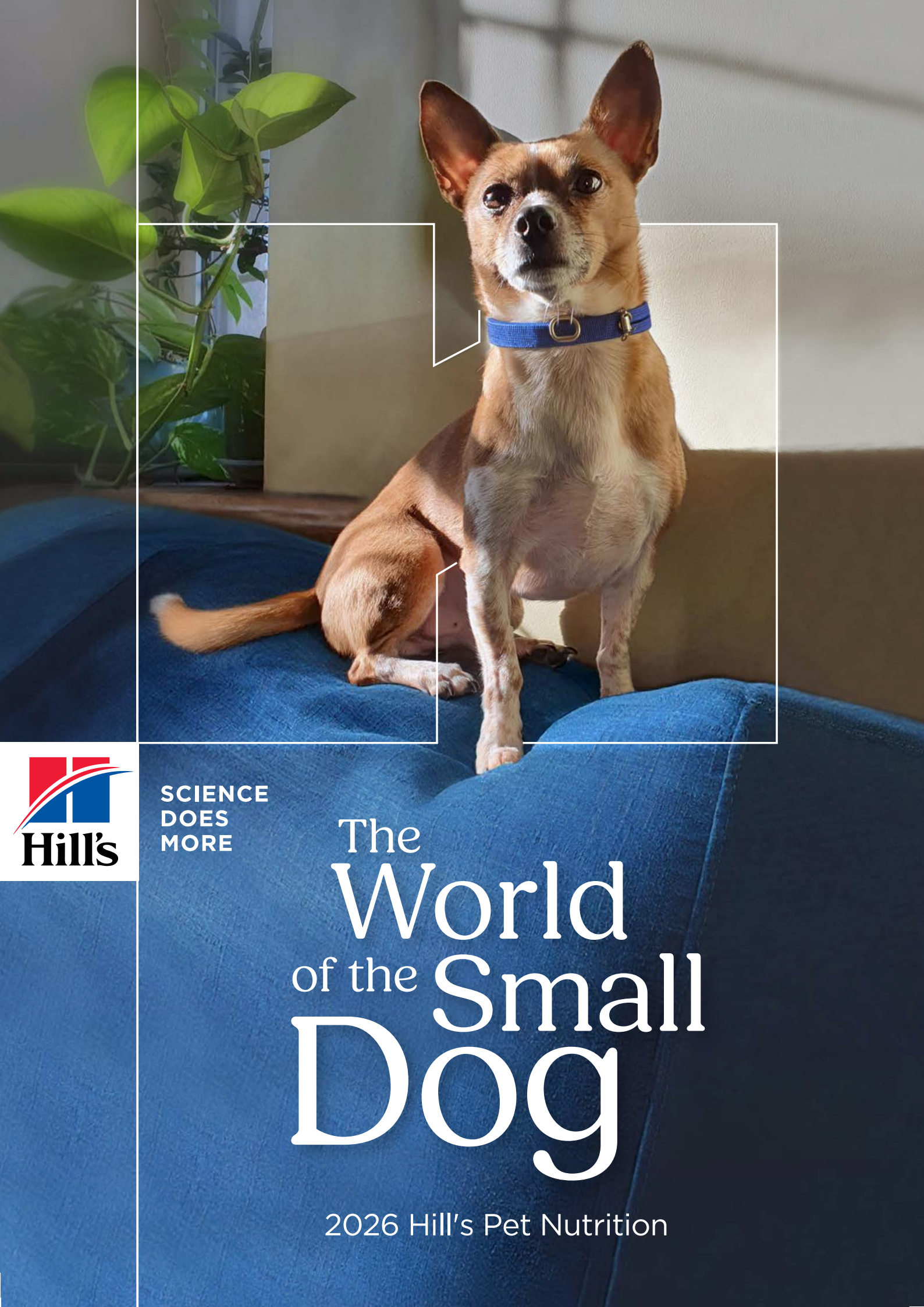


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SCIENCE DOES MORE

The World of the Small Dog

2026 Hill's Pet Nutrition



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Acknowledgments



Sarah Baker,

Global Marketing Measurement Manager

Sarah pairs a lifelong passion for pets with extensive insights expertise to uncover what truly drives small dog pet parents. She specializes in translating complex consumer data into strategic recommendations that elevate care, nutrition and well-being for small and mini dogs worldwide. Sarah contributed greatly in collecting and selecting the information for the Veterinary and Ownership facts section of this report.

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Executive Summary

Defining Small Dogs
Small and mini dogs (under 25 lbs) possess distinct physiological, metabolic and anatomical profiles that can benefit from tailored preventive care and precision nutrition, moving away from a traditional "scaled-down" veterinary approach.

Evolution and History
A fixed ancestral genetic variant (IGF1) dictates small body size, while human selection for "baby schema" (Kindchenschema) features drives their enduring popularity, creating a distinct biological profile and conformation-related health dynamics.

Metabolism, Energy and Oxidative Stress
Small breeds mature rapidly and outlive giant breeds by 4 to 5 years on average. Due to a high surface area-to-mass ratio and distinct cellular metabolism, they require roughly twice the calories per kilogram of body weight compared to large dogs. Paradoxically, despite their extended longevity, they operate with lower baseline circulating antioxidant levels.

Health Vulnerabilities



Gastrointestinal: Small dogs possess significantly faster colonic transit times than large dogs. This rapid colonic transit limits fermentation, resulting in naturally firmer stools but potentially increasing susceptibility to constipation if dietary fiber is inadequate. Small dogs also face specific gastrointestinal health risks.



Dental: Small dogs are up to five times more likely to develop periodontal disease than giant breeds. This is driven by severe tooth crowding in disproportionately small jaws, retained deciduous teeth and shortened roots that lead to rapid alveolar bone loss.



Cardiac: Cardiovascular pathology represents the primary cause of mortality among small breeds, with myxomatous mitral valve disease emerging as the most prevalent disease within this category.



Urinary: According to the Minnesota Urolith Center data, small and mini dogs account for approximately 71% of all canine urinary stones. Mini dogs over-index in a different type of urolith (calcium oxalate) compared to small and larger dogs (struvite).



Skeletal: Small and mini dogs face a 12 times higher risk of medial patellar luxation than large dogs. Additionally, their specific FGF4 retrogene variant may predispose them to skeletal disease.



Behavior and Cognition: Small dogs experience higher rates of fear, anxiety and excitability, which are frequently exacerbated by pet parent "babying" and a lack of training. Furthermore, their extended lifespans put them at a significantly higher lifetime risk of canine cognitive dysfunction.

Socioeconomics and Ownership

Making up over 52% of the global dog population, small dogs are overwhelmingly viewed as family members or children. Because daily food volume is low, cost is less of a barrier, driving strong demand and high client compliance for premium, palatable and functional therapeutic nutrition.



Hill's role in advancing small dog science:

Building on these distinct biological traits, Hill's Small Paws Innovation Center is continuously developing precision nutrition designed to help support the clinical paradoxes of the small dog. Research focuses on refining amino acid profiles to reduce microbial proteolysis in the gut, integrating methyl donors (like betaine) and L-carnitine to bolster their naturally lower antioxidant capacity, optimizing prebiotic fibers for rapid GI transit, and tailoring omega-3 profiles to preserve cognitive healthspan in their extended geriatric years.



Introduction

When you look at a Chihuahua, a Dachshund or a Miniature Poodle, you are looking at a dog that is intrinsically different from a larger breed one. Traditionally, pet parents and veterinarians have viewed small and mini dogs as separate breeds instead of a group with shared physiological needs.

Hill's Pet Nutrition wants to change how we think about small dogs. Driven by the core truth that small and mini dogs have completely unique metabolic, nutritional and aging needs, this report sets out to change the standard of care. By combining current research with new, cutting-edge discoveries from our **Small Paws Innovation Center**, we are redefining how we understand small dog biology. Whether you are a veterinary professional or a pet parent, this report is not just about size, it is about honoring the unique science that makes small dogs a distinct and remarkable category of their own.

Definition of Small and Mini Dogs

When it comes to canine health, how exactly do we define a “small” dog? While researchers and kennel clubs agree that adult body weight is the best metric, the exact dividing lines are often debated. Based on scientific literature (Turcsán & Kubinyi, 2024; Montoya et al., 2023), we’ve broken down the spectrum into two primary groups:



Mini Dogs

< 11 to 14 lbs | < 5 to 6.5 kg

For example, Chihuahuas, Yorkshire Terriers and Pomeranians.



Small Dogs

11 to 25 lbs | 5 to 11.3 kg

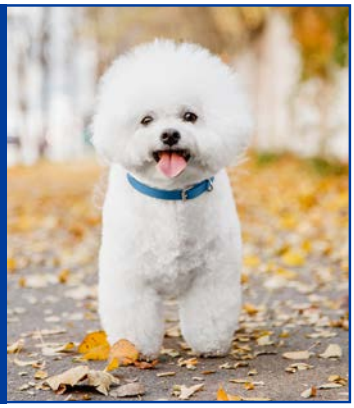
For example, Jack Russell Terriers and Miniature Schnauzers.

This report uses the collective term “small and mini dogs” to refer to all canine companions under 25 pounds.

These categories are far more than just labels; they have real-world impact. A dog's body size is actually one of the most powerful predictors of their life expectancy and lifetime disease risk (Turcsán & Kubinyi, 2024; Montoya et al., 2023). By recognizing the unique biology and behavior of dogs under 25 pounds, veterinary teams and pet parents can move away from one-size-fits-all medicine, crafting highly tailored preventive care and daily nutrition plans that help these tiny dogs thrive.

Popular Small and Mini Dog Breeds

BICHON FRISÉ



BOSTON TERRIER



CAVALIER KING CHARLES SPANIEL (CKCS)



CHIHUAHUA



DACHSHUND



FRENCH BULLDOG



HAVANESE



MALTESE



JACK RUSSELL TERRIER



SHIH TZU



SCOTTISH TERRIER



POMERANIAN



MINIATURE SCHNAUZER



WEST HIGHLAND WHITE TERRIER (WESTIE)



SHETLAND SHEEPDOG (SHELTIE)



POODLE (MINIATURE AND TOY)



PAPILLON



YORKSHIRE TERRIER (YORKIE)



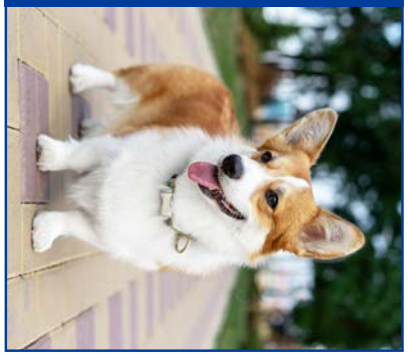
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Biological Evolution and History of Small and Mini Dogs

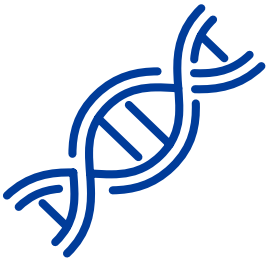
Among mammals, dogs exhibit a breathtaking diversity in physical size. While wild canines show some natural variation, from the 1-kilogram (2.2-lb) fennec fox to the 55-kilogram (121-lb) gray wolf, domestication has completely rewritten the biological rulebook.

Intense, targeted breeding has pushed domestic dogs into entirely new metabolic and physiological territory (Hoffman et al., 2018). Today's breeds represent a massive 40- to 50-fold difference in body mass, with the smallest adults weighing less than a kilogram and the largest surpassing 90 kilograms (Jimenez et al., 2018; Hernot et al., 2005). Effectively, expecting a Chihuahua and a Mastiff to require the exact same clinical approach is like treating a human and a hippopotamus in the exact same exam room.

Evolution: The Ancient Blueprint

While the domestic dog (Canis lupus familiaris) diverged from the gray wolf an estimated 15,000–40,000 years ago (Arendt et al., 2016), the key genetic variant at the IGF1 locus, the major determinant of small body size, was already present in Pleistocene wolves over 53,000 years ago (Plassais et al., 2022).

