

# West Highland White Terrier

## Health Survey

### Final Report

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For the

Health Committee

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## INTRODUCTION

The primary purpose of this study was to determine the prevalence of several diseases in West Highland White Terriers (WHWT) by means of an anonymous survey distributed by mail to owners and breeders. Secondary objectives included determination of the occurrence of other conditions among WHWT as reported by owners, determining characteristics of these respondents, and comparison of disease prevalences between several dog and owner demographic groups.

## METHODS

### Survey Design And Administration

The survey instrument was designed by the Health Committee of the West Highland White Terrier Club of America based on a 100 item prototype provided by the American Kennel Club. The final survey contained a list of 14 targeted diseases. The list was developed by a consensus of Health Committee members, with the advice of Dr. Padgett.

The sample frame included all members of the national club and members of many regional clubs. In addition, a 25 percent random sample was also selected from a list of all individuals who had registered a WHWT with the AKC between 1995 and 1998.

Copies of the survey along with detailed instructions, including definitions of the 14 targeted diseases and common pseudonyms, were mailed to approximately 5400 homes, along with a stamped self-addressed return envelope. Follow-up mailings to non-responders were not conducted, as no effort was made to track returns. This was the result of a decision to make the surveys completely anonymous in an effort to increase response rates and the validity of reported information.

### Data Collection

Completed surveys were forwarded to an independent collection center and results were entered into a Microsoft Access™ database. Extensive error checking was built into the program and comprehensive written instructions were provided to the data entry team. Data entry personnel were required to verify inconsistencies when they appeared, but to enter the data as found on the survey. These records were flagged for later review. Respondent entries under "other" were entered exactly as found, as data entry personnel had no medical knowledge with which to interpret the information.

### Data Cleaning

The data were forwarded to the analyst as Access data tables. Extensive range checking was performed within Access, and a sample of data records was checked against the original surveys to confirm the accuracy of data entry. Dog ages—at the time of the survey or time of death—were calculated by subtracting the BirthDate from either the Date Entered field or the DeathDate, as needed. Onset ages for each disease were calculated by combining the OnsetYears, OnsetMonths, and OnsetWeeks fields. A new variable, "Layprof," was created by combining the Self, Breeder, Vet, and Specialist fields, where Layprof equaled 0 for Self or Breeder and 1 for Vet or Specialist. Layprof was coded 1 whenever the Vet or Specialist fields were checked, regardless of whether the Self or Breeder fields were also checked. Some targeted disease responses were clearly inappropriate for deafness and juvenile cataracts, where the onset ages exceeded those specified in the survey instructions. These were recoded. "Other" responses were reviewed for targeted diseases, and when found, were recoded as targeted conditions. The remainder were grouped according to organ system with the exception of all cancers, which were placed in the same category without regard to organ system.

### Data Analysis

Ultimately, a working dataset was created by exporting the data to STATA™, a standard statistical analysis program. Simple descriptive statistics were calculated for each variable in the dataset. Where appropriate, subgroups were determined and hypotheses tested using the applicable statistical tests. Statistical analyses were performed for the targeted disease data, but not for the additional disease data.

A note on statistical tests: these are used to test a statistical hypothesis, for instance that there is no difference in the distributions of litters bred between owner categories. In general, these tests arrive at a “p-value” which assesses whether a result as large or larger than what was observed could have been obtained by chance alone. Generally, scientists have adopted  $p = 0.05$  as a cut point. P-values smaller than this figure indicate a statistically significant difference, meaning chance probably had minimal impact. However, statistical tests are not only impacted by the differences being measured, but also by sample size. For these data, the large numbers present in the data set will have a dramatic impact on any statistical significance tests. The chi-square statistic, in particular, is highly influenced by sample size. The Cramer’s V statistic was designed by statisticians to account for the impact of sample size on the chi-square and to assess the magnitude of the associations between two factors. The Cramer’s V can range from 0 to 1, with 1 indicating an extraordinarily strong association. In addition, 95 percent confidence intervals were calculated for most percentages, due to the uncertainty associated with estimates obtained from only a sample of the entire population. These figures represent the range around each estimate in which the true value is expected to be found.

## RESPONSE RATE

Table 1 shows a total of 5,411 surveys were distributed, of which 1538 were returned for an overall response rate of 27.1 percent. Of these, approximately 64 percent of the total (980 surveys) were from the general ownership category, 32 percent (489 surveys) were returned by members of the national and various regional clubs, and 69 surveys were unsolicited. The latter were not considered in calculating the overall response rate. However, in most later analyses, these were combined with the 980 surveys from the general owner category, except where noted.

**Table 1. Response rate by ownership category.**

SourceID	Description	Number Received	Percent of Total	Number Sent	Percent Received
1	General	980	63.7	3858	25.4
2	Member	489	31.8	1553	31.5
4	Supplemental	69	4.5		
	Overall	1538	100.0	5411	27.1

## OWNER INFORMATION

The 1538 respondents were asked to provide information on the number of litters they had bred since January 1, 1993, to list the three diseases most important to the breed, and also offered a chance to attach comments if desired.

The number of litters bred by respondents are summarized in table 2. By far, the vast majority of respondents—1186 or 77.1 percent—reported they had not bred a litter. In decreasing order, those reporting they had bred litters were classified as “Seldom,” 1 to 4 litters ever bred; “Hobbyists,” 5 to 10 litters ever bred; or “Professionals,” more than 10 litters ever bred. A large number of respondents (9.8 percent) provided no information on the number of litters they had ever bred.

**Table 2. Summary of litters bred reports.**

LittersID	Description	Number	Percent
0	Missing	150	9.8
1	None	1186	77.1
2	Seldom	148	9.6
3	Hobbyist	33	2.1
4	Professional	21	1.4
	Overall	1538	100.0

The litters ever bred information is presented by ownership category in table 3. Among the general ownership group (includes general category plus supplemental responses) 82.6 percent reported they had never bred a litter as opposed to only 65.4 percent from the members category. The results were highly statistically significant, although a further statistical test suggested only a weak association between the distribution of owners reporting they had never bred a litter and category of membership (chi-square = 60.93, p = 0.00, Cramer's V = 0.21).

