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CENTRO UNIVERSITÁRIO DE LISBOA
FACULDADE DE MEDICINA VETERINÁRIA
MESTRADO INTEGRADO EM MEDICINA VETERINÁRIA

CANINE DEMOGRAPHICS OF DUBLIN CITY COUNCIL'S DOG SHELTERS: AN AFTERMATH OF BREED SPECIFIC LEGISLATION?

Dissertação apresentada a provas públicas para a obtenção do grau de mestre em Medicina Veterinária, orientada por Professora Doutora Raquel Estevão de Matos.

Luna Mel Dias Gomes Chaves Pinho

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VERSÃO FINAL

Trabalho de Projeto defendida por Luna Mel Dias Gomes Chaves Pinho em provas públicas na Universidade Lusófona, Centro Universitário de Lisboa no dia 02/12 de 2025, perante o júri, nomeado pelo Despacho de Nomeação n.º: 585 / 2025, de 12 de Novembro, com a seguinte composição:
Presidente: Professor Doutor André Duarte Belchior Pereira (Universidade Lusófona)
Vogal: Professor Doutor Tiago Serradas Viegas Mendonça (Universidade Lusófona) - arguente
Orientador: Professora Doutora Raquel Estevão de Matos

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Abstract

Dogs have contributed to humanity for thousands of years, serving various roles such as hunting, guarding, and companionship. Despite the many benefits of dog ownership, dog aggression remains a drawback of the close relationship between dogs and humans, placing a significant toll on healthcare systems worldwide.

In an attempt to curb the issue of dog bites, some governments implement Breed-specific legislation (BSL) to impose restrictions or bans on breeds considered risky for public safety. In Ireland, ten breeds are restricted, and owners must comply with specific requirements when having these dogs in public.

This study utilized a database containing information on dogs admitted to Dublin City Council's dog shelters over a one-year period (January 2024 to February 2025). The analysis focused on the demographics of the shelter population, with emphasis on dog breed and the impact of breed-specific legislation in Ireland. Outcomes such as length of stay, live release rates, and euthanasia were compared across breeds, using both descriptive and analytical statistical methods.

The findings revealed that restricted breeds were 6.38 times more likely to be euthanised than non-restricted breeds. Specifically, Pit bull-type dogs were 5.26 times more likely to be euthanised compared to all other breeds. Additionally, restricted breeds had a significantly longer length of stay, averaging 44.5 days, compared to 24.7 days for non-restricted breeds. This difference was even more pronounced for Pit bull-type dogs, who had an average stay of 46.7 days, compared to 27.2 days for other breeds.

These results suggest that BSL may negatively affect the welfare and outcomes of dogs within the shelter system in Dublin City Council, notably for breeds subject to restrictions.

Key words: Breed specific legislation, Length of stay, Euthanasia, Live release, Pit bull-type dogs, Dog aggression, Dublin city council dog shelter.

Resumo

Os cães têm contribuído para a humanidade há milhares de anos, desempenhando diversas funções, como caça, guarda e companhia. Apesar dos muitos benefícios da tutoria de cães, a agressão canina continua a ser uma desvantagem da relação proxima entre cães e humanos, colocando uma carga significativa nos sistemas de saúde em todo o mundo.

Na tentativa de reduzir o problema das mordidas de cães, alguns governos implementam a legislação específica para raças de cães (BSL, na sigla em inglês) para impor restrições ou proibições a raças de cães consideradas de risco para a segurança pública. Na Irlanda, dez raças são restritas, e os tutores devem cumprir requisitos específicos ao manusear esses cães em público.

Este estudo utilizou uma base de dados contendo informações sobre cães admitidos nos abrigos de cães do Conselho Municipal de Dublin ao longo de um período de um ano (Janeiro 2024 a Fevereiro 2025) . A análise centrou-se na caracterização demográfica da população dos abrigos, com ênfase na raça e no impacto da legislação específica de raças de cães na Irlanda. Foram comparados resultados como o tempo de permanência, taxa de saída com vida e eutanásia entre diferentes raças, utilizando métodos estatísticos descritivos e analíticos.

Os resultados revelaram que cães de raças restritas apresentaram uma probabilidade 6.38 vezes maior de serem eutanasiados em comparação com cães de raças não restritas. Especificamente, cães do tipo Pit bull apresentaram uma probabilidade 5.26 vezes maior de serem eutanasiados em relação às demais raças. Além disso, as raças restritas permaneceram significativamente mais tempo nos abrigos, com uma média de 44.5 dias, em comparação com 24.7 dias para raças não restritas. Essa diferença foi ainda mais acentuada no caso dos cães do tipo Pit bull, que tiveram uma permanência média de 46.7 dias, contra 27.2 dias das outras raças.

Esses resultados sugerem que a legislação específica por raça pode impactar negativamente o bem-estar e o destino dos cães no sistema de abrigos do Conselho municipal de Dublin, especialmente para as raças sujeitas a restrições.

Palavras chave: Raças potencialmente perigosas, Conselho municipal de Dublin, Cães do tipo Pit-Bull Terrier, Eutanásia, Agressão canina, Tempo de permanencia.

Abbreviations and Symbols

AHWA- Animal Health and Welfare Act 2013

BSL- Breed Specific Legislation

C-BARQ - Canine Behavioural Assessment and Research Questionnaire

CODA- Control of Dogs Act 1986

COHA- Control of Horses Act 1996

DCC- Dublin City Council

DIAS - Dog Impulsivity Assessment Scale

DSPCA- Dublin Society for the Prevention of Cruelty to Animals

GWAS- Genome-wide association studies

Pit bull- American Pit bull Terrier

PBTD- Pit Bull-type dogs

SAB- Socially Acceptable Behaviour

UK- United Kingdom

US- United States

WHO- World Health Organization

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Chapter I: Internship Report

The academic internship, undertaken to complete the Integrated Master's in Veterinary Medicine at the University of Lusófona, was carried out at the Animal Welfare and Control Unit of Dublin City Council (DCC). The duration was 4 months, taking place from 23 September 2024 to 23 January 2025, and totalling 660 hours.

The Animal Welfare and Control Unit is an integral part of Ireland's Animal Welfare Strategy 2021–2025, which emphasizes the One Health perspective by recognizing the interconnectedness of human and animal well-being. Aligned with this strategy, the unit is dedicated to promoting animal welfare standards.

The primary aim of the internship was to deepen the author's understanding of animal welfare legislation and its practical approach. The work conducted was that of an animal welfare officer, whose position involves investigating welfare cases under the *Animal Health and Welfare Act 2013 (AHWA)* and monitoring compliance with the *Control of Dogs Act* 1986 (CODA) and the *Control of Horses Act 1996 (COHA)*. The role has a multifaceted nature, combining fieldwork, enforcement and community education.

The authorized officer under the *Control of Dogs Act 1986* (CODA) has the responsibility in collecting stray dogs, enforcing restricted breed regulations, and ensuring that dogs in public areas are properly controlled by their owners. Under the *Animal Health and Welfare Act* (AHWA), responsibilities extend to guaranteeing that animals' needs are met in line with the Five Freedoms: freedom from hunger, pain, discomfort, fear, and distress, along with the freedom to express natural behaviours. Although the AHWA covers multiple species, the unit mainly focuses on dogs and horses. Furthermore, under the COHA enforcement duties include the collection of horses found in public spaces and managing licensing within the controlled area.

The casework of the unit was based from complaints received from various sources. Reports were made by members of the public or stakeholders, such as An Garda Síochána, the Dublin Society for Prevention of Cruelty to Animals, other welfare charities or Dublin City Council

housing officers, and had the option of being submitted anonymously or with identification, via phone or email. These reports included details about the issue, such as the animal's owner, location, breed, and any other relevant information. Upon receipt of a complaint, the administrative team was responsible for assigning the cases to the officers, who would then apply the appropriate measures according to relevant legislation.

Regarding stray dogs, members of the public are legally required to notify the local authority if they find one, providing details such as the breed and location where the animal was found. The same applies for other charities, rescues and members of An Garda Síochána. While not all local authorities take in surrenders in Ireland, Dublin City Council does accept them under specific conditions. These include the availability of space in the kennels, payment of a fee, and submission of documentation proving ownership of the animal.

In animal welfare cases, visits involved inspecting the property or area where the animal was kept and assessing the animal's living conditions using a welfare assessment book (Annex A) based on the Five Freedoms. If welfare standards were not met, owners were issued an improvement notice with a specified timeframe for compliance, followed by a reinspection. In more severe cases, owners unable to meet welfare requirements were encouraged to voluntarily surrender the animal, or the animal was seized, with legal action pursued under the AHWA. While barking complaints also fall under the Environmental Protection Agency (EPA) Act 1992 and are typically considered a civil matter under the CODA it is, welfare officers also conduct checks to assess compliance with the Five Freedoms of animal welfare.

Some reports involved breaches of the CODA, such as owners failing to comply with requirements for restricted breeds in public areas or not keeping their dogs under effective control. The breeds legislated in Ireland include the: American Pit Bull Terrier, English bull terrier, Staffordshire bull terrier, Bull mastiff, Dobermann pinscher, German shepherd (Alsatian), Rhodesian ridgeback, Rottweiler, Japanese akita, Japanese tosa, and any dog with a strain of the mentioned breeds. In these situations, officers educated owners on their responsibilities, including the need for muzzling, using a secure leash and being led by a person over 16 years old, and ID collars. For other breeds, owners were required to maintain effective control and use a leash in certain areas and at specific times, in accordance with the bye laws in the CODA. Fines were issued if violations were confirmed, either through direct observation

by authorized officers, including members of An Garda Síochána, or by obtaining a written witness statement from a member of the public, in case the event was contested in court.

During the internship, the author participated in multi-agency operations organized by An Garda Síochána. These operations focused on seizing dangerous dogs under Section 22 of the CODA following a dog bite incident. Welfare officers were responsible for managing the dogs, transporting them securely to the shelter, where they were held pending court proceedings. In two cases, the dogs involved were of the Pit bull-Type dog (PBTD) (Figure 1), breed that has gained media attention due to dog attacks and played a significant role in the implementation of the XL Bully Ban, which came into effect during the author's internship.

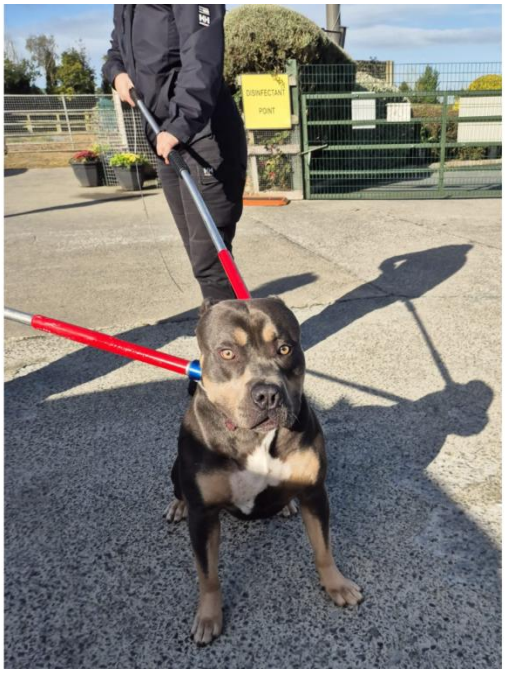


Figure 1 : Pit-bull Type dog (American Bully) seized under section 22 CODA.

Beyond dogs, the unit also monitored horses under the COHA. This legislation requires horses within Dublin City Council's controlled area to be licensed. Licenses are issued only after verifying the animal's documentation and inspecting the stable to ensure it meets welfare standards. During the author's time with the unit, they participated in multi-agency inspections of horse-drawn carriages (Figure 2), a cultural tradition in Ireland often used for tourism in Dublin's city centre. Two multi-agency operations were carried out to ensure compliance with licensing and welfare standards. Horses found to be unfit for work or lacking proper documentation were removed from the controlled area until compliance was achieved.

Figure 2 : Multi agency inspection of horse drawn carriages, with members of An Garda Síochána and Animal Welfare officers of Dublin City Council.

Community education is also a strategy implemented by the section, aiming on changing how animals are treated within Dublin's context and creating awareness of animal welfare principles. Recognizing the importance of promoting responsible dog ownership and animal welfare, the unit collaborates with local schools and community groups. The author participated in a program revolving around Halloween, a time often associated with increased cases of animal abuse, and focused on delivering educational sessions to kindergarten children in an area with high reports of roaming dogs and restricted breeds. The session, supported by members of An Garda Síochána, emphasized the responsibilities of dog ownership, best animal welfare practices, and safety during the holiday period.

Table 1 : Table containing the number and frequency of cases during the internship period.

