



Breed Health and Conservation Plan

Dachshund (Miniature Wire Haired) Evidence Base

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INTRODUCTION

The Kennel Club launched a new resource for breed clubs and individual breeders – the Breed Health and Conservation Plans (BHCP) project – in September 2016. The purpose of the project is to ensure that all health concerns for a breed are identified through evidence-based criteria, and that breeders are provided with useful information and resources to support them in making balanced breeding decisions that make health a priority.

The Breed Health and Conservation Plans take a complete view of breed health with consideration to the following issues: known inherited conditions, complex conditions (i.e. those involving many genes and environmental effects such as nutrition or exercise levels, for example hip dysplasia), conformational concerns and population genetics.

Sources of evidence and data have been collated into an evidence base which gives clear indications of the most significant health conditions in each breed, in terms of prevalence and impact. Once the evidence base document has been produced it is discussed with the relevant Breed Health Co-ordinator and breed health committee or representatives if applicable. Priorities are agreed based on this data and incorporated into a list of actions between the Kennel Club and the breed to tackle these health concerns. These actions are then monitored and reviewed on a regular basis.

DEMOGRAPHICS

The numbers of Miniature Wire Haired Dachshunds registered by year of birth between 1980 and 2017 are shown in Figure 1. The 1980 registrations figure appears depressed for all breeds due to registrations moving across to the electronic system from paper files.

The trend of registrations over year of birth (1980-2018) was +8.13 per year (with a 95% confidence interval of +4.48 to +11.77), reflecting the overall increase in registrations.

[Put simply, 95% confidence intervals (C.I.s) indicate that we are 95% confident that the true estimate of a parameter lies between the lower and upper number stated.]

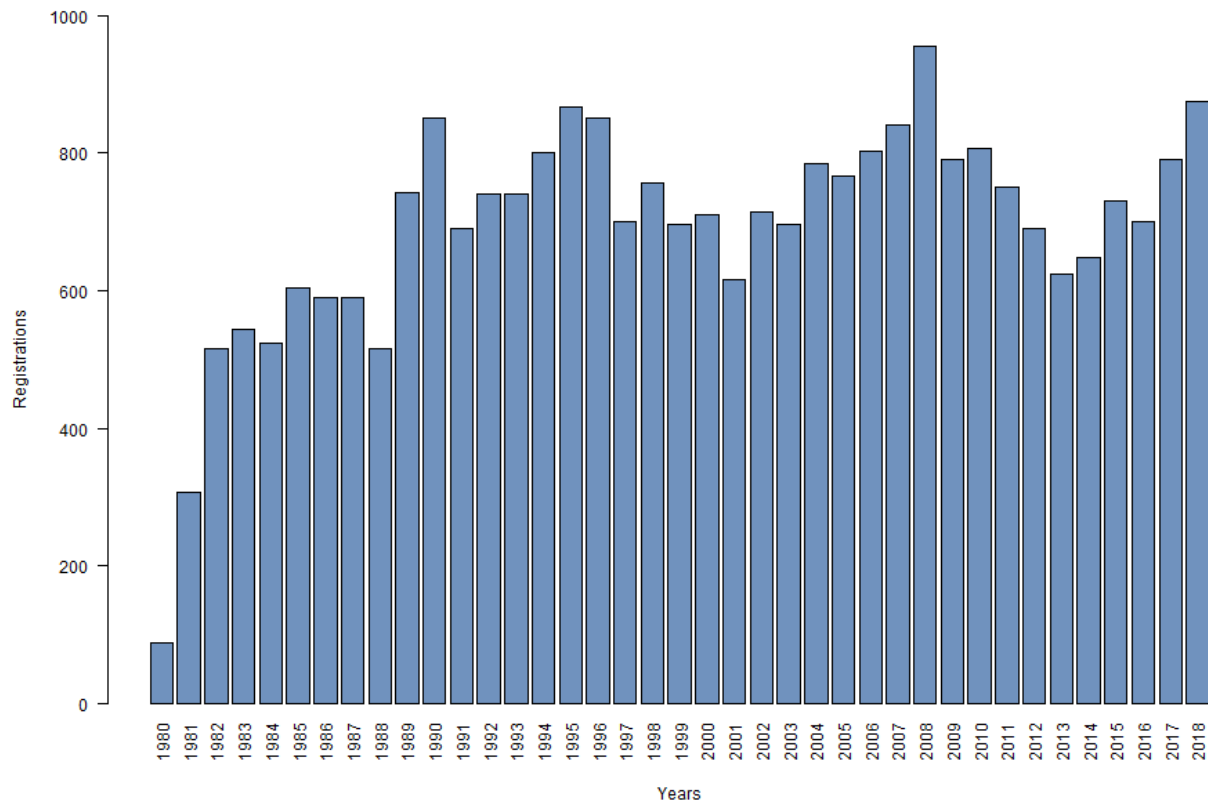


Figure 1: Number of registrations of Miniature Wire Haired Dachshunds per year of birth, 1980 – 2018

BREED HEALTH CO-ORDINATOR ANNUAL HEALTH REPORT

Breed Health Co-ordinators (BHCs) are volunteers nominated by their breed to act as a vital conduit between the Kennel Club and the breed clubs with all matters relating to health.

The BHC's Annual Health Report 2018, completed for all six Dachshund varieties together, yielded the following response to 'please list and rank the three health and welfare conditions that the breed considers to be currently the most important to deal with in your breed':

1. Intervertebral disc disease (IVD)
2. Lafora disease
3. PRA (cord1)

In terms of what the breed has done in the last year to help tackle these listed health and welfare concerns, the breed continue to encourage screening for IVDD, and consider the possibility of subsidisation, and have been heavily involved in genetic analysis with the aim to identify causative genes.

BREED CLUB HEALTH ACTIVITIES

The Dachshund has a health council, an active Breed Health Coordinator (BHC) and a dedicated health website: <https://www.dachshundhealth.org.uk/> .

BREED SPECIFIC HEALTH SURVEYS

All six Dachshund varieties were grouped together in the 2004 Purebred Dog Health Survey.

2004 Morbidity results: Health information was collected for 509 live Dachshunds of which 322 (63%) were healthy and 187 (37%) had at least one reported health condition. The top categories of diagnosis were reproductive (19.7%, 58 of 294 reported conditions), neurologic (11.9%, 35 of 294 reported conditions), dermatologic (10.5%, 31 of 294 reported conditions), cardiac (8.8%, 26 of 294 reported conditions) and dental (8.8%, 26 of 294 reported conditions). The most frequently reported specific conditions were IVDD (4.5% prevalence, 23 cases), heart murmur (4.3%, 22 cases), false pregnancy (3.2% prevalence, 11 cases in the 346 female Dachshunds in the survey), alopecia (3.1% prevalence, 16 cases) and dental disease (2.8% prevalence, 14 cases).

2004 Mortality results: A total of 245 deaths were reported for all Dachshund varieties combined. The median age at death was 12 years and 8 months (min = 4 months, max = 19 years). The most frequently reported causes of death by organ system or category were old age (21.6%, 53 of 245 deaths), cancer (16.7%, 41 deaths), cardiac (14.3%, 35 deaths) and neurologic (11.0%, 27 deaths). The most frequently reported specific causes of death apart from old age and cancer were heart failure (4.9%, 12 deaths) and IVDD (4.1%, 10 deaths).

The Dachshund varieties were separated for the 2014 Pedigree Dog Health Survey.

2014 Morbidity results: Health information was collected for 146 live Miniature Wire Haired Dachshunds of which 111 (76.0%) had no reported conditions and 35 (24.0%) were reported to be affected by at least one condition. The most frequently reported conditions were IVDD (8.9% prevalence, 13 cases), alopecia/baldness (4.1% prevalence, 6 cases), cryptorchidism (3.2% prevalence, 2 cases in the 63 males in the survey) arthritis (2.1% prevalence, 3 cases) and hypersensitivity (allergic) skin disorder (2.1% prevalence, 3 cases) and unspecified skin, ear or coat. (2.7% prevalence, 8 cases).