**Table 3. Litters bred by ownership category.**

	Litters	Number	Percent
General	Missing	91	8.7
	None	866	82.6
	Seldom	73	7.0
	Hobbyist	10	1.0
	Professional	9	0.9
	Overall	1049	100.0
Member	Missing	59	12.1
	None	320	65.4
	Seldom	75	15.3
	Hobbyist	23	4.7
	Professional	12	2.5
	Overall	489	100.0

Respondents were also asked to list the top three diseases in order of importance to the breed. The results for the "Top 10" conditions based on survey responses are presented in table 4. (Note there are actually 14 conditions listed in the table in order to obtain 10 conditions across the three choice categories). The overall rank for each targeted disease was determined by averaging the scores for each disease across the three choice categories.

**Table 4. Respondent's Disease Rankings in Order of Importance.**

Disease ID	Disease Name	Ranking			Overall
		First	Second	Third	
3	Atopic Dermatitis	1	1	1	1
5	CMO	2	4	3	2
1	Addison's	3	8	8	6
13	Pulmonary Fibrosis	4	5	2	3

4	Copper Toxicosis	5	2	5	4
11	Legg Perthes	6	2	4	4
25	Allergies	7	13	15	11
2	Aggression	8	6	7	7
7	Diabetes	9	7	9	8
21	Cancer	10	16	13	14
8	Dry Eye	11	9	12	10
14	White Shaker Syndrome	12	12	5	9
12	Luxated Patella	14	10	11	12
9	Globoid Cell Leukodystrophy	16	11	10	13

Atopic dermatitis was the most commonly cited disease for each choice category—whether first, second, or third. Overall, CMO was ranked second in importance, followed by pulmonary fibrosis, copper toxicosis and Legg-Perthes (tied for fourth), Addison’s disease, aggression, diabetes, white shaker syndrome, and dry eye. Allergies, luxated patella, Globoid Cell Leukodystrophy, and cancer complete the table.

There were comments included with 690 (approximately 45 percent) of the surveys. These are loosely summarized in table 5, where the results of keyword searches on the database memo field are presented. These findings should be interpreted with caution, since the context within which these keywords are used cannot be predicted by the Microsoft Access™ queries written. For example, the query would count “aggressive dog” as well as “aggressive breed improvement program,” when the search term “aggressive” was used. Regardless, similar terms have been grouped together in table 5. Keywords containing a “\*,” or wildcard, were used to account for various combinations of the same root word. For instance, allerg\* was used to find records containing allergy, allergies, and allergic.

Dermatologic conditions were frequently mentioned, with the words “skin” and “dermatitis” appearing often. The term “ear” was also commonly found, suggesting that otitis externa was frequently mentioned. Some keyword root words were also used—such as “allerg\*” for allergy and allergies and “aggress\*” for both aggressive and aggression. Both words were commonly encountered among the respondents’ comments. The terms “disposition” and “temperament” were also found, but at a lesser frequency. None of the behavior terms are readily interpretable since the computer algorithm is unable to distinguish between good or bad behaviors. Specific diseases were often mentioned, among them, Addison’s disease, CMO, cancer or tumors, cleft palate, and cataracts. A word search was also made for different organs. Hits for ‘ear’, “eye,” and “heart” were most often found, followed by “stomach,” “liver,” and “bladder.”

**Table 5. Results of Comments Field Disease Keyword Search.**

Search Term	Count	Search Term	Count
Skin	95	Bladder	6
Dermatitis	35	Cataract	9
		Liver	13
Allerg*	90	Stomach	17
Atopy	14	Ear	68
		Eye	27
Aggress*	39	Heart	27
Temperament	13	Patella	9
Disposition	13	Stone	3
Cancer	24	Flea	21
Tumor	5		
		Breeding	43
CMO	32	Genetic	21
Cleft P*	6	Uter*	19

A.D., AD	78	Whelp	4
Addi*	16	Pregnancy	2
Legg P*	13	Fertil*	0
		Steril*	1

Conditions related to reproduction were found, though not too commonly. The search term “breeding” was found most often, followed by “genetic,” “uter\*,” and many fewer mentions of “whelp\*,” “pregnan\*,” “fertil\*,” and “steril\*.”

These findings might lead the reader to conclude owners contributed largely negative comments. However, a quick review of the surveys suggested this was not the case. The results of keyword searches for positive terms are included in table 6.

**Table 6. Results of Comments Field Positive Keyword Search.**

Search Term	Count
Healthy	130
Love	96
Wonderful	52
Happy	37
Excellent	20
Perfect	15
Friendly	14
Affectionate	8

By far, the most common term in this group was “healthy,” followed by “love,” “wonderful,” “happy,” and “excellent.” Less commonly encountered terms included “friendly,” “affectionate,” “kind,” “lovable,” and “adorable.”

Many positive remarks about the survey and the efforts of the club to improve the breed were seen. A few negative comments about the survey itself were found. These mainly concerned the lack of detailed disease information in the survey instructions, the brevity of the survey (several respondents felt it should be much more extensive), and the failure to include genetic conditions, reproductive problems, and cancer as specific focus areas.

There were 2773 dog records submitted by the 1538 respondents as shown in table 7, which provides the numbers and percentages of dogs reported on by total dogs and membership category. Note that 17, 9, and 1 general, member, and supplemental category respondents, respectively, listed no dog information on their surveys. General owners tended to report on only a single dog (66.2 percent). In fact, over 95 percent of general owners reported on three dogs or less, while only 86.5 percent of member owners reported on three dogs or less. The maximum number of dogs recorded per respondent was 23.

**Table 7. Number of Dog Records Reported by Owner Category.**

Total Dogs Reported	General		Member		Supplemental		Total Responses	Number of Dogs
	Number	Percent	Number	Percent	Number	Percent		
0	17	0.0	9	0.0	1	0.0	27	0
1	649	66.2	164	33.5	39	56.5	852	852
2	212	21.6	135	27.6	21	30.4	368	736
3	82	8.4	124	25.4	7	10.1	213	639
4	3	0.3	13	2.7	0	0.0	16	64
5	9	0.9	12	2.5	1	1.4	22	110
6	4	0.4	9	1.8	0	0.0	13	78
7	0	0.0	7	1.4	0	0.0	7	49
8	1	0.1	1	0.2	0	0.0	2	16



9	0	0.0	4	0.8	0	0.0	4	36
10	0	0.0	2	0.4	0	0.0	2	20
11	1	0.1	2	0.4	0	0.0	3	33
12	0	0.0	2	0.4	0	0.0	2	24
13	1	0.1	0	0.0	0	0.0	1	13
14	0	0.0	1	0.2	0	0.0	1	14
15	0	0.0	2	0.4	0	0.0	2	30
16	0	0.0	1	0.2	0	0.0	1	16
20	0	0.0	1	0.2	0	0.0	1	20
23	1	0.1	0	0.0	0	0.0	1	23
Overall	980	100.0	489	100.0	69	100.0	1538	2773

On average, club members, as shown in table 8, reported owning 2.17 dogs, while those from the general category reported on an average of only 1.32 dogs. The difference between these means was highly statistically significant ( $t = 9.33, p = 0.00$ ). The maximum number of dogs reported on, 23, was reported by an owner from the general ownership category.