This allele, which codes for small size, sits in a specific RNA sequence that interacts with the IGF1 gene to regulate growth. This means early humans did not create small dogs from scratch; they simply selected for a pre-existing genetic variant already circulating in wild populations, allowing body size to be reduced quickly once domestication and selective miniaturization began (Plassais et al., 2022).



The Genetic Architecture

Unlike humans, where height is influenced by hundreds of genes, dog size is controlled by a handful of genomic regions (Rimbault & Ostrander, 2012)**.**

- **Six to 20 genomic regions account for the vast majority of size differences**, with IGF1, HMGA2, STC2, GHR and SMAD2 playing the central roles (Rimbault & Ostrander, 2012; Sutter et al., 2007).
- **The IGF1 haplotype is fixed in nearly all modern small breeds**, pointing to a shared ancestral origin likely rooted in the Middle East (Gray et al., 2010; Sutter et al., 2007).

This shared genetic background underpins many of the biological and clinical patterns described later in this report.

Small and Mini Dogs in History

Small dogs have a rich and varied history. Some small and mini dog breeds were originally created for specific tasks, such as hunting underground, while others were among the earliest dogs kept purely for companionship. This diverse background is evident in many global examples.



Ancient China

Small snub-nosed dogs like the Pekingese were revered in imperial courts since the Tang dynasty (618–907 CE) / 8th century. The smallest individuals, called sleeve dogs, were carried within the billowing sleeves of noblemen to act as hidden guards (Bell, 2012; DK, 2013).

Pre-conquest Mexico



The Chihuahua, a descendant of the *Techichi*, a dog kept by the Toltec people as early as the 9th century, served as a living warm compress to treat aches and pains. Farmers used their radiating body heat to help keep themselves warm on cold nights, giving rise to the phrase "three dog night" (Bell, 2012; DK, 2013). Later, highly treasured by the Aztecs, these small dogs were sometimes buried with their masters and their descendants. Eventually they became popular companions in the U.S. after being exported from the Mexican state of Chihuahua in the mid-19th century (Bell, 2012).



Japan

The Japanese Chin was specifically bred to warm the laps and hands of the ladies in the Imperial Palace in the 1700s (Bell, 2012; DK, 2013).



Europe

Small spaniels were favored by royalty and nobility as early as the 15th and 16th centuries, often portrayed as pampered pets, as shown in the art of the era (Bell, 2012). Until the late 19th century, almost all dogs kept solely for companionship were owned by the wealthy (The Dog Encyclopedia, 2013). Breeds such as the Pug and the Maltese were developed solely for companionship (Bell, 2012) and the English Toy Spaniel, originally used to hunt woodcock, was selectively bred over time to function exclusively as a lap dog (Bell, 2012).

Yorkshire Terrier



The breed's origins trace back to various Scottish terrier lines, specifically the Waterside terrier crossed with the Paisley, Skye, Clydesdale and rough-coated Black and Tan English terriers that accompanied Scottish weavers migrating to Northern England during the Victorian Era. These early, significantly larger progenitors were developed for vermin control, catching the rats and mice that infested wool mills and mine shafts (Bell, 2012; The Dog Encyclopedia, 2013).



Dachshund

Their compact stature was designed to "go to earth," allowing them to enter underground dens to hunt badgers (The Dog Encyclopedia, 2013).

Jack Russell Terrier



Bred by the Reverend John “Jack” Russell in the early 19th century, these dogs were selected to possess speed and stamina to run alongside horses and stature small enough to go underground to flush out game, resulting in a tenacious, workman-like temperament that persists in the breed today (Bell, 2012). Depending on their size and leg length, these dogs are now classified into two separate breeds: the Jack Russell Terrier and the Parson Russell Terrier (American Kennel Club, n.d.-b).

The Ethology of "Cuteness": Effects in Small and Mini Dog Selection

Small dogs were originally bred for function, built to maneuver through tight spaces and to flush out game (Sutter et al., 2007). Today, their explosive popularity is driven more by emotional appeal than practical need.



The root of this appeal is Kindchenschema (the "Baby Schema"), a hardwired human response where infant-like features, such as a tiny body, large eyes and a rounded head trigger automatic caregiving behaviors (Paul et al., 2023). Studies show that while a dog's face matures, a small body remains a lifelong marker of "infancy," keeping these dogs perpetually endearing to their owners (Paul et al., 2023).

For veterinary professionals, this intense selection for "cuteness" has resulted in a biological paradox. Selection for extreme anthropomorphic features, such as those seen in brachycephalic "hypertypes," has come with significant health risks. Despite their popular appearance and affectionate temperaments, dogs with these exaggerated conformations can suffer severe health and welfare compromises, which will be discussed later in this report (Morel et al., 2024; Packer et al., 2021; Proschowsky et al., 2025).

Distinct from these conformational risks is the factor of small stature itself. While diminutive size is also a primary driver of the Kindchenschema response, it also correlates with a significantly extended lifespan compared to larger breeds (Kraus et al., 2013; McMillan et al., 2024; Yordy et al., 2020). This increased longevity presents a secondary clinical consideration, as it leads to a higher prevalence of age-related and chronic conditions that affect the small dog population as a whole.



Key Takeaways for Pet Parents

Biological Evolution and History

- Small size stems from an ancient genetic variant, not just modern breeding.
- Small dog breeds have rich histories, bred for diverse tasks from hunting to lap-warming.
- "Baby-like" features may drive their popularity but could also lead to health issues.

Key Takeaways for Veterinarians



Biological Evolution and History

- The IGF1 haplotype is fixed in nearly all modern small breeds.
- Small dogs trigger the “baby schema” (Kindchenschema), inducing an impulse where infant-like physical traits evoke instinctive caregiving and affection.
- Diminutive size correlates with longer lifespans, shifting focus to chronic disease management.



Health and Nutrition

Small and mini dogs are physiologically distinct from larger breeds, operating with a significantly higher metabolic rate per kilogram of body weight, distinct aging trajectories and unique anatomical vulnerabilities. The following sections outline these biological differences and define specialized clinical considerations for their care.

Lifespan and Aging Trajectories of Small and Mini Dogs









Small and Mini Dog Lifespan

Large clinical datasets reveal that small and mini dogs outlive giant breeds by four to five years on average (Jimenez et al., 2018; Kraus et al., 2023; Montoya et al., 2023; Yordy et al., 2020). While small and mini dogs' life expectancies are reported to be between 10.7 to 16 years, giant breeds average just 6.5 to 10.6 years (De Gennaro et al., 2024; Inoue et al., 2015; Montoya et al., 2023; Teng et al., 2022; Turcsán & Kubinyi, 2024).

Extreme conformation can affect the reported average lifespan. Brachycephalic breeds like the French Bulldog (4.53 to 9.8 years) and Pug (7.65 years) are reported to have lower life expectancies (Geraz et al., 2024; Teng et al., 2022; McMillan et al., 2024). These low averages are likely driven by a combination of early-life health risks and potential statistical biases. Furthermore, an increase in a breed's popularity can cause a larger young population fraction, which can heavily skew the mortality data towards early-life deaths (Geraz et al., 2024; Teng et al., 2022). Despite these low averages at birth, demographic life tables reveal that French Bulldogs do not drop to a remaining life expectancy of 1.5 years until they reach 10 to 11 years of age (Teng et al., 2022). This trajectory aligns with the 10-plus year lifespans reported for these breeds by both the American and Royal Kennel Clubs (American Kennel Club, 2026; Royal Kennel Club, 2026).

Aging Trajectories and the "Geriatric Window" of Small and Mini Dogs

Biological aging of small and mini dogs occurs in progressive phases (Creevy et al., 2019). Subtle metabolic shifts, such as decreasing maintenance energy requirements and the gradual accumulation of oxidative stress, typically occur around 7 years of age (Dhaliwal et al., 2023; Jimenez et al., 2018; Jimenez & Downs, 2020). Addressing these early shifts is critical to offsetting changes in body composition, preventing age-related weight gain, and preserving lean body mass well before outward signs of aging appear (Creevy et al., 2019; Dhaliwal et al., 2023).

As defined by the AAHA Senior Care Guidelines, dogs officially enter the senior life stage during the last 25% of their estimated lifespan (Creevy et al., 2019; Dhaliwal et al., 2023). For long-lived small dogs, this transition typically occurs between 8 and 12 years of age, marking the beginning of an extended "geriatric window" (Dhaliwal et al., 2023; Turcsán & Kubinyi, 2024). Spared from the early mortality risks linked to the rapid growth of giant breeds, small dogs are instead more likely to show slow-progressing age-related conditions like sarcopenia and canine cognitive dysfunction (Dhaliwal et al., 2023; Fleming et al., 2011; Kraus et al., 2013; Turcsán & Kubinyi, 2024).

Veterinary care for small dogs should prioritize healthspan preservation, aspiring to maintain a high quality of life throughout their extended senior years (Kraus et al., 2023; Ruple et al., 2022; Turcsán & Kubinyi, 2024).



Growth and Size Implications to Metabolism

Skeletal Maturity

Small dogs reach skeletal maturity much faster, typically between eight and twelve months, whereas larger breeds can require up to 24 months (Hawthorne et al., 2004; Salt et al., 2017).

Figure 1

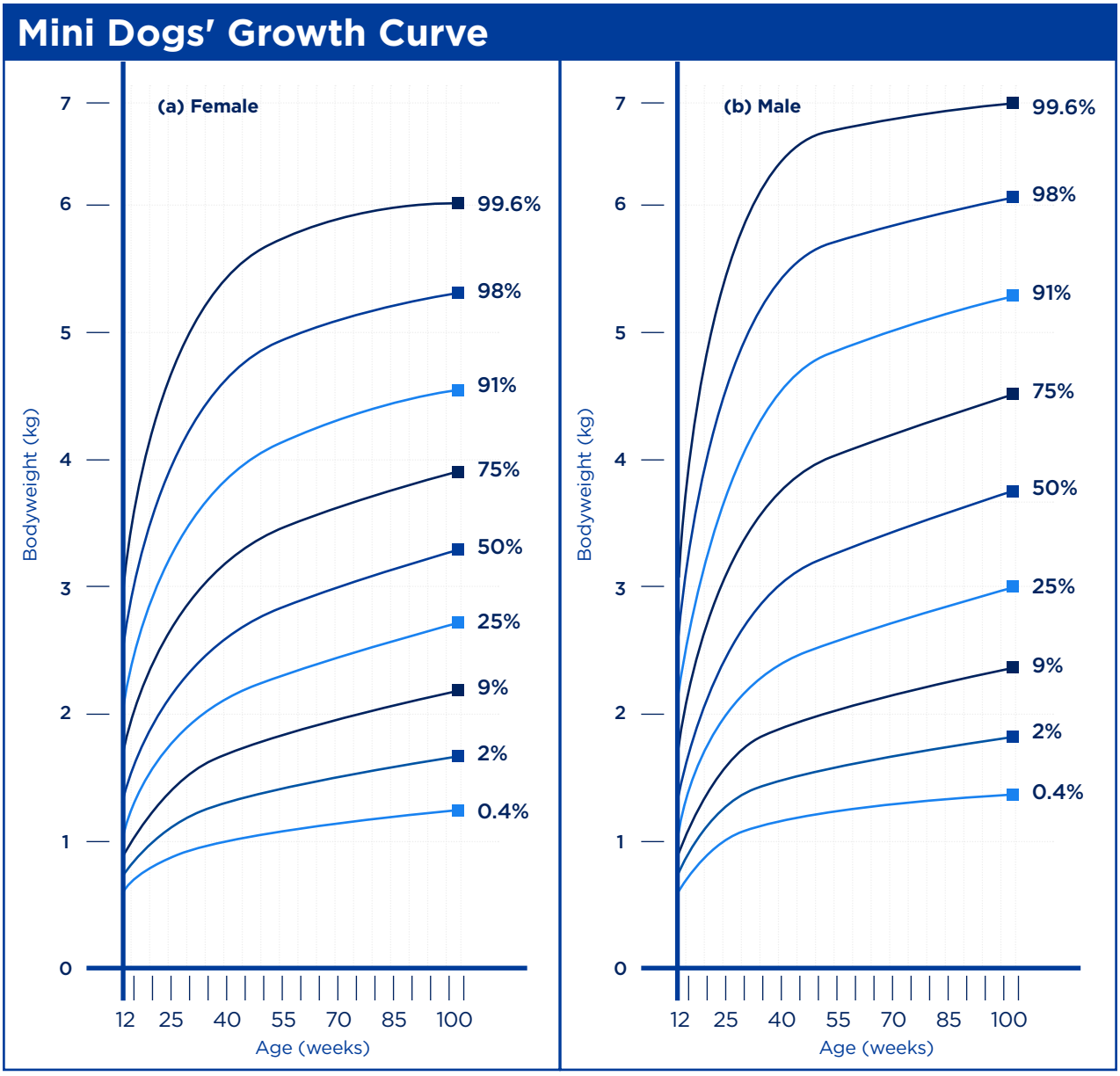


Figure 1: Left and right panels show the final curves for males and females, respectively, for dogs with a predicted adult bodyweight of <6.5kg (14.3 lbs). The x-axis depicts age in weeks, whereas the y-axis depicts bodyweight in kilograms. The chart displays nine standardized centile lines (0.4%, 2%, 9%, 25%, 50%, 75%, 91%, 98% and 99.6%) that are equally spaced along a standard deviation (z-score) scale (Salt et al., 2017).