2014 Mortality results: A total of 21 deaths were reported for the breed. The range of age at death for Miniature Wire Haired Dachshunds was zero years to 16 years. The most frequently reported causes of death were senile dementia/cognitive dysfunction (3 cases) and old age (2 cases).

DachsLife 2012

DachsLife 2012 was a survey of UK Dachshunds that was conducted between 1st January 2012 and 31st March 2012. The survey was widely advertised among the Breed Club community, and also many owners of pet Dachshunds, via online discussion groups and Facebook. Responses were received for 1,464 Dachshunds. The survey results can be found here:

<https://sites.google.com/site/ukdachshundhealthreport/view-reported-health-statistics/dachs-life-2012>

DachsLife 2015

A web-based survey 'Dachs-Life 2015: The UK Dachshund Breed Council's Back Disease (IVDD) and lifestyle survey' was carried out for ten weeks from January to April 2015. The survey was hosted by the UK Dachshund Breed Council and owners of Dachshunds with or without a history of IVDD were recruited online via social media and the Council's newsletter. Responses were received for 2031 individual Dachshunds. The overall prevalence of IVDD was 15.7% (95% C.I. 14.1 – 17.3; 310 cases, 1665 non-cases and 56 exclusions). Variety-specific IVDD prevalences are shown in Table 1 below.

Table 1: Prevalence of IVDD for the six varieties of Dachshunds, from the DachsLife 2015 survey

Breed	Cases	Total	IVDD prevalence (%)	95% C.I. (%)
Standard Wire Haired	18	252	7.1	5.97-8.23
Standard Smooth Haired	49	201	24.4	22.51-26.29
Standard Long Haired	16	127	12.6	11.14-14.06
Miniature Wire Haired	54	305	17.7	16.02-19.38
Miniature Smooth Haired	127	744	17.1	15.44-18.76
Miniature Long Haired	46	346	13.3	11.80-14.80

Full analysis of the results of the survey have been published (Packer et al, 2016) and are available here:

<https://cgejournal.biomedcentral.com/track/pdf/10.1186/s40575-016-0039-8>

DachsLife 2018

This year's survey was run from the 1st September to the 30th November 2018 and received responses accounting for 2,564 dogs, with the survey focusing on cancers affecting the breed. Of the 228 dogs that were deceased, 37.7% were due to cancer, with the highest prevalence by variety seen in the Miniature Longhaired (~13%), followed by Long Haired (~12%). Overall the prevalence of cancers was 7%. The

body location of cancer/tumour by variety and age of cancer diagnosis by variety is shown in Figure 2 and 3, respectively. Whilst no specific cancer at this time requires prioritisation, the breed are continuing to monitor the incidence of lymphomas.

Body location of Cancer/Tumour by Variety (N = 155)

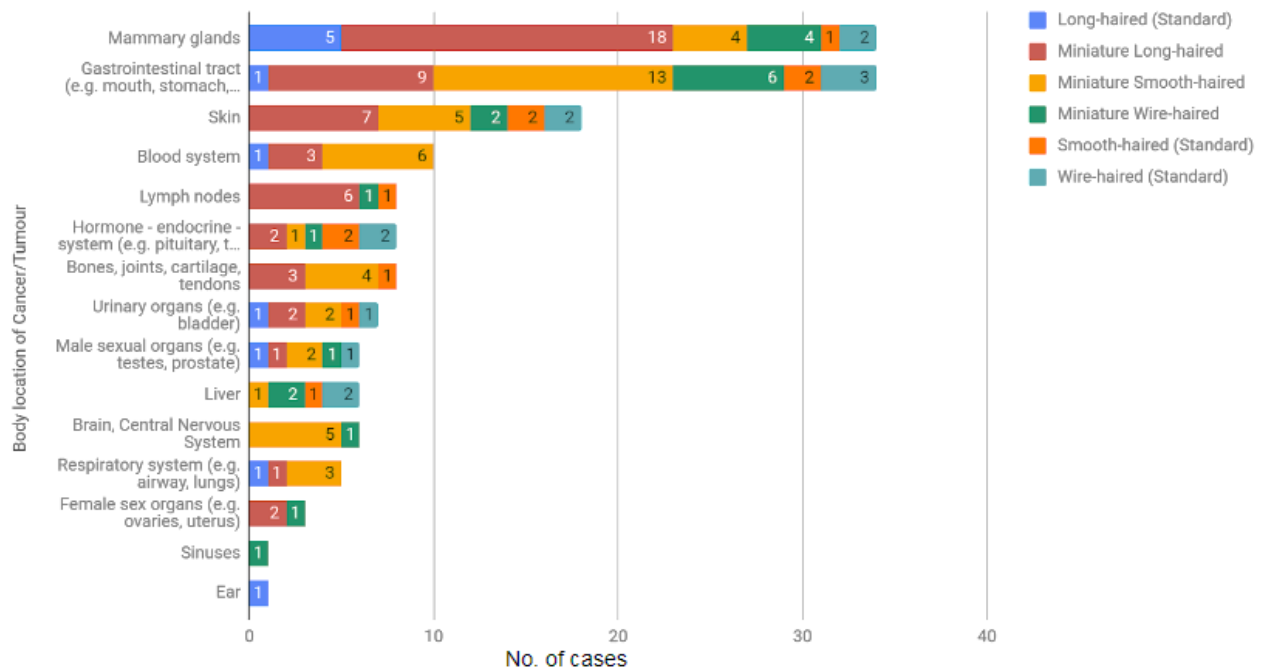


Figure 2: A breakdown of body location for cancer/tumours by variety in the Dachslife 2018 survey.

Age of Cancer Diagnosis by Variety (N = 153)

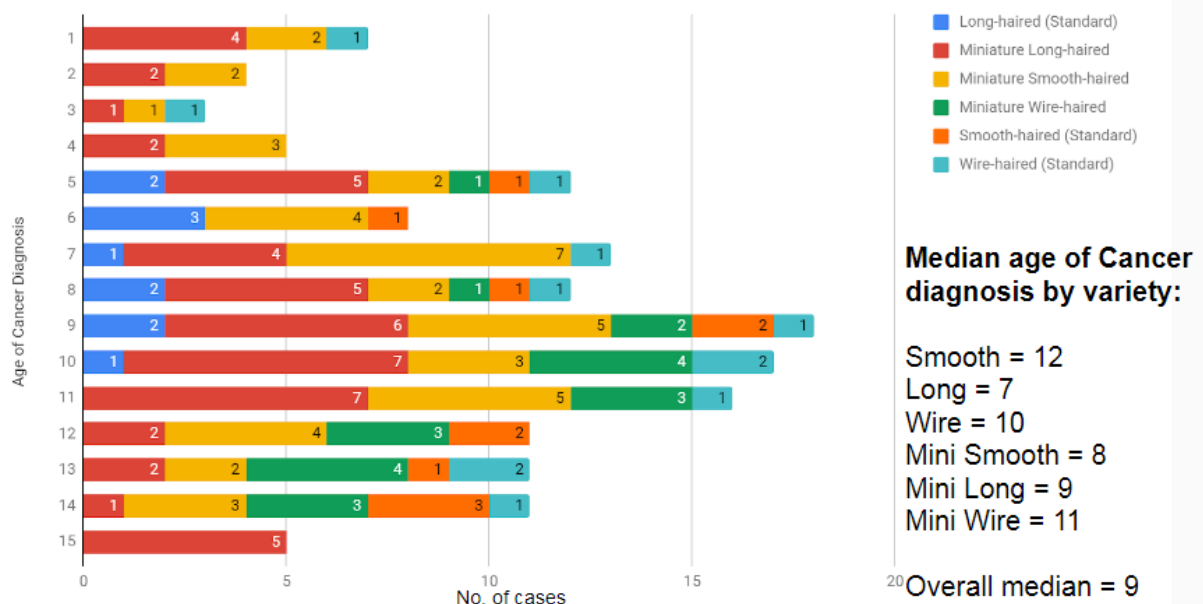


Figure 3: Age of cancer diagnosis by variety and median age of cancer diagnosis for dogs reported in the Dachslife 2018 survey.