**Table 8. Average Number of Dog Records by Owner Category.**

Source	Number	Average	SD	Min	Max
General	1049	1.32	1.20	0	23
Member	489	2.17	2.37	0	20
Overall	1538	1.84	1.64	0	23

**DOG INFORMATION**

Respondents were asked to complete surveys for all dogs that currently reside with them, and any they had lost since January 1, 1993. Survey information was returned for 2773 dogs. The vital status of these animals is shown in table 9.

**Table 9. Vital Status of Surveyed Dogs.**

Source	Dead		Alive	
	Number	Percent	Number	Percent
General	143	8.4	1562	91.6
Member	191	13.6	1211	86.4
Overall	334	10.7	2773	89.3

Roughly eleven percent of the dogs were reported to be deceased at the time of the survey. These figures varied slightly depending on whether respondents belonged to the general or member owner categories. This result was highly statistically significant (chi-square = 21.99,  $p = 0.00$ ) but vital status lacked any association with owner category (Cramer's  $V = -0.08$ ).

Among those reported dead at the time of the survey, the average age of both males and females was around ten years as shown in table 10. The difference in age at death between males and females was not statistically significant ( $t = 0.30$ ,  $p = 0.76$ ). The oldest dog was seventeen when it died and the youngest died at birth.

**Table 10. Ages of Deceased Dogs.**

Sex	Number	Average	SD	Youngest	Oldest
Unknown	13	9.92	5.47	1	17
Female	192	10.11	4.31	0	17
Male	129	9.95	5.04	0	17
Overall	334	10.04	4.64	0	17

For all dogs, the average ages at the time of death or at the time of the survey are included in table 11. The average age of member's dogs, 7.21 years, was 1.6 times that of all other respondents, although the age ranges (0 to 19 and 0 to 21 years, respectively) were similar. The age difference between dogs from the two ownership groups was statistically significant ( $t = -18.80$ ,  $p = 0.00$ ), but this information is meaningless given the different sampling periods between the two ownership groups.

**Table 11. Average Ages of Surveyed Dogs.**

Source	Number	Average	SD	Youngest	Oldest
General	1562	4.45	3.34	0	21
Member	1211	7.16	4.40	0	19
Overall	2773	5.62	4.07	0	21

The sex distributions of the dogs reported on by respondents are shown in table 12. The majority were female, although a large proportion had no gender indicated. Members reported having fewer males (36.7 percent) than did all other respondents (44.9 percent). The difference in the sex distributions of dogs reported on by the ownership groups was statistically significant (chi-square = 21.48, p = 0.00), but the magnitude of the association between sex and ownership group was negligible (Cramer's V = 0.09).

**Table 12. Sex distributions of Surveyed Dogs.**

Source	Male		Female		Unknown	
	Number	Percent	Number	Percent	Number	Percent
General	701	44.9	773	49.5	88	5.6
Member	445	36.7	707	58.4	59	4.9
Overall	1146	41.3	1480	53.4	147	5.3

Table 13 groups average dog ages by sex and ownership category. Club members tended to have dogs of higher average ages, regardless of sex. This result was statistically significant for both males (t = -11.12, p = 0.00) and females (t = -14.32, p = 0.00). However, as pointed out previously, this finding cannot be interpreted given the sampling restrictions for general owners. Within ownership categories, females tended to have the same average ages as males, and any differences were not statistically significant whether for club members (t = 1.09, p = 0.27) or other respondents (t = 0.00, p = 1.0000). Regardless of ownership category, females had higher maximum reported ages than males.

**Table 13. Average Ages of Surveyed Dogs by Sex and Ownership.**

	Sex	Number	Average	SD	Youngest	Oldest
General	Missing	88			1	14
	Female	773	4.45	3.28	0	21
	Male	701	4.45	3.42	0	17
	Overall	1562	4.45	3.34	0	21
Member	Missing	59			1	17
	Female	707	7.29	4.32	0	19
	Male	445	7.00	4.51	0	19
	Overall	1211	7.20	4.39	0	19

**TARGETED DISEASES**

Over half (59.4 percent) of the dogs had none of the targeted diseases reported. For the remainder, 30 percent had a single disease reported, and slightly over 10 percent had two or more diseases checked.

Table 14 contains responses for all 2773 dogs for the 14 targeted diseases, along with rankings by the frequency of positive responses. These have been adjusted for incorrect responses; that is, positive responses for dogs with either deafness that were older than 6 months of age at the time of onset, or juvenile cataracts that were older than five years were dropped from these two disease totals. Overall 2.7 percent of the responses were positive, with a high of 15.5 percent yes for atopic dermatitis to a low of 0.1 percent for globoid cell leukodystrophy. Confidence intervals are included with each percentage because the results are based on a sample and there is uncertainty associated with each measure. The confidence interval reflects the range around each estimate in which the true answer can be expected to be found 95 percent of the time. Thus, the “true” answer for atopic dermatitis likely lies somewhere between 14.2 and 16.8 percent with 95 percent certainty.

Dog records marked as inconsistent—having a disease onset age greater than the actual dog age, for example—comprised only 2.6 percent (or 72) of the total records. The targeted disease prevalences were essentially the same whether corrections for records with inconsistent entries were applied or not. In addition, the rank order of disease reports from most to least common did not change when inconsistent records were excluded. Therefore adjustments for inconsistent records were not performed in order to retain as many records as possible in the final analysis.