Cases	**Relative Frequency (%)**	**Absolute Frequency**
Responsible Dog Ownership	27%	48
Community education	1%	1
Welfare Check	35%	62
Aggressive dog	8%	14
An garda Siochana operation	3%	6
Stray collection	23%	41
Surrender collection	3%	6
Total	100%	178

The participation in cases of dog bite incidents and the author's experience with the *Control of Dogs Act* inspired a deeper interest in exploring issues surrounding canine aggression and the connection with breed-specific legislation. This motivated the theme of this dissertation which seeks to address the challenges posed by regulating specific breeds, which, while intended to reduce aggression, fails to meet its purpose and often compromises the welfare of the dogs.

Chapter II: Canine Demographics of Dublin City Council's Dog Shelters: An aftermath of Breed Specific Legislation?

I. Introduction

The bond between humans and dogs began thousands of years ago with the domestication of the gray wolf (*Canis lupus*). While various theories exist about how wolves evolved into modern dogs, there is a consensus that their domestication was a mutually beneficial process, developing over multiple phases and ultimately enhancing the survival of both species (Tancredi & Cardinali, 2023).

Dogs accompanied humans during the transition from a hunter-gatherer society to an agriculture-based lifestyle, serving roles in hunting, security, and companionship (Galibert et al., 2011).

The relationship between dogs and humans has been shaped by domestication, leading to dog's increased attractiveness to humans and the development of social behaviours unique to the human-dog bond (Lazzaroni et al., 2020). The variability in their morphological and behavioural traits, along with their ability to interpret social cues, has been crucial to the roles they play in modern society. Nowadays, dogs assist humans in various capacities, including therapy, companionship, guarding, and rescue. Their presence has also been shown to benefit human mental and physical well-being (Gee et al., 2021).

However, despite the numerous benefits of pet ownership, challenges arise from the interaction between species. Dog ownership, in particular, has been associated with public health concerns, including zoonotic diseases and canine aggression (Overgaauw et al., 2020).

According to the World Health Organization (WHO), dog bites are responsible for an estimated 10 million injuries each year (World Health Organization, 2024).The toll on the healthcare system underscores the need for a deeper understanding of canine aggression and its connection to policies motivated by the interest in protecting public safety.

1.1 Understanding dog aggression

Aggression is a common behaviour observed in dogs, and serves them various purposes such as hunting, conflict resolution, and establishing hierarchy. The definition of aggression is "a physical act or threat of action by one individual that reduces the freedom or genetic fitness of another" (Radosta, 2024). Before resorting to biting, dogs usually exhibit changes in body posture and vocalizations to signal their intent to create distance from a perceived threat (Siniscalchi et al., 2018).

The types of canine aggression dogs may exhibit include conflict-related, resource guarding, fear-related, territorial, predatory, pain-induced, play-related, dominance-related, maternal, redirected, intraspecific miscommunication, intraspecific dominance, and pathophysiological aggression. This classification considers both the motivation behind the behaviour and its intended target (Horoszewicz et al., 2017; Radosta, 2024). The complexity of classifying canine aggression is further complicated by the multitude of variables influencing its display, including external factors such as the environment and internal factors such as genetics and early socialization.

Dogs communicate within their social groups using a variety of methods, including auditory, visual, olfactory, and tactile signals. For visual communication, they rely on body postures, movements, and facial gestures to indicate their intentions and mental state. When confronted with a situation, their ears, tail, head, lips, and overall body posture provide cues about their emotional state, for instance fear, arousal, threat, or attention. Vocalizations, including howling, whining, growling, and barking, also express a dog's mental state and may emerge in different contexts to convey emotions or reactions (Elzerman & Radosta, 2024).

However, the messages dogs convey through body language are not always properly interpreted by humans, which can lead to situations where dog bites incidents happen. Lakestani and collaborators (2014) assessed participants of different age groups by showing them videos and drawings of dogs with varying facial expressions to evaluate their ability to interpret canine emotions. The study found that younger children were less capable of understanding dog behaviour, with the ability to recognize and interpret these expressions improving with age. Younger participants relied mostly on vocalizations of the dog rather than body posture to interpret aggression (Lakestani et al., 2014).

A study conducted by Mariti and collaborators (2012) analysed dog owners' ability to recognize signs of stress in their pets. The survey revealed that owners most commonly identified trembling and whining as indicators of stress, subsequently aggressiveness, barking, and panting. However, more subtle stress-related behaviours often went unnoticed, supporting the idea that humans have limited understanding of canine body language as a form of communication, impacting early intervention (Mariti et al., 2012).

Kendal Shepherd, a veterinary behaviourist, developed the "Ladder of Aggression" model (Figure 3), which illustrates how dogs escalate their warning signals, before resorting to biting. The author found that when owners seek professional help, the animal has often already attempted other, more subtle communication methods that were ineffective in expressing its discomfort. The behaviours displayed along this ladder are primarily driven by stress and anxiety, emphasizing the importance of recognizing early warning signs to prevent escalation. (Shepherd, 2009)

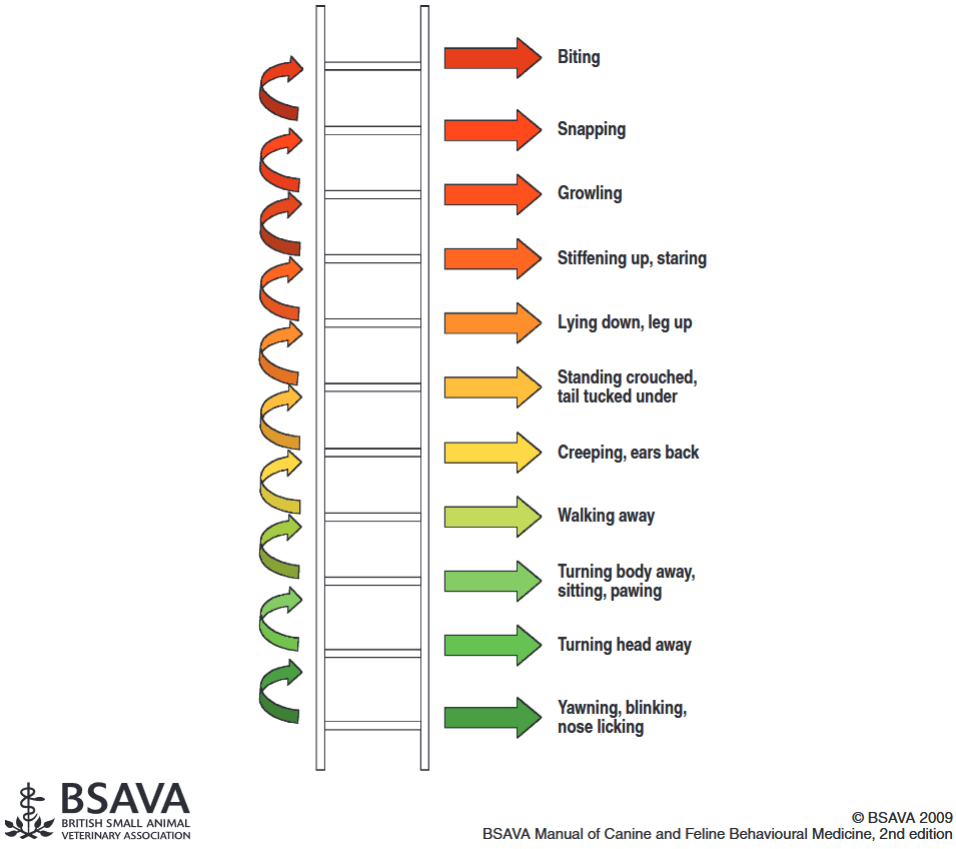


Figure 3 : Ladder of Aggression. Source: Shepherd (2009)

1.2 The development of canine Behaviour: Influences of genetics, health, environment and life stages

1.2.1 Life stages of the dog

The dog's development is composed of six phasis: the prenatal period, the neonatal period, the transition period, the socialization period, the juvenile period and the pubertal period. The socialization period is considered the most important stage in the dog's life when it comes to developing social relationships (McEvoy et al., 2022).

The prenatal environment plays a significant role in the dog's neurodevelopment. Although studies on dogs are limited, research from other animal models provides evidence that stress experienced by the mother during pregnancy can be linked to elevated stress levels in the offspring through epigenetic mechanisms. This suggests that early-life stressors, both in utero and after birth, can have lasting effects on a dog's stress response and overall behaviour (Romaniuk et al., 2025).

During the neonatal period, although puppies are entirely dependent on their mother, they can still benefit from early stimulation. Studies suggest that handling during this stage helps regulate the hypothalamic-pituitary-adrenal (HPA) axis, enabling them to better cope with stressful events later in life. In other species, maternal stress—marked by the release of stress-related hormones—has been linked to reduced grooming and licking of offspring, which in turn leads to increased stress reactivity in the young (Serpell et al., 2016).

The socialization period, with peak importance up until 14 weeks of age, is extensively studied and recognized as a crucial stage in a dog's development. This phase plays an important role in shaping how dogs respond to various stimuli later in life. During this time, exposure to different visual and auditory stimuli, as well as interactions with diverse people, animals, and objects, helps them become familiar with a wide range of situations they might face in the future. Dogs that have not undergone proper socialization during their critical development period are more likely to exhibit negative responses, often driven by fear (Howell et al., 2015).

The effects of puberty on canine behaviour remain an area requiring further study. Dogs reach sexual maturity at different ages, largely influenced by body size—miniature breeds tend to mature earlier than giant breeds, for example. The role of gonadal hormones acquired during

sexual maturity and their potential influence on behaviour is still a matter of debate (Serpell et al., 2016).

1.2.2 Genetics

A dog's behaviour results from a complex interaction between genetics, life experiences, and environmental influences. Identifying behavioural phenotypes is crucial for tracing the genetic components of traits in dogs. Researchers commonly use tests or questionnaires to assess behavioural traits that may be associated with aggression, such as the Canine Behavioural Assessment and Research Questionnaire (C-BARQ), Socially Acceptable Behaviour (SAB) test, and Dog Impulsivity Assessment Scale (DIAS). However, different behavioural assessments often yield conflicting results, and there is no consensus on how to reliably measure or categorize aggression-related traits due to variability in individual responses (Overall et al., 2014).

Molecular genetic studies include candidate gene studies, genome-wide association (GWAS) studies, and linkage studies. Candidate gene studies focus on specific genes presumed to influence the phenotype under investigation. Linkage studies examine genetic inheritance within related individuals, identifying genetic components by tracing the transmission of genetic markers through family lineages. Genome-wide association studies (GWAS), on the other hand, analyses the entire genome of individuals to identify genetic factors associated with variations in specific traits (Fadel & Pilot, 2017).

Van Rooy and collaborators (2014) in their study emphasized the challenges in researching canine behavioural genetics. Polygenic factors, where multiple genes influence a behaviour, complicate the identification of a single gene responsible for a disorder. The interaction with the environment, life experiences, and epigenetics further adds to this complexity. Additionally, the difficulty in categorizing aggressive behaviour, due to its many subtypes and the potential subjectivity involved, introduces another layer of challenge. They provide an example of how fear responses and anxiety are grouped together, each involving different mechanisms and activating distinct parts of the nervous system. By grouping them in this way, it can be assumed that they share a genetic component (van Rooy et al., 2014).

Throughout domestication, dogs have undergone a process of artificial selection. In the past, breeding primarily focused on a dog's functionality, categorizing them into groups such as hunting dogs, guard dogs, lapdogs, and sheepdogs. Researchers believe that selective breeding has contributed to the behavioural differences observed between breeds. However, with the shift in breeding priorities, now including a focus on the aesthetics, with a particular emphasis on body conformation, significant differences in behavioural traits have emerged. Dogs categorized as working dogs are proven to differ behaviourally from show-type dogs (Svartberg, 2006).

Hammond and Rowland (2022) conducted a study comparing "dangerous breeds", those labelled as such due to legislative restrictions and other dog breeds. They used psychometric tools to assess whether these breeds exhibit behavioural traits associated with aggression, which could justify their categorization as dangerous. The study found significant variability in behaviour within breeds, challenging the misconception of breed stereotyping. The authors concluded that relying solely on breed as a predictor of aggression is ineffective, given the individual variability (Hammond et al., 2022).

1.2.3 Health status

The welfare of the dog is also a crucial factor when evaluating aggression, as both physical and mental well-being play significant roles. When addressing cases of canine aggression, veterinarians first rule out the possibility of an underlying medical condition, as neurological, endocrine, and metabolic diseases have been directly or indirectly connected to behavioural changes in dogs (Camps et al., 2019a).

