THE KENNEL CLUB
DOG HEALTH

Breed Health and Conservation Plan

Irish Wolfhound Evidence Base

BHCP/Version 3/August 2021

CONTENTS

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 raise awareness of current health and welfare concerns in their breed, and support them in making balanced breeding decisions.

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 representatives where 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 Irish Wolfhound has been categorised as a vulnerable native breed, defined as a breed with fewer than 300 new registrations a year, although in 2017 it moved out of this category as the number of registrations rose. The number of Irish Wolfhounds registered by year of birth between 1980 and 2019 are shown in Figure 1.

There appears to be a leap in registrations for all breeds between 1980 and 1981. Prior to 1981, breeders would record litter details only and new owners could register their puppy themselves. In 1981 it became compulsory for breeders to register all the pups themselves, leading to an apparent jump in registration numbers for all breeds.

The trend of registrations over year of birth (1980-2019) was -14.9 per year (with a 95% confidence interval of -12.5 to -17.4). This trend reflects the decreasing registration numbers over this time period.

[A ‘95% confidence interval’ (C.I.) is a tool used in statistics which shows that we are 95% certain that an estimated number is between the lowest number and the highest number provided.]

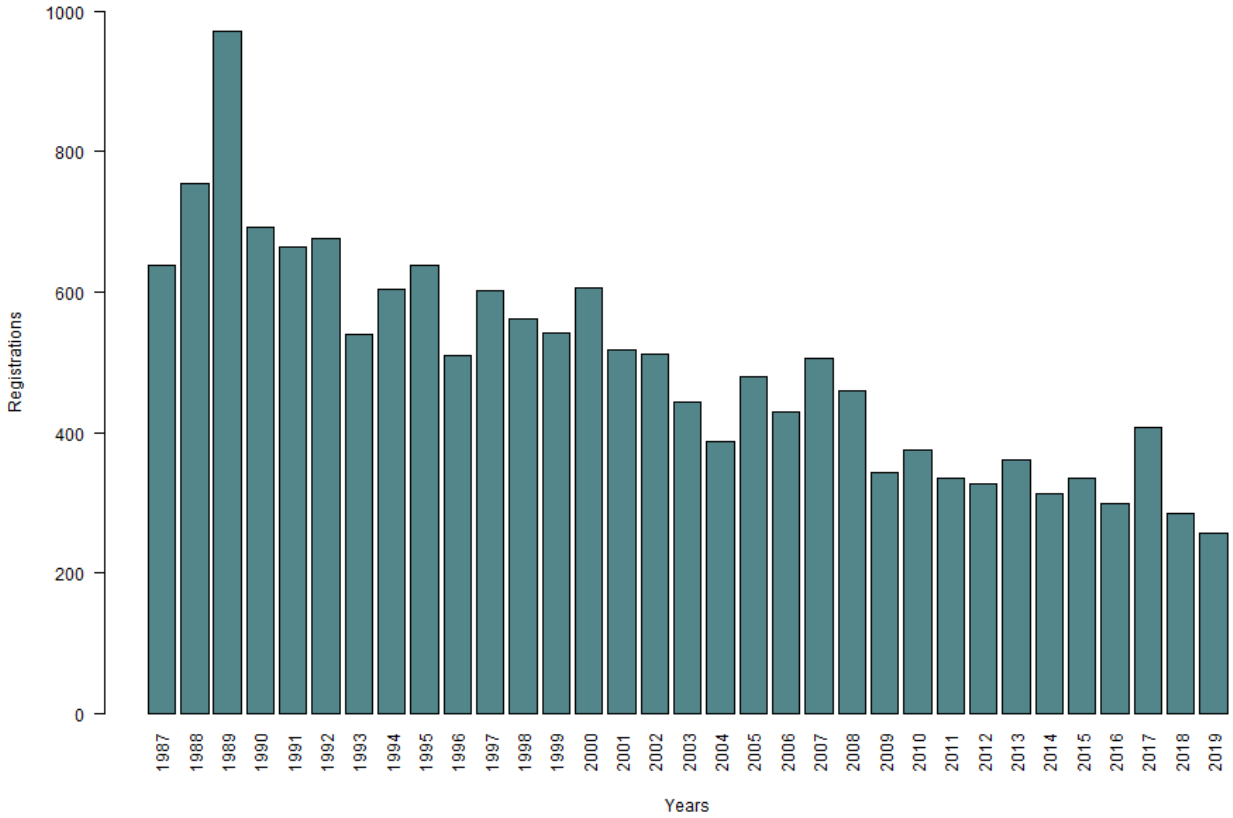


Figure 1: Number of registrations of Irish Wolfhounds per year of birth, 1980 – 2019.

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 2019 Breed Health Coordinator's Annual Health Report 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. Osteosarcoma/ bone cancer
2. Heart disease – AF and DCM
3. Pneumonia and bloat/ GDV

Actions to tackle these health concerns included:

- Continuing to work with the University of Nottingham to develop the ongoing lifetime study regarding osteosarcoma, and continuing to support a study into owner attitudes towards treatment, experiences and protocols in bone cancer

The breed also continue to promote and work closely with the AHT on their long term breed specific osteosaromca study, run by Dr Mike Starkey.

- Regarding heart health, the breed continue the Regional Heart Testing Scheme that offers a full three stage screening, (auscultation, electrocardiogram and echo scan), for a subsidised rate. The scheme continues to gather data from the sessions that is submitted to Dr Serena Brownlie-Sykes, their heart research specialist. As well as this, the breed continue to investigate ways of utilising the data generated to enable breeders to breed in an informed way – with the aim that EBVs may be able to produced based on the data. The breed are further hoping to launch a new trial to test the efficacy of the NT-ProBNP blood test as a possible diagnostic tool for the breed.

- The breed currently have a new survey into bloat run with the University of Nottingham and Matthew Haynes and are constantly monitoring other breed research into the condition and continue to promote the findings of these.

- The pneumonia study continues with Dr Mark Dunning from the University of Nottingham and Dr Angela Bodey, with the breed clubs continuing to encourage owners to submit surveys. We continue to educate owners with two versions of our guide alerting both vets and owners to the unique presentation of the condition in the breed and the need to treat hard and fast.

BREED CLUB HEALTH ACTIVITES

The breed has a health group (https://www.iwhealthgroup.co.uk/home.html) and an active Breed Health Coordinator in the UK.

There is also an international Irish Wolfhound Database (https://www.iwdb.org/), which holds pedigrees and health information for more than 160,000 Irish Wolfhounds. IWDB is an independent organisation, although supported by most breed clubs it is not affiliated to any of them.

In addition the Irish Wolfhound Foundation in the USA (https://www.iwfoundation.org/index.html) funds research and provides information about health conditions affecting the breed.

BREED SPECIFIC HEALTH SURVEYS

Kennel Club Purebred and Pedigree Dog Health Surveys Results

The Kennel Club Purebred and Pedigree Dog Health Surveys were launched in 2004 and 2014 respectively for all of the recognised breeds at the time, to establish common breed-specific and breed-wide conditions.

2004 Morbidity results: Health information was collected for 123 live Irish Wolfhounds of which 76 (62%) were healthy and 47 (38%) had at least one reported health condition. The top categories of diagnosis were reproductive (26.3%, 20 of 76 reported conditions), musculoskeletal (13.2%, 10 of 76 reported conditions), dermatologic (10.5%, 8 of 76 reported conditions), respiratory (9.2%, 7 of 76 reported conditions) and trauma (9.2%, 7 of 76 reported conditions). The most frequently reported specific conditions were uterine inertia (9.0% prevalence, 7 cases in the 78 female Irish Wolfhounds in the dataset), irregular heat cycles (5.1% prevalence, 4 cases in the 78 female Irish Wolfhounds in the dataset), kennel cough (4.1% prevalence, 5 cases), pyometra (3.8% prevalence, 3 cases in the 78 female Irish Wolfhounds in the dataset) and cystitis (3.3% prevalence, 4 cases)

2004 Mortality results: A total of 112 deaths were reported for the breed. The median age at death for Irish Wolfhounds was 7 years (min = 1 year, max = 17 years and 7 months). The most frequently reported causes of death by organ system or category were cancer (33.9%, 38 of 112 deaths), cardiac (19.6%, 22 deaths), gastrointestinal (12.5%, 14 deaths), combinations (5.4%, 6 deaths) and urologic (5.4%, 6 deaths). The most frequently reported specific cause of death apart from cancer was GDV (10.7%, 12 deaths).