**Table 14. Prevalence of Targeted Diseases Among Surveyed Dogs.**

Disease ID	Disease Name	No	Yes	% Yes (95% CI)	Rank
1	Addison's Disease	2738	35	1.3 (0.8 - 1.7)	8
2	Aggression	2632	141	5.1 (4.2 - 5.9)	2
3	Atopic Dermatitis	2343	430	15.5 (14.2 - 16.8)	1
4	Copper Toxicosis	2754	19	0.7 (0.4 - 1.0)	11
5	CMO	2730	43	1.6 (1.1 - 2.0)	6
6	Deafness	2769	4	0.1 (0.0 - 0.3)	13
7	Diabetes	2737	36	1.3 (0.9 - 1.7)	8
8	Dry Eye	2697	76	2.7 (2.1 - 3.3)	4
9	Globoid Cell Leukodystrophy	2769	4	0.1 (0.0 - 0.3)	13
10	Juvenile Cataracts	2757	16	0.6 (0.3 - 0.9)	12
11	Legg Perthes	2727	46	1.7 (1.2 - 2.1)	5
12	Luxated Patella	2662	111	4.0 (3.3 - 4.7)	3
13	Pulmonary Fibrosis	2733	40	1.4 (1.0 - 1.9)	7
14	White Shaker Syndrome	2737	36	1.3 (0.9 - 1.7)	8
Total		37785	1037	2.7 (2.6 - 2.9)	

Table 15 lists the onset ages for each of the targeted conditions calculated by combining the reported years, months, and weeks data for each dog record. Average onset ages ranged from 0.5 years (6 months) for deafness to 8.23 years for diabetes. The oldest onset age, 15.51 years, was recorded for diabetes.

**Table 15. Average Onset Ages for Targeted Diseases Among Surveyed Dogs.**

Disease Name	Number	Average	SD	Min	Max
Addison's	35	3.58	3.57	0	13.25
Aggression	141	1.63	1.84	0	13.00
Atopic Dermatitis	430	2.48	2.64	0	15.00
Copper Toxicosis	19	6.33	3.81	0	12.00
CMO	43	1.15	2.73	0	12.00
Deafness	4	0.5	1.00	0	2.00
Diabetes	36	8.23	3.70	0	15.51
Dry Eye	76	4.74	3.59	0	14.00
Globoid Cell Leukodystrophy	4	3.61	6.27	0.23	13.00
Juvenile Cataracts	16	2.34	1.68	0	5.00
Legg Perthes	46	1.67	2.46	0	12.00
Luxated Patella	111	2.83	2.81	0	12.00
Pulmonary Fibrosis	40	7.95	4.67	0	14.00
White Shaker Syndrome	36	2.57	3.22	0	14.00
Total	1037	3.00	3.34	0	15.51

Onset ages for targeted conditions were also grouped by quartiles of onset age with results presented in table 16. Onset ages for atopic dermatitis were evenly distributed across each of the age groups. A similar pattern was seen for luxated patella. The onset ages reported for aggression were much less common in dogs ages five and older. On the other hand, dry eye became increasingly common in each advancing age group. Onset ages were more commonly reported for younger dogs with CMO, deafness, globoid cell leukodystrophy, and more commonly for older dogs for copper toxicosis, diabetes, and pulmonary fibrosis. Taken all together, onset ages are evenly distributed across each age group.

**Table 16. Onset Age Groups (In Years) For Targeted Diseases.**

Disease Name	Total	<0.68		0.68-1.99		2.00-4.99		5.00+	
		N	%	N	%	N	%	N	%
Addison's	35	5	14.3	10	28.6	12	34.3	8	22.9
Aggression	141	41	29.1	50	35.5	39	27.7	11	7.8
Atopic Dermatitis	430	90	20.9	121	28.1	141	32.8	78	18.1
Copper Toxicosis	19	1	5.3	2	10.5	6	31.6	10	52.6
CMO	43	34	79.1	5	11.6	1	2.3	3	7.0
Deafness	4	4	100.0	0	0.0	0	0.0	0	0.0
Diabetes	36	4	11.1	0	0.0	1	2.8	31	86.1
Dry Eye	76	11	14.5	6	7.9	24	31.6	35	46.1
Globoid Cell Leukodystrophy	4	2	50.0	1	25.0	0	0.0	1	25.0
Juvenile Cataracts	16	3	18.8	3	18.8	10	62.5	0	0.0
Legg Perthes	46	25	54.3	11	23.9	5	10.9	5	10.9
Luxated Patella	111	23	20.7	28	25.2	33	29.7	27	24.3
Pulmonary Fibrosis	40	8	20.0	1	2.5	0	0.0	31	77.5
White Shaker Syndrome	36	7	19.4	11	30.6	13	36.1	5	13.9
Total	1037	257	24.8	249	24.0	285	27.5	246	23.7

Targeted disease reports are grouped by sex in table 17. The rankings by frequency were fairly consistent between the sexes, except for aggression, which was found to be nearly twice as common among males (ranked second) than females (ranked third). The proportions of yes answers for each sex were similar except for aggression, atopic dermatitis, diabetes, and overall, where statistically significant differences were noted. However, the Cramer's V statistics computed for each of these targeted conditions suggested only negligible associations between the prevalence of these targeted diseases and sex.

**Table 17. Targeted Diseases by Sex.**

Disease Name	Female				Male			
	No	Yes	% Yes (95% CI)	Rank	No	Yes	% Yes	Rank
Addison's	1601	26	1.6 (1.0 – 2.2)	8	1137	9	0.8 (0.3 – 1.3)	9
Aggression	1567	60	3.7 (2.8 – 4.6)	3	1062	81	7.1 (5.6 – 8.6)*	2
Atopic Dermatitis	1411	216	13.3 (11.6 – 14.9)	1	932	214	18.7 (16.4 – 20.9)*	1
Copper Toxicosis	1614	13	0.8 (0.4 – 1.2)	11	1140	6	0.5 (0.1 – 0.9)	11
CMO	1604	23	1.4 (0.8 – 2.0)	9	1126	20	1.7 (1.0 – 2.5)	5
Deafness	1626	1	0.1 (0.0 – 0.2)	13	1144	3	0.3 (0.0 – 0.6)	13
Diabetes	1600	27	1.7 (1.0 – 2.3)	6	1137	9	0.8 (0.3 – 1.3)*	9
Dry Eye	1576	51	3.1 (2.3 – 4.0)	4	1121	25	2.2 (1.3 – 3.0)	4
Globoid Cell Leukodystrophy	1625	2	0.1 (0.0 – 0.3)	13	1144	2	0.2 (0.0 – 0.4)	14
Juvenile Cataracts	1617	11	0.7 (0.3 – 1.1)	12	1141	5	0.4 (0.0 – 0.8)	12
Legg Perthes	1595	32	2.0 (1.3 – 2.6)	5	1132	14	1.2 (0.6 – 1.9)	7
Luxated Patella	1564	63	3.9 (2.9 – 4.8)	2	1098	48	4.2 (3.0 – 5.4)	3
Pulmonary Fibrosis	1600	27	1.7 (1.0 – 2.3)	6	1133	13	1.1 (0.5 – 1.7)	8
White Shaker Syndrome	1606	21	1.3 (0.7 – 1.8)	10	1131	15	1.3 (0.6 – 2.0)	6
Total	22206	573	2.5 (2.3 – 3.8)		15578	464	2.9 (2.6 – 3.2)*	

\*p < 0.05, ratio of females to males.