The prevalence of reported health conditions in comparison to the results of the 2015 and 2012 surveys are also shown in Figure 4 below. By far the most commonly reported health concern was IVDD, followed by skin allergies/atopy, cancers/tumours, cryptorchidism and dystocia.

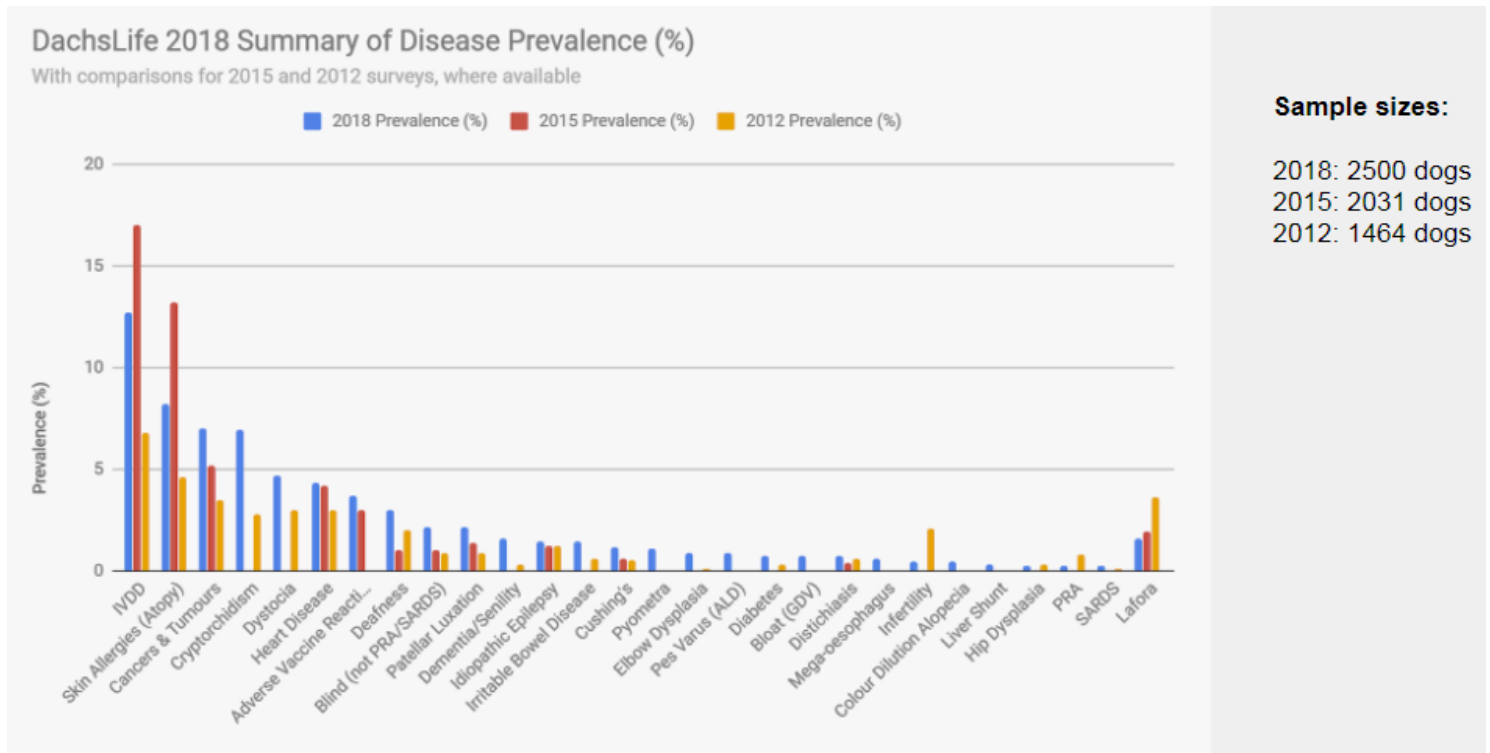


Figure 4: A summary of disease prevalence for dogs reported in the Dachslife 2018 survey, and a comparison in prevalence to the date reported in the 2015 and 2012 surveys.

The Wire Haired varieties appeared to be more often affected with dementia/senility in this survey, with 7.5% of Standard Wire Haired reportedly affected by this condition, and Miniatures approximately 4.5%. Miniature Wire Haired were the most commonly affected variety for several reproductive concerns, including dystocia (difficulty birthing), with approximately 5.5% having been affected. Similarly, infertility was reported in ~1.1% of this variety and cryptorchidism in 13.0%.

A full breakdown of the survey can be found through the link provided below:

<https://www.dachshundhealth.org.uk/dachslife-2018>

Rolling online health survey

The Dachshund Breed Council have been running an online health survey since 2009. The number of reports of particular categories of health condition in the eight years the survey has been running are shown in Figure 5.

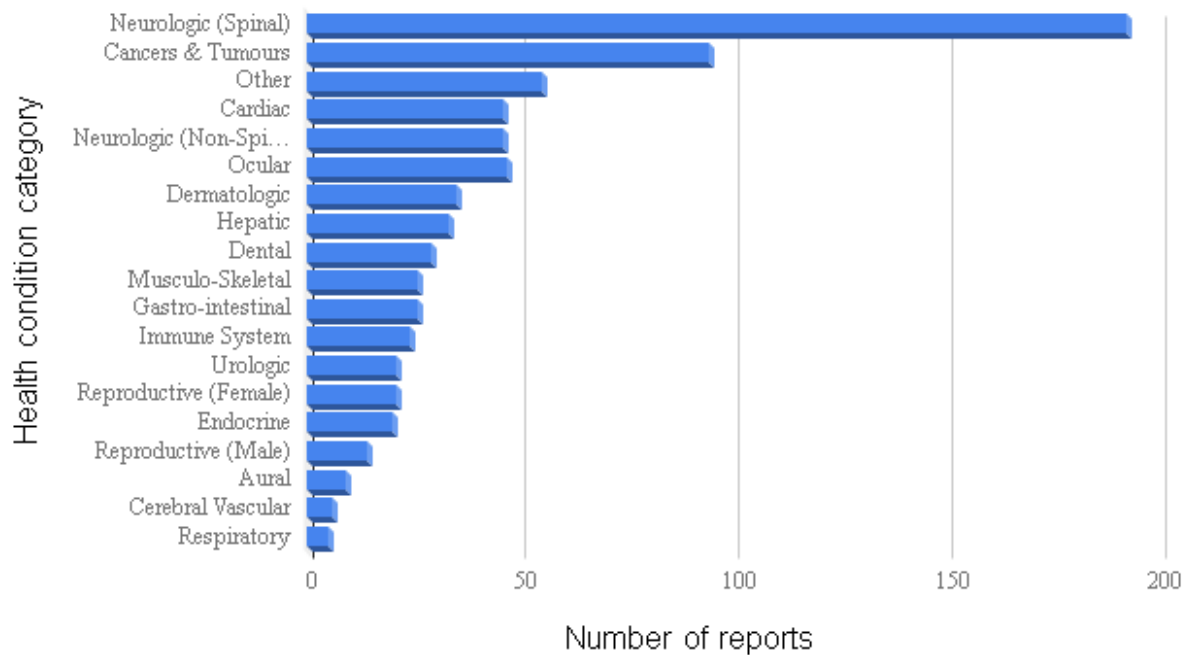


Figure 5: Number of reports of particular categories of health condition received over eight years in the Dachshund Breed Council's rolling online health survey.

UK LITERATURE REVIEW

The literature review lays out the current scientific knowledge relating to the health of the breed. We have attempted to refer primarily to research which has been published in peer-reviewed scientific journals. We have also incorporated literature that includes dogs residing within the UK primarily, and literature that was released relatively recently to try to reflect current publications and research relating to the breed.