Figure 2

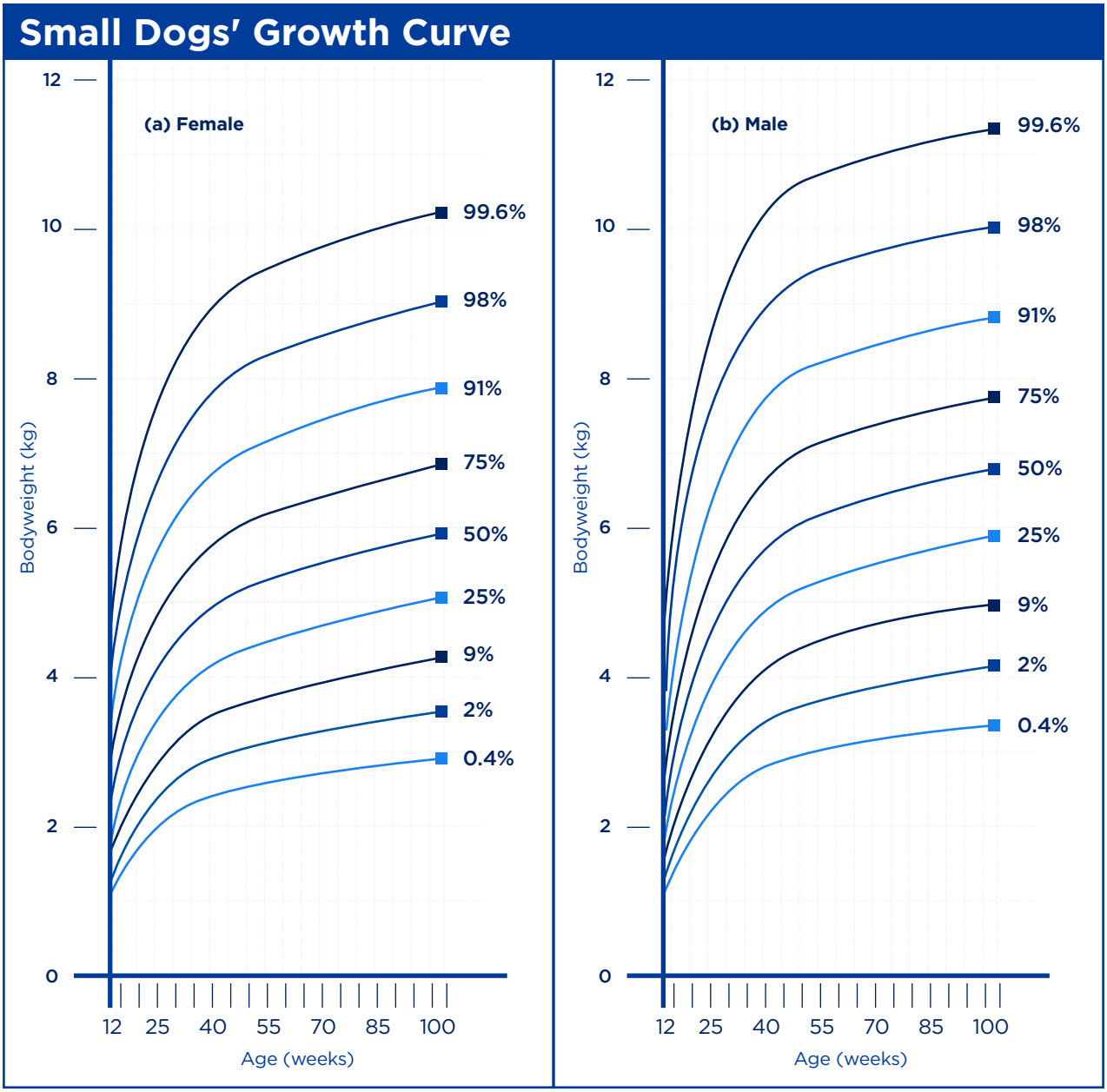


Figure 2: Left and right panels show the final curves for males and females, respectively, for dogs with a predicted adult bodyweight of between 6.5kg (14.3 lbs) and 9kg (19.8 lbs). The x-axis depicts age in weeks, whereas the y-axis depicts bodyweight in kilograms. The chart displays nine standardized centile lines (0.4%, 2%, 9%, 25%, 50%, 75%, 91%, 98% and 99.6%) that are equally spaced along a standard deviation (z-score) scale (Salt et al., 2017).

Life Cycle

The life history of small dogs combines rapid maturation with exceptional longevity, the pattern strongly influenced by the IGF1 gene (Jimenez & Downs, 2020).

- Specific IGF1 variants (haplotypes) limit circulating IGF-1 concentrations. This restricts physical size and is associated with significantly longer lifespans compared to giant breeds (Plassais et al., 2022; Sutter et al., 2007).

- While they grow fast, they reproduce conservatively. Mini breeds typically produce litters of just one to three puppies, compared to seven to eight puppies in large breeds (Case, 2005; Borge et al., 2011; Gough et al., 2018; Kamphues et al., 2020).

Nutritional Risks

Small and Mini dog growth patterns give them a distinct nutritional risk profile compared to giant breeds.

- Large and giant breed puppies are highly sensitive to calcium excess, which risks orthopedic disease including osteochondrosis and hip dysplasia (Dobenecker et al., 2002; Nap & Hazewinkel, 1994). Small breeds, however, have a wider safety margin. Their lower absolute growth rate and reduced skeletal loading make them less sensitive to mineral excess (Nap & Hazewinkel, 1994).

- The combination of their higher metabolic rate, limited glycogen stores and inadequate gluconeogenesis creates a higher risk for transient juvenile hypoglycemia in small and mini breeds (Bell et al., 2012).

Energy Distinctions

Being small comes with specific energy costs driven by a relatively larger body surface area.

- A high surface-to-mass ratio dictates rapid heat loss, predisposing smaller dogs to hypothermia (Speakman, 2005).

- More skin per pound means more hair to grow. This implies a higher relative metabolic "hair cost" for certain small breeds compared to larger ones (Serisier et al., 2013).

Clinical Benchmarks

Finally, small dogs' unique morphology alters the "normal" baseline of certain clinical and metabolic markers.

- **Creatinine:** Healthy small-breed dogs generally have lower serum creatinine concentrations than the wider canine population, attributed to a lower muscle mass (Hall et al., 2015; Relford et al., 2016).
- **Thyroid Hormones (T3):** Small dogs operate with higher circulating levels of triiodothyronine (T3) to support their higher metabolic oxygen consumption and carbohydrate metabolism (Middleton et al., 2017).
- **Antioxidant**: Healthy small dogs present lower circulating plasma levels of non-enzymatic antioxidants including total bilirubin, urate and glutathione metabolites (such as gamma-glutamyl amino acids and cysteine-glutathione disulfide)(Middleton et al., 2017).
- **Electrolyte profile:** Small dogs also exhibit significantly lower serum potassium levels than larger breeds (Middleton et al., 2017)
- **Glomerular Filtration Rate (GFR):** Renal physiology in dogs follows an allometric scaling pattern where GFR relates to body mass by an exponent of roughly 0.75 (Achanta et al., 2016). Due to this non-linear relationship, weight-normalized GFR is notably elevated in small and mini dogs relative to large and giant breeds (McKenna et al., 2020). Clinical data indicates that healthy small dogs (1.8–12.4 kg) maintain an expected mean GFR of 2.89 mL/kg/min, whereas large dogs (32.0–70.3 kg) operate at 2.25 mL/kg/min (Bexfield

et al., 2008; McKenna et al., 2020). This size-linked metabolic divergence is reinforced by findings showing mean GFR values of 3.66 ± 0.47 mL/min/kg in dogs under 10 kg, compared to only 2.35 ± 0.56 mL/min/kg in giant breeds over 45 kg (Lefebvre, 2010).

- **Pharmacokinetics and Drug Dosing:** Renal filtration and the mass of metabolic organs in dogs follow allometric scaling exponents well below unity (0.70–0.79), meaning mass-specific drug clearance is inherently faster in small and mini dogs compared to larger breeds (Achanta et al., 2016; Martinez et al., 2009).

  Traditional weight-based (mg/kg) dosing assumes linear scaling, a model that often overestimates clearance in giant breeds, risking toxic systemic exposure, as reported with oral prednisolone, while underestimating clearance in toy breeds, which risks subtherapeutic outcomes (Martinez et al., 2009; Nam et al., 2017).

  Furthermore, body surface area (BSA; mg/m^2) adjustments do not mitigate this risk; BSA-based math tends to overestimate drug clearance for patients under 10 kg, predisposing small dogs to dangerous toxicities like carboplatin-induced neutropenia (Béguin et al., 2024).



Key Takeaways for Pet Parents

Lifespan & Aging

- Small dogs often live 4–5 years longer than giant breeds.

Growth & Size

- Reach full skeletal maturity very quickly, usually by 8–12 months.

Clinical Benchmarks

- Small dogs have some baseline levels of health markers different from large dogs.

Key Takeaways for Veterinarians

Lifespan & Aging

- Extended "geriatric window" increases the prevalence of sarcopenia and cognitive dysfunction.

Growth & Size

- Lower sensitivity to calcium excess during growth, but higher risk for juvenile hypoglycemia.

Clinical Benchmarks

- Small dogs show higher weight-normalized Glomerular Filtration Rate (GFR) and faster drug clearance, which may lead to a need for drug dosing considerations by size.
- Small dogs' normal baseline serum creatinine is lower, and their circulating T3 is higher than large dogs.



Energy & Metabolism

Energy Requirements

Energy requirements in dogs are usually expressed per unit of metabolic body weight ($kg^{0.75}$). For adult maintenance, general recommendations range from about 90–130 kcal of metabolizable energy (ME) per $kg^{0.75}$ per day, depending on activity level and physiological status (FEDIAF, 2025; Gross et al., 2010). The relationship between metabolic body weight and actual body weight is not linear. Therefore, small dogs need more energy per kilogram of body weight than large dogs, even when requirements are similar on a $kg^{0.75}$ basis (NRC, 2006).