2014 Morbidity results: Health information was collected for 74 live Irish Wolfhounds of which 43 (58.1%) had no reported conditions and 31 (41.9%) were reported affected by at least one condition. The most frequently reported specific conditions were skin (cutaneous) cyst (6.8% prevalence, 5 cases), bursitis (4.1%, 3 cases), hypersensitivity (allergic) skin disorder (4.1%, 3 cases) and urinary incontinence (4.1%, 3 cases). Two reports of GDV were reported for the breed.

2014 Mortality results: A total of 32 deaths were reported for the breed. The median age at death for Irish Wolfhounds was 6.5 years (min = 2 years, max = 12 years). The most frequently reported causes of death were cardiomyopathy (15.6%, 5 deaths), bone tumour (12.5%, 4 deaths), cancer – unspecified (9.4%, 3 deaths), heart failure (9.4%, 3 deaths) and old age combinations (9.4%, 3 deaths).

Irish Wolfhound Health Group Survey 2018

The Irish Wolfhound Health Group undertook a breed health survey in September 2018. Results of the survey have been reported through the Irish Wolfhound Health Group newsletter and website, with a summary given below. It is intended to repeat this survey at intervals to monitor disease and illness occurrence.

A total of 363 completed surveys were received, which also included mortality information on 286 dogs – these dogs had died in the preceding 10 years. The Breeders' Health survey had 35 completed responses giving details on 91 bitches used in a total of 159 matings.

Of the live dogs that information was submitted for approximately 57% were female and 43% were male.

Questions were asked based on which body part or system was affected by disease conditions or disorders. There were 15 categories in which owners could record conditions affecting their dogs, and it was acknowledged that often an illness may fall into two different categories. The categories are recorded below in order of most commonly reported diseases. It is important to note that some hounds may suffer from more than one illness.

The most commonly affected body system affected by count are shown in Table 1 below, with the top five being bones, muscles and joints, skin, coat and ears, digestive, cardiovascular and reproductive systems.

Table 1: The most commonly affected body systems for Irish Wolfhounds reported for in the 2018 health survey.

Body System Disease Category	**Number of Recorded Hounds**	**Males/Females**
No Diseases Reported	154	62/92
Bones, Muscles, Joints	73	36/37
Skin, Coat, Ear	56	28/28
Digestive System	51	27/24
Cardiovascular System	42	24/18
Reproductive System	30	6/24
Respiratory Conditions	27	12/15
Dentition	24	10/14
Urinary Tract System	23	10/13
Nervous System	12	6/6
Other Cancers	8	2/6
Eye Problems	8	5/3
Other Conditions	7	6/1
Liver Problems	3	2/1
Hormone/Endocrine System	2	2/0
Blood Conditions	1	0/1

The most commonly reported specific conditions are shown in Figure 2 below, and are consistent with what are generally seen across all dogs, such as chronic ear infections, persistent, recurring diarrhoea and allergies affecting skin. Following these were osteosarcoma (3.8%), atrial fibrillation (3.6%), pneumonia and bursas (3% each). Only 2.4% of live wolfhounds reported being affected with DCM.

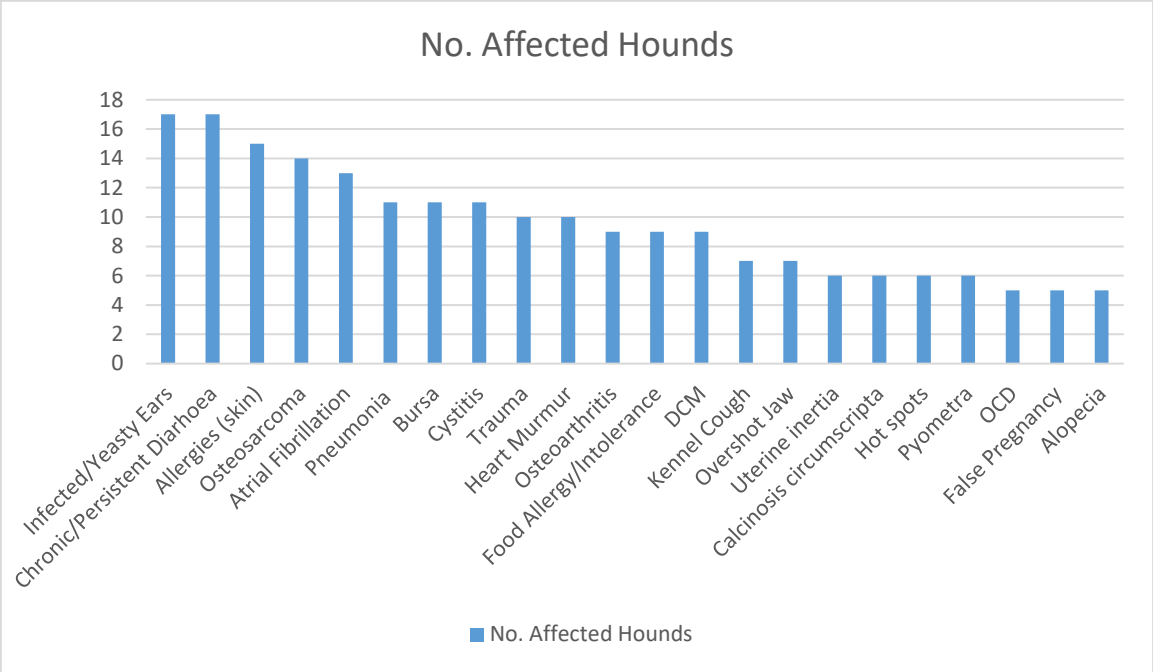


Figure 2: Number of affected Irish Wolfhounds for specific conditions reported in the 2018 health survey

Mortality Data

Respondents were asked for the cause of death data for any hounds that had passed away in the last 10 years. Responses were received for 286 dogs, with heart disease and osteosarcoma being the most commonly reported causes of death among deceased dogs, shown in Figure 3 below.

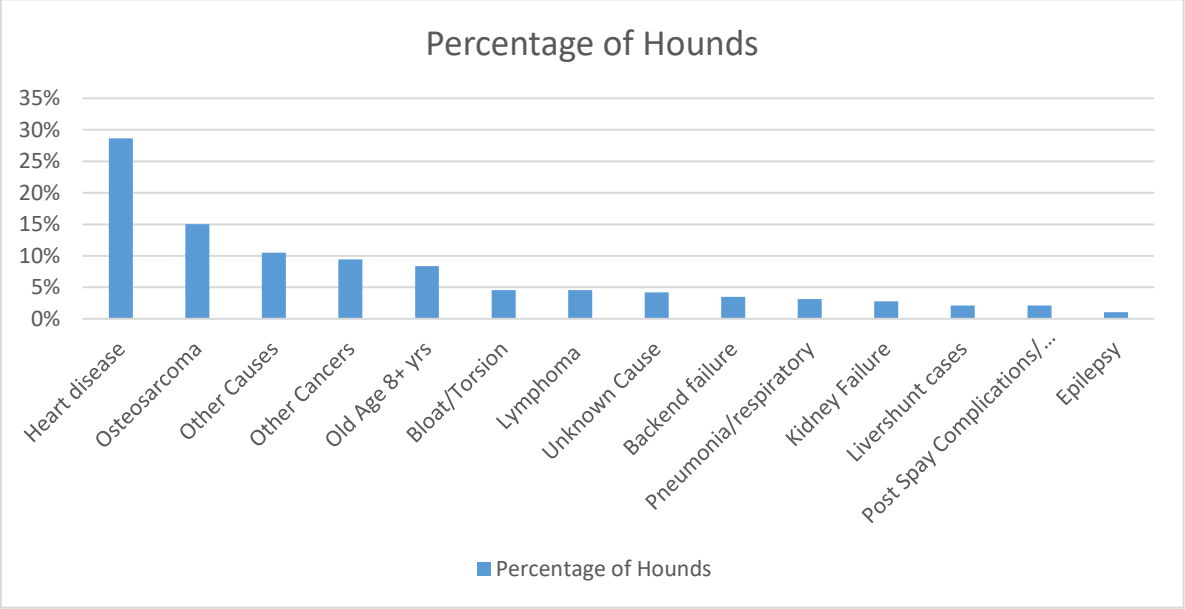


Figure 3: Cause of death for Irish Wolfhounds reported in the 2018 health survey

Breeder Survey

Breeders were asked to report on the litters and attempted matings they had had over the last 10 years, with responses from 35 breeders.