Diabetes mellitus: Dachshunds were reported to be more likely to develop anti-insulin antibodies than crossbreeds in a study of blood samples collected in the UK between 2002 and 2010 from 942 cases (including 14 Dachshunds) and 100 controls (Holder et al, 2015). Development of anti-insulin antibodies can lead to higher doses of insulin being needed to control blood glucose levels.

The Dachshund is a chondrodystrophic breed (Parker et al, 2009). This means that they have abnormal cartilage and bone growth resulting in characteristic disproportionate dwarfism. This is considered to be a breed characteristic in the Dachshund and a number of other breeds (including Basset Hounds and Corgis) rather than a disease condition.

Osteogenesis imperfecta (OI): OI is a congenital, inherited disease involving defects of type I collagen, with affected individuals therefore having fragile, fracture-prone bones and other signs. 1352 Dachshunds of all sizes and coat types from 12

different European countries were genotyped for the mutation; the overall frequency of carriers was 12.9%, while Wire Haired Dachshunds of both sizes were overrepresented with 17.3% carriers (Eckardt et al, 2013)

Progressive retinal atrophy (PRA): PRA is the collective name for a group of inherited and progressive retinal diseases characterised by gradual retinal degeneration resulting in initial night blindness and progressing to total vision loss. A form caused by a cone-rod dystrophy has been described in a breeding colony of Miniature Long Haired Dachshunds at the Animal Health Trust (Turney et al, 2007). The causal mutation was subsequently identified as a 44-nucleotide insertion in exon 2 of the *RPGRIP1* gene (Mellersh et al, 2006). A DNA test for the mutation, designated PRA (cord1) is available. However, after launch of the test doubt was cast on the penetrance of this mutation, with some homozygotes retaining vision until late in life. In 2016, researchers identified a 22kb deletion ~30Mb upstream from *RPGRIP1* as a modifier locus, fusing two genes (*MAP9* intron 10 and *MAP9* pseudogene) (Forman et al, 2016).

Other researchers have shown that these two genes are not sufficient to explain all cases, and posit that 'cord1 is a multigenic disease in which mutations in neither *RPGRIP1* nor *MAP9* alone lead to visual deficits, and additional gene(s) contribute to cone specific functional and morphological defects' (Das et al, 2017).

VetCompass Results

Whilst a breed-specific VetCompass study has not yet been completed, some condition-specific studies have yielded findings relevant to Dachshunds. These results are summarised under the respective conditions below.

Heart Murmurs: Out of a total of 111,967 dogs attending primary care veterinary practices 405 were diagnosed as affected by DMVD, and a further 3,557 with heart murmurs (Mattin et al, 2015). The breed (all varieties) were listed as being at a slightly increased risk of heart murmurs (odds ratio of 1.42, 95% CI: 1.06 – 1.90) but not of degenerative mitral valve disease (DMVD), with only six affected cases of DMVD.

INSURANCE DATA

There are some important limitations to consider for insurance data:

- Accuracy of diagnosis varies between disorders depending on the ease of clinical diagnosis, clinical acumen of the veterinarian and facilities available at the veterinary practice.
- Younger animals tend to be overrepresented in the UK insured population.
- Only clinical events that are not excluded and where the cost exceeds the deductible excess are included (O'Neill et al, 2014)

UK Agria data

Insurance data were available for Miniature Wire Haired Dachshunds insured with Agria UK. 'Exposures' are equivalent to one full policy year; in 2017 there were 37 free exposures, 494 full exposures and 370 claims, in 2018 these figures were 39, 473 and 359 respectively. Full policies are available to dogs of any age. Free policies are available to breeders of Kennel Club registered puppies and cover starts from the time the puppy is collected by the new owner; cover under free policies lasts for five weeks from this time. It is possible that one dog could have more than one settlement for a condition within the 12-month period shown. The top 10 conditions by number of settlements, for authorised claims where treatments started between 1st June 2017 and 31st July 2018, are shown in Table 2 below.

Table 2: Top 10 conditions and number of settlements for each condition between 1st June 2017 and 31st July 2018 for Miniature Wire Haired Dachshunds insured with Agria UK

Condition	Number of settlements
Intervertebral disc extrusion/herniation/prolapse	67
Hypersensitivity (allergic) skin disorder (unspecified)	15
Spinal pain finding	11
Heart (cardiac) murmur	11
Epilepsy	10
Lameness finding	10
Foreign body - gastric (stomach)	9
Glaucoma (unclassified)	9
Hyperadrenocorticism - adrenal-dependent ("Cushing's")	9
Skin (cutaneous) disorder (unspecified)	8

Swedish Agria Data

Swedish morbidity and mortality insurance data were also available from Agria for the three Miniature Dachshund varieties grouped together. Reported rates are based on dog-years-at-risk (DYAR) which take into account the actual time each dog was insured during the period (2006-2011). The number of DYAR for Miniature Dachshunds in Sweden during this period was between 500 and 1,000, meaning that these results should be interpreted cautiously.

Swedish Agria insurance morbidity data

The most common specific causes of veterinary care episodes (VCEs) for Agria-insured Miniature Dachshunds in Sweden between 2006 and 2011 are shown in Figure 6. The top five specific causes of VCEs were

vomiting/diarrhoea/gastroenteritis, disc/vertebral, mammary tumour, skin tumour and pyometra/endometritis.

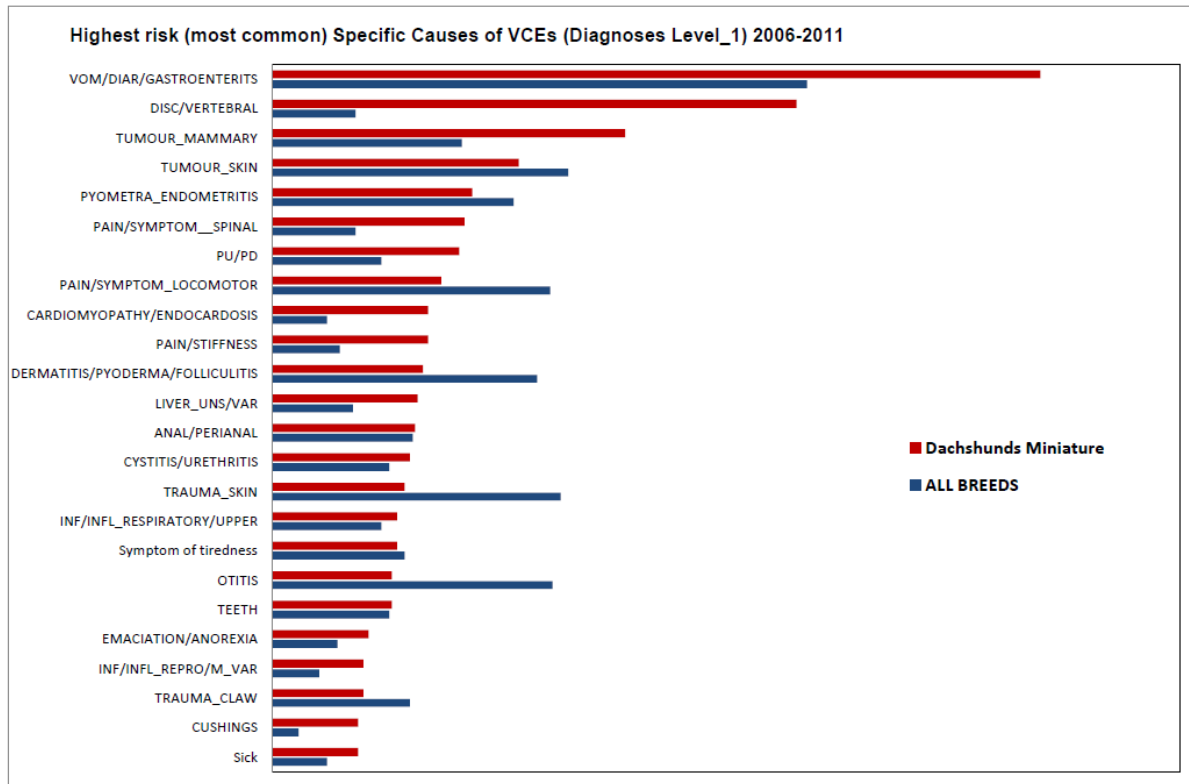


Figure 6: The most common specific causes of VCEs for Miniature Dachshunds compared to all breeds in Sweden between 2006 and 2011, from Swedish Agria insurance data.