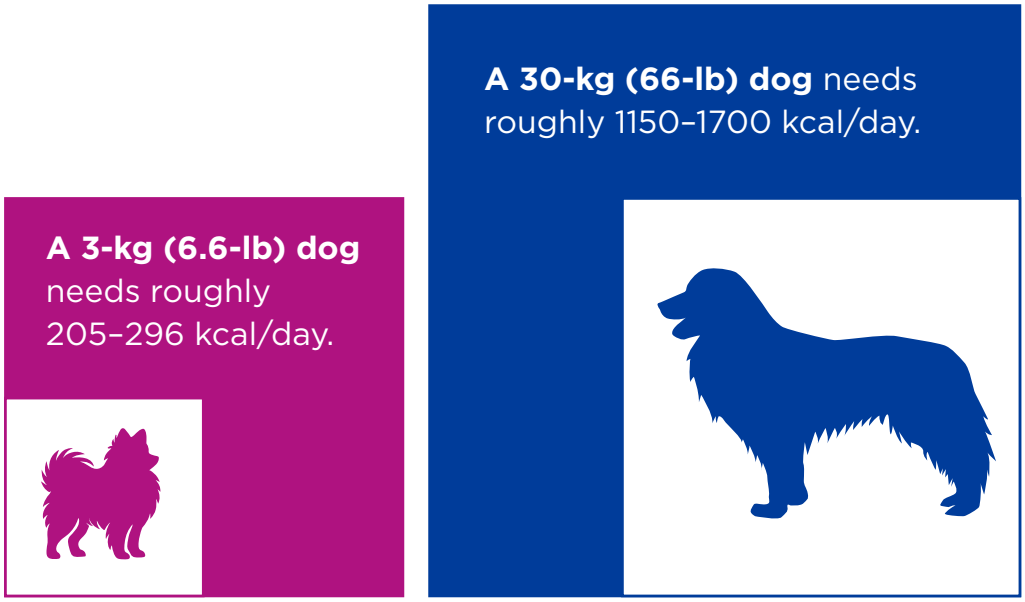


Table 1

Comparison of Daily Energy Requirements

Between a 3-kg and a 30-kg Dog

Body Weight (kg)	Daily Energy Requirement (DER) (kcal/day)	Energy Requirement (kcal/kg)	Difference in Body Weight (Magnitude)	Difference in DER (Magnitude)
3	250 (205-296)	83 (68-99)	10x	5.6x
30	1400 (1150-1700)	47 (38-57)	Body weight of the large dog is 10x larger than the small dog	DER of the large dog is only 5.6x greater than the small dog

This example illustrates that a dog 10 times larger than a small dog only has to eat five times the food to maintain their body weight.

From that example, on a per-kilogram basis, the small dog requires around twice as many kilocalories as the large dog. This metabolic rate is driven by several physiological factors. Because of a greater surface area-to-volume ratio, small dogs lose heat faster and must burn more basal energy to maintain body temperature. Furthermore, their shorter stature makes movement biomechanically more energy-intensive per kilometer (NRC, 2006; Kamphues et al., 2020), and their cells inherently operate with a distinct, 'faster' metabolic profile than those of larger breeds (Bermingham et al., 2014; Middleton et al., 2017; NRC, 2006).

While predictive equations provide a starting point, individual needs vary significantly. The biological reality ranges widely, with median maintenance energy requirements (MER) spanning from 68 to 183 kcal/kg$^{0.75}$ per day even in healthy colony dogs (Serisier et al., 2013). Supporting what was previously reported in the literature that small dogs require higher energy per kilogram of body weight (Gross et al., 2010; Bermingham et al., 2014; Middleton et al., 2017; Jimenez & Downs, 2020), recent data suggests that small dogs generally exhibit greater caloric needs compared to larger dogs (McGrath et al., 2023). Furthermore, the variance in caloric needs was significantly greater in small dogs than in larger dogs, suggesting that individual metabolic rates fluctuate more drastically within the small dog population than in larger breeds (McGrath et al., 2023).

Metabolism is not uniform across the size category depending on the dog breed. Certain small breeds naturally expend more energy.



Yorkshire Terriers demonstrate maintenance energy requirements that are significantly higher than other miniature dogs (Serisier et al., 2013).



Chihuahuas have been reported to have a maintenance energy requirement lower than the average of other miniature breeds (Serisier et al., 2013).



Miniature Dachshunds seem to exhibit a lower resting energy expenditure than the standard predictive equation suggests (Mansilla et al., 2018; Templeman et al., 2019).



Norfolk Terriers' energy requirements for healthy growth have been reported to be significantly lower than standard predictive equations suggest (Bradley et al., 2021).

Weight Management

Genetics play a significant role in weight management. Clinicians should be aware of breeds prone to excess weight, like Beagles, Border Terriers, Cocker Spaniels, Dachshunds and Pugs (Gough et al., 2018; Pegram et al., 2021), and take an active role in making nutritional recommendations to help small dogs maintain a healthy weight.

A dog's weight history plays a critical role in its ongoing nutritional management. Dogs that were previously obese and subsequently lost weight retain significantly lower maintenance energy requirements (median 86 kcal/$kg^{0.75}$/day) compared to dogs that have never been overweight (113 kcal/$kg^{0.75}$/day) (Serisier et al., 2013). This metabolic suppression means a "formerly obese" dog requires fewer calories to maintain weight than a naturally lean dog of the exact same size.

Consequently, energy allowance must be individualized using regular body weight checks and Body Condition Scoring (BCS) rather than relying solely on math (Serisier et al., 2013).

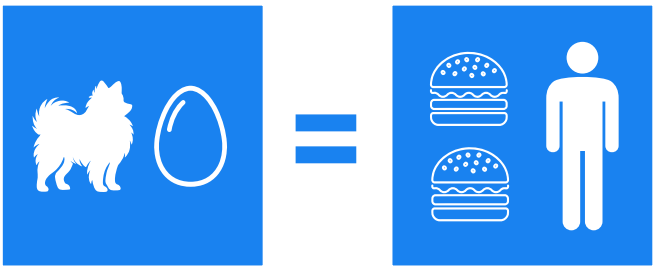
Because small dogs require such a low absolute amount of energy daily, they face a unique nutritional challenge. Even modest amounts of energy-dense foods or treats can make up a significant share of their total daily intake.

To maintain nutritional balance, a common clinical guideline is that treats should provide no more than 10% of a dog's daily caloric intake (Cline et al., 2021). For a Great Dane, this "treat budget" is large and could represent multiple treats; for a Chihuahua, it might be a single dog biscuit.



Treats should provide no more than **10%** of a dog's daily caloric intake.

Table 2 shows the caloric value of common human food portion sizes and calculates the percentage of a small and mini dog's daily calorie allowance these portions constitute. The treat allowance for a 3-kg (6.6-lb) dog is around 31 kcal. On an energy basis, that makes one egg the same as a human eating two whole cheeseburgers!



For a 3-kg dog, 1 egg is equivalent to a human eating 2 cheeseburgers.

Table 2

Approximate Calorie Intake

from Common Small Food Items for a 3-kg and a 7-kg Dog.*

Recommended treat allowance for dogs is <10% of daily calories.
Text in **bold** shows when the treat portion exceeds daily allowance.

Food Item (Portion)	**Approx. kcal**	**3-kg Dog** (% of daily kcal)*	**7-kg Dog** (% of daily kcal)*	**Human** (2000 kcal/day)
Egg (1 large)	78	**26.3–38.0%**	**13.9–20.1%**	3.9 %
Cheeseburger (1 large)	303	**102.4–147.8%**	**53.9–78.1%**	15.1 %
Bacon, small strip (~8 g)	35	**11.8–17.1%**	6.3–9.0%	1.8%
Small sausage, cocktail (~15 g)	30	**10.1–14.6%**	5.4–7.7%	1.5%
French fry, 1 piece (~4 g)	12	4.0–5.8%	2.1–3.1%	0.6%
Baby carrot, 1 piece (~10 g)	4	1.3–1.9%	0.7–**1.0%**	0.2%
Cheddar cheese, small cube (~10 g)	40	**13.5–19.5%**	7.1–**10.3%**	2.0%
Peanut butter, 1 tsp (~5 g)	30	**10.1–14.6%**	5.4–7.7%	1.5%
Small dog biscuit (~5 g)	20	6.7–9.7%	3.6–5.2%	1.0%
Vegetable oil, 1 tsp (~4.5 g)	40	**13.5–19.5%**	7.1–**10.3%**	2.0%
Mozzarella stick (1 pc)	80	**27.0–39.0%**	**14.2–20.6%**	4.0%

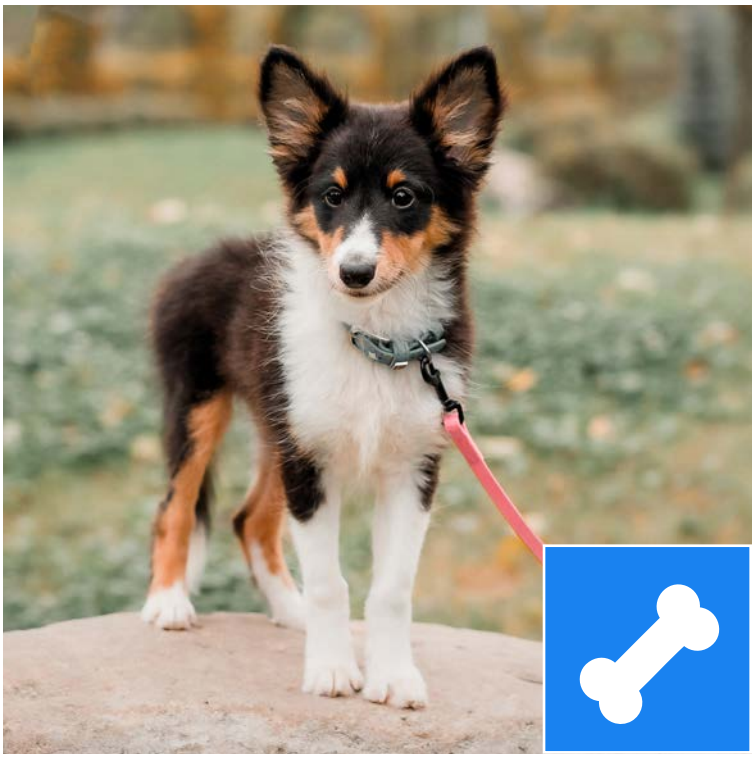
*Metabolizable Energy Requirement (MER) = 90–130 × Body weight $kg^{0.75}$ in kcal/day.
3-kg dog MER: ≈ 205–296 kcal/day; 7 kg dog MER: ≈ 387–559 kcal/day.

Oxidative Stress in Small and Mini Dogs

The higher metabolic rates of small dogs indicate that they will produce more reactive oxygen species (ROS), or free radicals. Typically, longevity correlates with stronger antioxidant defenses. Small dogs present a paradox: despite outliving large breeds, they have significantly lower circulating levels of key antioxidants (Middleton et al., 2017).

This systemic shortage includes a lower total antioxidant status, characterized by reduced bilirubin (which prevents lipid damage) and lower urate and glutathione levels (which protect cellular proteins) (Middleton et al., 2017). These lower baseline levels likely result from rapid consumption, as their fast metabolisms continually deplete these protective molecules (Middleton et al., 2017). Consequently, this diminished antioxidant buffer leaves aging small dogs with much higher markers of lipid damage compared to large dogs (Jimenez & Downs, 2020).

This unusual profile stems directly from artificial selection. Unlike wild canids, whose antioxidant defenses naturally strengthen with increasing age and body mass, domestic dogs have lost this correlation due to intense selective breeding (Jimenez & Downs, 2020). As a result, small domestic breeds are left with weaker defenses and accumulate more oxidative damage over time (Jimenez & Downs, 2020).



Ultimately, small dogs achieve remarkable longevity despite carrying a heavier oxidative burden and possessing weaker systemic defenses (Jimenez & Downs, 2020; Middleton et al., 2017). To survive this, researchers suspect they rely on compensatory biological advantages, such as inherently lower rates of cellular glycolysis—which helps prevent tumor growth—and superior DNA repair systems that protect against age-related diseases like cancer (Jimenez et al., 2018; Jimenez & Downs, 2020).

Small Dog Amino Acid Metabolism

The amino acid metabolism of small dogs is heavily influenced by a combination of their unique systemic physiological demands and the distinct composition of their gastrointestinal microbiome (Middleton et al., 2017). Recent clinical studies using stable isotope methods have looked into potential differences in the amino acid metabolism and requirements for small dogs (Mansilla et al., 2018; Templeman et al., 2019).

- **Amino Acid Metabolism and Transport:** Small breed dogs exhibit a distinct circulating amino acid profile characterized by significantly lower plasma concentrations of essential amino acids (such as phenylalanine, tyrosine and lysine) and non-essential amino acids (such as glutamine and hydroxyproline), while paradoxically possessing higher circulating levels of arginine compared to larger dogs (Middleton et al., 2017). These metabolic variances directly impact cellular transport mechanisms. Because arginine and lysine share the same cationic amino acid transporter (CAT) system, it is highly likely that the elevated arginine concentrations in small dogs competitively inhibit the transport of lysine (Middleton et al., 2017).