Pain is one of the causes associated with aggressive behaviour. When triggered, the animal may react defensively to protect itself from further harm. The stress response induced by pain is associated with reduced serotonin activity in the central nervous system. Furthermore, the painful experience can create a memory response, so when the dog encounters a similar situation in the future, even in the absence of the original stimulus, it may react out of fear (Camps et al., 2019b). Studies indicate that bites from dogs in pain are usually directed at human extremities and are of low intensity, suggesting that the motivation is mostly a defensive mechanism (Barcelos et al., 2015).

Thyroid disease is one of the most common endocrinological disorders in veterinary medicine (Travail et al., 2024). Dogs with hypothyroidism may exhibit non-specific behavioural changes, including mental dullness, lethargy, and aggression. In a study of 1,500 dogs with behavioural issues, 61% were found to have hypothyroidism or signs of thyroid gland dysfunction (Aronson & Dodds, 2008). Although the exact link between hypothyroidism and aggression needs further study, one hypothesis suggests that the connection between serotonergic activity and thyroid insufficiency may play a role in the development of aggressive behaviour in dogs (Fatjó et al., 2002).

1.2.4 Environment

Learning is fundamental for dogs, influencing how they react to novel situations. When confronted with discomfort, such as food guarding or guarding an item, a dog may exhibit defensive or aggressive behaviour. In some cases, a human's response, like recoiling or backing away, can unintentionally reinforce the dog's behaviour. Similarly, if the dog is punished or subjected to negative reinforcement, it could amplify the dog's fear responses, escalating anxiety or aggression. This pattern can extend to any type of stressor, and in all cases, the dog can learn to associate aggression with avoiding discomfort, possibly repeating the behaviour in the future (Kleszcz et al., 2022).

A study reviewing cases of dog aggression toward children found that the majority of incidents involved dogs biting due to food or resource guarding. Additionally, a high percentage of these dogs exhibited some sort of anxiety. Exposure to children, who often make loud noises, unpredictable gestures, and engage in rough interactions triggering stress in the dog, was associated with an increased risk of biting (Reisner et al., 2007).

Dog training is a widely used strategy for modifying canine behaviour, typically employing two main approaches: aversive-based methods and reward-based methods. A study comparing punishment-based and reward-based dog training found that reward-based methods significantly improved obedience while reducing problematic behaviours. In contrast, punishment-based training heightened anxiety in dogs, often exacerbating behavioural issues (Hiby et al., 2004).

1.3 Epidemiology of dog bites

Dog bites place a considerable strain on healthcare systems worldwide, impacting both victims and the dogs involved. Victims may suffer physical injuries ranging from minor wounds to severe, life-threatening attacks, as well as psychological distress. Children, in particular, may develop post-traumatic stress disorder, dog phobia, nightmares, and anxiety following a dog bite incident (Westgarth et al., 2024). As a result, dogs involved in aggressive behaviour are more at risk in being surrendered or even euthanized (Patronek & Bradley, 2016).

1.3.1 Challenges in data collection and reporting

A major obstacle in understanding the true incidence of dog bites is the underreporting of incidents. Not all victims seek medical care, and not all incidents are reported to authorities, leading to incomplete data on the frequency and patterns of dog bites. Although this underrepresentation may imply that many bites are not severe, it also limits the understanding of risk factors and affects the development of targeted prevention strategies (Westgarth et al., 2018).

Studies often rely on medical records, which lack standardized reporting, limiting their ability to capture crucial contextual details. Useful information, such as the location of the incident, the victim's activity at the time, and specific characteristics of the dog (e.g., age, neutering status, relationship to the victim, and breed), may not be recorded (Ramgopal & Macy, 2021). Furthermore, one study evaluating hospital admissions for dog bites encountered limitations due to the ICD-10 coding system used by hospitals in the UK, which classifies any injury related to a dog in one category, including minor incidents like bruises from being pushed by a dog. This broad classification leads to an overrepresentation of dog bites in medical data (Tulloch et al., 2021).

Other methods are used to address gaps in medical data and better understand the factors involved. Some authors use questionnaires and telephone surveys, though these approaches have their limitations. One important issue is recall bias, where participants may inaccurately or incompletely remember details of the event. Additionally, convenience sampling can introduce bias, as individuals who are more likely to respond, often those who have sustained

more serious injuries, may not represent the broader population of dog bite victims. These limitations can impact the accuracy and generalizability of the findings (Chen et al., 2018; Oxley et al., 2019).

1.3.2 The breed conundrum

Breed misidentification further complicates the study of dog bites. Many dogs involved in bite incidents are not officially registered, and their breed is often determined through visual assessment by victims, witnesses, or authorities. These identifications lack scientific validation and are often inconsistent, leading to overrepresentation of certain breeds in bite statistics (Bailey et al., 2020). Moreover, bites from larger breeds are more likely to be reported and cause significant damage, exacerbating existing biases (Shuler et al., 2008).

A study conducted by Essig and collaborators (2019), aimed to systematically investigate the correlation between dog breeds and bite injuries to the face, finding that mixed-breed dogs and Pit bull-type dogs were the most frequently associated with bite incidents and causing more damage to the victim. However, the author highlights key limitations in these findings. First, it is challenging to determine the specific breeds that constitute mixed-breed dogs, which introduces variability and uncertainty in the data. Second, classifying a dog as a "Pit bull-type" is most of the times based solely on physical characteristics, which can lead to errors. This category may include multiple breeds, such as the American Pit Bull Terrier, American Staffordshire Terrier, and Staffordshire Bull Terrier, among others, further complicating the accuracy of breed related risks (Essig et al., 2019).

1.3.3 Defining dog bites

Studies on risk factors for biting often fail to provide explicit explanations of what constitutes a dog bite, which can inadvertently lead to events being classified as bite incidents without considering their context. For example, playful nips or mouthing from puppies may be recorded as bite incidents, even though they differ significantly in both intention and severity from bites caused by aggressive behaviour. This lack of distinction can skew data and misrepresent the true nature of dog bite incidents (Westgarth et al., 2017).

A study by Oxley and collaborators (2019) surveyed people's perceptions of dog bites and found no clear consensus on what qualifies as a bite. Participants with varying levels of experience with dogs were presented with different scenarios, such as a dog making contact only with clothing versus causing an actual injury with its teeth. Fewer than half of the participants agreed that mere contact with clothing constituted a bite, showing no significant agreement on the definition. Disagreement also arose over the role of intent, with some believing that if a dog did not intend to bite, the incident should not be classified as one. These findings highlights the inherent subjectivity in defining a dog bite, which can lead to inconsistencies in reporting, legal interpretations, and research on bite prevention (Oxley et al., 2019).

1.3.4 Risk factors related to the target and owner related factors

Dog bite incidents are influenced by a combination of factors related to the victim (target) and the dog owner. A study by Overall and collaborators (2001) identified several factors associated with dog bites, including the victim's gender, their relationship with the dog, and their behaviour at the time of the incident. The study found that male victims were more likely to be bitten across all age groups, potentially due to gender-based differences in interactions with dogs. Additionally, dogs owned by the victim were more frequently involved in bite incidents, with bite severity increasing in cases of ownership. Children were identified as the most commonly bitten group, likely due to their behaviour around dogs and a lack of understanding of canine body language, particularly signals of aggression.

A systematic review analysing dog bite incidents among children aged 0–19 over a 30-year period found that children aged 0–9 experienced the highest number of bites, with those under six accounting for half of all cases. Younger children often sustained injuries to the head, neck, and face, frequently requiring surgical intervention, while older children were more likely to suffer bites to the extremities. The study also highlighted age-related differences in bite circumstances: younger children were typically bitten at home, often due to resource guarding, whereas older children were more likely to be bitten outdoors, often without prior interaction, likely due to territorial guarding (Patterson et al., 2022).

Adults are also at risk of dog bites, but their experiences differ from those of children. A study by Guy and collaborators (2001) used questionnaires to survey dog owners and found that

adults were the most common victims of human-directed aggression within households. Bites in adults primarily affected the hands and arms, and only one in ten victims sought medical attention. This underreporting may explain why children appear overrepresented in dog bite statistics.

Socioeconomic and environmental factors also had an influence on dog bite incidents. Studies have shown that low-income areas tend to experience higher rates of dog bites, potentially due to factors such as inadequate fencing, free-roaming dogs, a higher number of children playing outdoors, lack of proper dog training, and the use of large-breed dogs for protection (Raghavan et al., 2014; Ryan et al., 2023; Shuler et al., 2008). Rural areas also report higher rates of dog bites compared to urban areas, which can be due to the higher prevalence of dog ownership in these communities (De la Puente-León et al., 2020).

1.3.5 Risk factors related to the dog

Neutering dogs remains a subject of ongoing debate regarding its health benefits and potential consequences. A study by Farhoody and collaborators (2018) found that gonadectomy, performed at different ages, did not correlate with a reduction in aggression toward familiar people, strangers, or other dogs when compared to unneutered dogs. The authors suggest that these findings may be explained by the complex interplay of factors influencing dog aggression, such as training, life experiences, and owner-related influences.

The source from which a dog is acquired—which can be from pet shops, breeders, or shelters—can influence aggression towards humans. Dogs raised in pet shop environments or breeding establishments are often more susceptible to aggression, likely due to the stress of these environments and improper socialization during critical developmental periods. It has also been hypothesized that owners who acquire dogs from these sources may have different understandings of their pets' behaviour (Flint et al., 2017).

1.3.6 Dog Bite Related Fatalities

Death resulting from dog bites, though rare, is an extreme and unfortunate event that often attracts significant media attention and public outcry. It has been the subject of research in

many countries, aiming to better understand dog attacks and ensure public safety (Healey, 2007; Langley, 2009; Raghavan, 2008; Sarenbo & Svensson, 2021).

A study was conducted by Patronek and collaborators (2013) to determine preventable factors in dog bite-related fatalities over a 9-year period. The author identified three main categories of factors underlying these fatalities: owner-related factors, husbandry-related factors, and dog-related factors. The victims were mainly children under 5 years old with no relationship to the dog, and most of the victims were unable to engage with the dog safely. Most cases involved intact male dogs, and, in some instances, females kept for reproduction were also present in the vicinity, raising the suspicion that this could have influenced the dogs' behaviour. In terms of husbandry, the majority of the dogs were kept secluded from human family members with most accidents occurring on the owner's property and as a result of the owner's mismanagement (Patronek et al., 2013).

Various dog breeds have been implicated in fatal dog bites, with Rottweilers and PBTD being frequently mentioned (Sacks et al., 2000). Conversely, in Canada, fatal dog attacks have been attributed to sled dogs, suggesting that there may be an association between breed implication and its popularity (Raghavan, 2008). Sacks and colleagues (2000) also emphasized that limitations arise when breed identification lacks scientific support, noting that assessing the risk associated with a specific breed becomes problematic without knowledge of the total population of that breed. The absence of comprehensive licensing data and reliable official registration complicates the ability to accurately assess breed-related risks.

1.4 Breed Specific Legislation

Canine aggression poses a significant risk to human health and imposes substantial costs on the healthcare system. These factors, along with intense media coverage, drive the legal regulation of certain breeds in an attempt to curb the issue (Holzer et al., 2019; Podberscek, 1994).

The enactment of breed-specific legislation is based on the belief that certain breeds or types of dogs pose a greater threat to public safety than others, due to its physical characteristics and historical function. Regulations may govern breeding, selling, importing, exporting, management, and ownership. The specifics of such legislation vary by region, with several

countries—including the UK, various European nations, the USA, Australia, and Japan—implementing restriction measures (Cooke, 2017).

The breeds that are regulated vary between countries and are often linked to media coverage, which can lead to a shift in public perception of attacks involving those breeds. Podberscek (1994) evaluated media coverage from 1988 to 1992 in the UK and observed a shift in attention toward certain breeds. During 1989-1990, the most frequently mentioned breeds were the German Shepherd and Rottweiler, which were later replaced by the American Pit Bull Terrier in 1991. This media coverage of dog attacks played a pivotal role in inflaming public outcry, leading to the government's response with the adoption of the Dangerous Dogs Act 1991, which became one of the most emblematic legislative measures aimed at restricting certain dog breeds.

1.4.1 The issue with the Pit bulls

Pit Bulls are the most commonly targeted breed in breed-specific legislation, facing restrictions or outright bans in countries worldwide (Cooke, 2017). Their popularity surged in the early 1900s, particularly in dog fighting and bullbaiting, where their physical strength and endurance were believed to give them an advantage. At the same time, they were regarded as fiercely loyal to their owners. Although the already existing prohibitions on dog fighting, the increase attention from law enforcement shifted the practice to the underground world. Their involvement in illegal practices was the subject of media coverage and gradually changed into the negative public perception of Pit bulls (Iliopoulou et al., 2019).