Table 2: Summary of responses received by breeders regarding matings over the past 10 years.

Question Asked	Total	% of Whole
How many bitches have had litters	91	
How many litters have they had	109	
Natural birth	78	71.56%
Emergency Caesarean Section	30	27.52%
Elective Caesarean Section	1	0.92%
Total number of puppies born	822	
Number of pups born alive	774	94.16%
Number of puppies that died in the first week	12	1.46%
Number of pups that had a birth defect	37	4.5%
Number of matings that did not result in a litter -	50	31%

In total, over a quarter of all births need to be via emergency caesarean section, and almost a third of the total number of matings did not result in a litter. Reported birth defects are given in Table 3, with the most common defects being livershunt and monorchidism.

Table 3: Birth defects reported under the breeder health survey

Category	Surgery/Survived	PTS/Died
Livershunt	4	3
Monorchid	4	
Defective heart valve	2	
Entropion	1	
Bilateral Subluxating patellas	1	
FCE	1	
Cryptorchid	5	
Overshot	2	
Hernia	1	
Heart murmur	1	
Incomplete midline closure		4
Encephalitis		1
Dysplasia	4	
Kidney problem	1	
Carpal hyperflexion	1	

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 attempted to acknowledge possible limitations of the studies reported, including when the research involved dogs in other countries. Whilst there are often strong links between populations of a breed in different countries, there are also often differences between the populations and issues seen in one country may not be seen (or may have a different prevalence) in another. However, it may also be useful for United Kingdom (UK) breeders to be aware of conditions occurring in the breed in other countries which have not yet been seen in the UK population, especially given that movement of breeding stock does occur between countries.

Cardiovascular conditions

Atrial fibrillation (AF): The Irish Wolfhound has been found to be at increased risk of this arrhythmia in an American case series. In a study of 109 cases of AF from two North American veterinary teaching hospitals, Irish Wolfhounds were over-represented in both the group of cases where structural heart disease and overt congestive heart failure was present and the group of cases with only AF without evidence of structural disease or systolic dysfunction; there were five cases in the breed in each group (Menaut et al, 2005). There appears to be an association between AF and dilated cardiomyopathy (DCM), with 80.5% of individuals with DCM in a recent British study also having a diagnosis of AF and those receiving a

diagnosis of AF while being free of DCM often go on to develop the condition in time (Simpson et al, 2016). Research into the condition in the breed is ongoing.

Dilated cardiomyopathy (DCM): The Irish Wolfhound has long been known to be predisposed to DCM. A full review of the literature relating to DCM in the breed is beyond the scope of this document; however, some key points and recent highlights are described here. A study of electronic patient records of 90,004 dogs examined at the University of California-Davis Veterinary Medical Teaching Hospital, USA, between 1st January 1995 to 1st January 2010 found the Irish Wolfhound to be the fourth most frequently affected breed with DCM, with a breed-specific prevalence of 6.08% compared to a mixed breed-prevalence of 0.16% (Bellumori et al, 2013).

A genome-wide association study performed using 106 Irish Wolfhound DCM cases and 84 controls of the breed, with samples from dogs from Germany, The Netherlands, Belgium, France, Sweden, Denmark and Norway, found six loci which were potentially involved with DCM in the breed (Philipp et al, 2012. This suggests that DCM is not inherited as a simple Mendelian trait in the breed. A subsequent study of 379 British Irish Wolfhounds, 36 (9.5%) of which had a confirmed diagnosis of DCM, looked at single nucleotide polymorphisms (SNPs) at five of these six loci and found that only three of them were associated with DCM/AF in the UK study and only one of these had the same allele associated with the disease (Simpson et al, 2016). Research into the condition in the breed is ongoing.

Gastrointestinal conditions

Gastric dilatation-volvulus syndrome (GDV, 'bloat'): GDV is an acute, life-threatening condition featuring rapid accumulation of air in the stomach, malposition of the stomach to a varying degree and a rise in intragastric pressure, frequently leading to the development of cardiogenic shock (Glickman et al, 2000). In an analysis of data collected in the 2004 Purebred Dog Health Survey, 10.7% (12 of 112) Irish Wolfhounds were reported to have died due to GDV giving a prevalence ratio of 4.5 (95% Confidence Intervals 2.6 – 7.7); this represented an increased risk of death due to the condition than dogs of other breeds (Evans et al, 2010).

Haematological conditions

von Willebrand's disease (vWD): vWD is the most common heritable canine bleeding disorder. Type I vWD is characterised by a low concentration of structurally normal vW factor (vWf) and relatively mild clinical signs, and this form has been reported in Irish Wolfhounds (Brooks, 1999). No more recent reports, nor prevalence estimates, could be found in the literature.

Hepatic conditions

Congenital portosystemic shunt (PSS): The Irish Wolfhound has long been known to be at increased risk of PSS. A retrospective Australian study of 233 affected dogs presenting to the University Veterinary Centre, Sydney, found the Irish Wolfhound to be at the greatest risk of the condition with an odds ratio of 10.88 (95% C.I. 2.09-56.39) compared to other breeds; however this result was based on just two cases in the breed (Hunt, 2004).

A Dutch test mating study involved one affected sire and two of his affected sisters; all five puppies in one litter had an intrahepatic PSS (IHPSS), and five of 11 pups in the other litter were affected (van Steenbeek et al, 2009). The authors reported that the observed occurrence could be explained by a digenic, triallelic mode of inheritance, but other modes of inheritance could not be excluded; however it is unlikely to be a single gene disorder. The UK breed clubs have been screening puppies since 1996, using the dynamic bile acid test, which has been shown to be an appropriate method for the mass screening of Irish Wolfhound puppies for PSS (Kerr and van Doorn, 1999). Research into the condition in the breed is ongoing.

Immunological conditions

No scientific references to conditions in this category could be found for the breed. However, it has been suggested that rhinitis / bronchopneumonia syndrome (discussed under respiratory conditions) may reflect an underlying immunodeficiency (Leisewitz et al, 1997).

Musculoskeletal conditions

Elbow dysplasia: The Irish Wolfhound was reported to be at elevated risk of fragmented coronoid process (FCP), a form of elbow dysplasia, with a breed-associated odds ratio compared to mixed breeds of 93.4 (95% C.I. 39.6 – 220.3) based on dogs which had attended veterinary teaching hospitals in the USA between 1986 and 1995; however these results were only based on 6 cases and 2 non-cases in the breed (LaFond et al, 2002).

Hip dysplasia: The Irish Wolfhound has been described as predisposed to hip dysplasia (Gough, Thomas and O'Neill, 2018). This was based on a Norwegian prospective cohort study which followed dogs of four breeds from birth to nine years of age; 9.5% (6 of 63 dogs) of Irish Wolfhounds were diagnosed with mild or moderate hip dysplasia by screening radiography at 12 months of age (Krontveit et al, 2012). Puppies born in Norway between November 1998 and June 2001 were eligible for inclusion in the study; two of the other breeds in the study, the Labrador Retriever and the Leonberger, had apparent prevalences of hip dysplasia based on screening radiography more than twice as high as that for the Irish Wolfhound.

Osteochondrosis (OCD) of the shoulder: The breed was reported to be at elevated risk of OCD of the shoulder, with a breed-associated odds ratio compared to mixed breeds of 47.1 (95% C.I. 26.4 - 84.0), based on dogs which had attended veterinary teaching hospitals in the USA; however this result was based on just 17 cases and 6 non-cases in the breed (LaFond et al, 2002).