Table 18 categorizes average onset ages by sex for each of the targeted diseases. Females, on average, developed atopic dermatitis at an older age than males. However, although the age difference was statistically significant (t = 2.21, p = 0.03), the practical significance of a 2.76 year average for females compared to a 2.2 year average for males is debatable. There was no testable difference in onset ages reported for the 4 dogs with congenital deafness, although the prevalence among males was three times that of females. The onset ages for diabetes were also statistically significantly different between females and males and might warrant further study, especially given the higher prevalence of this condition reported in females (table 17).

**Table 18. Average Onset Ages By Sex For Targeted Diseases.**

Disease Name	Females					Males					Statistics	
	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max	t-test	p-value
Addison's	26	3.82	3.67	0	13.3	9	2.89	3.36	0	9	0.67	0.51
Aggression	60	1.52	2.31	0	13	81	1.71	1.4	0	7	-0.61	0.55
Atopic Dermatitis	216	2.76	2.83	0	15	214	2.2	2.4	0	11	2.21	0.03
Copper Toxicosis	13	6.22	3.86	0	12	6	6.59	4.05	1.51	12	-0.19	0.85
CMO	23	1.51	3.25	0.11	12	20	0.74	1.96	0	9	0.92	0.36
Deafness	1	0		0	0	2	0	0	0	0	--	--
Diabetes	27	8.96	3.27	0	15.5	9	6.06	4.23	0	12	2.04	0.04
Dry Eye	51	4.6	3.72	0	14	25	5.01	3.39	0	11	-0.46	0.64
Globoid Cell Leukodystrophy	2	6.84	8.71	0.68	13	2	0.37	0.2	0.23	0.51	1.05	0.40
Juvenile Cataracts	10	2.35	1.37	0	4	5	1.8	2.05	0	4	0.62	0.54
Legg Perthes	32	1.96	2.80	0.34	12	14	1.01	1.26	0	5	1.21	0.23
Luxated Patella	63	2.72	2.66	0	9	48	2.99	3.02	0	12	-0.50	0.62
Pulmonary Fibrosis	27	8.26	4.45	0	14	13	7.31	5.22	0	13	0.60	0.55
White Shaker Syndrome	21	2.8	3.19	0	12	15	2.26	3.33	0	14	0.49	0.63
Total	572	3.38	3.62	0	15.51	463	2.52	2.9	0	14	4.15	0.00

Although the sampling constraints limit the inferences that can be made about longevity, the same should not hold true for disease onset ages. Here, the onset ages may yield valuable clues about the etiologies of some of the diseases, whether congenital or acquired.

Table 19 contains targeted disease reports by owner category. Overall, club members and other respondents reported similar percentages of targeted diseases (2.7 vs. 2.6 percent, respectively). Club members reported significantly less aggression than did general category respondents (3.5 vs. 6.4 percent), but significantly more copper toxicosis, diabetes, dry eye, and pulmonary fibrosis. Regardless, the low Cramer's V values for each of these contrasts indicates the presence of targeted diseases is not strongly associated with membership category even though statistically significant differences were observed.

**Table 19. Targeted Diseases by Owner Category.**

Disease Name	General			Member		
	No	Yes	% Yes (95% CI)	No	Yes	% Yes (95% CI)
Addison's	1540	22	1.4 (0.8 – 2.0)	1198	13	1.1 (0.5 – 1.7)
Aggression	1462	100	6.4 (5.2 – 7.6)	1170	41	3.4 (2.4 – 4.4)*
Atopic Dermatitis	1318	245	15.7 (13.9 – 17.5)	1026	185	15.3 (13.2 – 17.3)
Copper Toxicosis	1556	6	0.4 (0.0 – 0.7)	1198	13	1.1 (0.5 – 1.7)*
CMO	1541	21	1.3 (0.8 – 1.9)	1189	22	1.8 (1.1 – 2.6)
Deafness	1560	2	0.1 (0.0 – 0.3)	1210	2	0.2 (0.0 – 0.4)
Diabetes	1553	9	0.6 (0.2 – 1.0)	1184	27	2.2 (1.4 – 3.1)*
Dry Eye	1527	35	2.2 (1.5 – 3.0)	1170	41	3.4 (2.4 – 4.4)
Globoid Cell Leukodystrophy	1560	3	0.2 (0.0 – 0.4)	1210	1	0.1 (0.0 – 0.2)
Juvenile Cataracts	1552	10	0.6 (0.2 – 1.0)	1205	6	0.5 (0.1 – 0.9)
Legg Perthes	1537	25	1.6 (1.0 – 2.2)	1190	21	1.7 (1.0 – 2.5)
Luxated Patella	1500	62	4.0 (3.0 – 4.9)	1162	49	4.0 (2.9 – 5.2)
Pulmonary Fibrosis	1548	14	0.9 (0.4 – 1.4)	1185	26	2.1 (1.3 – 3.0)*
White Shaker Syndrome	1539	23	1.5 (0.9 – 2.1)	1198	13	1.1 (0.5 – 1.7)
Total	21293	577	2.6 (2.4 – 2.9)	16495	460	2.7 (2.5 – 3.0)

\* p < 0.05, ratio of general owners to club members.

Source of diagnosis information was grouped into two categories, “lay” and “vet.” The former included the categories self and breeder and the latter veterinarian and specialist. When both lay and vet-type boxes were checked on the survey, the record was considered vet. Table 20 shows the source of diagnosis for each of the targeted diseases on the survey. Overall, nearly 81 percent of the reported diseases were diagnosed by a veterinarian. The notable exception was aggression, which was more frequently diagnosed by owners or breeders. In addition, nearly ten percent of dog records were missing source of diagnosis information, which explains why the totals differ in table 20.