- **Relationship to the Microbiome:** The differences in circulating amino acids are strongly driven by the unique gut microbiome of small dogs, which features a higher relative abundance of the bacterial genus Bacteroides (Middleton et al., 2017). These bacteria actively ferment tyrosine in the large intestine into phenolic compounds (like p-cresol and indoxyl), which are then absorbed and sulfated by the liver into p-cresol sulfate and phenol sulfate (Middleton et al., 2017). Consequently, this heightened microbial metabolism in small dogs depletes the available systemic pool of tyrosine and its precursor, phenylalanine, while simultaneously elevating the circulating levels of their sulfated bacterial byproducts (Middleton et al., 2017).

- **Dietary Requirements vs. Circulating Levels:** A study using the direct amino acid oxidation technique determined that the dietary requirements for phenylalanine are remarkably similar across small, medium and large breed adult dogs (Mansilla et al., 2018). Similarly, an indicator amino acid oxidation study evaluating tryptophan requirements showed that the physiological needs of small dogs are comparable to or even slightly lower than those of medium-sized dogs (Templeman et al., 2019). Both studies concluded that further research is needed to better understand essential amino acid requirements for dogs across varying sizes and life stages, noting that current overarching guidelines may underestimate or imperfectly capture the needs of all canine phenotypes (Mansilla et al., 2018; Templeman et al., 2019). Further research is needed to determine the specific amino acid requirements of small and mini dogs.



Key Takeaways for Pet Parents

Energy & Metabolism

- Small and mini dogs require roughly twice the calories per pound compared to large dogs.
- Even tiny treats (like a single cheese cube) eat up a massive portion of their daily calories.
- Have different natural antioxidant levels compared to large dogs.

Key Takeaways for Veterinarians



Energy & Metabolism

- High variance in caloric needs among individual small dogs compared to large breeds.
- Paradoxically lower baseline circulating non-enzymatic antioxidants despite extended longevity.
- Unique *Bacteroides*-rich microbiome actively ferments tyrosine, altering systemic amino acid profiles.



Health Differences in Small and Mini Dogs

Gastrointestinal (GI) Health, Physiology and Microbiome

While it might seem intuitive that a small dog's internal organs are simply a scaled-down version of those from a large one, their gastrointestinal architecture tells a different story. Relative to their body weight, small dogs actually possess a greater intestinal mass (6 to 7% of their body weight) compared to large breeds (3 to 4% of their body weight) (Weber et al., 2003; Weber et al., 2017). Furthermore, the compartmental design is distinct. Barium contrast studies have shown that giant breeds, such as the Great Dane, possess a colorectum with approximately eight times the surface area and 23 times the volume of that found in Miniature Poodles (Weber et al., 2017). Functionally, this anatomical configuration means that small dogs have shorter large intestine transit times; consequently, small dogs rely on efficient small-intestinal digestion with relatively limited colonic fermentation (Weber et al., 2017).

The primary driver of small breed digestive physiology is rapid transit. While gastric emptying and small intestinal transit times remain similar across all dog sizes, the speed at which food moves through the colon differs dramatically (Hernot et al., 2005; Weber et al., 2002; Weber et al., 2003).

- **Total Transit Time:** A small dog (e.g., Miniature Poodle) completes digestion in roughly 22 to 24 hours. In contrast, large and giant breeds average 43 to 59 hours (Hernot et al., 2005; Weber et al., 2002).
- **Colonic Transit Time:** The discrepancy in total transit time is primarily driven by colonic retention. Small dogs clear the colon in approximately 9.1 hours, compared to 29.3 hours in giant breeds (Deshmukh, 2023; Weber et al., 2002).

This rapid transit creates a unique physiological trade-off between nutrient absorption and stool quality.

- **Reduced Fermentation and Firmer Stools:** Because transit is so fast, small dogs have limited capacity for colonic fermentation (Weber et al., 2017). While this results in slightly lower apparent protein digestibility (approx. 4% lower) compared to large breeds, it offers a significant clinical benefit: firmer stool consistency (Nery et al., 2010; Weber et al., 2003).
- **Elevated Fermentation and Fecal Moisture in Large Breeds:** Large dogs exhibit higher fecal moisture and osmolarity. Their extended retention times lead to higher accumulation of fermentation products (like lactate) and higher intestinal permeability, which draws water into the gut (Nery et al., 2010; Weber et al., 2003).

Ultimately, the physiological combination of lower permeability and rapid colonic transit allows small dogs to naturally produce drier, better-formed feces compared to their larger counterparts (Hernot et al., 2005; Weber et al., 2017).

Microbiome studies demonstrate consistent size-related functional patterns; when fed the same diet, small dogs exhibit a higher relative abundance of bacteria associated with proteolytic fermentation (Bacteroides and Faecalibacterium), whereas large dogs harbor elevated levels of saccharolytic, lactic-acid-producing bacteria (Collinsella and Lactobacillus) (Middleton et al., 2017). These differences suggest that small and large dogs use different microbial networks to support their distinct metabolic demands (Middleton et al., 2017).

From a clinical standpoint, the limited colonic fermentation capacity and naturally drier stools in small dogs mean they are more prone to constipation if their food does not provide appropriate fiber (Goudez et al., 2011; Weber et al., 2017). Potential nutritional strategies for small and mini dogs therefore could emphasize cereal flours and non-fermentable fibers to support regular bowel movements (Goudez et al., 2011; Weber et al., 2017).

Some small and mini breeds demonstrate distinct predispositions to gastrointestinal conditions that are clinically important in practice:



Miniature Schnauzers: Have a well-documented tendency toward primary hyperlipidemia (higher than normal fat in the bloodstream), particularly hypertriglyceridemia (too many triglycerides (fats) in the blood), is strongly associated with an increased risk of acute and recurrent pancreatitis (Xenoulis & Steiner, 2012).



Yorkshire Terriers: Are consistently over-represented among dogs with protein-losing enteropathy (PLE) and intestinal lymphangiectasia (inflammatory condition where the lymphatic vessels leak proteins into the gut). These conditions often present with chronic diarrhea, weight loss and hypoproteinemia (low protein levels caused by disease) (Craven et al., 2004; Dossin & Lavoué, 2011).



Brachycephalic Breeds: In breeds such as French Bulldogs and Pugs, gastrointestinal comorbidities frequently accompany brachycephalic obstructive airway syndrome (BOAS). These associated conditions include esophagitis, gastroesophageal reflux and hiatal hernias that contribute to chronic regurgitation and vomiting (Poncet et al., 2005; Poncet et al., 2007). French Bulldogs are also predisposed to granulomatous (histiocytic ulcerative) colitis, a severe large-intestinal inflammatory disease characterized by ulceration and mucosal invasion by Escherichia coli (Manchester et al., 2013).



Small dogs: Lower body weight is the primary risk factor for acute hemorrhagic diarrhea syndrome (AHDS), leading to a significant overrepresentation of miniature breeds like Chihuahuas, Poodles and Maltese (Schmid et al., 2024). In affected dogs, this condition is characterized by a sudden onset of profuse hemorrhagic diarrhea, often accompanied by marked hemoconcentration (abnormally high red blood cell count) (Schmid et al., 2024).

Behavior

Commonly labeled "Small Dog Syndrome," the behavioral profile of miniature dogs is often dismissed as a quirk of personality. However, the data suggests a clinical reality: reduced stature does not equate to a reduced behavioral footprint. Large-scale studies using tools such as the Canine Behavioral Assessment and Research Questionnaire (C-BARQ) consistently reveal that as body size decreases, behaviors like fear, anxiety, reactivity and aggression tend to increase (Arhant et al., 2010; Duffy, Hsu, & Serpell, 2008; Duffy & Serpell, 2012). However, these patterns are strongly shaped by environmental factors, not just the dogs themselves.

Specific Behavioral Patterns

- **Fear and Anxiety:** Small dogs exhibit higher rates of stranger-directed fear, non-social fear (e.g., noise sensitivity) and separation-related behaviors (Arhant et al., 2010; Blackwell et al., 2013; Duffy et al., 2008; Serpell & Duffy, 2014; Turcsán & Kubinyi, 2024). Clinically, this manifests as vigilance, trembling and defensive aggression during handling or veterinary visits (Arhant et al., 2010; Turcsán & Kubinyi, 2024; Zapata et al., 2016).

- **Aggression:** While bite severity is limited by jaw size, small dogs show higher reported rates of pet parent- and stranger-directed aggression (Duffy et al., 2008; Serpell & Duffy, 2014; Zapata et al., 2016). They are more prone to growling or snapping during resource guarding or when personal space is invaded (Zapata et al., 2016).

- **Excitability:** Small breeds are frequently reported to exhibit higher levels of excitability, excessive barking and attention-seeking behaviors (Arhant et al., 2010; Serpell & Duffy, 2014).

- **House Soiling:** Elimination problems such as house soiling are common behavioral challenges reported among several small breeds (Arhant et al., 2010).

What drives small and mini dog behavior?

The answer lies in a complex interaction between how humans treat them and their genetics (Arhant et al., 2010).

- **Training and Exercise Differences:** Pet parents of small dogs report engaging in significantly less play, exercise and formal obedience training compared to owners of large dogs. Undersocialization and unclear rules can allow fear and nuisance behaviors to persist (Arhant et al., 2010; Bennett & Rohlf, 2007). When behavior problems arise, they are sometimes met with aversive punishment, which is strongly associated with increased aggression and anxiety in small dogs (Arhant et al., 2010; Herron et al., 2009; Serpell & Duffy, 2014).

- **The "Babying" Effect Consequences:** Small dogs are often carried, coddled or comforted when they show fear. While well-intentioned, this restricts socialization and inadvertently reinforces the anxiety. Their pet parents essentially teach them that the world is scary and they need protection (Arhant et al., 2010; Dreschel & Granger, 2005; Fox & Stelzner, 1967; Herron et al., 2009; Serpell & Duffy, 2014).
- **Genetic Persistence:** Because small dog aggression is physically less dangerous than aggression of larger dogs, it is often tolerated. This lack of selection against aggression allows these predispositions to persist in the gene pool (Arhant et al., 2010; Gough et al., 2018; Guy et al., 2001).

For veterinary teams, these size-related behavior patterns underline the importance of early, preventive guidance.

- Counseling should emphasize reward-based training and early socialization over physical control or punishment, such as picking the dog up to "save" or restrain it, which can be perceived as threatening and is associated with increased anxiety and aggression (Arhant et al., 2010; Herron et al., 2009).



- Subtle signs of stress are often overlooked or dismissed as "cute" by pet parents (Arhant et al., 2010; Paul et al., 2023). Clinicians must help owners identify these subtle signs of stress and their dog's triggers to prevent the escalation of underlying anxiety into overt behavioral disorders and communicate their significance to pet parents (Frank, 2014).
- Effective behavior modification depends on addressing the dog's medical status and temperament alongside the pet parent's management practices, consistency, expectations, daily routines and responses to fear or aggression (Arhant et al., 2010; Frank, 2014; Herron et al., 2009).

Cognitive Dysfunction in Small and Mini Dogs

Epidemiological data reveals an inverse relationship between body size and the prevalence of canine cognitive dysfunction (CCD). In other words, the risk of cognitive impairment decreases as body size increases (Turcsán & Kubinyi, 2024). The prevalence rates of CCD-risk reported were 84.6% for dogs under 6.5 kg (14 lbs) and 61.4% for dogs between 6.5 to 9 kg (14–20 lbs) (Turcsán & Kubinyi, 2024).

While the initial onset of age-related behavioral changes typically begins around 10.5 years of age across all dogs, the trajectory differs fundamentally by size. Larger dogs often exhibit behavioral changes driven primarily by physical and musculoskeletal decline. In contrast, smaller dogs experience a much steeper trajectory of true neural decline as they age (Turcsán & Kubinyi, 2024).