OCD of the stifle: The breed was reported to be at elevated risk of OCD of the stifle, with a breed-associated odds ratio compared to mixed breeds of 523.5 (95% C.I. 165.6 - 1655.0), based on dogs which had attended veterinary teaching hospitals in the USA; however this result was based on just 6 cases and no non-cases in the breed (LaFond et al, 2002).

Panosteitis: The Irish Wolfhound was reported to be at elevated risk of panosteitis, with a breed-associated odds ratio compared to mixed breeds of 2.3 (95% C.I. 1.2 – 4.2), based on dogs which had attended veterinary teaching hospitals in the USA between 1986 and 1995; however this result was based on just 13 cases and 39 non-cases in the breed (LaFond et al, 2002).

Neoplastic conditions

Mammary tumours: Analysis of Swedish Agria insurance data, considering female dogs enrolled for both veterinary care and life insurance during 1995 to 2006, estimated the disease incidence of mammary tumours in 260,000 female dogs. Each full year a dog was insured contributed to one dog-year at risk (DYAR). The overall incidence rate for mammary tumours was 112 cases per 10,000 DYAR (95% C.I. 110 - 114). The proportion of bitches of all breeds that developed mammary tumours by 10 years of age was 13%; using Cox's proportional hazards regression without independent variables, the proportion of Irish Wolfhound bitches in this study that developed mammary tumours by 10 years of age was 41.0% (absolute numbers were 19 cases in 496 bitches), ranking the breed third out of 110 breeds in terms of breed-specific proportion (Jitpean et al, 2012). It has been reported that just 8% of bitches in Sweden are spayed, with elective neutering of dogs of both sexes being rare (Egenvall et al, 1999); therefore the incidence of mammary tumours in all breeds is likely to be significantly higher in the reported study than would be the case in the UK.

Osteosarcoma: A study of insured Swedish dogs under 10 years old between 1995 and 2002 found 764 dogs were diagnosed with bone tumours between 1995 and 2002. The Irish Wolfhound was the most common breed to be diagnosed with osteosarcoma, with 23 cases in the breed, giving an incidence rate of 99 cases (95% C.I. 59 - 140) per 10,000 dog years at risk (DYAR) compared to an all-breed incidence rate of 5.5 cases per 10,000 DYAR (Egenvall et al, 2007).

Genome-wide association analysis of 174 Irish Wolfhounds found four regions of the genome which together describe 53% of the phenotypic variance, demonstrating that inherited factors play a large part in the aetiology of the condition in the breed (Karlsson et al, 2013). Research into the condition in the breed is ongoing.

Neurological conditions

Fibrocartilaginous embolism (FCE): This condition is characterised by obstruction of the spinal vasculature, leading to a restriction in blood supply and eventual cell death, causing clinical signs such as difficulty moving and partial paralysis. Following a case report of eight puppies of the breed, and communications with breeders and owners of affected dogs, the Irish Wolfhound was suggested to be at elevated risk of this, specifically in puppies aged 8-20 weeks (Junker et al, 2000). The cause of the condition is not yet known, although the Irish Wolfhound Health Group continue to collect information from affected puppies.

Idiopathic epilepsy: An American retrospective study of 796 closely related Irish Wolfhounds from 115 litters reported a prevalence of idiopathic epilepsy of 18.3% (146 confirmed cases) (Casal et al, 2006). Pedigree analysis suggested that the trait could possibly be autosomal recessive with incomplete penetrance in the breed; males appeared to be at increased risk.

Ocular conditions

Progressive retinal atrophy (PRA): This inherited form of retinal degeneration has been described in the Irish Wolfhound, with an autosomal recessive mode of inheritance (Gould et al, 1997). To date, the causal mutation has not been identified.

Reproductive conditions

Dystocia: A study of Swedish insurance claim records from 1995-2002 reported an overall incidence rate of dystocia of 5.7 cases per 1000 dog years at risk; for Irish Wolfhounds the dystocia incidence rate was 16.5 cases per 1000 dogs years at risk, with 19 dystocia claims in 438 insured Irish Wolfhounds, suggesting that the breed is at increased risk of dystocia compared with dogs of other breeds (Bergstrom et al, 2006).

Low fertility: A Finnish study of 25 male Irish Wolfhounds reported that they had a higher incidence of low libido, small testicles and poor semen quality compared to a control group of 44 dogs of 21 breeds (Dahlbom et al, 1997). The inbreeding coefficients of the Irish Wolfhounds in the study were low, so this was not thought to be a factor.

Pyometra: Analysis of Swedish Agria insurance data, considering female dogs enrolled for both veterinary care and life insurance during 1995 to 2006, estimated

the disease incidence of pyometra in 260,000 female dogs. The overall incidence rate for pyometra was 199 cases per 10,000 DYAR (95% C.I. 196-202). The proportion of bitches of all breeds that developed pyometra by 10 years of age was 19%; using Cox's proportional hazards regression without independent variables, the proportion of Irish Wolfhound bitches in this study that developed pyometra by 10 years of age was 58.0% (absolute numbers were 38 cases in 496 bitches), ranking the breed fifth out of 110 breeds in terms of breed-specific prevalence (Jitpean et al, 2012). As previously noted for mammary tumours neutering is much less commonplace in Sweden than in the UK, therefore the incidence rate for pyometra is likely to be higher for all breeds than it would be in a UK study.

Respiratory conditions

Aspiration pneumonia: A possible breed predisposition to aspiration pneumonia was reported in an Australian study (Greenwell and Brain, 2014). In a retrospective study of dogs diagnosed with aspiration pneumonia at the Small Animal Specialist Hospital, Sydney, between January 2008 and December 2012, the overall incidence of aspiration pneumonia was 0.5% (138 cases). The incidence rate for the Irish Wolfhound was 36%, the highest for all breeds, with nine cases in 25 dogs of the breed seen over this time period (Greenwell and Brain, 2014). Age of the affected dogs of the breed ranged from one year to nine years. Four of the affected Irish Wolfhounds in this study had a predisposing cause identified; one had suffered a choking episode, one had GDV and two were subsequently diagnosed with laryngeal paralysis.

Rhinitis / bronchopneumonia syndrome: A case series of 28 dogs of the breed diagnosed with rhinitis / bronchopneumonia syndrome included 10 from Canada, six from the UK, six from Germany, four from Belgium and The Netherlands and two from Switzerland. Clinical signs included persistent mucoid or mucopurulent nasal discharge, cough and dyspnoea; pedigree analysis revealed common ancestry, suggesting that the syndrome may be heritable (Clercx et al, 2003). The underlying cause of the condition is unclear.

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

However, insurance databases are too useful a resource to ignore as they fill certain gaps left by other types of research; in particular they can highlight common, expensive and severe conditions, especially in breeds of small population sizes, that may not be evident from teaching hospital caseloads (Egenvall et al, 2009).

UK Agria data

Insurance data were available for Irish Wolfhounds insured with Agria UK. 'Exposures' are equivalent to one full policy year, free exposures 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. Full policies are available to dogs of any age. Between July 2016 and June 2017 there were 13 free exposures, 55 full exposures and 110 claims, for 2018 these figures were 13, 75 and 176 respectively.

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 July 2017 and 31st June 2018, are shown in Table 3 below. There were a low number of claims for any specific disorder. The previous years' top settlements were infection of inflammation of the skin, infection of inflammation of the bladder/ urethra, infection of inflammation of the nail/ claw, lameness and heart defect.