When relative risk of specific causes of VCEs was compared for Miniature Dachshunds to all breeds, a couple of interesting findings were reported. The specific causes of VCEs ordered by relative risk are shown in Figure 7. In this analysis, the top five specific causes of VCEs ordered by relative risk were degenerative or dystrophic corneal condition, disc/vertebral, upper respiratory tumour, traumatic hernia and congenital hernia.

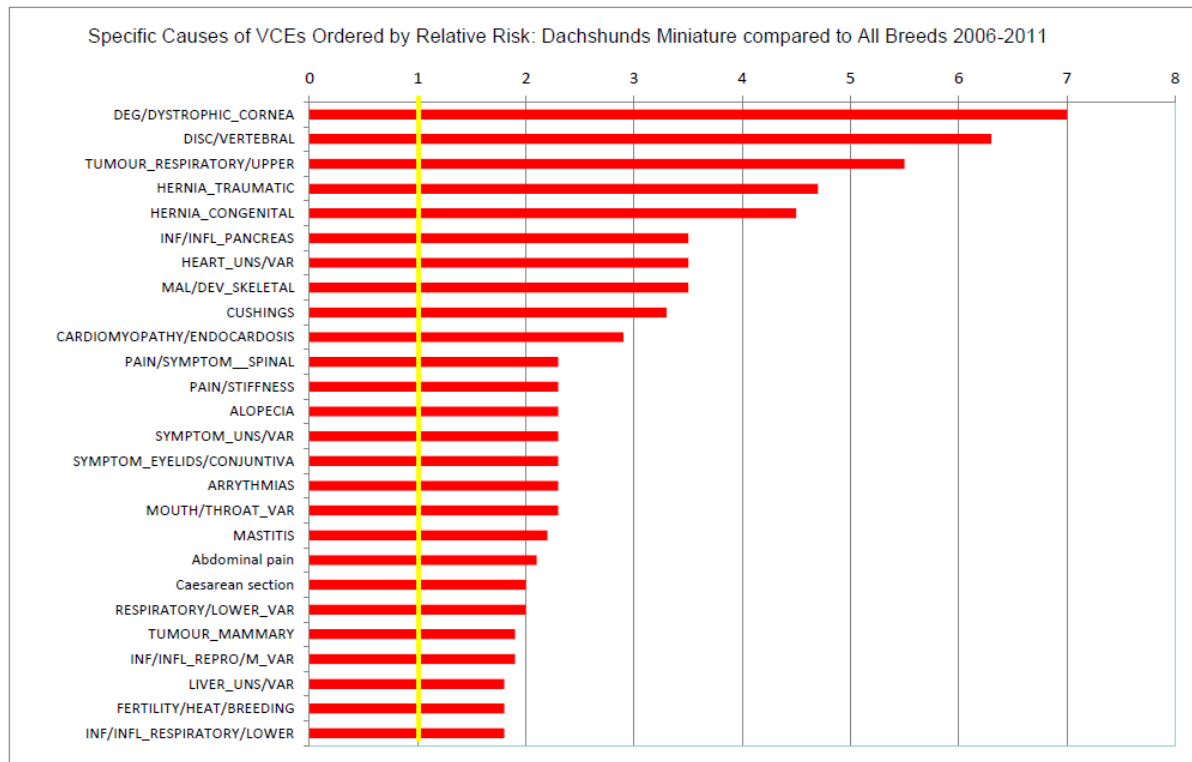


Figure 7: The specific causes of VCEs for Miniature Dachshunds ordered by relative risk compared to all breeds in Sweden between 2006 and 2011, from Swedish Agria insurance data. The yellow line indicates the baseline risk for all breeds.

Swedish Agria insurance mortality data

The most common specific causes of death or euthanasia for Agria-insured Standard Dachshunds in Sweden between 2006 and 2011 are shown in Figure 8. By far the most common specific cause of death was disc/vertebral.

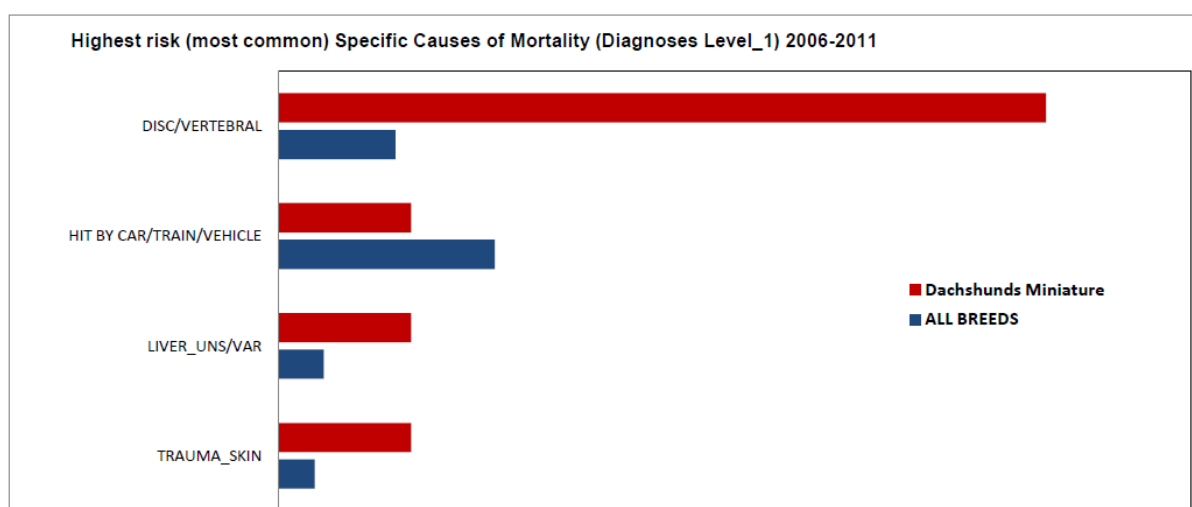


Figure 8: The most common specific causes of death for Miniature Dachshunds compared to all breeds in Sweden between 2006 and 2011, from Swedish Agria insurance data.

BREED WATCH

As a category two breed judges' health monitoring forms are mandatory at championship level. The points of concern reported are shown below in Table 3.

Table 3: Percentage of Miniature Wire Haired Dachshunds exhibited at dog shows with points of concern for 2016 - 2018. The points with an asterisk next to them indicate concerns reported by judges which are not listed for the breed.

Point of concern	2016	2017	2018
*Misplaced lower canine teeth	0.0%	0.0%	0.0%
*Nervous temperament	0.6%	0.2%	0.0%
*Overly narrow lower jaw	1.7%	0.0%	0.0%
*Overweight	0.9%	0.0%	0.0%
Bodyweight / condition	1.3%	0.7%	1.8%
*Other (not specified)	0.0%	0.3%	0.0%
Total dogs shown	871	832	895

ASSURED BREEDER SCHEME

Currently within the Kennel Club (KC)'s Assured Breeders Scheme it is required that all breeding stock are DNA tested for PRA (cord 1). Results for the PRA (cord1) DNA test have been recorded for the breed since May 2009, and the test has been a mandatory requirement under the Kennel Club's Assured Breeder Scheme (ABS) since January 2010.

As of the end of 2019 it will also be a recommendation that all breeding stock are screened under the Breed Council's IVDD screening scheme prior to breeding.

BREED CLUB BREEDING RECOMMENDATIONS

There are not currently any Breed Club breeding recommendations listed on the Kennel Club's website for the breed.

