnicity, region, and income, as reported by the US Census Bureau¹²; values in categories may not add up to the total number of households and percentages in categories may not total 100% because of rounding associated with sample weighting.

18 and 39 years old were significantly more likely to have at least 1 sexually intact cat in their household than were respondents ≥ 60 years old.

Reasons for neutering—When respondents with at least 1 neutered cat in their household were asked why

they had had their cats neutered, the most commonly cited reasons were “to avoid unwanted litters” (224/328 [68.3%]), “it’s healthier for my cat” (90/328 [27.5%]), and “to eliminate spraying” (84/328 [25.6%]; **Table 5**). For all demographic groups, avoiding unwanted litters was the most commonly cited reason. Multivariate logit

Table 4—Results of multivariate logit analysis of factors potentially associated with all cats in a household being sexually intact.

Factor	OR (95% CI)	P value	OR (95% CI)*	P value*
Gender				
Female	0.439 (0.178–1.085)	0.074	Referent	NA
Male	Referent	NA	2.279 (0.922–5.632)	0.074
Age (y)				
18–39	4.019 (1.522–10.611)	0.005	2.083 (0.817–5.311)	0.124
40–59	1.929 (0.708–5.257)	0.198	Referent	NA
≥ 60	Referent	NA	0.518 (0.190–1.412)	0.198
Annual family income				
< \$35,000	16.741 (3.898–71.907)	< 0.001	13.589 (4.309–42.848)	< 0.001
\$35,000–\$74,999	1.232 (0.277–5.485)	0.784	Referent	NA
\geq \$75,000	Referent	NA	0.812 (0.182–3.614)	0.784
Education level				
High school graduate or less	1.545 (0.470–5.083)	0.473	1.773 (0.753–4.174)	0.189
Technical or vocational training or some college	0.871 (0.256–2.965)	0.825	Referent	NA
College graduate or post-graduate study	Referent	NA	1.148 (0.337–3.907)	0.825

Odds ratios were calculated by means of multivariate logit analysis that included factors for gender, age, annual family income, education level of respondents, and sex of cats; odds ratios represent the odds that at least 1 cat in the household was not neutered, compared with the odds that at least 1 cat in households in the reference category was not neutered.

See Table 2 for remainder of key.

Table 5—Reasons for having their cats neutered reported by individuals who responded to a survey concerning population characteristics of cats living in households in the United States.

Factor	No. of respondents	To avoid unwanted litters*	It’s healthier for my cat*	To eliminate spraying*
All respondents	328	224 (68.3)	90 (27.5)	84 (25.6)
Gender				
Female	204	134 (65.5)	49 (24.1)	50 (24.5)
Male	124	90 (72.9)	41 (33.2)	34 (27.3)
Age (y)				
18–39	124	87 (70.1)	31 (25.4)	29 (23.5)
40–59	133	94 (70.9)	44 (33.4) ^a	37 (27.7)
≥ 60	72	43 (60.5)	15 (20.3) ^a	18 (25.2)
Annual family income				
< \$35,000	56	36 (63.8)	17 (30.4)	14 (25.5)
\$35,000–\$74,999	108	72 (66.6)	38 (35.4)	26 (24.0)
\geq \$75,000	109	86 (79.1)	24 (22.1)	23 (21.4)
Education level				
High school graduate or less	133	94 (70.9)	39 (29.7)	37 (28.0)
Technical or vocational training or some college	94	56 (59.5)	29 (30.6)	24 (25.9)
College graduate or post-graduate study	96	70 (73.0)	22 (23.2)	20 (21.1)

Data were obtained on a household basis and are reported as weighted proportions of survey responses. Sampling weights were adjusted as necessary to ensure that the sample was representative of the adult population of the continental United States with respect to age, gender, education, race or ethnicity, region, and income, as reported by the US Census Bureau.¹² Values in categories may not add up to the total number of households and percentages in categories may not total 100% because multiple responses could be selected. Only the 3 most common responses are reported.

*Data are given as number (%) of households.

^aValues were significantly ($P < 0.05$) different.

analysis indicated that respondents between 40 and 59 years old were more likely (OR, 2.350; 95% CI, 1.096 to 5.038; $P = 0.028$) to select “it’s healthier for my cat” than were respondents ≥ 60 years old, but no other factors were significantly associated with reported reasons for having cats neutered.

Reasons for not neutering—When respondents ($n = 67$) with at least 1 sexually intact cat in their household were asked why they had not had their cats neutered, the most commonly cited reasons were “a female cat will be better off having 1 litter first before being spayed” (27/67 [40.7%]), “the procedure costs too much” (26/67 [38.8%]), and “plan to or might breed the cat” (13/67 [20.0%]). Owing to the small number of households with sexually intact cats, none of the demographic factors analyzed were significantly associated with reported reasons why cats were not neutered.