Because cognitive decline is a primary threat to the quality of life in senior small and mini dogs, proactive screening must become a staple of their routine care (Dhaliwal et al., 2023).

Veterinary teams should rely on standardized questionnaires like CADES (Canine Dementia Scale) and monitor for the classic DISHAA signs:

D	**Disorientation**
I	**Interactions:** Altered social interactions
S	**Sleep:** Sleep-wake cycle disruptions
H	**House:** Loss of house training
A	**Activity:** Altered activity levels
A	**Anxiety:** Increased anxiety

(Dhaliwal et al., 2023)

Management of canine cognitive dysfunction is most effective when initiated early in the disease process. A successful, multimodal approach requires nutrition, environmental enrichment and potential pharmaceutical intervention (Dhaliwal et al., 2023).

Dental Health

Dental care should be a priority for small and mini dogs. Primary care reports suggest periodontal disease in small dogs has a prevalence of 10–20%, and more in-depth diagnostic studies reveal the actual prevalence is between 44–100% (Wallis et al., 2021). In fact, dogs smaller than 6.5 kg (14 lbs) are up to five times more likely to be diagnosed with periodontal disease than giant breeds (Wallis et al., 2021). This reality is starkest in specific small breeds like Yorkshire Terriers, Poodles, Dachshunds, Maltese and Chihuahuas (Forsyth et al., 2023; Wallis et al., 2021). Consider the Chihuahua: a staggering 47.6% are reported to have teeth extracted during their lifetime (Forsyth et al., 2023).

This predisposition to periodontal disease is linked to their anatomical configuration. Through selective breeding, the maxillary and mandibular size of small dogs has been drastically reduced, but their teeth have not scaled down at the same rate. This results in severe crowding, rotation and decreased interdental space (Case, 2005; Niemiec, 2021; Wallis et al., 2021).



- This problem is amplified in brachycephalic breeds with shortened facial skeletons but is also common in mesocephalic small breeds such as Miniature Poodles and Yorkshire Terriers (Niemiec, 2021; Wallis et al., 2021).
- These tight spaces interfere with natural cleaning mechanisms, turning the mouth into a trap for plaque and calculus (Niemiec, 2021).
- Toothrow crowding is actually a primary trait distinguishing domestic dogs from their wolf ancestors, and even smaller dogs versus small wild canids (Janssens et al., 2016; Wayne, 2001).

Two specific factors make this crowding clinically problematic. First, small dogs (especially Yorkshire Terriers) are significantly more likely to retain deciduous teeth. This prevents normal maturation of the gingival collar, and periodontal damage can begin as early as 48 hours after a permanent tooth erupts next to a retained one (Niemiec, 2021). Second, small and mini dogs have shorter tooth roots and very little mandibular bone apical to the roots resulting in reduced bone support. As a result, many dogs under 4.5 kg (10 lbs) show measurable alveolar bone loss as early as one year of age (Niemiec, 2021). With less attachment to lose, small dogs are uniquely susceptible to severe complications, including oronasal fistulas and pathologic mandibular fractures (Niemiec, 2021).

Recent research into the oral microbiota of small breed puppies reveals a dominance of gram-negative bacteria (Proteobacteria, Bacteroidetes and Fusobacteria) in healthy gingiva. While this ecosystem matures by 6–8 months, certain health markers like Neisseria animaloris may still be absent in younger dogs (Morita et al., 2024). Importantly, chronic oral infection in periodontal disease is not just a local issue: it has been linked with systemic effects on the cardiovascular, hepatic and renal systems, reinforcing the need for early prevention and regular dental care in small and mini dogs (Case, 2005; Morita et al., 2024; Niemiec, 2021).

Cardiac Health

Cardiovascular disease represents a leading and defining cause of mortality in small and toy breed dogs (Fleming et al., 2011; O'Neill et al., 2020). Body size in dogs is closely linked to heart structure and function, and emerging evidence suggests that the compact stature of small breeds is accompanied by distinctive cardiovascular anatomy and physiology that carries important clinical implications (Nam et al., 2024; Parker & Kilroy-Glynn, 2012).



Research indicates that heart size in small dogs does not scale down in direct proportion to their significantly reduced skeletal dimensions (Parker & Kilroy-Glynn, 2012). Indeed, allometric organ scaling studies demonstrate that canine heart weight scales to body weight with a mass exponent of approximately 0.86 (Achanta et al., 2015). Because this exponent is significantly less than unity (1.0), small dogs possess a larger relative heart weight compared to their overall body mass than their larger counterparts (Achanta et al., 2015). This allometric disproportion, potentially driven by the IGF1 gene, results in a relatively large heart attempting to fit into a progressively smaller thoracic cavity (Parker & Kilroy-Glynn, 2012). This anatomic 'tight fit' is suspected to predispose small breeds to structural abnormalities, such as valve malformations, analogous to findings in human medicine where reduced chest dimensions are directly linked to mitral valve prolapse (Parker & Kilroy-Glynn, 2012).

Because of this unique anatomy and scaling, standard clinical and physiological metrics must be adjusted for small and miniature dogs:

- **Resting Heart Rate Scaling:** While some clinical studies have historically disputed a direct size-to-heart-rate correlation (Ferasin et al., 2010), large-scale epidemiological and biometric assessments confirm that resting heart rate is negatively associated with body weight (Hezzell et al., 2013).

Healthy dogs weighing under 10 kg exhibit significantly higher resting heart rates and respiratory rates than heavier dogs in their home environments. Statistically, resting heart rate decreases by approximately 0.11 to 0.24 beats per minute for every 1 kg increase in body weight (Hezzell et al., 2013). Consequently, a small 5-kg dog typically averages a resting heart rate that is about 10.5 bpm higher than a large 55-kg dog (Hezzell et al., 2013).

- **Radiographic Calibration (VHS):** The Vertebral Heart Scale (VHS)—a radiographic method that indexes heart size against the length of the thoracic vertebrae—is typically higher in breeds like Pomeranians and Whippets than in the general dog population (Bavegems et al., 2005, 2007; Buchanan & Bücheler, 1995; Jepsen-Grant et al., 2013; Wiegel et al., 2022; Murphy et al., 2025). Clinicians should be aware that 'normal' radiographic heart size is relative to the breed.
- **Hyperdynamic Ventricular Compensation:** Under chronic volume overload from valvular disease, small dogs compensate with a hyperdynamic left ventricular fractional shortening, maintaining a normal or only mildly increased end-systolic diameter while dilating their end-diastolic diameter (Uechi et al., 2026). In contrast, large dogs tend to dilate both systolic and diastolic dimensions, resulting in a faster decline in fractional shortening under volume overload (Uechi et al., 2026).

Myxomatous mitral valve disease (MMVD) is the single most common acquired cardiac disease in dogs, accounting for over 70% of all canine heart disease (Parker & Kilroy-Glynn, 2012). The risk is heavily skewed toward small breeds:



< 9 kg (20 lbs) (Small Breeds):

75% report cardiovascular issues as a major cause of death.



> 9 kg (20 lbs) (Large Breeds):

Only 25% report the same.

(Fleming et al., 2011; Parker & Kilroy-Glynn, 2012)

While the small size phenotype itself is a risk factor, certain breeds show extreme susceptibility:

Cavalier King Charles Spaniel (CKCS): The highest risk group. Up to 90% of CKCS develop MMVD by 10 years of age (Häggström et al., 2009; Pedersen et al., 1999; Birkegård et al., 2016).

Dachshunds, Miniature/Toy Poodles, Yorkshire Terriers and Maltese are highly susceptible for MMVD (Gough et al., 2018; Parker & Kilroy-Glynn, 2012).

While MMVD is the primary concern, small dogs generally exhibit an 11% lifetime prevalence of cardiac disease history, compared to just 2% in giant breeds (Nam et al., 2024). This includes congenital conditions like Patent Ductus Arteriosus (PDA), which disproportionately affects small breeds and females (Gough et al., 2018).



Dermatologic Health

Allergic and inflammatory skin disease is another one of the most common chronic health problems in small and mini dogs, which are also more likely to have skin and ear disease than larger breeds (Middleton et al., 2017). Canine atopic dermatitis (cAD) and cutaneous adverse food reactions (CAFR) are frequently diagnosed in small and mini dogs.

- **High Risk:** The French Bulldog and Pug exhibit an annual prevalence of dermatological disorders **exceeding 40%** (Drechsler, 2024; Gentry, 2025; Inoue et al., 2015; Logas, 2021).
- Other predisposed breeds include the West Highland White Terrier, Yorkshire Terrier, Shih Tzu and Maltese (Gedon & Mueller, 2018; Gentry, 2025; Ryu et al., 2025).



Canine atopic dermatitis is a hereditary, T-cell-driven inflammatory disease arising from a complex interplay of genetic predisposition, epidermal barrier dysfunction and immune dysregulation (Bradley et al., 2023; Case, 2005; Gedon & Mueller, 2018; Halliwell et al., 2021; Saar & Dodd, 2024). This breakdown leads to intense skin pruritus and redness, frequently complicated by secondary bacterial (Staphylococcus) and yeast (Malassezia) infections (Bond et al., 2020; Bradley et al., 2023; Case, 2005; Halliwell et al., 2021; Saar & Dodd, 2024).

Skin anatomy plays a crucial role in exacerbating these conditions. The specific conformation of small and brachycephalic dogs creates a perfect environment for infection (Bajwa, 2019; Case, 2005; Outerbridge & Jordan, 2021; Ryu et al., 2025; Saar & Dodd, 2024).

- **Skin Folds:** Pendulous or narrowed ear canals and deep facial, mandibular, tail or interdigital folds create warm, moist microenvironments that favor recurrent otitis externa and intertriginous dermatitis (Bajwa, 2019; Case, 2005; Outerbridge & Jordan, 2021; Ryu et al., 2025; Saar & Dodd, 2024). For instance, Shih Tzus are structurally predisposed to Malassezia overgrowth due to characteristic folds on the ventral neck and axillae (Ryu et al., 2025).
- **Ear Architecture:** Small dogs with long, pendulous pinnae or stenotic canals are at a higher risk for recurrent otitis externa, which is often found concurrently with skin allergies (Case, 2005; Gentry, 2025).

Managing skin disease in small breeds requires targeting key modifiable risk factors.
(Case, 2005; Gentry, 2025; Hensel et al., 2015; Logas, 2021)



Parasite Control: Strictly controlling fleas and mites year-round is vital to rule out hypersensitivity triggers (Case, 2005).



Hygiene: Regularly cleansing the skin and ears can help prevent the buildup that can lead to secondary infections (Outerbridge & Jordan, 2021).



Nutritional Support: Specialized foods can improve skin health (Bauer, 2011; de Santiago et al., 2021; Gentry, 2025; Saar & Dodd, 2024; Witzel-Rollins et al., 2019). For dogs with suspected food allergies, an elimination diet trial for 6–8 weeks remains the gold standard for identifying specific triggers (Ryu et al., 2025).

Urinary Health

Small and mini dogs are heavily over-represented in clinical cases of urolithiasis as shown by data provided by the Minnesota Urolith Center for this report (see Table 3) and previously published large-scale studies (Low et al., 2010; Kopecny et al., 2021; Nam et al., 2024). This increased risk is driven by a specific physiological profile: higher mass-specific metabolic rates combined with a tendency to urinate less frequently and produce lower urine volumes. This creates ideal conditions for mineral supersaturation (Jimenez, 2016; Middleton et al., 2017; Stevenson & Markwell, 2001; Lekcharoensuk et al., 2000).



Gizmo, a 4-year-old Shih Tzu whose urolith marks the 2 millionth submission to the Minnesota Urolith Center.

Inset: Gizmo's urolith, an ammonium urate stone.