Media representation of Pit bulls often relies on images of dogs displaying signs of aggression, such as snarling and bearing their teeth, reinforcing negative stereotypes. The intense coverage of dog attacks in the media often uses images of Pit bulls, even when the animal involved isn’t of that breed, impacting how viewers perceive these dogs. Their portrayal as "devil dogs" and "vicious" catches public attention and contributes to widespread fear. Compared to other breeds, articles on Pit bulls are overemphasized, amplifying public fear and exaggerating the perceived danger they pose (Cohen & Richardson, 2002).

Karen Delise, in her book *The Pit Bull Placebo*, discusses how public knowledge about Pit bulls is largely based on pseudoscience. One widely spread myth, often perpetuated by the

media, is the 'jaw-locking' theory—the idea that Pit bulls have a unique ability to lock onto their victims, refusing to release their grip and causing massive damage. However, this claim has no scientific basis. Another common misconception is that Pit bulls bite without displaying warning signs, reinforcing the notion that their attacks are unpredictable or deceptive. This belief, however, is widely contested, as it can be argued that people have limited understanding of canine communication (Delise, 2007).

One of the major challenges with laws targeting Pit bulls is the difficulty in accurately identifying them. Law enforcement officers, veterinarians, and animal control personnel often struggle to distinguish between breeds that share similar physical traits, such as the American Pit Bull Terrier, Staffordshire Bull Terrier, and American Staffordshire Terrier (Lockwood & Rindy, 1987). These breeds are frequently grouped together as "Pit bull-type" dogs (PBTD), complicating efforts to assess the actual risk posed by any single breed (Collier, 2006). This broad classification fuels negative media portrayals and undermines the credibility of breed-specific legislation. If multiple breeds are treated as one, labelling a single breed as inherently dangerous is both misleading and flawed (Arluke et al., 2018; Rowan, 1986).

The negative publicity surrounding PBTD often extends to their owners, leading to social stigma. Research by Twining and collaborators, 2000, examined PBTD owners' perceptions of how others treated them due to their dog's breed. Owners reported that strangers frequently reacted with fear and apprehension, particularly when children were present. Additionally, law enforcement officers were perceived as biased and discriminatory when interacting with PBTD owners. To counter this stigma, some owners chose to rename their dog's breed, referring to them as American Staffordshire Terriers to minimize negative perceptions. In some cases, the stigma became so overwhelming that a few owners in the study ultimately decided to relinquish their pets (Twining et al., 2000).

1.4.2 The controversies of breed-specific legislation

Dog attacks occur due to a multitude of factors, which can be related to both the owner and the dog itself (Howell et al., 2025). The focus of breed-specific legislation is based on the notion that certain breeds are more likely to cause harm due to their perceived dangerous nature. Ott and colleagues (2008) compared dogs from legislated breeds with golden retrievers as a control group to assess whether restricted breeds were inherently more aggressive, concluding that

there were no ethological bases for aggression in such breeds. This research led to the withdrawal of regulating legislation in Lower Saxony, Germany (Ott et al., 2008).

The American Veterinary Association created a task force on the prevention of dog bites and raised concerns about how breed-specific legislation fails to achieve its purpose, particularly due to complications in dog bite statistics. Dog bite statistics are not accurate in measuring breed risk, as bites from larger breeds are more frequently reported due to the greater damage they cause, often requiring medical attention. The size of the dog explains the extent of physical injury, rather than the breed itself, especially when considering that children are the most affected by dog bites. Additionally, determining the breed of a dog is a complicating factor, particularly in the case of mixed-breed dogs, which is often the case with PBTD's (American Veterinary Medical Association, 2001).

Breed-specific legislation also creates a false sense of security by focusing on a few specific breeds when, in reality, any dog can bite (Bandow, 1996). This further diverts attention from the importance of responsible dog ownership, as owners' responsibility is often overlooked due to the emphasis on traits inherent to the dog. For instance, Reese and Vertalka (2021), in their research, analysed human-related factors in dog bite incidents and found that a significant proportion of bites were caused by neighbourhood dogs that were straying, often after escaping from their homes or yards (Reese & Vertalka, 2021).

Public education on dog bites is also an aspect that breed-specific legislation fails to address. Cornelissen and colleagues (2010), in their research on dog bites in the Netherlands, found that children were overrepresented in the statistics. Upon further analysis, they discovered that the majority of bites involved dogs familiar to the victims and often resulted from attempts to interact with the dog, which aligned with existing literature. The authors emphasized that preventing dog attacks would be more effective through educating children on appropriate behaviour around dogs and increasing their understanding of canine communication. They also extended responsibility to adults, highlighting the risks associated with leaving children unsupervised with dogs (Cornelissen & Hopster, 2010).

The economic cost of BSL places a significant burden on public funds. These costs range from court proceedings and kennel expenses to the involvement of law enforcement agencies and veterinary care, including procedures such as euthanasia. Hawes and contributors (2020) conducted a study estimating the costs of implementing BSL to the Denver Animal Protection, the agency responsible for animal control in the City and County of Denver, USA. The author

found that the cost of implementing BSL was $750 per dog. This estimate did not include expenses related to court proceedings, both civil and criminal, or the costs of transferring dogs to jurisdictions without BSL (Hawes et al., 2020).

In terms of dog bite incidents, BSL also fails to meet its purpose in increasing public safety reducing the incidence and severity of bite injuries (Creedon & Ó Súilleabháin, 2017; Nilson et al., 2018; Wyker & Gupta, 2024). In Wyker and Gupta's (2024) study, they compared dog bite incidents in municipalities in Missouri, USA, with and without BSL and found no statistically significant differences in the number of bites that required medical attention. Similarly, in the Irish context, Creedon & Ó Súilleabháin (2017) examined the relationship between breed regulation and bite severity and found that dogs from regulated breeds were not more likely to cause bites of greater severity than those from non-regulated breeds. These findings suggest that BSL does not effectively reduce dog bite risks and that other factors, such as behaviour and environment, are contributing factors in dog bite incidents.

1.4.3 Breed specific legislation in Ireland

In Ireland, the Control of Dogs Act 1986 is the primary legislation governing the control and responsibilities of dog ownership, with enforcement overseen by An Garda Síochána, dog wardens, and local authorities. The legislation covers mandatory dog licensing, procedures for strays, unwanted dogs, and seizures, and the responsibility of owners to keep their dogs under effective control. Those who breach the legislation are liable for offences and penalties prescribed by law (Control of Dogs Act, 1986).

In 1991, the Control of Dogs Regulations were introduced in Ireland, imposing restrictions on certain dog breeds. Eleven breeds were initially included in this regulation, including the American Pit Bull Terrier, Bullmastiff, Doberman Pinscher, English Bull Terrier, German Shepherd, Japanese Akita, Japanese Tosa, Rhodesian Ridgeback, Rottweiler, Staffordshire Bull Terrier, and any dog that is a cross or strain of these breeds (Control of Dogs (Restriction of Certain Dogs) Regulations, 1991). In 1998, an amendment was made, removing Bulldogs from the list of restricted breeds (Control of Dogs Regulations, 1998).

Legislated breeds are subject to specific requirements, including mandatory muzzling in public areas, the use of a sufficiently strong leash not exceeding one meter in length, a collar ID bearing the owner's name and address, and being led by a person over the age of 16. Owners

of such dog breeds are liable for fines if they fail to comply with these requirements (Control of Dogs Regulations, 1998). Furthermore, in Dublin city council local authority owned houses, the ownership of breeds included on the restricted list is prohibited (Dublin City Council, n.d.).

Ireland experienced two traumatic dog attacks involving XL Bully-type dogs: one in 2022, where a young boy sustained serious injuries and lasting scars, and another in 2024, which tragically resulted in a fatality (Clarke, 2022; Hilliard, 2024). These incidents formed the basis for the implementation of a two-phase XL Bully ban, following the example set by the UK. Phase 1, introduced in October 2024, prohibited the sale, breeding, and importation of XL Bully dogs while requiring owners to obtain an exemption certificate. Phase 2, enforced in February 2025, mandated the seizure and euthanization of any XL Bully type dog without a certificate, as well as those whose owners failed to comply with the exemption requirements (Department of Rural and Community Development, 2024b).

To obtain a certificate of exemption, the responsibility for identifying the breed lies with the owner. Guidelines outlining the physical characteristics of the breed have been provided, allowing owners to determine whether their dog meets the description and requires the exemption. The regulation mandates that dogs seeking exemption be neutered, microchipped, and licensed. XL Bully type dogs must be on a leash, wear a muzzle, and have an ID collar once in public. Failure to comply with these requirements will render the certificate invalid, which could lead to the dog being seized and euthanized (Control of Dogs (XL Bully) Regulations, 2024).

Dogs that were already in shelters before October, when the legislation took effect, were allowed to be rehomed or transferred to other charities. However, after October, any new dogs entering shelters and recognized as XL Bullies by enforcement agencies are required to be euthanized (Control of Dogs (XL Bully) Regulations, 2024).

1.4.4 Impact of BSL on shelter dog population

Breed-specific legislation (BSL) varies across countries and regions, imposing restrictions such as mandatory leashing and muzzling in public spaces, special licensing, third-party liability insurance, spaying or neutering, ownership limitations, and housing restrictions (Cooke, 2017).

These regulations can place a significant burden on owners who may struggle to comply with the requirements (Burstein, 2004). As a result, many are forced to relinquish or euthanize their animals, especially those from low-income backgrounds (Slater, 2018).

Housing restrictions pose a significant challenge for owners of legislated breeds. Many landlords and housing authorities enforce breed bans or impose additional costs, making it difficult for tenants to keep certain type of dogs (Rose et al., 2023). A study examining the impact of housing restrictions on pet relinquishment identified breed bans as a key factor in owners surrendering their dogs, with Pit bulls being disproportionately affected (Applebaum et al., 2024).

The claim that certain breeds are more dangerous and pose a significant threat is often used by insurance companies to justify making their services more difficult for owners of these breeds. Some insurers refuse to provide coverage, citing statistics on dog bites and the higher liability claims associated with certain breeds. As a result, with fewer companies offering coverage, competition in the market decreases, driving up costs for dog owners (Cunningham, 2005).

Shelter life can be highly challenging for dogs, often leading to stress-induced consequences that negatively impact their overall well-being and welfare. Restrictions on social interaction, exposure to constant noise, and confinement are key factors that trigger stress and can have harmful effects on their health. Prolonged exposure to such environments may also alter their behaviour negatively, with some dogs developing fear-based aggression (Hennessy et al., 2020).

Non-compliance with legislation restricting certain dogs can result in their seizure by authorities. These dogs are then placed in kennel environments pending court proceedings, which can be indefinite, leading to prolonged confinement. In the UK, under the Dangerous Dogs Act, the average length of stay for seized dogs was 28 months. (Ledger et al., 2005) This extended period in enclosed environments can have a significant impact on the dogs' welfare, potentially leading to stress, anxiety, and behavioural deterioration (Herron et al., 2014).

Raudies and colleagues (2021) conducted a study evaluating dog-related factors contributing to prolonged shelter stays. They found that dogs classified as 'dangerous breeds', a term used in legislation, were overrepresented in long-term shelter populations. One contributing factor was breed-specific legislation, which reinforces negative perceptions and decreases adoption likelihood (Raudies et al., 2021).

Shelter labelling of dogs as Pit bulls can have lifelong consequences, contributing to their overrepresentation in shelter populations. Their reputation as fighting dogs, along with unfounded beliefs about their aggressiveness, negatively impacts their likelihood of adoption (Guenther, 2020). Gunter and contributors (2016) examined the correlation between PBTD and their length of stay in shelters, finding that dogs labelled as Pit bulls remained in shelters three times longer than other breeds. They also observed that when breed labels were removed, participants found the dogs more attractive, demonstrating how preconceived notions about Pit bulls influence judgment (Gunter et al., 2016).

Rehoming dogs can sometimes result in setbacks, leading to situations where dogs are returned to the shelter due to a combination of dog-related and owner-related factors. This, in turn, has implications for the dog, with repeated exposure to the stress of kennel environments. Powell and colleagues (2021), in their attempt to identify intrinsic characteristics of animals that contribute to the risk of return, found that breed was a significant risk factor. When comparing different breeds, Pit bulls were more likely to have failed adoption, returning to shelter facilities and being subsequently euthanized (Powell et al., 2021).

Euthanasia is a common negative outcome for dogs of legislated breeds, especially when shelters face overcrowding and a surplus of unwanted dogs. The reasons for euthanasia can vary: some shelters have policies that prevent breed types, such as Pit bulls, from being put up for adoption, while others are forced to make the difficult decision due to low adoption prospects, prolonged stays and their limited space capacity. In such cases, euthanasia may be seen as the most humane option, considering the potential impact of extended shelter life on their welfare, including stress and illness facilitated by kennel environments (Clevenger & Kass, 2003; Lepper et al., 2002).