**Table 20. Source Of Diagnosis For Targeted Diseases.**

Disease Name	Number	Lay	% Lay	Vet	% Vet
Addison's	32	5	15.6	27	84.4
Aggression	122	91	74.6	31	25.4
Atopic Dermatitis	400	48	12.0	352	88.0
Copper Toxicosis	17	1	5.9	16	94.1
CMO	42	2	4.8	40	95.2
Deafness	3	1	33.3	2	66.7
Diabetes	33	2	6.1	31	93.9
Dry Eye	68	5	7.4	63	92.6
Globoid Cell Leukodystrophy	3	0	0.0	3	100.0
Juvenile Cataracts	15	1	6.7	14	93.3
Legg Perthes	44	5	11.4	39	88.6
Luxated Patella	104	5	4.8	99	95.2
Pulmonary Fibrosis	35	3	8.6	32	91.4
White Shaker Syndrome	32	12	37.5	20	62.5
Total	950	181	19.1	769	80.9



Table 21 shows the percent of records with a vet diagnosis by owner category. Members were significantly more likely than others to report a veterinary diagnosis for Addison's disease (chi-square = 4.05, p = 0.04) and the magnitude of this association was moderate (Cramer's V = 0.36). No significant differences were noted for other targeted diseases, which indicates the percentages of veterinary diagnoses were equivalent in each owner category.

**Table 21. Source of Diagnosis By Ownership Category For Targeted Diseases.**

Disease Name	General				Member			
	N	Lay	Vet	% Vet (95% )	N	Lay	Vet	% Vet (95% CI)
Addison's	19	5	14	73.7 (51.9 – 95.5)	13	0	13	100.0*
Aggression	89	68	21	23.6 (14.6 – 32.6)	33	23	10	30.3 (13.8 – 46.9)
Atopic Dermatitis	228	28	200	87.7 (83.4 – 92.0)	172	20	152	88.4 (83.5 – 93.2)
Copper Toxicosis	5	0	5	100.0	12	1	11	91.7 (73.3 – 100)
CMO	21	0	21	100.0	21	2	19	90.5 (76.8 – 100)
Deafness	1	1	0	0.0	2	0	2	100.0
Diabetes	7	0	7	100.0	26	2	24	92.3 (81.3 – 100)
Dry Eye	32	4	28	87.5 (75.4 – 99.6)	36	1	35	97.2 (91.6 – 100)
Globoid Cell Leukodystrophy	2	0	2	100.0	1	0	1	100.0
Juvenile Cataracts	9	0	9	100.0	6	1	5	83.3 (40.5 – 100)
Legg Perthes	24	3	21	87.5 (73.2 – 100)	20	2	18	90.0 (75.6 – 100)
Luxated Patella	59	4	55	93.2 (86.6 – 99.8)	45	1	44	97.8 (93.3 – 100)
Pulmonary Fibrosis	13	0	13	100.0	22	3	19	86.4 (70.8 – 100)
White Shaker Syndrome	21	8	13	61.9 (39.3 – 84.6)	11	4	7	63.6 (29.7 – 97.5)
Total	530	121	409	77.2	420	60	360	85.7

\* p < 0.05, ratio of general owners to club members.

**ADDITIONAL DISEASES**

In addition to the fourteen targeted diseases, owners were able to provide information on other health conditions experienced by their animals. Approximately 15 percent (419) of dog records contained a reported additional condition. Some of these were clearly targeted diseases, for example, "Addiston's disease." However, the majority represented various other diseases, conditions, and symptoms. For convenience sake, these were grouped into organ systems, with the exception of all cancers, which were grouped into a single category regardless of organ system of origin. A denominator cannot be applied to these data, as every respondent did not have the same opportunity to indicate whether their dog had cancer or ear infections, for instance, as they did with the targeted diseases. Therefore, these data are reported simply as raw numbers and ranked according to frequency as shown in table 22.

**Table 22. Additional Disease Responses Among Dogs Surveyed.**

System ID	System Name	Yes	Percent Yes	Rank
1	Cancer	89	21.2	1
2	Immune	66	15.8	3
3	Genitourinary	40	9.5	4
4	Gastrointestinal	88	21.0	2
5	Cardiovascular/Respiratory	37	8.8	5
6	Musculoskeletal	18	4.3	8
7	Organs of Special Sense	26	6.4	6
8	Endocrine	25	6.0	7
9	Integumentary	12	2.9	9
10	Neurobehavioral	9	2.1	10
11	Unclassifiable	8	1.9	11
	Total	418	100.0	

The most commonly identified system was cancer, closely followed by gastrointestinal. Immune system conditions may have included some atopic dermatitis cases, but these were described as "skin allergy" and couldn't necessarily be classified as atopy; they might just as easily have been flea allergy or contact dermatitis. The various other systems were represented with decreasing frequencies. Organs of special sense are conditions related to the eyes and ears. Less than 2 percent of the additional disease reports were unclassifiable according to system, but these were mostly of infectious origin (i.e. "yeast" or "staph").

Looking at the additional disease reports in more detail, 65 of the 89 cancer responses were generically labeled as "cancer" or "tumor." The most commonly cited gastrointestinal conditions were "stomach" or "stomach upset"-22, "inflammatory bowel disease"-14, "pancreatitis" or "pancreatic inhibition"-11, "irritable bowel"-8, and "liver problems"-8. For the immune system reports, 54 of 66 records were labeled "allergies" or "skin allergies," 5 were reported as "anaphylactic shock," and 4 were recorded as "asthma."

Few clear trends were found in the other systems with the exception of: genitourinary—19 were "kidney disease," cardiovascular/respiratory—17 were "heart disease" or "heart failure," musculoskeletal—6 were "arthritis," organs of special sense—16 were "ear problems," and endocrine—10 were "Cushing's disease."

The average onset ages for reported additional diseases are shown by system in table 23. The average onset ages ranged from approximately one and a half years for immune conditions to over eight years for cancer. The oldest onset age, 15 years, was reported for several systems. These findings should not be over-interpreted due to the heterogeneous grouping of different disease and symptom reports included in each system category. Note that the totals in tables 23, 24, and 26 are different from table 22 due to missing onset age data for 7 dog records.