DNA TEST RESULTS

DNA tests are available for the Miniature Wire Haired Dachshund for:

- PRA (cord 1)
- Lafora's Disease

DNA test results are only recorded for official Kennel Club DNA Testing Schemes which involve collaboration between the Kennel Club, the breed clubs and the DNA testing facilities. A list of laboratories that provide the test can be found through clicking here: <https://www.thekennelclub.org.uk/worldwide-dna-tests/>

As a note, as of January 2022 hereditarily clear status will no longer apply after two generations and dogs will need to be retested to confirm the status of that individual. This is to prevent the possibility of misclassification of status and therefore unintentional breeding of affected puppies. Where parentage is confirmed by DNA profile, the major contributor to erroneous status will be removed. Therefore, a less stringent restriction for HC status is applied where parentage is confirmed by DNA test.

PRA (cord1)

Results for the PRA (cord1) DNA test have been recorded for the breed since July 2011, and have been a mandatory requirement under the Kennel Club's Assured Breeder Scheme since July 2011. The results for the 3,909 dogs which had been DNA tested up to 04/06/2018 are shown in Table 4.

Table 4: PRA (cord1) DNA test results held by the Kennel Club for Miniature Wire Haired Dachshunds up to 02/10/2019.

Total number results	Clear	Carrier	Affected	Hereditarily clear	Hereditarily carrier
3909	505 (12.9%)	122 (3.1%)	4 (0.1%)	3252 (83.2%)	26 (0.7%)

LAFORA

Results for the PRA (cord1) DNA test have been recorded for the breed since January 2014; the DNA test was strongly recommended under the ABS since January 2014, and this was upgraded to a mandatory requirement in January 2015. The results for 3,232 dogs which had been DNA tested up to 04/06/2018 are shown in Table 5.

Table 5: Lafora disease DNA test results held by the Kennel Club for Miniature Wire Haired Dachshunds up to 02/10/2019.

Total number results	Clear	Carrier	Affected	Hereditarily clear	Hereditarily carrier
3232	378 (11.7%)	196 (6.1%)	36 (1.1%)	2589 (80.1%)	33 (1.0%)

It is encouraging to see that the prevalence of Lafora's is significantly reducing in the Wire Haired varieties, as portrayed in Figure 9 and 10 taken from the Dachslife Survey 2018 (further summary of survey findings on Page 6), with the prevalence of reported disease effectively halving over this period.

Lafora Disease Prevalance (%)

2012, 2015, 2018 Surveys

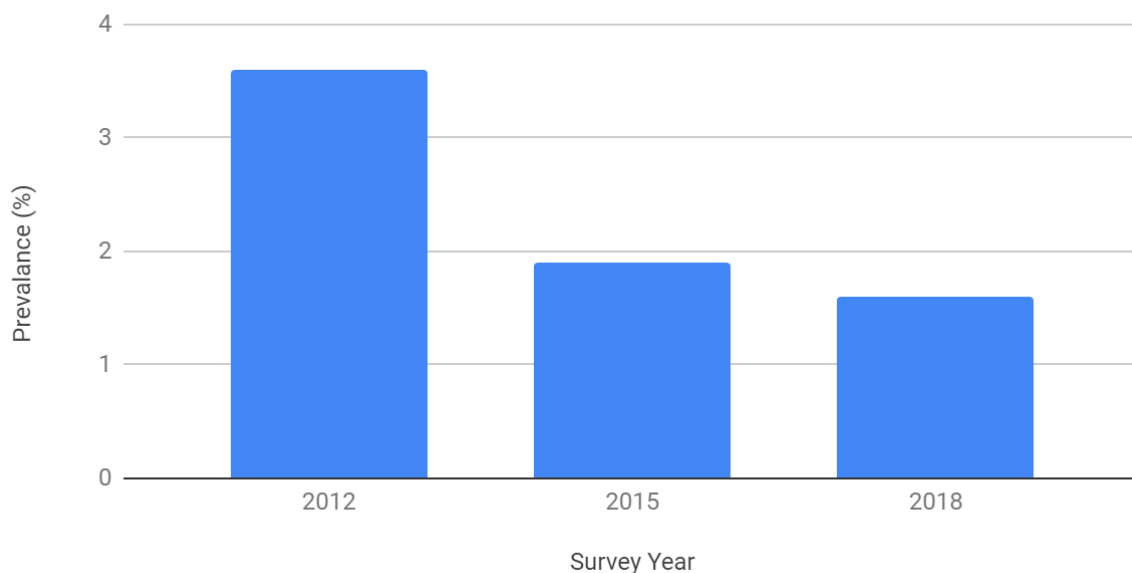


Figure 9: A graph to show the prevalence of Lafora disease in the Wire Haired varieties as reported in the Dachslife surveys.

Mini Wire Litters - Lafora Status

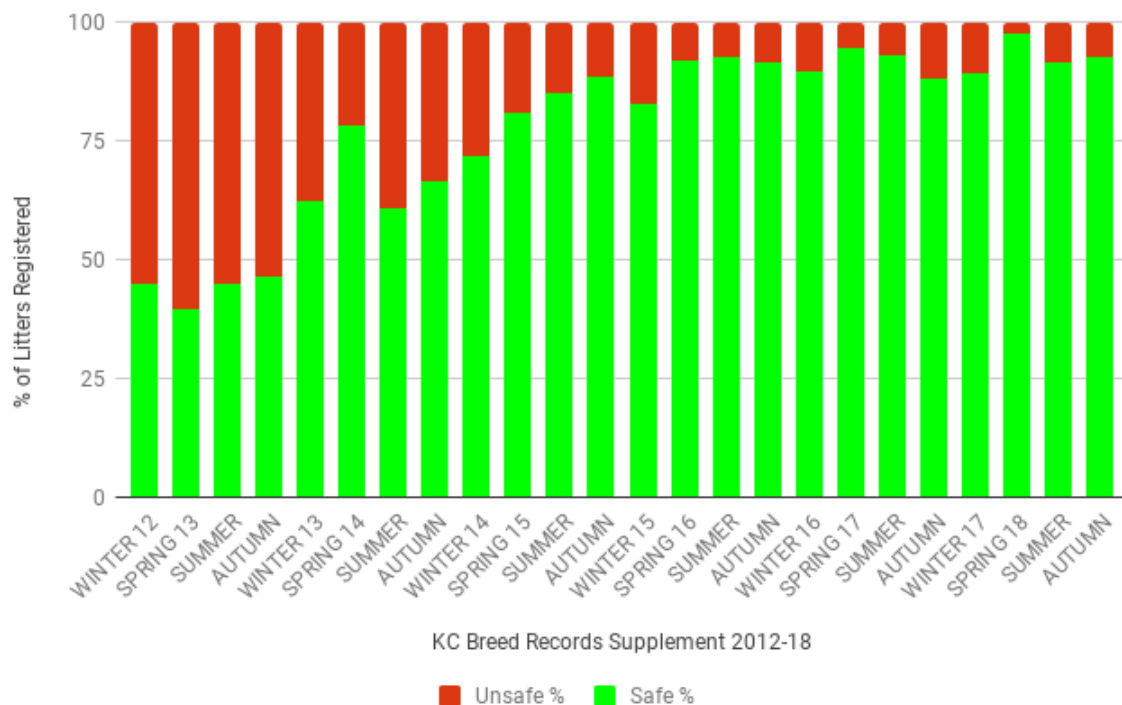


Figure 10: A graph portraying the percent of litters registered between 2012 and 2018 that were Lafora tested, as reported in the Dachslife 2018 survey.

CANINE HEALTH SCHEMES AND ESTIMATED BREEDING VALUES

All the British Veterinary Association (BVA)/KC Health Schemes are open to dogs of any breed with a summary given of dogs tested to date below. Estimated breeding values are only available to breeds where a significant proportion of the population have been tested.