Table 4: Top 10 conditions and number of settlements for each condition in 2018 for Irish Wolfhounds insured with Agria UK

Condition	Number of settlements
Lameness finding	21
Skin (cutaneous) disorder (unspecified)	9
Hygroma (site unspecified)	8
Mitral valve disorder	7
Cruciate ligament rupture - caudal and cranial	7
Neoplasm - renal (kidney)	6
Pruritis finding	6
Hypothyroidism	6
Mass lesion - skin (cutaneous)	6
Tail injury	6

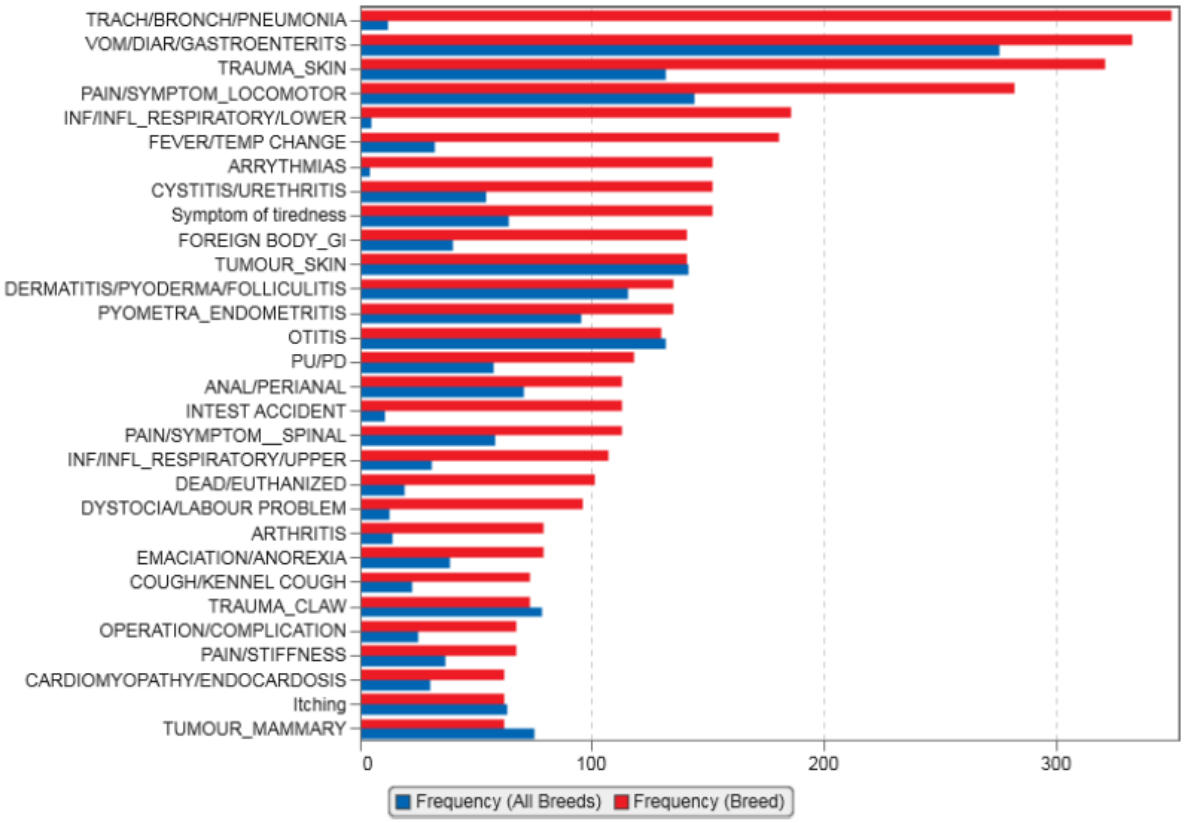
Swedish Agria insurance morbidity data

Swedish morbidity and mortality insurance data were also available from Agria for the Irish Wolfhound. Reported rates are based on dog-years-at-risk (DYAR) which take into account the actual time each dog was insured during the period (20011-

2016). The number of DYAR for the Irish Wolfhound in Sweden during this period was between 1,000 and 2,500, so the results should be interpreted with caution.

The full Swedish insurance results are available through https://dogwellnet.com/, but key findings are reported below.

The most common specific causes of veterinary care episodes (VCEs) for Agria-insured Irish Wolfhounds in Sweden between 2011 and 2016 are shown in Figure 2. The top conditions were tracheitis/ bronchitis/ pneumonia, vomiting/ diarrhoea/ gastroenteritis, skin trauma, pain during locomotion and infection/ inflammation of the lower respiratory tract.



Reminder: Categories are shown only if at least 8 animals had the diagnosis.

Figure 4: The most common specific causes of VCEs for the Irish Wolfhound compared to all breeds in Sweden between 2011 and 2016, from Swedish Agria insurance data.

The specific causes of VCEs ordered by relative risk for the Irish Wolfhound are shown in Figure 3. In this analysis, the top specific causes of VCEs ordered by relative risk were infection/ inflammation of the lower respiratory tract, arrhythmias, tracheitis/ bronchitis/ pneumonia, intestinal accident and dystocia/ labour problems. Rare conditions that occur sporadically may appear as a high relative risk; which

may apply to some of these conditions, particularly due to the small number of dogs included.

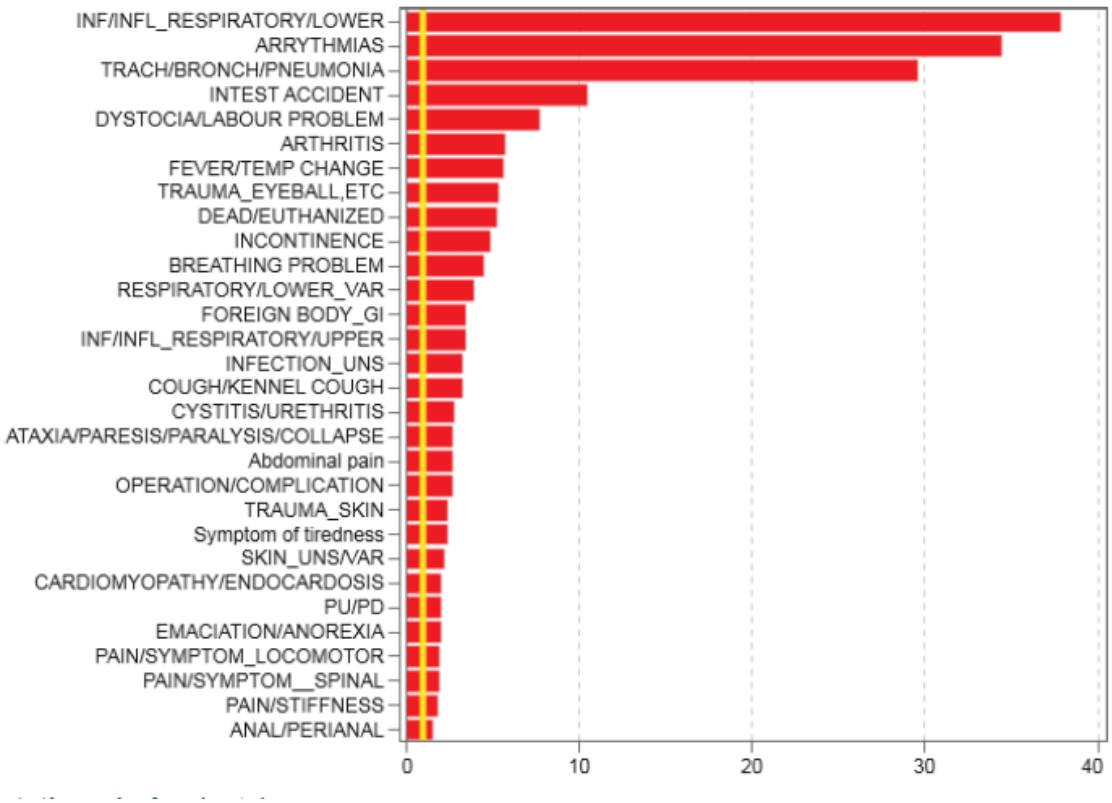
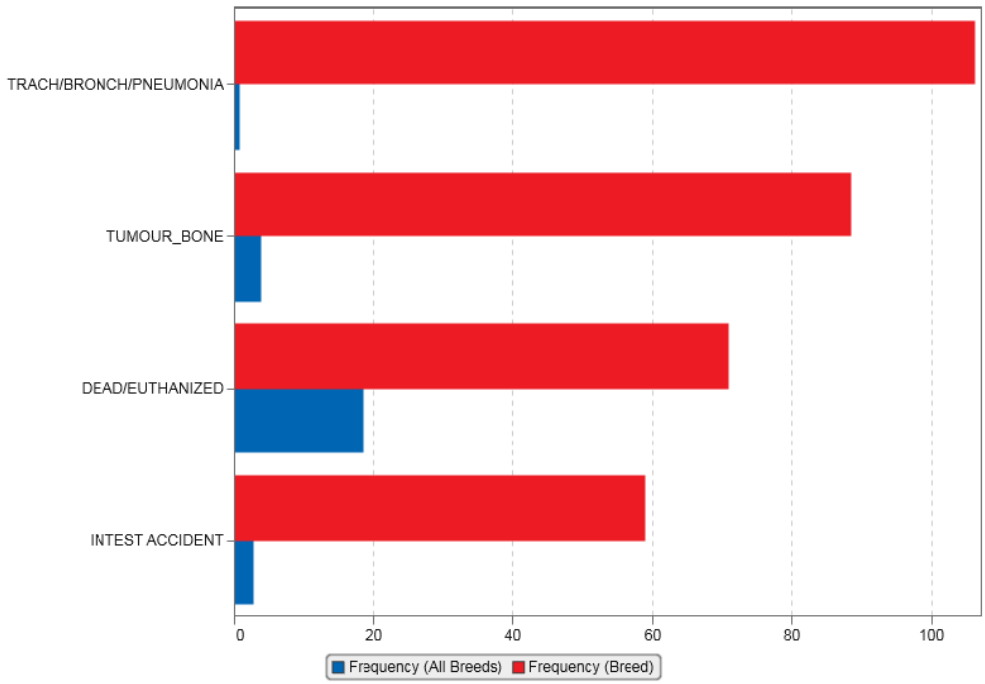