**Table 23. Average Onset Ages for Additional Diseases.**

System Name	Number	Average	SD	Min	Max
Cancer	89	8.11	4.42	0	15
Immune	64	1.59	4.78	0	8
Genitourinary	37	6.41	5.54	0	15
Gastrointestinal	87	3.32	3.51	1	13.5
Cardiovascular/Respiratory	37	5.82	5.47	0	15
Musculoskeletal	18	2.50	3.46	0	11
Organs of Special Sense	26	3.56	3.51	0	13.4
Endocrine	25	6.59	4.79	0	14
Integumentary	11	1.9	2.99	0	10
Neurobehavioral	9	6.33	5.75	0	14
Unclassifiable	8	2.78	2.56	0	7
Overall	411	4.79	4.67	0	15

The onset ages are grouped in table 24 according to same scheme that was used for targeted diseases. As expected, the prevalence of cancer was quite low in younger dogs, and was highest in the oldest age group. Similar patterns were seen for the genitourinary, cardiovascular/ respiratory, endocrine, and neurobehavioral systems. The trend for increasing prevalence with age was less apparent for immune, musculoskeletal, and organs of special sense. The opposite pattern was seen for the integumentary system. Overall, a consistent increasing pattern of additional diseases reports was seen for each successive age group.

**Table 24. Onset Age Groups (In Years) For Additional Diseases.**

System Name	Total	<0.68		0.68-1.99		2.00-4.99		5.00+	
		N	%	N	%	N	%	N	%
Cancer	89	9	10.1	6	6.7	3	3.4	71	79.8
Immune	64	23	35.9	17	26.6	18	28.1	6	9.4
Genitourinary	37	10	27.0	1	2.7	6	16.2	20	54.1
Gastrointestinal	87	20	23.0	25	28.7	14	16.1	28	32.2
Cardiovascular/Respiratory	37	11	29.7	5	13.5	2	5.4	19	51.4
Musculoskeletal	18	7	38.9	4	22.2	4	22.2	3	16.7
Organs of Special Sense	26	5	19.2	3	11.5	10	38.5	8	30.8
Endocrine	25	2	8.0	2	8.0	8	32.0	13	52.0
Integumentary	11	6	54.6	2	18.2	2	18.2	1	9.1
Neurobehavioral	9	2	22.2	0	0.0	3	33.3	4	44.4
Unclassifiable	8	2	25.0	2	25.0	2	25.0	2	25.0
Overall	411	97	23.6	67	16.3	72	17.5	175	42.6

Additional disease reports are grouped by sex in table 25. The rankings by frequency were fairly consistent between the sexes except for cancer (ranked first for females and second for males), and the immune system (ranked first for males and third for females). In addition to ranking differences, the percentages of yes responses for females were dramatically higher than those for males for cancer, gastrointestinal, cardiovascular/respiratory, musculoskeletal, endocrine, integumentary, neurobehavioral, and all additional reports overall. These differences are likely influenced by the larger proportion of females included in the survey and should not be over-interpreted.

**Table 25. Additional Diseases By Sex.**

System Name	Female			Male		
	Yes	% Yes	Rank	Yes	% Yes	Rank
Cancer	57	64.0	1	32	36.0	2
Immune	28	42.4	3	38	57.6	1
Genitourinary	21	52.5	4	19	47.5	4
Gastrointestinal	56	63.6	2	32	36.4	2
Cardiovascular/Respiratory	21	56.8	4	16	43.2	5
Musculoskeletal	14	77.8	7	4	22.2	8
Organs of Special Sense	13	50.0	8	13	50.0	6
Endocrine	19	76.0	6	6	24.0	7
Integumentary	8	66.7	9	4	33.3	8
Neurobehavioral	7	77.8	10	2	22.2	10
Unclassifiable	6	75.0	11	2	25.0	10
Overall	250	59.8		168	40.2	

Table 26 shows the average onset for each sex for each system. There were substantial differences for many systems, but these cannot be interpreted without knowing more about the diseases which contributed to each system count.

**Table 26. Average Onset Ages By Sex for Additional Diseases.**

System Name	Females					Males				
	Number	Mean	SD	Min	Max	Number	Mean	SD	Min	Max
Cancer	57	8.00	4.74	0	15	32	8.30	3.84	0	14
Immune	28	1.94	1.91	0	7	36	1.31	1.64	0	8
Genitourinary	19	7.05	5.54	0	15	18	5.73	5.63	0	15
Gastrointestinal	56	3.84	3.67	0	13.51	31	2.39	3.04	0	11
Cardiovascular/Respiratory	21	4.60	4.33	0	12	16	7.41	6.48	0	15
Musculoskeletal	14	2.64	3.88	0	11	4	2	1.41	1	4
Organs of Special Sense	13	2.96	3.82	0	13.42	13	4.16	3.22	0	13
Endocrine	19	6.60	4.88	0	14	6	6.59	4.94	1.51	13
Integumentary	7	0.51	0.56	0	1.51	4	4.34	4.08	0.34	10
Neurobehavioral	7	6.93	6.11	0	14	2	4.21	5.36	0.42	8
Unclassifiable	6	2.88	2.86	0	7	2	2.5	2.12	1	4
Overall	247	4.96	4.69	0	15	164	4.52	4.65	0	15

## DISCUSSION

Determining disease prevalence is an important yet difficult part of any breed improvement program. Genetic conditions in particular need to receive attention. Various approaches towards screening for disease in dog populations have been tried with variable results. Screening individual animals prior to breeding has been used with some success to control hip dysplasia and retinal conditions.<sup>1</sup> This approach is likely to become more common as the genetic basis for more diseases is characterized and as the tools with which to study them are developed. In the mean time, health surveys have been commonly used to characterize the common diseases afflicting animal populations. These have taken several forms, including surveys of veterinarians and owners.<sup>1,2</sup> Previous health surveys presented in the veterinary literature have included either general health surveys,<sup>1,2</sup> or have been targeted towards specific conditions.<sup>3</sup>

Generally, response rates of at least 40 percent are considered necessary to obtain a representative sample of opinion, although it has been found that response rates to surveys have been declining over the years due to concerns about privacy and the negative influence of telemarketers. Compared to surveys conducted by other breed clubs, the response rate to this survey is on the lower end. In 1990, the response rate to a survey focused on Fanconi syndrome in Basenjis was reported to be 62 percent.<sup>3</sup> A high response rate was also obtained in 1988 from members of the Newfoundland Club of America.<sup>1</sup> Results comparable to this survey were obtained from members of the Old English Sheepdog (OES) Club (23 percent) and Bearded Collie Club (39 percent).<sup>1</sup> This is not to say that useful information cannot be obtained when response rates are low. Rather, low response rates effect how widely the findings of a study can be applied and indicate the degree of caution which should be used in interpreting the results.