Sources of cats in households—Overall, 43.2% (165/383) of respondents reported obtaining their cats from a friend or family member, 34.0% (130/383) reported obtaining their cats as strays, and 20.0% (77/383) reported obtaining their cats as a result of one of their cats having kittens (Table 6). For all demographic groups, the most commonly reported sources of their cats were from a friend or family member and obtained as a stray; the third most commonly reported source varied across demographic categories. Overall, 273 of 383 (71.4%) households had obtained at least 1 cat from a friend or family member or as a stray. Multivariate logit analysis indicated that significantly more respondents with

annual family incomes $< \$35,000$ (80/90 [88.0%]) had obtained at least 1 cat from a friend or family member or as a stray than respondents with annual family incomes between \$35,000 and \$74,999 (78/114 [68.2%]) or respondents with annual family incomes $\geq \$75,000$ (68/110 [61.3%]). Conversely, multivariate logit analysis indicated that significantly fewer respondents with annual family incomes $< \$35,000$ had obtained at least 1 cat by adoption from an animal pound or shelter (5/90 [6.0%]) than did respondents with annual family incomes between \$35,000 and \$74,999 (20/114 [17.9%]) or respondents with annual family incomes $\geq \$75,000$ (26/111 [23.3%]).

Neuter status and source of cat—Even after including source of cats as a factor in the multivariate logit analysis, respondents with annual family incomes $< \$35,000$ were still significantly more likely than respondents in the 2 other income groups to not have had all of their cats neutered (Table 7). Respondents between 18 and 39 years old were also significantly more likely to not have had all of their cats neutered, compared with respondents ≥ 60 years old.

Even after controlling for gender, age, annual family income, and education level, respondents who obtained at least one of their cats from a friend or family member or as a stray were significantly more likely to have at least 1 sexually intact cat in their household than were respondents who had not obtained any of their cats through these 2 sources. Respondents who obtained at least one of their cats from an animal pound or shelter were significantly more likely to have had all

Table 6—Sources of cats reported by individuals who responded to a survey concerning population characteristics of cats living in households in the United States.

Factor	No. of respondents	From a friend or family member*	Obtained as a stray*	From one of your cats having kittens*	From an animal pound or shelter*
All respondents	383	165 (43.2)	130 (34.0)	77 (20.0)	62 (16.2)
Gender					
Female	230	96 (41.8)	82 (35.7)	46 (20.2)	40 (17.4)
Male	153	69 (45.3)	48 (31.4)	30 (19.8)	22 (14.5)
Age (y)					
18–39	156	71 (45.6)	40 (25.4) ^a	44 (28.2) ^a	29 (18.4)
40–59	146	60 (41.0)	58 (39.9) ^b	25 (16.8) ^{a,b}	24 (16.1)
≥ 60	80	34 (42.5)	32 (40.0) ^b	8 (10.0) ^b	10 (12.3)
Annual family income					
$< \$35,000$	90	58 (64.2) ^a	30 (33.1)	22 (24.0)	5 (6.0) ^a
\$35,000–\$74,999	114	46 (40.0) ^b	43 (37.7)	22 (19.3)	20 (17.9) ^b
$\geq \$75,000$	110	29 (26.2) ^b	41 (37.4)	23 (20.9)	26 (23.3) ^b
Education level					
High school graduate or less	169	72 (42.5) ^a	47 (27.8) ^a	38 (22.7)	27 (15.7)
Technical or vocational training or some college	108	60 (55.8) ^b	37 (34.8) ^{a,b}	23 (21.6)	16 (14.4)
College graduate or post-graduate study	99	30 (29.9) ^a	44 (44.9) ^b	14 (14.2)	20 (20.3)

Data were obtained on a household basis and are reported as weighted proportions of survey responses. Sampling weights were adjusted as necessary to ensure that the sample was representative of the adult population of the continental United States with respect to age, gender, education, race or ethnicity, region, and income, as reported by the US Census Bureau.¹² Values in categories may not add up to the total number of households and percentages in categories may not total 100% because multiple responses could be selected. Only the 3 most common responses and responses for “from a pound or shelter” are reported.^{a,b} Within each factor and each source, values with different letter superscripts were significantly ($P < 0.05$) different.

See Table 5 for remainder of key.

Table 7—Results of multivariate logit analysis of factors potentially associated with all cats in a household being sexually intact.

Factor	OR (95% CI)	P value	OR (95% CI)*	P value*
Gender				
Female	0.451 (0.184–1.105)	0.082	Referent	NA
Male	Referent	NA	2.218 (0.905–5.438)	0.082
Age (y)				
18–39	4.685 (1.727–12.705)	0.002	2.231 (0.842–5.913)	0.106
40–59	2.100 (0.788–5.592)	0.137	Referent	NA
≥ 60	Referent	NA	0.476 (0.179–1.269)	0.137
Annual family income				
< \$35,000	7.796 (1.771–34.322)	0.007	9.712 (2.985–31.601)	< 0.001
\$35,000–\$74,999	0.803 (0.176–3.661)	0.776	Referent	NA
≥ \$75,000	Referent	NA	1.246 (0.273–5.682)	0.776
Education level				
High school graduate or less	2.108 (0.669–6.640)	0.202	2.287 (0.916–5.713)	0.076
Technical or vocational training or some college	0.921 (0.278–3.056)	0.893	Referent	NA
College graduate or post-graduate study	Referent	NA	1.085 (0.327–3.599)	0.893
Cat source				
At least 1 cat from friend or family member or obtained as stray	4.995 (1.621–15.393)	0.005	Referent	NA
No cats from friends or family members or obtained as strays	Referent	NA	0.200 (0.065–0.617)	0.005
Cat source				
At least 1 cat from pound or shelter	0.089 (0.009–0.896)	0.040	Referent	NA
No cats from pound or shelter	Referent	NA	11.180 (1.116–112.000)	0.040