In general, the fate of dogs in the shelter system falls into two outcomes: live release (adoption, transfer to rescue groups, or rehoming) or negative outcomes (euthanasia or death from natural causes). Research indicates that certain breeds, especially those classified as PBTD, are more likely to face negative outcomes and endure longer stays in shelters. (Gunter et al., 2016; Lepper et al., 2002; Patronek & Crowe, 2018; Raudies et al., 2021). These dogs often struggle with adoption due to negative public perceptions and BSL which can result in prolonged kennel stays and an increased risk of euthanasia. According to Walker and Powell (2024), breeds targeted by BSL should be considered high-risk groups, as this directly impacts their length of stay and their outcome in the shelter environment (Walker & Powell, 2024).

The impact of breed-specific legislation (BSL) has been widely questioned due to its legal and ethical controversies, as well as the lack of scientific evidence supporting its efficacy in reducing dog bites or ensuring public safety. While most studies focus on the humane aspects of the legislation, to the authors knowledge, research addressing how BSL directly impacts the welfare of regulated breeds remains limited.

1.5Aim of the Study

The primary objective of this study is to analyse the demographics of canines in Dublin City Council's dog shelters, with a particular emphasis on the impact of Irish breed-specific legislation (BSL) on the outcomes of dogs within the shelter system and their length of stay. To evaluate the effects of BSL, the study will focus on the following specific objectives:

- Comparison of Length of stay of restricted and non-restricted breeds.
- Comparison of shelter outcomes (euthanasia and live release rates) between restricted and non-restricted breeds.
- Examine the specific case of PBTD to understand how breed-specific legislation influences their outcomes within the shelter system, including potential differences in their length of stay.

II. Methodology

2.1 Data Collection

This study is a descriptive analytical study which utilized data from Dublin City Council's two dog shelters (Hollygrove Kennels and Dublin Dog Hub), covering the period from January 2024 to February 2025. The dataset contains information on all dogs that entered the shelter system, with this study focusing mainly on stray and surrendered dogs. The data in this study was recorded using Microsoft Excel database.

Inclusion criteria:

- Dogs admitted between January 2024 and February 2025.
- Dogs with documented length of stay.
- Dogs with basis of exit determined.
- Dogs that have been admitted as strays or surrenders.

Exclusion criteria:

- Dogs born in the shelter (excluded due to the influence of the time required for them to reach adoptable age on their length of stay).
- Dogs seized (excluded because their length of stay and exit outcomes are influenced by the time spent in kennels and dependent on ongoing court proceedings).
- Dogs still present in the kennels at the time of data collection, (excluded as their length of stay and basis of exit were undetermined).

Data used in this study was based on anonymised records, in compliance with GDPR requirements and authorised in writing by Dublin City Council. No prospective procedures were used on live animals.

2.2 Variables analysed in the study

This study focused on the following variables relevant to the shelter outcomes of dogs:

- Length of Stay: Calculated using the Date of Entry and Date of Exit, representing the total number of days an animal remained in the shelter. This calculation includes the

mandatory five-day holding period required before an animal can be disposed of or destroyed.

- Primary Breed Type: Breed classification was determined by animal wardens or shelter staff based on phenotypic assessment; no independent genetic validation was performed. For this study, the first listed breed was used. In the case of crossbreeds, the first listed breed was used for analyses.
    - Dogs labelled as PBTD included those recorded as Pit bulls, XL Bullies, American Bullies, and "Staffies".
    - "Staffies" were categorized under PBTD due to the uncertainty regarding whether they referred to the Staffordshire Bull Terrier (recognized in Ireland) or the American Staffordshire Terrier.
    - The breed *Jack Russell Terrier* was treated separately from other dogs classified as *Terrier type*. The term *Terrier type* was used for dogs that shared terrier characteristics but were not specified as Jack Russell Terriers in the dataset.
- Breed Restriction: Dogs were classified as restricted or non-restricted based on the Control of Dogs Regulations 1998 (Control of Dogs Regulations, 1998). The restricted breeds included: American Pitbull Terriers, English Bull Terrier, Staffordshire Bull Terrier, Bull Mastiff, Dobermann Pinscher, German Shepherd, Rhodesian Ridgeback, Rottweiler, Japanese Akita, Japanese Tosa, and any dog with a strain of these breeds.
- Basis for Exit: Shelter outcomes were initially categorized as:
    - Died of natural causes
    - Euthanized
    - Transferred to an animal welfare group or rescue
    - Reclaimed by owner or family
    - Rehomed directly by the pound

  For analysis purposes, outcomes were grouped into two categories:
    - Euthanized (including voluntary euthanasia requests from owners and cases where dogs were deemed dangerous by shelter staff).
    - Live Release, which included dogs that were transferred to rescue organizations, reclaimed by their owners, or rehomed directly from the pound.

2.3 Statistical analysis

The data analysis was conducted using descriptive statistics, including measures such as median, mean, and standard deviation, along with graphs and tables to improve data visualization.

Additionally, analytical statistics were employed, with the Chi-square test used to assess statistical significance between two categorical variables ($p < 0.05$) and the odds ratio as a measure of association to evaluate the relationship between breed type, breed restriction, and outcome.

Furthermore, to assess the length of stay, the Shapiro Wilk test was used to evaluate if the data had a normal distribution. Since the data didn't have a normal distribution the Mann-Whitney U test was utilized for the comparison of two independent groups.

For statistical analysis, the Jamovi software (The Jamovi Project, 2024) was used (Version 2.6) alongside R statistical software (R Core Team, 2024).

III. Results

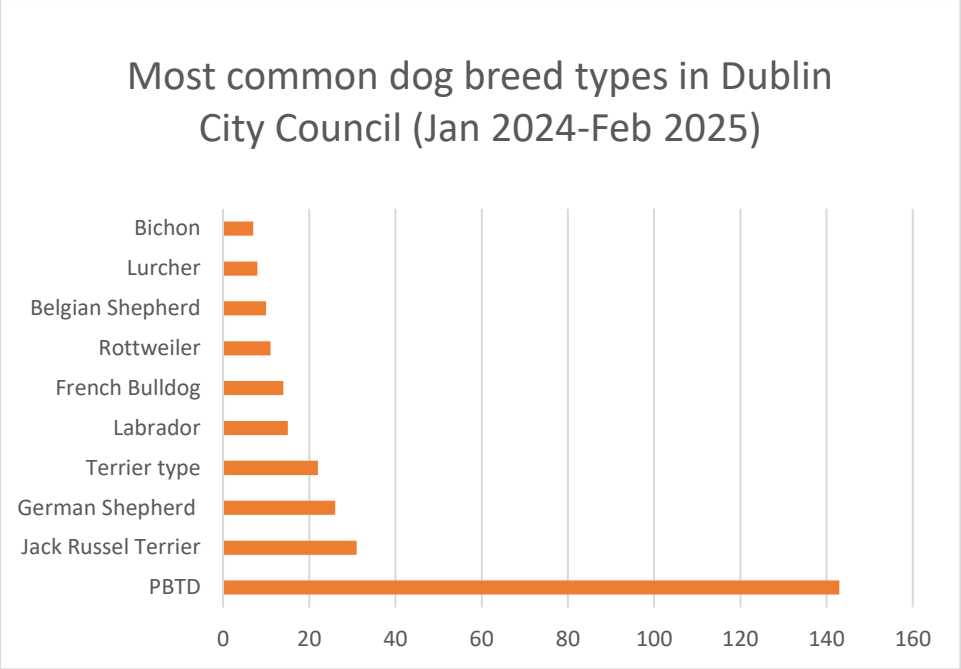
3.1 Demographics of dogs in the shelter

A total of 361 dogs, representing 45 different breeds (see Annex B), were included in this study. However, some records were excluded from the analysis for the following reasons: three dogs born in the shelter were removed, as their length of stay was influenced by the time required to reach adoptable age; one Belgian Shepherd was excluded due to an unregistered basis of exit; and thirty-nine dogs were not included in the analysis due to an undetermined length of stay, as they were still present in the shelters at the time of data collection.

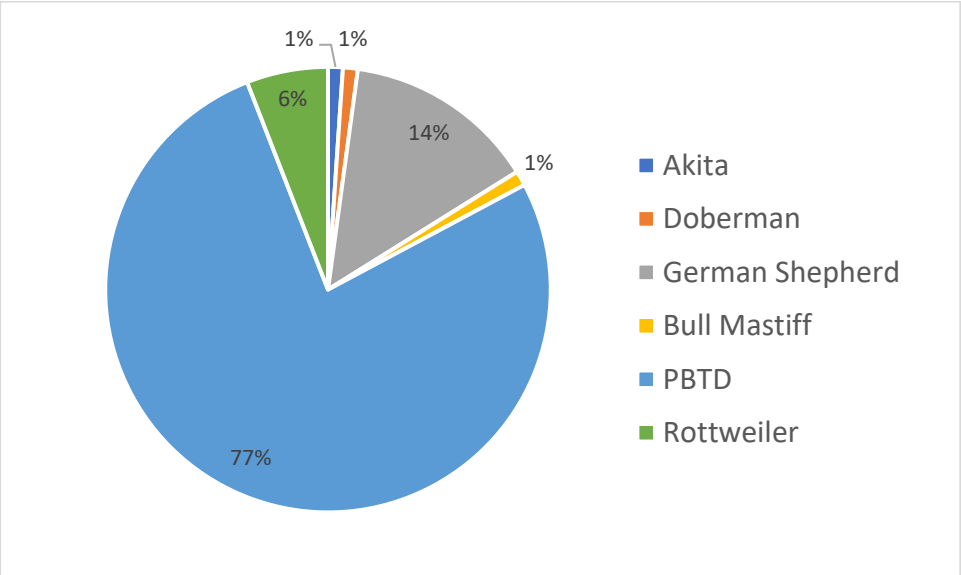
The ten most common breeds identified were PBTD (n=143), Jack Russel Terrier (n=31), German Shepherds (n=26), Terrier Type dogs (n=22), Labradors (n=15), French Bulldogs (n=14), Rottweilers (n=11), Belgian Shepherd (n=10), Lurchers (n=8) and Bichon Frise (n=7). (Graph 1).

Six breeds in the sample belong to the restricted category under the Control of Dogs Act 1998 regulations (Control of Dogs Regulations, 1998), including PBTD, Rottweiler, Akita, German Shepherd, Doberman, and Bull Mastiff. Among these, PBTD were the most common, accounting for 77% of the restricted breeds (n=143), followed by German Shepherd (n= 26), Rottweiler (n=11), Doberman (n=2), Akita (n=2), and Bull mastiff (n=2) (Graph 2).

Overall, 186 dogs (51.5%) were from restricted breeds, while 175 dogs (48.5%) were from non-restricted breeds (Table 2)



Graph 1: Ten most common breed types in the shelter during the evaluated period. X-axis: Number of registered dogs; Y-axis: Dog breed type. Data source: Dublin City Council Shelter records (Jan 2024-Feb 2025)



Graph 2: Restricted Breeds in the shelter during the period evaluated and their percentage. Data source: Dublin City Council Shelter records (Jan 2024-Feb 2025).

Table 2 : Frequency of restricted breeds and non-restricted breeds. Data source: Dublin City Council Shelter records (Jan 2024-Feb 2025).

Restriction	Counts	% of Total
Restricted Breeds	186	51.5%
Non restricted Breeds	175	48.5%

3.2 Comparison in the Basis of Entry Between Restricted and Non-Restricted Breeds

In this study, stray and surrender populations were used as the basis of entry. The comparison was made between the population of stray and surrendered dogs categorized by restricted and non-restricted breeds. The data reveals that among surrendered dogs, 67% were from restricted breeds, while 33% were from non-restricted breeds. For stray dogs, 44.8% were from restricted breeds, and 55.2% were from non-restricted breeds (Table 3). In total, restricted breeds accounted for 51.5% of the dogs in the shelter, while non-restricted breeds made up 48.5%.

Table 3 : Distribution of restricted and non-restricted breeds based on the basis of entry. Data source: Dublin City Council Shelter records (Jan 2024-Feb 2025).

Basis of Entry	Restriction	Counts	% of Total	% within Basis of Entry
Surrender	**Restricted Breed**	73	20.2%	67%
	Non restricted Breed	36	10.0%	33%
Stray	**Restricted Breed**	113	31.3%	44.8%
	Non restricted Breed	139	38.5%	55.2%

3.3 Basis of Exit of dogs in the shelter

The basis for exit for dogs in the shelter is illustrated in Table 4. The majority of dogs were transferred to animal welfare groups or charities, accounting for 141 dogs, followed by euthanasia, which accounted for 80 dogs.