Table 3

Canine Urolith Mineral Composition by Size Category (2019–2024)

Data provided by the Minnesota Urolith Center

Mineral Type	All Dogs (%) (N=387,791)	Mini (%) (N=93,989)	Small (%) (N=184,175)	Other (%) (N=109,627)
Struvite	40%	25%	43%	48%
Calcium Oxalate	34%	53%	34%	18%
Cystine	7%	4%	5%	13%
Purine	5%	3%	3%	9%
Compound	8%	9%	9%	6%
Mixed	4%	4%	5%	3%
Calcium Phosphate	1%	1%	1%	1%
Silica	1%	<1%	<1%	1%
Xanthine	<1%	<1%	<1%	1%
Other	<1%	<1%	<1%	<1%

Note: Because individual body weights were not available at submission, size categories (Mini (Under 4.5 kg (10 lbs)), Small (4.5 to 11 kg (10–24 lbs)), and Other) were assigned by reported breed using American Kennel Club adult-weight standards.

According to the data provided by the Minnesota Urolith Center, from a total of 387,791 canine uroliths submitted from 2019–2024, **small** (47%) **and mini** (24%) **dogs** (according to their breed expected size) together **accounted for approximately 71% of all stones.**

When stone type was examined by size category, mini dogs showed a clear predominance of calcium oxalate uroliths (53%), with struvite accounting for only 25%. Small dogs showed an intermediate pattern, with 43% struvite and 34% calcium oxalate, which better resembles the general population submissions (40% struvite). These size-specific patterns indicate that stone risk and composition are not uniform across the canine population and that small and mini dogs, particularly mini dogs, warrant heightened surveillance for calcium oxalate disease and appropriately targeted nutritional management.

Calcium Oxalate (CaOx) Stones

Congruently with the data shown in this report, small dogs have been reported to be at the highest risk for developing calcium oxalate (CaOx) urinary stones. Clinically, these are among the most frustrating because they cannot be dissolved medically and often require surgical intervention (Bell et al., 2012; Kopecny et al., 2021).

- **High Risk:** Miniature Schnauzer (odds ratio up to 21.6), Lhasa Apso, Yorkshire Terriers and Bichon Frise (Houston et al., 2004; Kopecny et al., 2021; Low et al., 2010; Roe et al., 2012).

- **Other predisposed breeds:** Miniature Pinscher, Shih Tzu, Pomeranian, Papillon, Cairn Terrier and Miniature Poodles (Bell et al., 2012; Kopecny et al., 2021; Low et al., 2010).

Struvite Stones

In dogs, struvite stones frequently occur in conjunction with urinary tract infections (UTIs), particularly those involving urease-producing bacteria like Staphylococcus or Proteus (Bell et al., 2012; Ettinger et al., 2017).

High Risk: Shih Tzu, Bichon Frise, Miniature Schnauzer, Lhasa Apso and Miniature Poodles (Houston et al., 2004; Low et al., 2010; Roe et al., 2012).

Other Stone Types

Beyond the common urinary stones, small breeds face specific risks of other types of stones driven by genetics and liver health (summarized in Table 3):

- **Cystine Stones:** Rare urolith, most often reported in male dogs due to inherited renal transport defects (cystinuria). The Dachshund, Miniature Pinscher, Chihuahua, Welsh Corgi and Jack Russell Terrier are specifically recognized for this risk (Case et al., 1992; Hoppe & Denneberg, 2001; Kopecny et al., 2021; Roe et al., 2012).
- **Urate Stones:** While Dalmatians are famous for this, small breeds like the Yorkshire Terrier, Maltese and Pug are at increased risk due to their high prevalence of congenital portosystemic shunts. The resulting hyperammonemia leads to the formation of ammonium urate uroliths (Bell et al., 2012; Tobias & Rohrbach, 2003; Yi et al., 2023).
- **Silica Stones:** Though less common, Miniature Schnauzers, Shih Tzus, Lhasa Apsos and Yorkshire Terriers have shown significantly increased odds ratios (OR 2.7 to 10.1) for developing silica uroliths (Aldrich et al., 1997; Low et al., 2010).

Table 4

Predisposition of Small and Miniature Breeds to Specific Urolith Types

Stone Type	Predisposed Small/Mini Breeds
Calcium Oxalate	Miniature Schnauzer, Lhasa Apso, Yorkshire Terrier, Pomeranian, Miniature Pinscher
UTI and Struvite	Shih Tzu, Bichon Frise, Miniature Schnauzer, Miniature Poodle
Cystine	Dachshund, Miniature Pinscher, Chihuahua
Urate	Pug, Yorkshire Terrier, Maltese

Skeletal Health

Small and mini dogs are often predisposed to a unique set of orthopedic disorders. Because their skeletal growth is rapid, often completing closure within 8 to 12 months compared to 24 months for giant breeds, this accelerated maturation comes with specific vulnerabilities (Salt et al., 2017).

Medial Patellar Luxation (MPL) is the defining orthopedic challenge for the small dog clinician. Small-statured dogs exhibit a 12 times higher risk of this disorder compared to large dogs (Engdahl et al., 2023; O'Neill et al., 2016; Priester, 1972).



Conformational deviations include medial displacement of the quadriceps mechanism and tibial tuberosity, distal femoral varus, hypoplasia of the medial femoral condyle and internal rotation of the proximal tibia. Instability leads to injury. The anatomical changes allow the patella to slip medially out of the trochlear groove and destabilise the stifle. Around 6.2% of dogs with patellar luxation also develop cranial cruciate ligament rupture, likely as a consequence of chronic joint instability (Engdahl et al., 2023; Perry & Dejardin, 2021). In small and medium breeds, radiographic osteoarthritis is significantly more severe following cranial cruciate ligament injury compared to MPL alone (Villatoro et al., 2023). When dogs suffer from both conditions concurrently, the resulting osteoarthritis is not significantly more severe than in cases of isolated cranial cruciate ligament injury (Villatoro et al., 2023). Furthermore, for dogs with MPL, the severity of osteoarthritis increases with age at presentation, which aligns with its developmental nature, whereas osteoarthritis severity from CCL injury does not correlate with age, likely due to its rapid inflammatory onset (Villatoro et al., 2023). Clinical presentation also differs; small dogs with cranial cruciate ligament injuries generally present older, heavier and with a shorter duration of lameness compared to those with MPL alone, suggesting the cruciate injuries may be more acutely painful or disabling due to higher inflammation (Villatoro et al., 2023).



Typically manifesting between 6 and 9 months of age, Legg-Calvé-Perthes disease (avascular necrosis of the femoral head) is a common small-dog condition (Bell et al., 2012; LaFond et al., 2002). It is most frequently reported in breeds such as the Miniature Pinscher, Pug, Yorkshire Terrier and West Highland White Terrier (LaFond et al., 2002). Because small dogs mature quickly, early detection during 6–9 months of age health and orthopedic exams is critical (LaFond et al., 2002; Salt et al., 2017).

While hip dysplasia is traditionally considered a large dog problem, it is remarkably prevalent in certain small dogs. Pugs, for instance, have one of the highest reported incidences, with estimates exceeding 50% (Case, 2005).

Small and mini dogs are also predisposed to atlantoaxial subluxation, a congenital or developmental instability at C1–C2 that can cause cervical spinal cord compression, particularly in Chihuahuas, Pomeranians, Yorkshire Terriers and Toy Poodles (Denny et al., 1988; Gough et al., 2018).

To understand these risks, it is essential to define and differentiate between two closely related phenotypes: chondrodysplasia and chondrodystrophy (Bannasch et al., 2022).

- **Chondrodysplasia** refers strictly to a form of disproportionate dwarfism characterized by very short, bowed legs paired with a normal or near-normal skull and axial skeleton (Bannasch et al., 2022; Parker et al., 2009). This conformation is primarily driven by the **FGF4L1** retrogene insertion on chromosome 18, which exerts a substantial effect on limb length and is uniquely associated with carpal valgus (outward-turning paws) (Bannasch et al., 2022; Sullivan et al., 2025).

Many popular small canine breeds, including Dachshunds, Pekingese and Corgis, carry specific **fibroblast growth factor 4 (FGF4) retrogene insertions** that dictate their breed-defining shortlimbed conformations but also introduce significant, lifelong health risks

(Parker et al., 2009; Sullivan et al., 2025).

- **Chondrodystrophy** is characterized by both shortened limbs and systemic, premature degeneration and calcification of the intervertebral discs (Bannasch et al., 2022; Brown et al., 2017). This condition is driven by the **FGF4L2** retrogene insertion on chromosome 12, which has a milder effect on limb length (reducing antebrachial length by approximately 10%) but acts as the primary determinant for early-onset intervertebral disc disease (IVDD) and Hansen Type I disc herniation (Bannasch et al., 2022; Brown et al., 2017; Packer & O'Neill, 2021; Sullivan et al., 2025).

Beyond spinal issues, these skeletal conformations negatively impact appendicular joint health (Villatoro et al., 2023). Specifically, when suffering from cranial cruciate ligament injuries, chondrodystrophic and chondrodysplastic breeds, such as West Highland White Terriers and Shih Tzus, develop significantly more severe stifle joint osteoarthritis than non-chondrodystrophic small breeds like Toy Poodles (Villatoro et al., 2023). This heightened severity is likely due to conformational biomechanical factors characteristic of shortened limbs, such as increased tibial plateau slopes (Villatoro et al., 2023).

Respiratory and Tracheal Disorders

For some small and mini dogs, respiratory health may be compromised by anatomical predispositions. These dogs are significantly more susceptible to respiratory disorders like tracheal collapse and chronic cough than their larger counterparts (Nam et al., 2024; Yi et al., 2022).

- **Tracheal Collapse:** This developmental predisposition stems from a combination of inherited cartilage weakness and specific conformational factors. The Yorkshire Terrier is particularly overrepresented, often comprising 50–65% of referral caseloads for tracheal collapse. Miniature Poodles, Pomeranians, Shih Tzus and Maltese are also high-risk breeds (Gough et al., 2018; Niemiec, 2021).
- **The Brachycephalic Burden:** Small brachycephalic breeds, like the Pekingese, Pug and French Bulldog, face a substantial additional hurdle: brachycephalic obstructive airway syndrome (BOAS). This involves a complex triad of structural defects:
  - Stenotic nares (narrow nostrils)
  - Elongated soft palate
  - Hypoplastic trachea (narrow windpipe) (Gough et al., 2018; Packer & O'Neill, 2021)

To mitigate these welfare concerns, the veterinary and breeding communities are implementing functional breeding limits. These range from the Respiratory Function Grading Scheme (RFGS) and craniofacial restrictions enforced in the Netherlands, to kennel club-approved outcrossing projects designed to reintroduce genetic diversity and moderate extreme conformations (Morel et al., 2024; Proschowsky et al., 2025).

Besides genetics, there are other risk factors to be considered for these conditions. The most critical *modifiable* risk is obesity. In small dogs, adipose tissue accumulation within the chest reduces lung volume and further compresses already compromised airways. Even a mild amount of excess weight can markedly exacerbate clinical signs like chronic cough and respiratory distress (German, 2006; Niemiec, 2021).

Finally, clinicians often receive calls from concerned pet parents regarding reverse sneezing. This mechanosensitive aspiration reflex is triggered by nasopharyngeal irritation. While often distressing to the pet parent, it is often referred to as a benign condition uniquely common in breeds like the Chihuahua and Maltese (Yi et al., 2022).

Endocrine and Reproductive Health

Endocrine

Due to their distinct genetic and metabolic profile, small and mini dogs are significantly more susceptible to severe, high-morbidity conditions like diabetes mellitus and hyperadrenocorticism (Cushing's disease) than large dogs (Nam et al., 2024; Fleming et al., 2011; Middleton et al., 2017).

- Hyperadrenocorticism is a marked predisposition for specific small dog breeds, particularly the Dachshund, Miniature Poodle and Dandie Dinmont Terrier (Bell et al., 2012).
- Regarding hypothyroidism, while traditionally considered a large-dog diagnosis (Nam et al., 2024), small breeds like the Cavalier King Charles Spaniel (CKCS) show a specific susceptibility driven by the presence of thyroid autoantibodies (Bell et al., 2012).
- The Miniature Schnauzer and Miniature Poodle are high-risk of diabetes mellitus (Bell et al., 2012). For Miniature Schnauzers, the path to diabetes is often complex. Their unique predisposition to primary hyperlipidemia increases the risk of pancreatitis, which can subsequently damage the pancreas and trigger diabetes (Bell et al., 2012).

Small and mini dogs are **more susceptible** to conditions like **diabetes and Cushing's disease** than large dogs.