HIPS

One Miniature Wire Haired Dachshunds has been examined under the BVA/KC Hip Dysplasia Scheme in the past fifteen years, and received a hip score of four indicating it had near perfect hips.

ELBOWS

No Miniature Wire Haired Dachshunds have been examined under the BVA/KC Elbow Dysplasia Scheme in the past fifteen years.

EYES

The Miniature Wire Haired Dachshund is Schedule B of the BVA/KC/International Sheep Dog Society (ISDS) Eye Scheme for persistent pupillary membranes (PPM).

Schedule A lists the known inherited eye conditions in the breeds where there is enough scientific information to show that the condition is inherited in the breed, often including the actual mode of inheritance and in some cases even a DNA test. Schedule B lists those breeds in which the conditions are, at this stage, only suspected of being inherited.

To date, 110 scheme results have been recorded by the Kennel Club for this variety, of which all were unaffected. As well as the Schedule A and B, the BVA records any other conditions affecting a dog at the time of examination, which is incorporated into an annual sightings report. The sightings reports of Miniature Wire Haired Dachshunds which have taken place since 2012 are shown in Table 6.

Table 6: Reports on dogs of the breed which have participated in the BVA/KC/ISDS Eye Scheme since 2012

Year	Number seen	Comments
2012	4 adults 0 litters	No comments
2013	5 adults 0 litters	2 – PPM
2014	6 adults 0 litters	1 – PPM
2015	5 adults 0 litter	No comments
2016	4 adults 0 litters	2 – PPM 1 – other cataract
2017	1 adult 0 adults	No comments

AMERICAN COLLEGE OF VETERINARY OPHTHALMOLOGISTS (ACVO)

Results of examinations through ACVO are shown in Table 7 below. Between 2015 and 2019, 1,019 Dachshunds were examined, of which 69.5% (708 of 1,019 dogs) were found to be unaffected by any eye condition. Whilst it is important to note that these data represent dogs in America, the organisation tend to examine a higher number of dogs than that in the UK, and therefore are a valuable source of information.

Table 7: ACVO examination results for Dachshunds, 1991 - 2019

Disease Category/Name	Percentage of Dogs Affected	
	1991-2014 (n=5900)	2015-2019 (n=1019)
Eyelids		
Distichiasis	6.0%	7.9%
Cornea		
Corneal dystrophy	0.8%	1.2%
Uvea		
Persistent pupillary membranes (iris to iris)	4.1%	5.6%
Lens		
Cataract (significant)	4.7%	3.5%
Retina		
PRA	1.9%	1.2%

Adapted from: <https://www.ofa.org/diseases/eye-certification/blue-book>

REPORTED CAESAREAN SECTIONS

When breeders register a litter of puppies, they are asked to indicate whether the litter was delivered (in whole or in part) by caesarean section. In addition, veterinary surgeons are asked to report caesarean sections they perform on Kennel Club registered bitches. The consent of the Kennel Club registered dog owner releases the veterinary surgeon from the professional obligation to maintain confidentiality (vide the Kennel Club General Code of Ethics (2)).

There are some caveats to the associated data;

- It is doubtful that all caesarean sections are reported, so the number reported each year may not represent the true proportion of caesarean sections undertaken in each breed.
- These data do not indicate whether the caesarean sections were emergency or elective.

The number of litters registered per year for the breed and the number and percentage of reported caesarean sections in the breed for the past 10 years are shown in Table 8.

Table 8: Number and percentage of litters of Miniature Wire Haired Dachshunds registered per year and number of caesarean sections reported per year, 2008 to 2018.

Year	Number of Litters Registered	Number of C-sections	Percentage of C-sections	Percentage of C-sections out of all KC registered litters (all breeds)
2008	275	2	0.73%	0.05%
2009	234	3	1.28%	0.15%
2010	230	1	0.43%	0.35%
2011	220	13	5.91%	1.64%
2012	185	39	21.08%	8.69%
2013	169	54	31.95%	9.96%
2014	179	54	30.17%	10.63%
2015	186	49	26.34%	11.68%
2016	180	54	30.00%	13.89%
2017	196	71	36.22%	15.00%
2018	210	59	28.10%	17.21%

GENETIC DIVERSITY MEASURES

The effective population size is the number of breeding animals in an idealised, hypothetical population that would be expected to show the same rate of loss of genetic diversity (rate of inbreeding) as the population in question; it can be thought of as the size of the 'gene pool' of the breed. In the population analysis undertaken by the Kennel Club in 2015, an estimated effective population size of 110.4 was reported (estimated using the rate of inbreeding over the period 1980-2014). An effective population size of less than 100 (inbreeding rate of 0.50% per generation) leads to a dramatic increase in the rate of loss of genetic diversity in a breed/population (Food & Agriculture Organisation of the United Nations, "Monitoring animal genetic resources and criteria for prioritization of breeds", 1992).

Annual mean observed inbreeding coefficient (showing loss of genetic diversity) and mean expected inbreeding coefficient (from simulated 'random mating') over the

period 1980-2014 are shown in Figure 11. As with most breeds, the rate of inbreeding was at its highest in this breed in the 1980s and 1990s. This represents a 'genetic bottleneck', with genetic variation lost from the population. However, since 2000 the rate of inbreeding has been broadly negative, implying moderate replenishment of genetic diversity (possibly through the use of imported animals).

It should be noted that, while animals imported from overseas may appear completely unrelated, this is not always the case. Often the pedigree available to the Kennel Club is limited in the number of generations, hampering the ability to detect true, albeit distant, relationships. For full interpretation see Lewis et al, 2015 <https://cgejournal.biomedcentral.com/articles/10.1186/s40575-015-0027-4>.

The current annual breed average inbreeding coefficient is 7.2%.