Table 4 : Basis of exit of dogs in the shelter, including the total amount and percentage of each outcome. Data source: Dublin City Council Shelter records (Jan 2024-Feb 2025.

Basis of Exit	Counts	% of Total
Natural death (poor health or age)	1	0.3%
Euthanized	80	22.2%
Reclaimed by owner or family	62	17.2%
Rehomed directly by pound	77	21.3%
Transferred to Animal Welfare Groups or Charities	141	39.1%

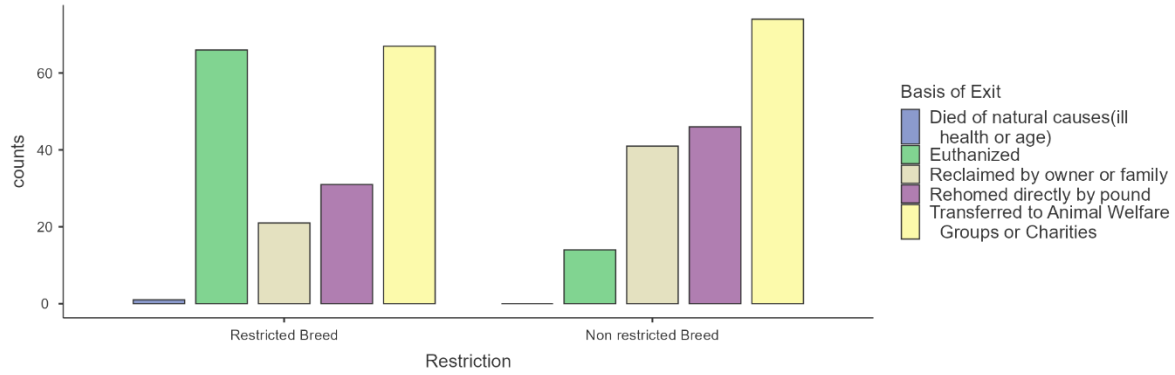
3.4 Restricted breeds *vs.* non-restricted breeds and their outcome

The basis of exit differed between restricted and non-restricted breed groups (Table 5). A larger proportion of dogs from restricted breeds were euthanized (18.3%) compared to dogs from non-restricted breeds (3.9%). Additionally, dogs from non-restricted breeds were more frequently reclaimed by owners or family (11.4%) compared to dogs from restricted breeds (5.8%). While 20.5% of dogs from non-restricted breeds were transferred to animal welfare groups or charities, only 18.6% of dogs from restricted breeds had this outcome (Graph 3).

In this study, restricted breeds had a strong association with higher euthanasia rates and lower live release rates, being 6.38 times more likely to be euthanized than non-restricted breeds (95% CI: 3.42–11.9; $\chi^2(df=1) = 39.9$, $p < .001$). Specifically, 35.7% of restricted breeds were euthanized compared to 8% of non-restricted breeds, while 92% of non-restricted breeds had a live release compared to 64.3% of restricted breeds, demonstrating a significant association between breed restrictions and their outcome.

Table 5 : Basis of exit for restricted and non restricted breed dogs in the shelter. Data source: Dublin City Council Shelter records (Jan 2024-Feb 2025).

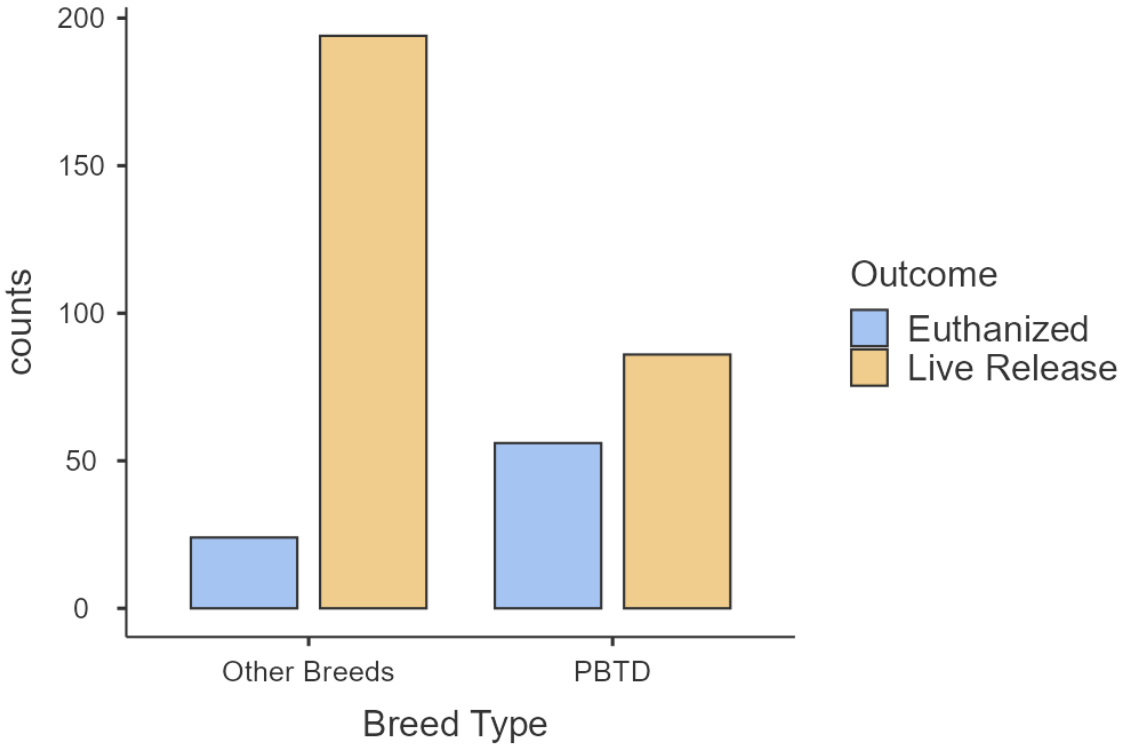
Restriction	Basis of Exit	Counts	% of Total
Restricted Breed	**Natural deaths (poor health or age)**	1	0.3%
	Euthanized	66	18.3%
	Reclaimed by owner or family	21	5.8%
	Rehomed directly by pound	31	8.6%
	Transferred to Animal Welfare Groups or Charities	67	18.6%
Non restricted Breed	**Natural deaths (poor health or age)**	0	0.0%
	Euthanized	14	3.9%
	Reclaimed by owner or family	41	11.4%
	Rehomed directly by pound	46	12.7%
	Transferred to Animal Welfare Groups or Charities	74	20.5%



Graph 3 : Bar plot representing a comparison of basis of exit for restricted and non-restricted breeds. Data source: Dublin City Council Shelter records (Jan 2024-Feb 2025).

3.5 PBTD *vs.* non-PBTD and their outcome

When comparing PBTD to other breeds, the basis of exit for dogs in the shelter differed significantly (Graph 4). A larger proportion of PBTD were euthanized (39.4%) compared to other breeds (11.0%). The Chi-Square test revealed a statistically significant association between breed type and outcome (euthanized vs. live release), with $\chi^2\ (df = 1) = 40.2, p < .001$. Additionally, the unadjusted (OR=5.26; 95% CI: 3.06–9.05) indicates that PBTD are 5.26 times more likely to be euthanized than dogs of other breeds.



Graph 4 : Bar plot comparing the outcome (euthanized vs. Live Release) with breed type (PBTD vs. Other Breeds). Data source: Dublin City Council Shelter records (Jan 2024-Feb 2025.

3.6 Length of Stay (LOS) and breed restriction

The Length of Stay (LOS) in the shelter varied significantly between dogs from restricted and non-restricted breeds. Dogs from restricted breeds had a mean LOS of 44.5 days, with a median of 36.0 days, and a standard deviation of 46.0 days, ranging from 0 to 240 days. In contrast, non-restricted breeds had a lower mean LOS of 24.7 days, with a median of 17.0 days, and a standard deviation of 29.4 days, ranging from 0 to 192 days (Table 6). The interquartile range for the restricted breeds was 60.5 days, while for the non-restricted breeds it was 26 days. (Graph 5). These results indicate that restricted breeds tend to stay in the shelter longer than non-restricted breeds, with a wider variation in their length of stay.

The Shapiro-Wilk test for normality revealed that the LOS data do not follow a normal distribution ($W = 0.795$; $p < .001$). Consequently, a non-parametric Mann-Whitney U test was performed to compare the LOS between restricted and non-restricted breeds. The results indicated a statistically significant difference in LOS between the two groups ($U = 12.785$, $p < .001$), indicating that restricted breeds have a longer length of stay in the shelter compared to non-restricted breeds.

Table 6 : Summary of the Length of Stay (LOS) for both Restricted Breed and Non-restricted Breed groups. Data source: Dublin City Council Shelter records (Jan 2024-Feb 2025).

	Restriction	N	Mean	Median	SD	Minimum	Maximum
Length of Stay (LOS)	**Restricted Breed**	186	44.5	36.0	46.0	0	240
	Non restricted Breed	175	24.7	17	29.4	0	192

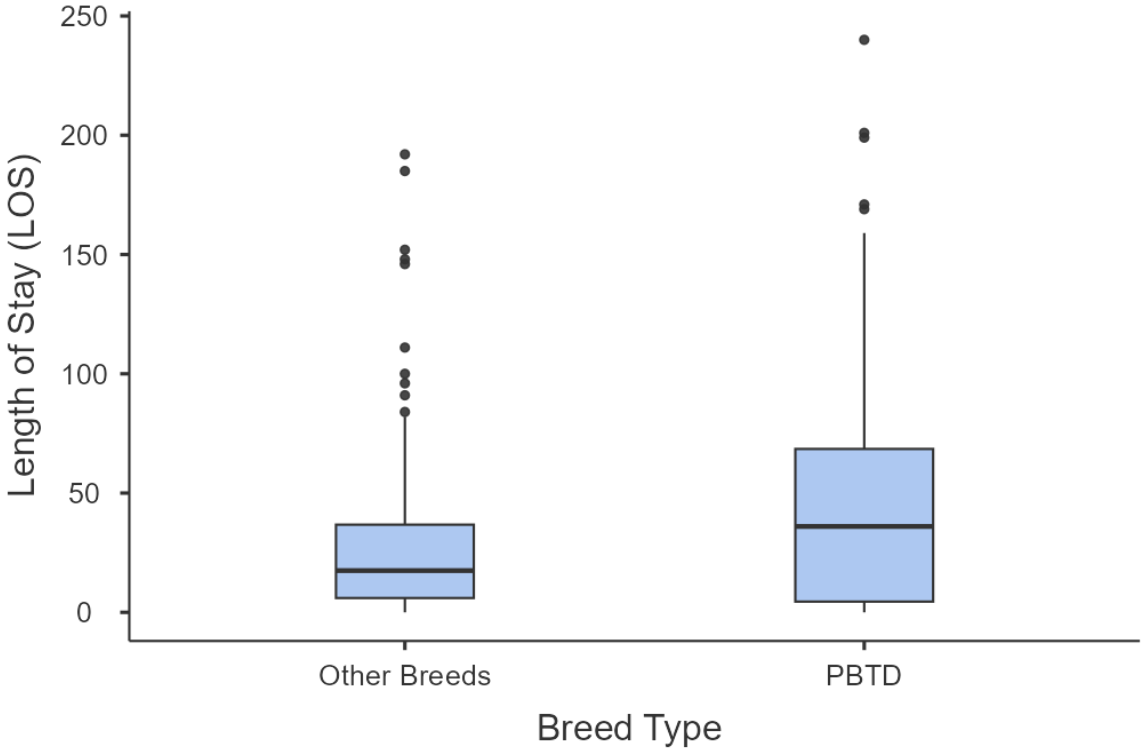
3.7 Length of stay and PBTD

The Length of Stay (LOS) in the shelter differed significantly between PBTD and other breeds. PBTD had a longer mean LOS (46.7 days), a higher median (36 days), and a range of 0 to 240 days, while other breeds had a shorter mean LOS and a narrower range (Table 7). The interquartile range for the PBTD was 64 days, while for other breeds it was 30.74 days (Graph 6). These results showed that PBTD have longer length of stay in the shelters.

The Shapiro-Wilk test for normality revealed that the LOS data for both PBTD and Other Breeds does not follow a normal distribution, with $W = 0.860$ ($p < .001$) and $W = 0.757$ ($p < .001$) respectively. As a result, a non-parametric, independent samples Mann-Whitney U test was conducted to compare the LOS between PBTD and Other Breeds. The results indicated a statistically significant difference in LOS between the two groups ($U = 12{,}495.5$, $p < 0.001$), suggesting that PBTD have a longer length of stay in the shelter compared to Other Breeds.