Figure 5: The specific causes of VCEs for the Irish Wolfhound ordered by relative risk compared to all breeds in Sweden between 2011 and 2016, from Swedish Agria insurance data. The yellow line indicates the baseline risk for all breeds.

Swedish Agria insurance mortality data

The most common specific causes of death or euthanasia for Agria-insured Irish Wolfhounds in Sweden between 2006 and 2011 are shown in Figure 3. Only four conditions were reported for more than eight dogs (Figure x) with these being tracheitis/ bronchitis/ pneumonia, bone tumours, dead/ euthanised, and intestinal accident.



Reminder: Categories are shown only if at least 8 animals had the diagnosis.

Figure 6: The most common specific causes of death for the Irish Wolfhound compared to all breeds in Sweden between 2011 and 2016, from Swedish Agria insurance data.

The specific causes of VCEs ordered by relative risk for the Irish Wolfhound are shown in Figure 3. In this analysis, again the top specific causes of VCEs ordered by relative risk were tracheitis/ bronchitis/ pneumonia, bone tumours, intestinal accident and dead/ euthanised.

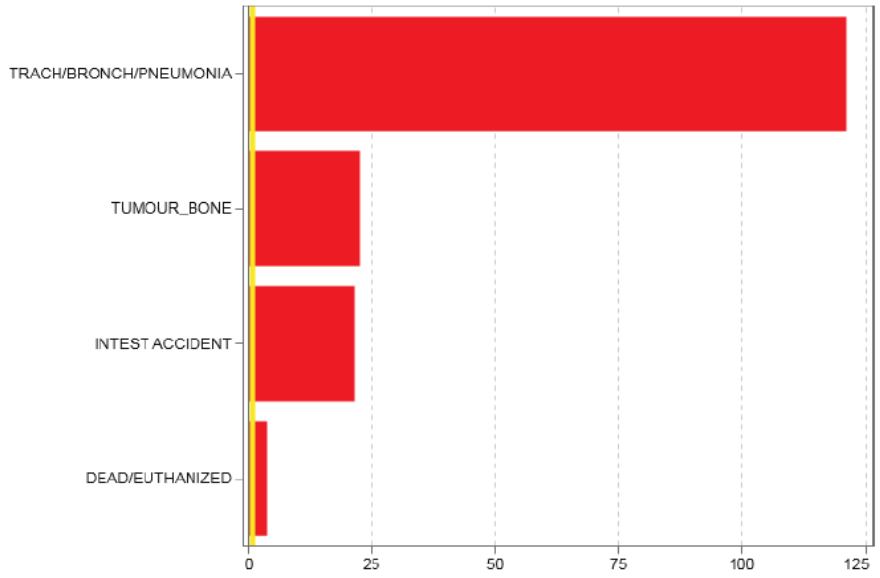


Figure 7: The specific causes of death for the Irish Wolfhound ordered by relative risk compared to all breeds in Sweden between 2011 and 2016, from Swedish Agria insurance data. The yellow line indicates the baseline risk for all breeds.

BREED WATCH

The Irish Wolfhound is a category 2 breed on Breed Watch, meaning judges are required to complete a mandatory monitoring form following a judging appointment at Championship Certificate level. The points of concern judges are required to monitor and the percentage of dogs reported to be affected are shown in Table 1.

Table 5: Judges' health monitoring reports for 2017 to 2019. Those marked with a * indicate newly reported points of concern.

Point of concern	**2017**	**2018**	**2019**
Misplaced lower canine teeth	5.78%	1.18%	2.72%
* Body weight/condition	0.84%	0.00%	0.00%
* Incorrect dentition	0.24%	0.00%	0.00%
* Nervous temperament	0.48%	0.00%	0.00%
* Overly narrow lower jaw	0.24%	0.00%	0.00%
* Unsound movement from weak hind movement	0.24%	0.00%	0.00%
Total dogs reported for	**831**	**1,018**	**662**

NB: As of quarter 3 in 2019 judges have no longer been reminded to complete their monitoring forms following their appointment, which has resulted in a drop in dogs

reported for across all breeds, and may be reflected in the total number of dogs in 2019.

PERMISSION TO SHOW

As of the 1st January 2020 exhibits for which permission to show (PTS) following surgical intervention has been requested will no longer be published in the Breed Record Supplement and instead will be detailed in BHCPs, and a yearly report will be collated for the BHC. In the past five years four PTS have been granted for Irish Wolfhounds (not including neutering), with two being for tail amputation as a result of trauma, and one for each other following: removal of teeth/ tooth due to trauma and removal of mammary glands.

ASSURED BREEDERS SCHEME

Under the Assured Breeder Scheme the following health test is currently a requirement:

- Eye testing under the British Veterinary Association (BVA)/ Kennel Club (KC)/ International Sheepdog Society (ISDS) Eye Scheme

The following are also recommended:

- Breed Club liver shunt testing of all puppies prior to being sold
- All hounds used for breeding take part annually in a heart testing scheme approved by the Irish Wolfhound Club: the minimum requirement being examination by a stethoscope, ECG and ultrasound scan
- Bitches under two years not to produce a litter
- Bitches over six years not to produce a litter
- Bitches not to produce more than one litter within a 12-month period

BREED CLUB BREEDING RECOMMENDATIONS

Breed Club members are recommended to comply with the following health measures:

- Bitches under two years not to produce a litter
- Bitches over six years not to produce a litter
- Bitches not to produce more than one litter in a 12-month period

- All hounds used for breeding to take part annually in a heart-testing scheme approved by the Irish Wolfhound Club: the minimum requirement being examinations by stethoscope, ECG and ultrasound scan
- Breed club liver shunt testing of all puppies prior to being sold

DNA TEST RESULTS

Whilst DNA tests may be available for the breed, results from these will not be accepted by the Kennel Club until the test has been formally recognised, the process of which involves collaboration between the breed clubs and the Kennel Club in order to validate the test's accuracy.

CANINE HEALTH SCHEMES

All the BVA/KC Health Schemes are open to dogs of any breed, and the results for Irish Wolfhounds which have been presented for assessment under the BVA/KC Health Schemes are shown below.

HIPS

In total four Irish Wolfhounds have participated in the BVA/KC Hip Dysplasia Scheme in the 15 years to date (July 2020), with a range in score of 8-11.