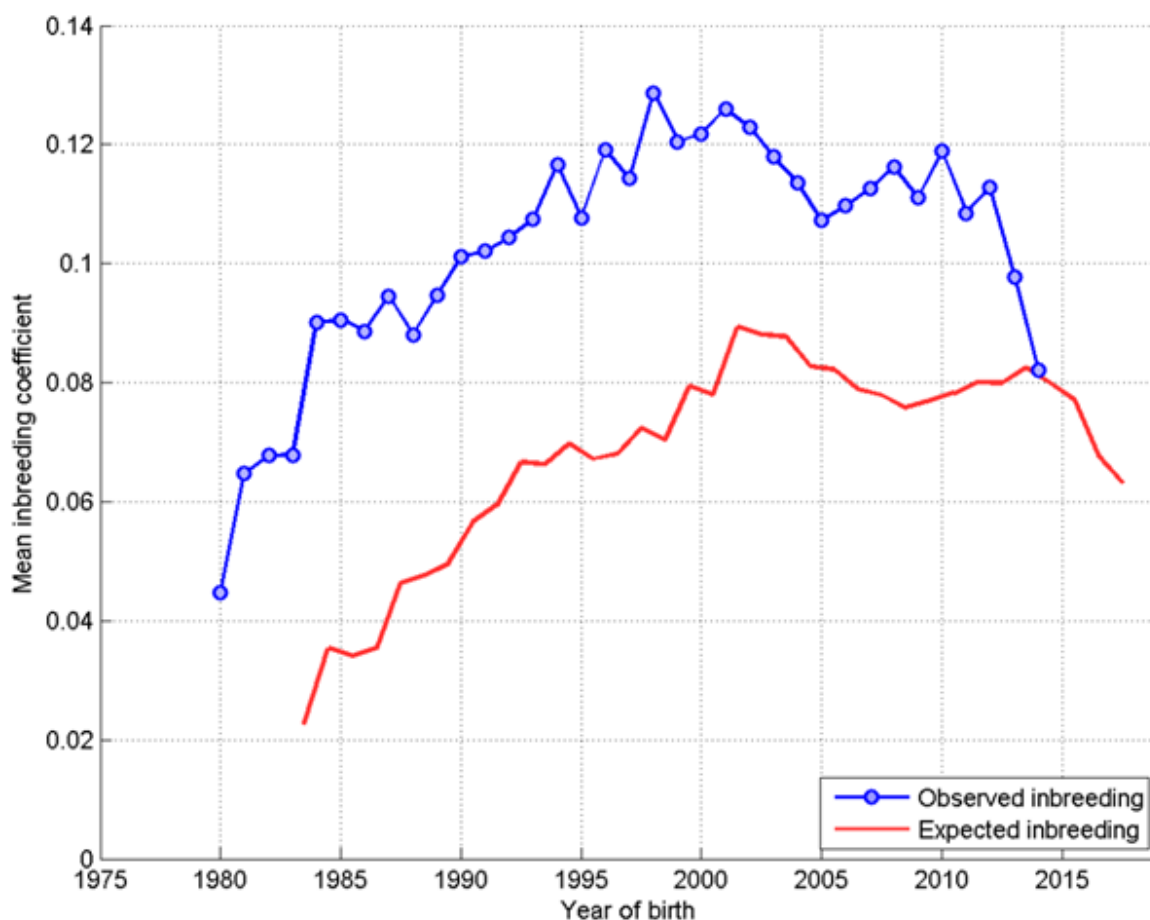


Figure 11: Annual mean observed and expected inbreeding coefficients.

Below is a histogram ('tally' distribution) of number of progeny per sire and dam over each of seven five-year blocks (Figure 12). A longer 'tail' on the distribution of progeny per sire is indicative of 'popular sires' (few sires with a very large number of offspring, known to be a major contributor to a high rate of inbreeding). There appears to be extensive use of popular dogs as sires in this breed (the 'tail' of the blue distribution in Figure 12).

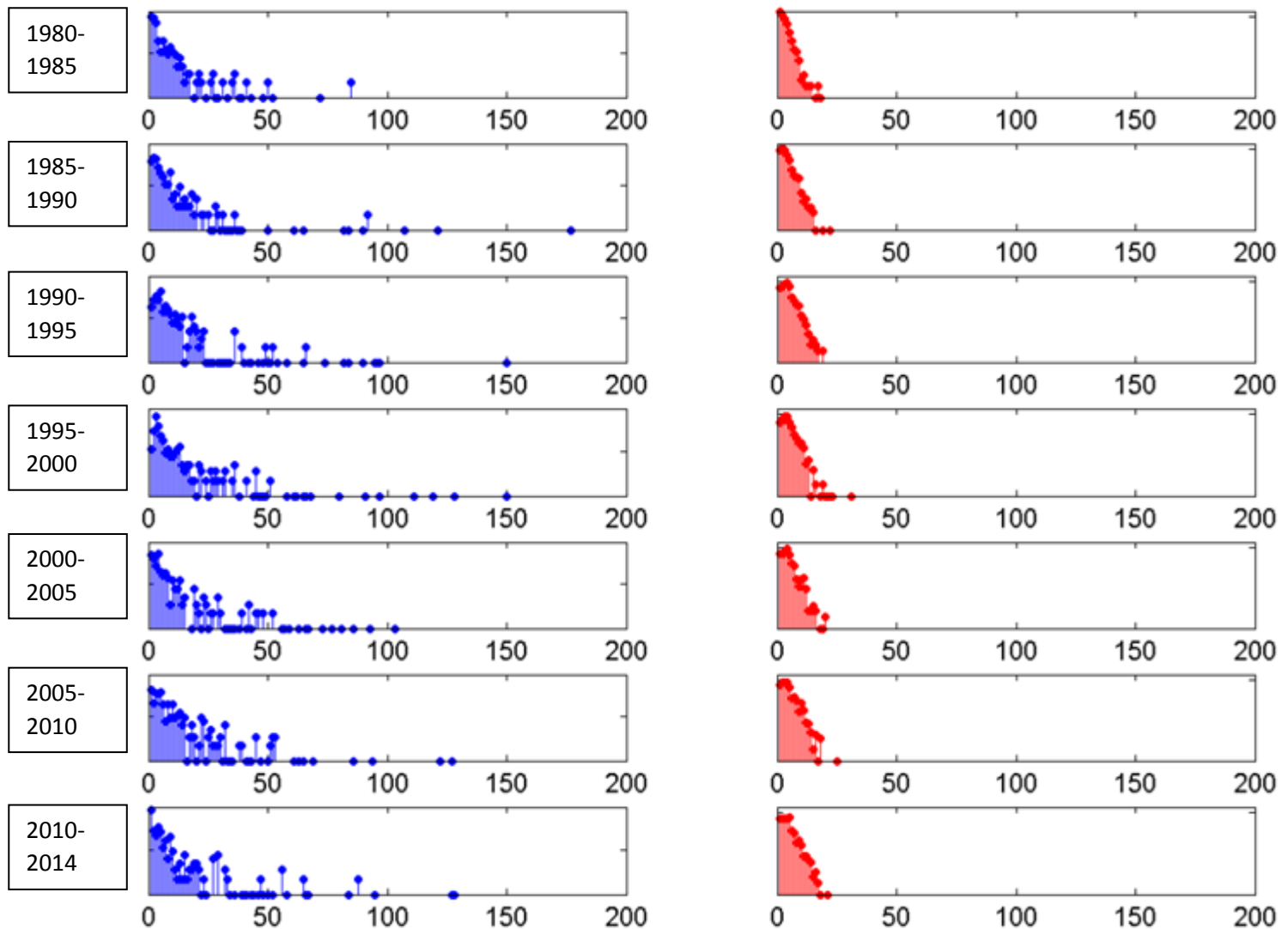


Figure 12: Distribution of progeny per sire (blue) and per dam (red) over 5-year blocks (1980-4 top, 2010-14 bottom). Vertical axis is a logarithmic scale.

CURRENT RESEARCH

Dachshunds are part of the Animal Health Trust (AHT)'s Give a Dog a Genome project; the health condition given as a concern in the breed was IVDD. A Miniature Long Haired Dachshund with PRA has been sequenced. As of October 2019, no further work is being undertaken at the AHT, although a test has been launched by Laboklin for Lafora.

The AHT is also working with the Dachshund Breed Council to evaluate the potential utility of the IVDD mutation identified by Brown et al at the University of California Davis.

PRIORITIES

A meeting was held with Dachshund breed club representatives on 12th July 2018 to discuss the evidence base of the BHCP and agree the priority issues for the health of the breed. The group agreed from the information provided and their own experience that the priority for the Dachshunds were:

- IVDD
- Lafora's in the Miniature Wirehaired variety
- Eye disease

The following conditions were also agreed to be kept at watch:

- Colour dilution alopecia
- Mitral valve disease
- Pes varus
- Maintenance of genetic diversity

ACTION PLAN

The following actions were decided between the breed clubs and the Kennel Club to tackle the priorities agreed (see previous page).

Breed club actions include:

- The breed council to send a list of genetically possible coat colours to the Kennel Club to be discussed at the next Colour Not Recognised working group meeting. – **COMPLETE**
- The breed council to continue to encourage participation in IVDD testing with the potential for subsidising tests. – **ONGOING**
- A Breed Watch proposal to be made for all varieties. Incorrect hindquarter movement, especially in the miniatures, as a possible result of pes varus and sore or runny eyes which may be due to distichiasis. – **COMPLETE**
- Two proposals to be made to the Assured Breeder Scheme for IVDD testing and participation in the BVA/KC/ISDS Eye Scheme to become recommendations across all Dachshund varieties. – **COMPLETE**

Kennel Club actions include:

- The Kennel Club to review and assist in promoting the Dachshund cancer survey, to determine whether particular cancers should also be considered a priority issue. – **COMPLETE**
- The Kennel Club to encourage participation in IVDD testing. – **ONGOING**
- The Kennel Club to request an update from the AHT with regard to progress in development of a swab test for Lafora disease. – **COMPLETE**
- The Kennel Club to keep the breed updated as to the feasibility of developing a spinal scheme
- The Kennel Club will review progress with the Dachshund breed club representatives in January 2021

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