Table 7 : Summary of the Length of Stay (LOS) for both PBTD and Other breed groups. Data source: Dublin City Council Shelter records (Jan 2024-Feb 2025).

	Breed Type	N	Mean	Median	SD	Minimum	Maximum
Length of Stay (LOS)	**PBTD**	143	46.7	36	48.1	0	240
	Other Breeds	218	27.2	17.5	31.4	0	192



Graph 5 : Box plot comparing the Length of Stay (LOS) for PBTD and Other Breeds. Data source: Dublin City Council Shelter records (Jan 2024-Feb 2025).

IV. Discussion

4.1 Demographics of dogs in the shelter

In this study, the majority of dogs were from restricted breeds, comprising 51.5% (n=186) of the total sample (see Table 2), compared to 48.5% (n=175) from non-restricted breeds. Among the restricted breeds, Pit-bull type dogs were notably overrepresented, accounting for 77% (n=143) of this category, making them the most common breed type overall in the shelter.

Animal shelter facilities can be categorized into three types: public shelters, private shelters, and private shelters funded by public assets (Moulton et al., 1991). The DCC shelter system aligns most closely with the public shelter category, as it is responsible for managing the dog population (including strays, surrenders, and seizures) in compliance with the Control of Dogs Act 1986 and is funded by public assets. For the DCC shelter system, the primary intake of dogs is based on space limitations, with the current capacity being 45 kennels.

The open-intake policy of DCC, with space being the only limiting factor, may contribute to the overrepresentation of restricted breeds in the shelter, as it doesn't possess the possibility of selective intake criteria used by many rescues and charities. These organizations often apply restrictions based on behavioural, medical, or adoptability factors, which could potentially reduce the number of restricted breeds they take in. Additionally, these figures may be influenced by the popularity of certain breeds in the Dublin area, which can directly affect the demographics of dogs in shelters (Carter & Martin, 2021).

For comparison, a study of Cork's local authority shelter, which serves a predominantly rural area, found that the most common breeds were "farm-type" dogs, such as crossbreeds, collies, and terriers. These breeds also accounted for the majority of licensed dogs in the region, reflecting their overall popularity in the local dog population. (O'Sullivan & Hanlon, 2012).

4.2 Comparison in the Basis of Entry Between Restricted and Non-Restricted Breeds

The comparison of stray and surrendered dog populations revealed significant differences in breed restriction. Among stray dogs, non-restricted breeds were more common, accounting for 55.2%, while in the surrendered dog population, restricted breeds represented the majority at 67%.

The DCC local authority's policy for dog relinquishment requires owners to pay a €250 fee and provide mandatory proof of ownership, typically through a dog license. Owners facing financial difficulties, for instance those in social housing, could negotiate fees on a case-by-case basis. DCC's social housing tenancy agreements prohibit the ownership of restricted breeds (Dublin City Council, n.d.). As a result, residents who own such breeds may be forced to surrender their dogs to remain compliant with housing regulations, or in extreme cases, risk facing eviction. This finding is consistent with research by Ly et al. (2021), who identified a clear association between the relinquishment of PBTD and areas experiencing socioeconomic disadvantage (Ly et al., 2021). This may help explain why, in the current study, surrendered dogs were predominantly from restricted breeds.

The predominance of restricted breeds in the shelter population may also be influenced by intake restrictions imposed by rescue organizations. Many rescues require a detailed behavioural and medical history of the dog prior to intake. In Dublin, two of the largest charities, Dogs Trust and the Dublin Society for the Prevention of Cruelty to Animals (DSPCA) require behavioural assessments as well as veterinary clearance, including proof of defleaing, deworming, and vaccination (Dogs Trust, n.d.; DSPCA, n.d.). For owners wishing to relinquish their dogs to such charities, the process can involve long waiting periods and offers no guarantee that their dog will be accepted. As a result, owners may rely on the public shelter which imposes less restrictions on intake.

4.3 Basis of Exit of dogs in the shelter

In this study, the most common basis of exit was transfer to animal welfare groups or charities, which accounted for 39.1% of the cases, then euthanasia, 22.2%, and only 17.2% of the dogs reclaimed by owners.

The increased reliance on transferring dogs to animal welfare charities and rescues may be partly attributed to the implementation of the XL Bully ban during the study period. The ban was introduced in two phases. The first phase, which took effect in October 2024, prohibited the importation, breeding, sale, rehoming, or transfer of XL Bully-type dogs. However, dogs of this type already in shelters before the ban were allowed to be rehomed or exported under strict conditions. The second phase, effective from February 2025, required owners to obtain a certificate of exemption to legally retain XL Bully dogs. Those remaining in shelters without an exemption after this deadline faced the possibility of humane euthanasia. (Department of Rural and Community Development, 2024a). This urgency prompted many animal welfare charities to intervene, rescuing these dogs from shelters and arranging for their export to avoid euthanasia.

A study conducted by Downes et al. (2009) estimated that only 10% of owned dogs in Ireland were acquired from shelters, forcing many public shelters to rely on euthanasia or the transfer of dogs to rescues, which often have greater resources and the capacity to export dogs to other countries. The findings of the present study reflect these ongoing challenges (Downes et al., 2009).

The Department of Rural and Community Development in Ireland releases an annual report compiling local authority dog control statistics, with the most recent data published in 2023. According to the report, euthanasia accounted for 8% of dogs exiting pounds across Ireland, highlighting a significant increase from the previous year. This rise is theorized to be linked to the increase in surrenders and euthanasia, potentially driven by heightened media attention on dog attacks (Department of Rural and Community Development, 2023). The higher percentage of euthanasia observed in this study, compared to the national figures from the previous year, may be further explained by the implementation of the XL Bully ban and negative media portrayals of PBTD. In particular, the requirement to euthanise unexempted XL Bully type dogs remaining in shelters after the enforcement deadline likely contributed to this increase.

Woodruff et al (2021) evaluated the outcome of dogs in shelters of five states in the USA, the findings were that the majority of dogs (45%) were rehomed, 18% were transferred, 19% were reclaimed, and 14% were euthanised (Woodruff et al., 2021). In comparison, the present study recorded a higher rate of euthanasia (22.2%) and a slightly lower rate of reclaimed by owners (17.2%).

4.4 Restricted breeds *vs.* non-restricted breeds and their outcome

The findings of this study revealed a strong association between breeds regulated by BSL and euthanasia outcomes, $\chi^2(df=1) = 39.9$, $p < .001$). Dogs from restricted breeds were significantly more likely to be euthanised than those from non-restricted breeds, with an odds ratio of 6.38 (95% CI: 3.42–11.9). Studies have shown that breed type is considered a risk factor for euthanasia of dogs in the shelter system (Gunter et al., 2016; Hawes et al., 2020; Skrzypek & Zawojska, 2025; Woodruff et al., 2021). Negative public perception and societal bias toward restricted breeds are significant factors influencing the outcomes of these legislated dogs within the shelter system. The widespread perception of aggression associated with such breeds often deters potential adopters, thereby reducing their chances of rehoming (Gunter et al., 2016; Oxley, 2012).

The likelihood of dogs being reclaimed by their owners differed significantly based on breed restriction status. Non restricted breeds were nearly twice as likely to be reclaimed (11.4%) compared to restricted breeds (5.8%). According to DCC's policy, owners can reclaim their dogs by providing satisfactory proof of ownership, such as a license or microchip details registered under their name. Reclaiming a dog incurs costs, and additional fines may be imposed. For restricted breeds, the penalties are more severe if found as strays, due to legislative requirements for muzzling, mandatory leashing, and the need for the dog to wear an ID collar with the owner's name and address. For breeds with no restrictions owners may only be subjected to fines for failing to keep the dog under effectual control (Department of Rural and Community Development, 2024c). The extra penalties involved in the reclaiming of regulated dogs may serve as a deterrent for owners to retrieve their dogs from the shelter.

In Ireland, dog licensing is a legal requirement under Ireland's legislation on the control of dogs, alongside the mandatory microchipping of dogs as specified in the Microchipping of Dogs Regulation 2015 (Microchipping of Dogs Regulations, 2015). Challenges arise when the licensing system is not integrated with the microchipping system, which, coupled with low compliance, undermines the effectiveness of the legislation (More et al., 2022). This lack of integration makes it particularly difficult to determine the origin of the stray dog population, as microchipping would enable traceability of the dogs and reduce abandonment (Manning, 2017). The low likelihood of being identified or penalised may act as a motivator for owners

to abandon their dogs and may help explain why restricted breeds are less likely to be reclaimed by their owners.

A study conducted by Lord and colleagues 2009, evaluated the return of animals when microchipped, finding that 75% of animals that were microchipped were able to be returned to their owners. While microchipping is a valuable tool for owner identification, it has limitations. These include the possibility of missing the microchip during an initial scan, outdated or incorrect details of owners, failure to update ownership records, and microchips that are found but not registered with a database. In this study, microchips were used to trace owners, but they were not included as a variable in the analysis. Future research incorporating microchip data as a variable could provide valuable insights into its role in increasing the success in the return of dogs to their owners (Lord et al., 2009).

4.5 PBTD *vs*. Non PBTD and their outcome

The findings of this study emphasize a significant disparity in the outcomes for PBTD compared to other breeds in the shelter system. PBTD were 5.26 times more likely to be euthanized compared to other breeds (95% CI: 3.06–9.05). A study by Clevenger and Kass (2003) found similar findings, with PBTD being more likely to be euthanized than other breed types (Hazard Rate Ratio = 1.6, 95% CI = 1.2 to 2.1).

Media representations of so-called "dangerous dogs", including newspaper articles, television programmes, and social media content, plays an influence on public perceptions of canine aggression, particularly in relation to bull breeds, which are often unfairly portrayed as inherently aggressive (Parkinson, et al., 2023). When considering the role of a dog's appearance in adoption decisions, public bias, shaped in part by media portrayals, can significantly impact the adoption outcomes of PBTD within the shelter system (Cain et al., 2020).

During the study period, the XL Bully ban was implemented following a series of serious dog attacks involving dogs of this breed type (Department of Rural and Community Development, 2024b). The issue with the legislation is that the XL Bully is considered as a type of dog rather than a distinct breed, with identification based on physical characteristics such as body shape and head structure, as well as the dog’s height (Greenwood et al., 2023). The subjectivity of the legislation, due to the classification being based on visual characteristics has been

evidenced to be challenging for the public, which may have limited knowledge in recognizing dog breeds. Webster and colleagues (2019) assessed the public's ability to identify "dangerous dog breeds" as defined by the UK Dangerous Dogs Act. Their research found that participants struggled to accurately distinguish these dogs, particularly bull breeds, which share similar physical traits (Webster & Farnworth, 2019). This difficulty in identification may contribute to the disproportionately negative outcomes experienced by dogs classified as Pit Bull-type, compared to non Pit Bull-type dogs.

Animal charities and rescues in Ireland have also identified breed misclassification as a contributing factor to the increasing number of bully breed surrenders and the growing difficulty in rehoming them, ultimately leading to a rise in the euthanasia of healthy dogs (O'Riordan, 2025).

At the DCC shelter system, breed identification is primarily based on visual characteristics, a method that has been shown to be unreliable (Gunter et al., 2018; Simpson et al., 2012; Voith et al., 2013). Olson et al. (2015) highlighted significant variability in shelter staff's ability to visually identify PBTD, with one-third of dogs labelled as Pit bulls despite lacking DNA evidence. DNA breed identification, though more accurate, also faces limitations when assessing mixed-breed dogs, especially with PBTD, which encompass multiple breeds with shared physical traits (Voith et al., 2009).

Furthermore, a study examining breed identification by shelter staff in the US and UK, both of which have Breed-Specific Legislation, highlighted considerable inconsistencies in classification. Participants used different parameters of physical traits, such as coat type, ear shape, and body structure, to identify breeds. Some staff members even confessed to have altered breed labels to increase a dog's chances of adoption (Hoffman et al., 2014). Given the timing of the XL Bully ban during this study's period, it is uncertain whether it influenced the breed classification by staff to increase the likelihood of live release.

4.6 Length of Stay (LOS) and breed restriction

Restricted breeds length of stay (LOS) in the kennels differed significantly from non restricted breeds. Restricted breeds had a mean LOS of 44.5 days (median = 36.0, SD = 46.0), with stays ranging from 0 to 240 days. In contrast, non-restricted breeds had a shorter mean LOS of 24.7

days (median = 17.0, SD = 29.4), with a range of 0 to 192 days. The interquartile range (IQR) further highlighted this disparity, with restricted breeds showing an IQR of 60.5 days compared to just 26 days for non-restricted breeds.