ELBOWS

Similarly, six Irish Wolfhounds have been elbow graded through the BVA/KC Elbow Dysplasia Scheme. Four of these dogs were graded as a 0, with the remaining two graded as a 1 and 3 respectively.

EYES

The Irish Wolfhound is currently on the BVA/KC/ISDS Known Inherited Ocular Disease (KIOD) list (formally Schedule A) for the following condition:

- PRA

KIOD 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.

A total of 44 dogs have been tested under the scheme in the past 15 years, of which none were found to be affected by the condition.

Schedule B has been incorporated into an annual sightings reports, which records the results of conditions not listed on KIOD for dogs which have participated in the

scheme. Results of Irish Wolfhounds included in the sightings reports are shown in Table 6 below.

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	4 – GPRA unaffected No additional comments
2013	1 adult 1 litters	1 – GPRA unaffected No additional comments
2014	7 adults 0 litters	7 – GPRA unaffected No additional comments
2015	0 adults 0 litters	
2016	2 adults 0 litters	2 – GPRA unaffected No additional comments
2017	2 adults 0 litters	1 – persistent pupillary membranes 1 – nuclear cataract
2018	1 adult	1 – nuclear cataract
2019	*Awaiting report*	

AMERICAN COLLEGE OF VETERINARY OPHTHALMOLOGISTS (ACVO)

Between 2015 and 2019, 629 dogs of the breed were examined by the ACVO and prevalence data are shown in Table 2 alongside data from previous years, for conditions affecting over 1% of the tested population. Overall, 67.7% (426 of 629) of dogs of the breed examined between 2015 and 2019 had healthy eyes unaffected by any disease conditions. However, it is important to bear in mind that the dogs were from America.

Table 7: ACVO examination results for Irish Wolfhounds, 1991 – 2019

Disease Category/Name	Percentage of Dogs Affected	
	1991-2014 (n=1,645)	**2015-2019** (n=629)
Eyelids		
Distichiasis	4.9%	5.1%
Nictitans		
Third eyelid cartilage anomaly	0.9%	1.4%
Cornea		
Corneal dystrophy	2.2%	0.8%
Uvea		
Persistent pupillary membranes (iris to iris)	1.0%	1.4%
Uveal cysts	5.0%	7.5%
Lens		
Cataract (significant)	8.3%	5.7%
Retina		
Retinal dysplasia (folds)	1.4%	1.4%
Optic nerve		
Micropapilla	0.7%	1.3%
Optic nerve hypoplasia	1.5%	0.6%
PRA	1.0%	1.0%

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

BREED CLUB HEART TESTING RESULTS

The Breed Clubs run a heart testing scheme, which consists of a full three stage screening, auscultation, electrocardiogram and echo scan. The full results of dogs are published on the Irish Wolfhound Health Group website. As of the end of 2019, a total of 427 dogs of the breed had been heart tested under the scheme. Of these 346 (81.0%) had a normal ECG and normal scan, and 6.7% had some degree of abnormality picked up through either scan or ECG.

http://www.iwhealthgroup.co.uk/publication-of-results.html

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.
- In all breeds, there was an increase in the number of caesarean sections reported from 2012 onwards, as the Kennel Club publicised the procedure to vets.
- It is important to remember that with a numerically small breed like this there will be a degree of fluctuation between the years.

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 Irish Wolfhounds registered per year and number of caesarean sections reported per year, 2009 to 2019.

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)***
2009	58	0	0.00%	*0.15%*
2010	46	0	0.00%	*0.35%*
2011	52	1	1.92%	*1.64%*
2012	40	5	12.50%	*8.69%*
2013	41	6	14.63%	*9.96%*
2014	44	9	20.45%	*10.63%*
2015	36	5	13.89%	*11.68%*
2016	36	13	36.11%	*13.89%*
2017	39	7	17.95%	*15.00%*
2018	35	11	31.43%	17.21%
2019	28	8	28.57%	15.70%

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 **222.2** 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 7. 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 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 breed has an international pedigree database (Irish Wolfhound Database) which holds information for over 160,000 Irish Wolfhounds and allows breeders to view potential matings, as well as known health test results. This database holds more pedigree information than the Kennel Club data, which is limited to a smaller number of generations of UK dogs only, and so breeders should consider this when deciding on a potential mating. The database can be found through clicking here: https://iwdb.org

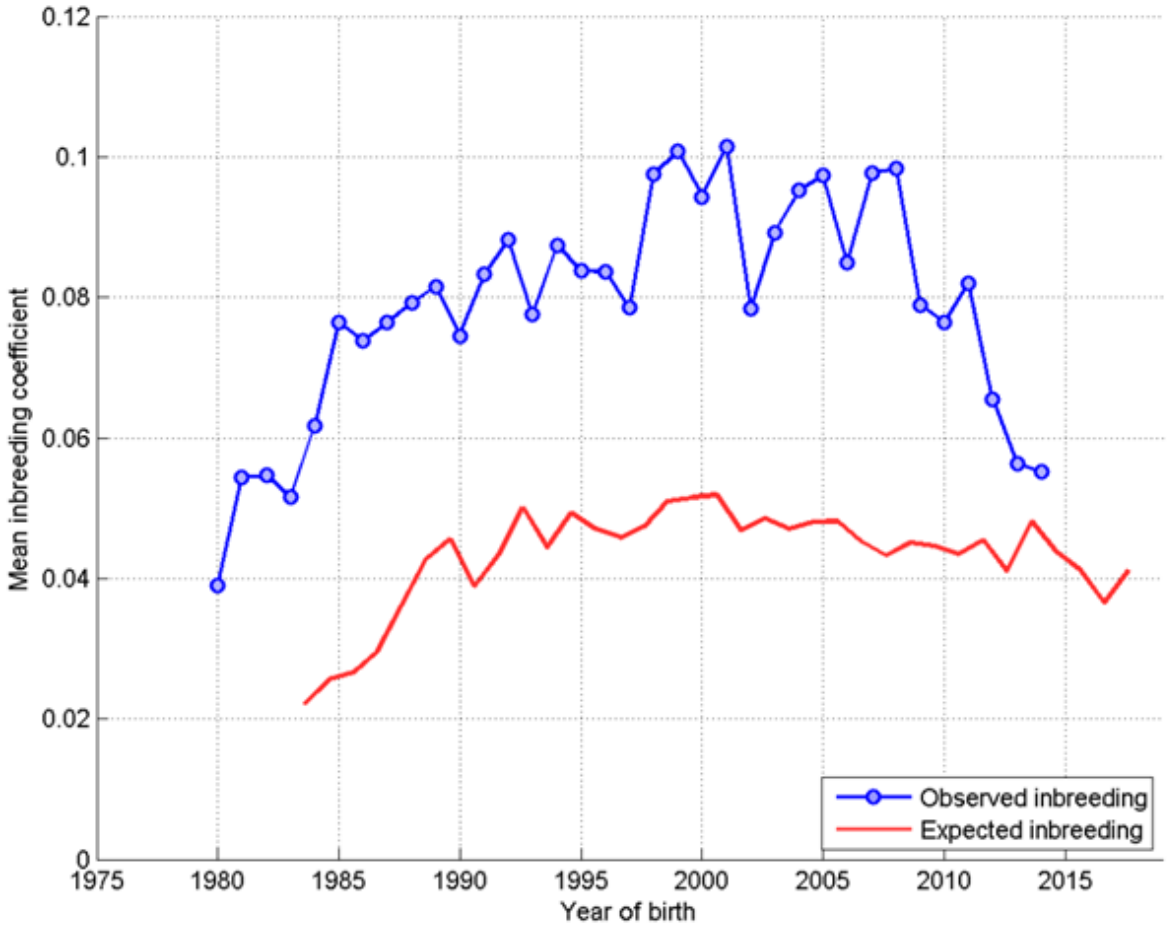


Figure 7: Annual mean observed and expected inbreeding coefficients.

Below is a histogram ('tally' distribution) of number of progeny per sire and dam over each of seven five-year blocks (Figure 8). 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). It appears that the extensive use of popular dogs as sires has eased a little (the 'tail' of the blue distribution shortening in Figure 8).