Only a small percentage of dogs reported on in this survey had died. The overall figure, roughly 11 percent, was much less than that reported for OES (36 percent).<sup>2</sup> However, given the constraints placed on the respondents—that only dogs dying since 1993 be included—the difference between these figures cannot be interpreted. Regardless, the maximum lifespan reported in this study was 21 years, and from the records of deceased WHWT it can be estimated that 95 percent of dogs would be expected to be alive between the ages of 1 and 19 years, based on an average age of 10 years and an approximate standard deviation of 4.5 years. Among those dogs reported to have died, females lived significantly longer than males on average (10.11 vs. 9.95 years), but the practical significance of this finding is debatable.

Several other studies have found breeders tend to own more females than males, and such was the case here where a significantly higher proportion of females was owned by club members (58.4 percent) than by others (49.5 percent). The explanation has been advanced that breeders tend to retain more females for this purpose and they pass the males along to their clients.<sup>1</sup> This survey appears to suggest that such is the case for West Highland White Terrier breeders. Within ownership groups, the average ages for females and males were comparable, although the oldest reported ages were found for females. The significant difference in the ages of both males and females owned by members versus those from the general category cannot be interpreted given the knowledge that general owner survey respondents were sampled from the AKC rolls obtained from a limited time period.

In surveys of other breeds, varying proportions of dogs have had one or more disease reports: for OES the figure was 72 percent, Newfoundlands 63 percent, Irish Wolf Hounds 34 percent, and Basenjis 28 percent.<sup>1</sup> Among the WHWT surveyed, 40 percent were reported to have one or more of the 14 targeted diseases, a figure which falls approximately midway between those reported for these other breeds. The differences can be readily explained by differences in survey design and administration; from that used for OES, where many diseases and symptoms were included, to that for Basenjis, which focused on a single disease. The upshot is that these prevalence rates are not directly comparable across breeds due to differences in questionnaire design and administration.

Atopic dermatitis was the most prevalent disease reported by respondents, being noted in

approximately 15.5 percent of the WHWT in this survey, with an upper confidence limit of nearly 21 percent among males. Atopy is recognized as a heritable susceptibility, with dogs developing IgE-mediated Type I hypersensitivity reactions to aeroallergens.<sup>4</sup> This typically appears at an early age, and the disease is thought to be either equally common in males and females, or perhaps slightly more common in females.<sup>5</sup> WHWT are often mentioned as having a high prevalence of atopy in various published reports. In one recent investigation, conducted to determine if serum IgE concentrations can predict future atopy, the investigators found 66 percent of WHWT puppies had developed some type of skin disease by 3 years of age. In 46 percent, the disease was severe enough for veterinary care to be required, and atopic dermatitis was diagnosed in 25 percent of the puppies.<sup>6</sup> This figure is only slightly higher than that found in this study, and may reflect the fact this study focused on known atopic WHWT families.

The overall average onset age for atopic dermatitis reported in this study, 2.5 years, fits the range reported in the literature. However, there were significantly more males reported in this study to have atopy than females, which is at odds with previously published reports.

The content of this survey was not specific enough to pinpoint the types of aggression reported by respondents, but in general, aggression has been classified as towards human family members, toward unfamiliar people, towards other dogs in the household, or toward unfamiliar dogs.<sup>7</sup> However, social dominance is the presumptive motivation for aggression towards owners, family members, and other dogs in the household, leading to use of the term dominance-related aggression.<sup>8</sup> This has been reported in a wide variety of dog breeds, although WHWT have not been specifically mentioned. Dominance-related aggression is most frequently reported in young adult dogs (generally around two years of age), and is seen in both males and females, although more so among males. Among the WHWT in this survey, the average onset age for aggression was approximately one and a half years, and was largely confined to dogs less than 5 years of age. Aggression was nearly twice as likely to be reported for males than females, although aggression was still among the most common targeted diseases for females. Taken all together, these findings are consistent with the literature.

Medial patellar luxation is a common orthopedic problem of smaller dog breeds.<sup>9</sup> The origins of this condition are complex and poorly understood, but congenital or developmental malalignment of the quadriceps mechanism is thought to be a possible cause, although other defects in pelvic limb conformation are also considered likely. Regardless, a hereditary component is considered highly probable by most authors.<sup>10</sup> Females are believed to be more liable to develop the condition than males. The average onset age for luxated patella reported in this survey was around 3 years and was evenly distributed across each age category studied. The maximum onset age reported was 12 years, which suggests there might be some admixture of congenital with traumatic etiologies. The disease was reported slightly more often in males than females, but the significant overlap in their confidence intervals suggests there is no true difference in luxated patella prevalence between the two sexes.

Dry eye, or keratoconjunctivitis sicca (KCS) is a common eye disease of dogs. One study found increasing incidence of KCS reports over a 25 year period. In 1988, the prevalence of KCS in one database was 1.5 percent and slightly over 50 percent of all canine conjunctivitis cases were thought to be due to this disease.<sup>11</sup> In the same report, the prevalence of KCS among WHWT was reported to be 4 percent. Females have also been reportedly more likely to develop KCS than males.<sup>12</sup> The prevalence of dry eye reported in this study was 2.7 percent overall, with a higher prevalence reported among females than males. Regardless, the prevalences reported here slightly lower than those previously reported. The differences may lie on comparing population figures from this survey with those from a referral veterinary ophthalmology practice. The onset ages for KCS among both females and males in this study were similar with is also at odds with the findings of other investigators.

The remaining targeted diseases had overall prevalences less than 2 percent—and few published reports in the literature—so they are not considered at length here. Legg-Perthes disease is a noninflammatory aseptic necrosis of the femoral head and neck, thought to be due to vascular occlusion.

Abnormal blood clotting factors have been ruled out as a cause of this condition.<sup>13</sup> CMO is a non-cancerous bony proliferation of the mandibular ramus and tympanic bulla.<sup>14</sup> One analysis of a kindred of WHWT found the inheritance of this condition to be autosomal dominant.<sup>15</sup>

The targeted and additional disease responses cannot be readily combined due to the differing circumstances under which they were collected—systematically for the former and volunteered for the later. However, based on the raw numbers, cancer and gastrointestinal problems would appear to be more common than the majority of the targeted conditions, but not as common as atopic dermatitis, aggression, and luxated patella. Future iterations of this survey, if any, should contain questions about cancer, reproductive health and gastrointestinal diseases. Lastly, many respondents asked to receive copies of the survey results.

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