Odds ratios were calculated by means of multivariate logit analysis that included factors for gender, age, annual family income, education level of respondents, and sex of cats; odds ratios represent the odds that at least 1 cat in the household was not neutered, compared with the odds that at least 1 cat in households in the reference category was not neutered.
See Table 2 for remainder of key.

of their cats neutered than were respondents who had not obtained any of their cats from a pound or shelter.

Discussion

On the basis of results of the present study, we estimated that there were 82.4 million cats living in 36.8 million households in the continental United States as of May 2007, with a mean of 2.24 cats/household. Similarly, the AVMA has estimated that there were 81.7 million cats living in 37.5 million households in the United States as of December 2006, with a mean of 2.2 cats/household,¹³ and the American Pet Products Manufacturers Association has estimated that there were 88.3 million cats living in 38.4 million households in the United States during 2007, with a mean of 2.3 cats/household.¹⁴ The AVMA and American Pet Products Manufacturers Association surveys were mail surveys sent to samples drawn from panels of individuals who had agreed to participate in ongoing market research. In contrast, the present study was conducted as a random-digit-dial telephone survey.

In the present study, 80.0% (680/850) of the household cats for which information was provided were reported to have been neutered. Similarly, another national study¹³ involving 3,465 cat-owning households contact-

ed during 1997 found that 77.3% of cats were neutered. Both of these estimated percentages of neutered cats were lower than the estimated percentage in the American Pet Products Manufacturers Association survey,¹⁴ which reported that 87% of cats in 492 surveyed households were neutered. The difference between studies likely reflects difference in survey populations. Importantly, the American Pet Products Manufacturers Association survey was designed to monitor consumer habits and identify trends in pet ownership and pet product and service consumption.¹⁴ Thus, it may have included individuals who were more frequent consumers of pet products and services, which may have reflected a greater tendency to have their cats neutered, compared with individuals in the general population.

In the present study, as in the 2 previous studies,^{13,14} some fraction of the sexually intact cats likely consisted of kittens that were too young to have been neutered at the time of the survey. In the present study, 12 of the 67 households that reported having at least 1 sexually intact cat indicated some variation of too young as their sole reason for not having their cats neutered. When these 12 households, which accounted for 15 cats, were excluded from the analysis, the percentage of neutered cats in the present study increased slightly from 80.0% to 81.2%.

Of the demographic factors examined in the present study, annual family income was the best predictor of neuter status. Whether neuter status was examined on the basis of cat-level or household-level data, cats in households with annual family incomes < \$35,000 were significantly less likely to be neutered than were cats in households in the 2 higher-income groups. Cats in households with respondents between 18 and 39 years old were significantly less likely to be neutered than were cats in households with respondents \geq 60 years old, but respondent age was a much weaker predictor of neuter status than was annual family income.

To our knowledge, only a single previous study¹⁶ examined the effect of annual family income on neuter status of cats; this study was conducted in 1994 and was limited to a single county in Indiana. In that study, neuter status was also associated with annual family income, in that all cats were neutered in 76.9% of households with annual family incomes < \$20,000, compared with 89.9% of households with annual family incomes \geq \$20,000.

In the present study, annual family income was significantly associated with source of household cats, and differences in cat source could potentially explain some, but not all, of the differences in neuter status among family income groups. For example, households that obtained at least 1 cat from a friend or family member or as a stray were significantly more likely to have at least 1 sexually intact cat than were households that had not obtained any of their cats from these sources. In addition, households that obtained at least 1 cat from an animal pound or shelter were significantly less likely to have any sexually intact cats than were households that had not obtained any cats from a pound or shelter. On the other hand, even after controlling for source of cats, cats in households with annual family incomes < \$35,000 were significantly less likely to be neutered than were cats in households in the 2 higher-income groups.

The association between neuter status and annual family income group in the present study could not be explained by differences in attitudes toward neutering, as survey respondents in the lowest family income group who reported having neutered cats gave the same reasons for having had their cats neutered as did respondents in the other 2 family income groups.

Importantly, information in the present study pertains only to cats living in households in the continental United States. Household cats represent only a part of the total national cat population, and various studies^{17,18} have estimated that stray and feral cats produce approximately 80% of the kittens born each year and that there may be as many stray and feral cats in the United States as there are cats living in households. Thus, any attempts to increase the proportion of neutered cats in the United States must include stray and feral cats.

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- a. Copies of the survey are available from the authors on request.
b. Stata for Windows, version 10, Intercooled Stata Corp, College Station, Tex.
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