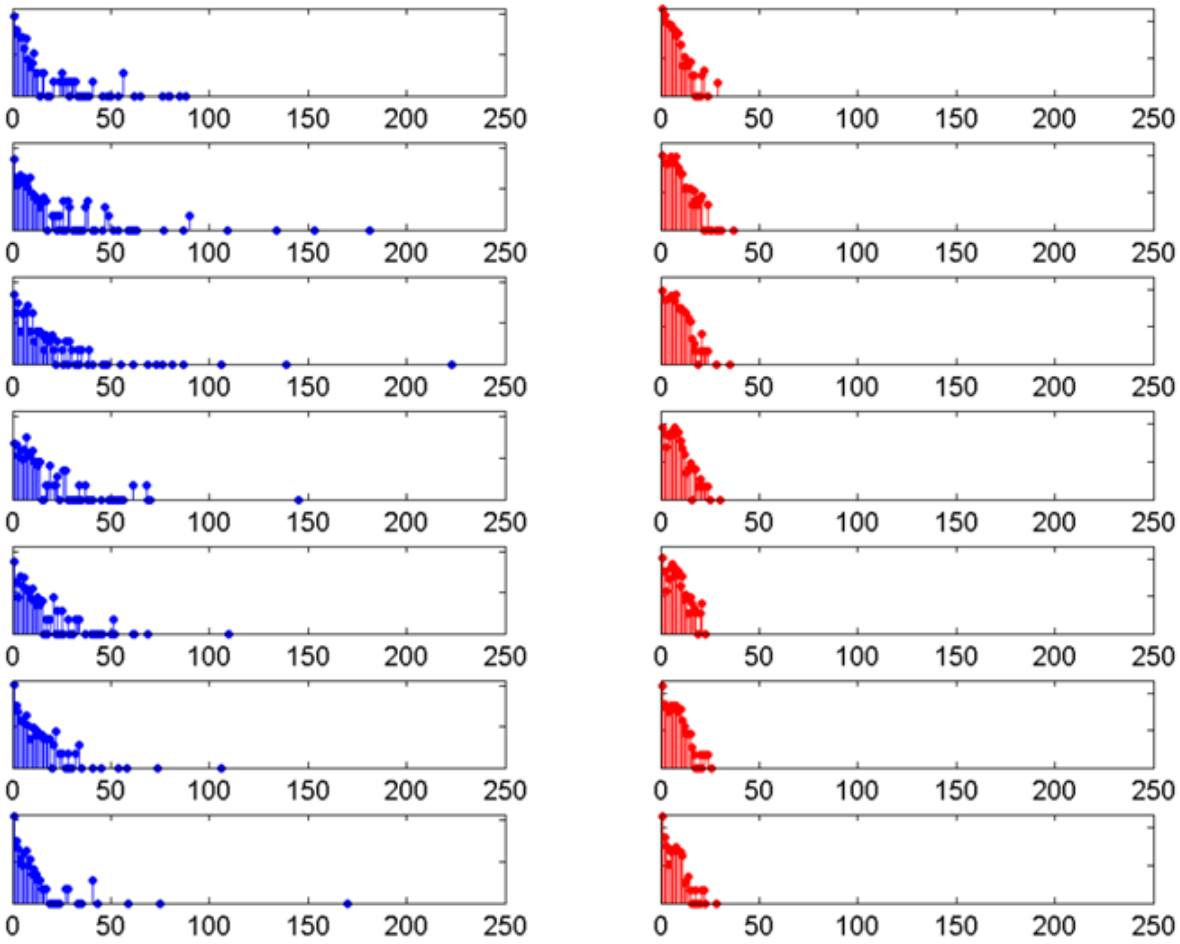


Figure 8: Distribution of progeny per sire (blue) and per dam (red) over 5-year blocks (1980-4 top, 2010-14 bottom). Vertical axis is a logarithmic scale.

CURRENT RESEARCH

The Irish Wolfhound is a breed heavily involved in aspects of health research, with the current projects summarised below:

- The Irish Wolfhound is one of the breeds in the AHT's Give a Dog a Genome project; the health condition given as a concern in the breed was osteosarcoma. An affected dog of the breed has been sequenced. Alongside this, a further five Wolfhound genomes were sequenced (four affected by osteosarcoma, one unaffected) with funding from the Irish Wolfhound Health Group.

- Research is also underway into the genetics of osteosarcoma in the breed in Sweden, through the Dog Genome Project.

- A long-term study into osteosarcoma also began at the University of Nottingham in April 2014 and is aiming to recruit 1,000 British Irish Wolfhounds. http://www.iwhealthgroup.co.uk/nottingham-university.html

- The Irish Wolfhound Health Group has been collaborating with researchers at the University of Nottingham since 2013 on research into pneumonia in the breed. http://www.iwhealthgroup.co.uk/pneumonia.html

- The Irish Wolfhound was part of the Lupa Project at the University of Liverpool, funded by the European Commission, investigating DCM.

- There is ongoing data collection relating to heart disease, in collaboration with the University of Nottingham. Through the IWHG Regional Heart Testing scheme. http://www.iwhealthgroup.co.uk/dates-and-locations-.html

- There is a research project investigating a possible link between the condition and thromboembolic disease, at the University of Nottingham respectively. http://www.iwhealthgroup.co.uk/nottingham-university-1.html

- There is research into the genetics of intrahepatic portosystemic shunts in the breed underway at the University of Utrecht. http://www.iwhealthgroup.co.uk/liver-shunt-1.html

- The IWHG is running a survey investigating the development of teeth and jaw alignment in Irish Wolfhound puppies. http://www.iwhealthgroup.co.uk/about-the-study.html

- A DNA Repository Scheme/Blood Bank for the breed is available at the AHT. http://www.iwhealthgroup.co.uk/dna-storage-programme.html

- The IWHG has a liver shunt, epilepsy and PRA reporting survey, which owners are invited to complete if their dogs are affected with any of these conditions. http://www.iwhealthgroup.co.uk/health-survey.html

- The IWHG runs a Veteran survey, for dogs of the breed who live to over seven years of age. http://www.iwhealthgroup.co.uk/veteran-study.html

PRIORITIES

Correspondence was made between the Kennel Club and the Irish Wolfhound breed representatives in July 2020 to review the action plan of the BHCP and updated data and progress for the breed.

The group agreed from the evidence base and their own experience that the priorities for the Irish Wolfhound remained the same with these being:

- Osteosarcoma
- Pneumonia
- Heart conditions, especially DCM and AF (with particular emphasis on using existing data produced to establish tools for breeders)
- Bloat/ GDV
- FCE

ACTION PLAN

Following the meeting between the Kennel Club and the breed regarding the evidence base of the Breed Health & Conservation Plans, the following actions were agreed to improve the health of the Irish Wolfhound. Both partners are expected to begin to action these points prior to the next review.

Breed Club actions include:

- The breed clubs to review the Breed Watch point of concern for misplaced canines.
- The breed clubs to investigate the possibility of developing a central database for health conditions in the breed instead of individual health surveys.
- The Breed Clubs to continue to run the condition-specific health surveys, with the Kennel Club to assist in dissemination.

Kennel Club actions include:

- The Kennel Club to investigate the possibility of the AHT researching PRA in the breed with the hope of developing a DNA test. – **ON HOLD**
- The Kennel Club to help disseminate health surveys and events for the breed. – **ONGOING**
- The Kennel Club to investigate the possibility of publicising results from liver shunt tests and making testing an ABS requirement. – **COMPLETE**
- The Kennel Club to investigate the possibility of developing a formal heart testing scheme for the breed, in collaboration with the Veterinary Cardiologist Society. - **ONGOING**
- The Kennel Club to investigate the possibility of the results of the research collaboration between Dr Lewis and Dr Brownlie into DCM being made available. – **ONGOING**
- The Kennel Club to share the link to the Irish Wolfhound Health Group website on the Breed Information Centre.
- The Kennel Club to investigate the possibility of adding a caveat to the Mateselect website for the breed and encourage owners to investigate data obtainable from the breed clubs
- The Kennel Club to repeat the population analysis for the breed.

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