The euthanasia policy used by DCC dictates that dogs deemed unfit for rehoming, mainly due to behavioural issues, are humanely euthanized. Length of stay has been attributed to behavioural deterioration of dogs in the kennel environment and therefore reducing their likelihood of successful rehoming (Raudies et al., 2021). This is of particular concern for certain breeds, whose morphological traits limit their chances of adoption, leading to longer stays in the shelter (Cain et al., 2020).

The disparity in LOS between dogs from restricted (SD=46) and non restricted breeds (SD=29.4), suggests that variables other than breed alone may be influencing adoption rates. A study conducted by Kay et al (2018) found that coat colour, reason for intake had a significant role in the time dogs spent in the shelter until rehomed (Kay et al., 2018). Another study from Žák et al (2015) associated characteristics, such as size, age and sex as predictors of LOS of dogs in shelters (Žák et al., 2015). These findings highlight the importance of considering other variables when interpreting differences in length of stay.

4.7 Length of stay (LOS) and PBTD

In this study, PBTD had a significantly longer length of stay (LOS) in the shelter compared to other breeds (U = 12495.5, p = .001). The median LOS for PBTD was 36 days, more than double that of other breeds, which had a median LOS of 17.5 days. These findings align with Gunter et al. (2016), which reported that PBTD had a length of stay three times longer than other breeds.

The variability length of stay was notably higher for PBTD, as reflected by an interquartile range (IQR) of 64 days, more than double that of other breeds, which had an IQR of 30.74 days. This may be partly explained by the fact that breed was used as the sole parameter for comparing live release with negative outcomes, as previous research has shown that factors such as coat colour, age, and size also influence outcomes of dogs within shelters (Brown et al., 2013; Patronek & Crowe, 2018; Sinski et al., 2016).

Nakamura et al. (2019) suggested that the breed-specific expectations and associated descriptors of dogs, such as those included in adoption profiles, can influence their likelihood of adoption. PBTD are frequently described with negative terms like 'aggressive' in media profiles, which may, in turn, deter potential adopters, reinforcing the negative stereotypes associated with these breeds. During the period of study, these perceptions could have been further intensified by the introduction of the XL Bully ban, which may have contributed to decreased adoption interest. The negative impact of breed labels is supported by Gunter et al. (2016), who found that removing breed labels was an effective strategy for increasing adoption success for PBTD in shelters (Gunter et al., 2016).

4.8 Overall study analysis and study limitations

The study was conducted during a period when new breed-specific legislation was introduced, targeting XL Bully-type dogs with stricter restrictions. As previously discussed, the heightened negative media attention surrounding these dogs, combined with limited public knowledge in accurately identifying dog breeds, may have influenced the results. The findings of the study indicated that PBTD were overrepresented and they tended to experience more negative outcomes compared to other breeds, which can be explained by the context of the recent implementation of the new legislation. To determine whether a trend exists, further studies should be conducted across different time periods to account for the potential impact of legislative changes on the findings of this study. This approach would also help to increase the sample size, which in turn would increase the statistical significance of the conclusions.

Breed identification in this study was based on visual assessments made by animal wardens and shelter staff. Previous research has shown that identification of dogs based on phenotypic characteristics has limitations, including inter-observer variation and inconsistency with genetic testing results (Arluke et al., 2018; Collier, 2006 ; Rowan, 1986). The limitations in identifying dogs based on visual assessment highlight the need for future validation studies to improve data reliability.

The influence of other variables other than breed, such as age, sex, coat colour, size has been shown to impact the length of stay of dogs within shelter systems. This study was limited in that it only considered breed as a variable when analysing a dog’s outcome. This limitation was evident in the variability observed in length of stay within individual breed categories,

suggesting that other factors may also play a significant role. Incorporating these variables in future analyses could support the development of targeted strategies aimed at improving rehoming of dogs based on their individual characteristics.

The prevalence of restricted breeds in shelters during the period evaluated may reflect their popularity within the Dublin City Council area. To determine whether the shelter demographics accurately reflects the broader dog population, further studies could compare this data with information from other sources, such as the national dog licensing system and microchipping databases. Additionally, comparisons with data from other charities and rescue organisations could help identify whether dogs from restricted breeds face similar challenges across different settings.

Overall, the study proved valuable in illustrating the impact of breed-specific legislation on both the intake of restricted breeds and shelter outcomes. Dogs from restricted breeds, particularly PBTD, should be considered an at-risk population within shelters, facing the potential for euthanasia and prolonged kennel stays.

Researchers have explored various strategies to mitigate the effects of long-term shelter stays and to increase adoption rates among shelter dogs. Certain behaviours displayed by dogs during the adoption process have been shown to be more desirable to potential adopters, particularly more sociable behaviours (Protopopova & Wynne, 2014). Dare et al (2023) evaluated enrichment strategies impact on undesired behaviours by dogs, and found that enrichment, through the use of calming items, was able to reduce signs of frustration and stress due to the kennel environment, especially vocalization and tense body posture (Dare & Strasser, 2023).

Social isolation can also negatively impact the welfare of dogs in the kennel environment. Hecker et al (2024) found that pair housing was able to reduce the length of stay of dogs in shelter and also reduce their stress levels. It was hypothesized that adopters, whom may already own a dog, showed increased interest in dogs that displayed notably more social behaviour (Hecker et al., 2024). While there are risks associated with multi dog kennelling, it may help reduce stress in certain individuals.

Human interaction also has a direct impact on reducing stress levels in dogs and can consequently lead to improved behaviour. A study by Gunter et al (2023) indicated that temporary foster programs can enhance adoption outcomes for shelter dogs by providing temporary stress relief associated with the shelter environment and increasing their visibility to potential adopters. (Gunter et al., 2023).

The findings of this study demonstrated a strong reliance on animal welfare charities and rescue groups to rehome dogs, rather than rehoming directly from pounds. Incorporating strategies aforementioned, such as enrichment, paired housing, and temporary fostering programs could improve adoption rates for restricted breeds and help reduce the negative breed stigma, as these breeds tend to experience poorer outcomes within the shelter system.

Non restricted breeds in this study had higher rates of return to owners or family members compared to restricted breeds, which may indicate the increased likelihood of abandonment among restricted breeds. Although the specific ways in which dogs were reunited with their owners were not examined, exploring these could provide valuable insights for developing strategies to prevent abandonment. In Ireland, dogs have been legally required to be microchipped since 2015 (Microchipping of Dogs Regulations, 2015). Strengthening the enforcement of these existing regulations could help to reduce the likelihood of abandonment and therefore possibly reduce the stray dog population.

V. Conclusion

In an attempt to reduce bite incidents, governments often rely on legislation, such as Breed-Specific Legislation (BSL), as a reactionary measure to address the issue. The intense media coverage of certain breeds included in BSL contributes to negative stereotypes, which impacts the demographics of dogs in the shelter population.

The basis of entry, basis of exit and length of stay of dogs in the DCC's shelters was compared between breed groups. The findings concluded that restricted breeds represented the majority of dogs in the shelter during the analysed period and experienced significantly longer lengths of stay and a higher incidence of negative outcomes, such as euthanasia, compared to breeds not affected by BSL. More specifically, PBTD were the most impacted, comprising the most common breed type in the shelter during the evaluated period, aligning with findings from existing research.

Breed was used as the only variable for comparison for the results, which comes with limitations. Evaluating variables such as, age, sex, coat colour and size could provide better insights to determine whether the breed of the dog alone determines its fate in the shelter system. Furthermore, during the period evaluated the implementation of the XL Bully Ban might have influenced the negative media representation of PBTD, potentially affecting the length of stay and the basis of exit from the shelter. Future studies should address these gaps by including other variables and comparing results from different shelters and time periods.

The findings of this study indicates that in the aftermath of BSL, restricted breeds, specially PBTD, are at risk of devastating outcomes and underscores the need to consider targeted strategies to ameliorate the challenges that these dogs face in the shelter system.

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Annex A

Comhairle Cathrach
Bhaile Átha Cliath
Dublin City Council

INSPECTOR ANIMAL WELFARE ASSESMENT

A Animal Welfare Inspector has called to see Animal(s) and Location: No. 0007

Time:_____ Day:_____ Date:_____

Below is the Inspectors view about how the animal(s) is/are being kept. **Any ticks in the "No" column means you need to do something for your animal(s) welfare.** See Inspectors comments below for details.

FREEDOM FROM HUNGER & THIRST?	Yes	No	FREEDOM FROM PAIN, INJURY & DISEASE?	Yes	No
Does the animal have access to clean water?			Is the animal free from any sign of pain, injury or disease? If "no" has its condition been diagnosed? Is its condition being treated properly?		
Does the animal look like it's getting a nutritionally adequate diet to stay healthy?			**FREEDOM TO EXPRESS NATURAL BEHAVIOURS?**	**Yes**	**No**
FREEDOM FROM DISCOMFORT?	**Yes**	**No**	Does the animal have enough space to express its normal behaviour? If it is working or in transit does the animal get enough opportunity to express its normal behaviour?		
Is the animal contained within a suitable environment?					
Is the environment clean? Can the environment be maintained in the clean condition?			Does the animal have enough opportunity to express its normal behaviour in the company of other animal of its own kind or its handler/owner?		
Is the environment free from hazards, such as sharp projections?			**FREEDOM FROM FEAR & DISTRESS?**	**Yes**	**No**
Is there adequate shelter from extremes of weather?			Is the animal free of any obvious signs of fear and distress? If showing fear, distress or mental suffering has the cause been identified? Is the right action being taken to alleviate the problem?		
Is there a comfortable resting area?					

INSPECTORS COMMENTS / ANY OTHER CONCERNS:

Signed:_____ **Date:**_____

DUBLIN CITY COUNCIL ANIMAL WELFARE AND CONTROL UNIT INSPECTORS AUTHORISED OFFICERS UNDER THE *ANIMAL HEALTH AND WELFARE ACT 2013.*

Animal Welfare and Control Unit, Housing and Community Services,
Block 2, Floor3, Civic Offices, Wood Quay, Dublin 8

An tAonad um Leas Aimsithe, Seirbhísí Tithíochta agus Pobal,
Bloc 2, Urlar 3, Oifigí na Cathrach, An Ché Adhmaid, Baile Átha Cliath 8

T. 01 2225441 E: animalwelfare@dublincity.ie

Annex B

Frequencies of Primary Breed Type

Primary Breed Type	Counts	% of Total	Cumulative %
Pitbull Type	143	39.6%	39.6%
Belgian Shepherd	10	2.8%	42.4%
Boxer	4	1.1%	43.5%
French Bulldog	14	3.9%	47.4%
Husky	3	0.8%	48.2%
Labrador	15	4.2%	52.4%
Mongrel	3	0.8%	53.2%
Sharpei	4	1.1%	54.3%
Terrier	22	6.1%	60.4%
Whippet	1	0.3%	60.7%
Akita	2	0.6%	61.2%
German Shepherd	26	7.2%	68.4%
Rottweiler	11	3.0%	71.5%
Bichon	7	1.9%	73.4%
Border Terrier	1	0.3%	73.7%
Chihuahua	6	1.7%	75.3%
Cockapoo	4	1.1%	76.5%
Collie Type	2	0.6%	77.0%
Corgi	3	0.8%	77.8%
Dachshund	3	0.8%	78.7%

Frequencies of Primary Breed Type

Primary Breed Type	Counts	% of Total	Cumulative %
Golden Retriever	1	0.3%	78.9%
Jack Russel Terrier	31	8.6%	87.5%
Lurcher	8	2.2%	89.8%
Olde English Bulldogue	3	0.8%	90.6%
Papillon	1	0.3%	90.9%
Pointer	1	0.3%	91.1%
Pug	3	0.8%	92.0%
Shih Tzu	3	0.8%	92.8%
Yorkie	2	0.6%	93.4%
Beagle	1	0.3%	93.6%
Dogo Argentino	1	0.3%	93.9%
English Bulldog	3	0.8%	94.7%
Hound Type	1	0.3%	95.0%
Maltese	2	0.6%	95.6%
Pomeranian	2	0.6%	96.1%
Saluki	1	0.3%	96.4%
Spaniel	3	0.8%	97.2%
Cocker Spaniel	1	0.3%	97.5%
Dogue De Bordeaux	1	0.3%	97.8%
Samoyed	1	0.3%	98.1%

Frequencies of Primary Breed Type

Primary Breed Type	Counts	% of Total	Cumulative %
Shihba Inu	1	0.3%	98.3%
Tibetan Spaniel	1	0.3%	98.6%
Weimaraner	1	0.3%	98.9%
Doberman	2	0.6%	99.4%
Mastiff	2	0.6%	100.0%