Nutritional support for hyperadrenocorticism and hypothyroidism is often directed at managing clinical signs and secondary conditions, such as the propensity for weight gain (Cline et al., 2021; Fascetti & Delaney, 2024).

Reproduction

Small size is associated with some important reproductive risks.

- **Eclampsia (Puerperal Tetany):** This life-threatening decrease in serum calcium is most frequently observed in recently whelped small females, with the Chihuahua, Miniature Poodle and Shih Tzu notably overrepresented (Gough et al., 2018; Bell et al., 2012).

- **Dystocia:** For many small and brachycephalic dogs, the process of giving birth naturally is challenging. The French Bulldog, for example, has a recorded cesarean section rate of 84% due to the extreme risk of obstructive labor (Gough et al., 2018; Bell et al., 2012). Ionized calcium level is the most clinically relevant parameter to monitor.

These patterns highlight the importance of proactive metabolic screening, careful reproductive planning and choosing the correct food with the appropriate nutritional adequacy for the intended life stage of small and mini dogs.



The French Bulldog has a recorded **cesarean section rate of 84%** due to the extreme risk of obstructive labor.

Neurologic Health

High Prevalence:

Despite selective breeding efforts, syringomyelia (SM) remains widespread. MRI screenings reveal that up to 70% of CKCS are affected by six years of age (Limpens et al., 2024).

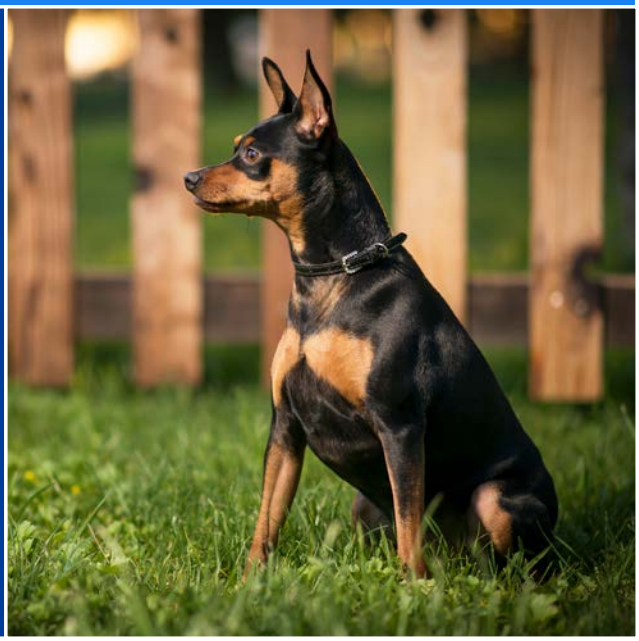
High Heritability:

Symptomatic SM is highly heritable in this population, making genetic screening an important consideration for dog breeders (Limpens et al., 2024).

Symptoms typically emerge between five months and three years of age.

Clinicians should watch for:

- Persistent "phantom" scratching (air scratching near the neck/shoulder)
- Cervical pain
- Neurologic deficits (weakness, muscle atrophy) (Bell et al., 2012; Gough et al., 2018)



Because these behaviors are so prevalent in the population, pet parents often inadvertently normalize them as "breed quirks." Veterinary professionals play a crucial role in identifying these signs as indicators of chronic pain and helping pet parents recognize them as such, rather than personality traits, ensuring earlier intervention (Morel et al., 2024).

Key Takeaways for Pet Parents

GI Health

- Naturally firmer stools, but may need the right fiber type and amount to reduce constipation risk.

Behavior

- Prone to fear/anxiety, which is often worsened if owners "baby" them instead of appropriate socialization and training.

Dental Health

- Up to 5x more likely to have dental disease.

Cardiac Health

- Heart disease is often reported in small dogs, especially mitral valve disease, as they age.

Dermatologic Health

- Highly prone to skin allergies and ear infections, especially breeds with lots of skin folds.

Urinary Health

- Urinary stones are more frequently a problem in small dogs; in many cases, diet can help with the management.

Key Takeaways for Veterinarians

GI Health

- Rapid colonic transit (9.1 hours) limits fermentation; risk of Acute Hemorrhagic Diarrhea Syndrome (AHDS) and breed-specific enteropathies.

Behavior

- Inverse relationship between size and behavioral issues; higher lifetime risk of cognitive dysfunction.

Dental Health

- High prevalence of periodontal disease driven by severe crowding, retained deciduous teeth and early alveolar bone loss.

Cardiac Health

- Myxomatous mitral valve disease is the most frequent heart condition in small dogs.
- Small dogs have higher resting heart rates.

Dermatologic Health

- High prevalence of canine atopic dermatitis (cAD) and secondary infections, exacerbated by conformational folds.

Urinary Health

- Account for ~71% of all uroliths; mini dogs are highly predisposed (53%) to calcium oxalate stones.

Key Takeaways for Pet Parents

Skeletal Health

- Prone to slipping kneecaps, and short-legged breeds face severe back/disc issues.

Respiratory Health

- Tiny windpipes can collapse (causing coughing), and they are reported more frequently to present reverse sneezing.

Endocrine & Reproductive

- Some small dog breeds have higher risk for diabetes/ Cushing's and some often need C-sections to give birth safely.

Neurologic Health

- Some small dog breeds are prone to a painful spinal condition causing "phantom scratching."

Key Takeaways for Veterinarians

Skeletal Health

- 12x higher risk of medial patellar luxation (MPL); FGF4 retrogene variants predispose to chondrodystrophy and IVDD.

Respiratory Health

- Small dogs more frequently show tracheal collapse; obesity is the primary modifiable risk.

Endocrine & Reproductive

- Some small dog breeds are predisposed to hyperadrenocorticism and diabetes. They also show higher rates of eclampsia and dystocia during reproduction.

Neurologic Health

- Syringomyelia (SM) is highly prevalent (up to 70%) in CKCS, presenting with cervical pain and neurologic deficits.



Veterinary and Ownership Facts

(Small & Mini Dog Focus)

Small and Mini Dog Specialty Training for Veterinarians

Currently, no formal advanced training certification exists for veterinary professionals seeking to specialize in "Small and Mini Dog" medicine. The closest high-level credential is the American Board of Veterinary Practitioners (ABVP) Diplomate status (Canine & Feline), which denotes board-certified expertise in the advanced, total management of canine and feline patients.

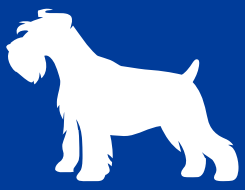
Small and Mini Socioeconomic Trends

The expansion of the small and mini dog population is not just a trend; it is a global shift driven by the realities of modern living, such as urbanization, growing single households, loneliness, housing constraints and changing lifestyles (Mintel, 2025; Glimpse, 2026).

While the total number of dogs increased by 25% across 50 countries over a recent decade, the population of miniature dogs surged by 45% (Serisier et al., 2013).

Nowhere is this saturation more evident than in South Korea. There, small and mini dogs comprise a staggering 83% of the dog population, a market where breeds like the Maltese, Miniature Poodle and Shih Tzu are overrepresented (Kim et al., 2018; Yi et al., 2023; Ipsos, 2025).

Current estimates suggest that **small dogs** now account for just over **52% of the global dog population** (Euromonitor, 2025).



Demographic data suggests that small dog owners represent a distinct psychographic segment. They are not just "dog owners;" they are often "single-dog loyalists."

- **The Household:** Globally, 73% of small dog households are single-dog households. They are also statistically less likely to own cats (36%) compared to owners of all dog owners (43%) (Ipsos, 2025).
- **The Demographic:** The primary caretaker for small and mini dogs is predominantly female (63% globally) and tends to be older. Behavioral studies confirm that owners of dogs under 20 kg (44 lbs) are significantly older on average than owners of larger dogs (Arhant et al., 2010; Ipsos, 2025).

As discussed previously, a defining characteristic of the small and mini dog demographic is longevity. These dogs generally live much longer than giant breeds (Jimenez et al., 2018; Montoya et al., 2023; Turcsán & Kubinyi, 2024). This creates an aging global cohort. While 49% of the small dog population is "adult," a significant 23% are classified as "elderly" (10+ years) (Ipsos, 2025). However, age varies by region:

- **Oldest Population:** Canada (32% elderly)
- **Youngest Population:** Mexico (15% elderly) (Ipsos, 2025)

When it comes to breed background, the world is divided.

Asia & Europe: In these markets, specific breed genetics dominate.

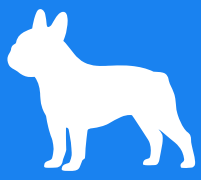
France	South Korea	Japan	UK
67% purebred	57% purebred	67.2% purebred	Nearly 70% purebred

(Ipsos, 2025; O'Neill et al., 2023; Chijiiwa et al., 2025)

Americas & Australia: Conversely, for the Americas and Australia, there is a split between mixed breeds and pure breeds in the small dog population.



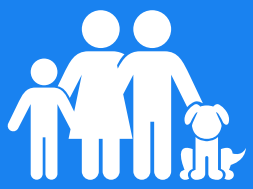
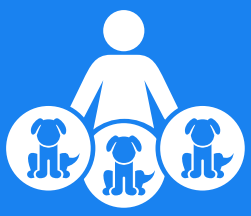
United States	Australia
52% mixed breeds	51% mixed breeds



(Forsyth et al., 2023; Ipsos, 2025; Turcsán et al., 2017)

Table 5

Global Acquisition Channels for Small and Mini Dogs

 **Friends and Family**	**39%** Global average	US acquisition: 30% **Dominates in Latin America, specifically:** ▪ Mexico (61%) ▪ Columbia (53%) ▪ Brazil (47%)
 **Private Breeders**	**24%** Global average	US acquisition: 25% **The primary source in:** ▪ Canada (52%) ▪ Australia (48%) ▪ France (45%)
 **Pet Stores**	**13%** Global average	US acquisition: 11% Significantly higher in South Korea (30%), which is more than double the global average
 **Shelters / Rescue**	**10%** Global average	US acquisition: 18% Highest in the United States (18%), followed by Australia and France (both at 12%)

Source: Ipsos 2025

Table 5, Continued

Global Acquisition Channels for Small and Mini Dogs



Found

5%
Global average

US acquisition: 3%



Online

4%
Global average

US acquisition: 6%

Source: Ipsos 2025

In the modern era, digital media does more than reflect trends—it creates them. Social media plays a pivotal role in shaping the perception of small and miniature breeds, transforming them from simple companions into aspirational lifestyle symbols.

One example is the "it" dog, which means something that possesses that undeniable, highly sought-after appeal of the current moment. Breeds like the Miniature Dachshund, French Bulldog and Miniature Poodle have been elevated to a status that blends home decor with pet care (American Kennel Club [AKC], 2025; Revelation Pets, 2025).

- Engagement metrics from TikTok and Instagram show that content is driven by breed-specific hashtags—#YorkshireTerrier, #MiniSchnauzer, #Chihuahua and #ToyPoodle—establishing these breeds as distinct lifestyle markers (Sniffspot, 2025; Revelation Pets, 2025).



- The rise of "scroll-stopping" breeds like the Pembroke Welsh Corgi and French Bulldog has accelerated adoption cycles, directly influencing the caseloads seen in veterinary clinics (Royal Veterinary College [RVC], 2025; PetfoodIndustry, 2026).

The digital landscape reinforces the trend of "pet humanization." Small dogs are frequently depicted in anthropomorphic contexts—wearing stylish outfits, dining in urban cafes or traveling in strollers. For the veterinary professional, this signals a client base that views their dog not just as an animal, but as a family member entitled to the same "services" as a human child (Gingr, 2026; Weinman Schnee Morais Inc., 2019).

Small and Mini Dog Food Choices

Feeding a small dog is rarely as simple as filling a bowl with kibble. It is a bonding activity, a negotiation and often, a culinary production.

Despite the intense "humanization" of small pets, commercial pet foods remain the nutritional anchor. Globally, 76% of small and mini dog pet parents rely on pre-packaged dry kibble as the primary food source. However, the small dog bowl often looks different to that of a large breed:

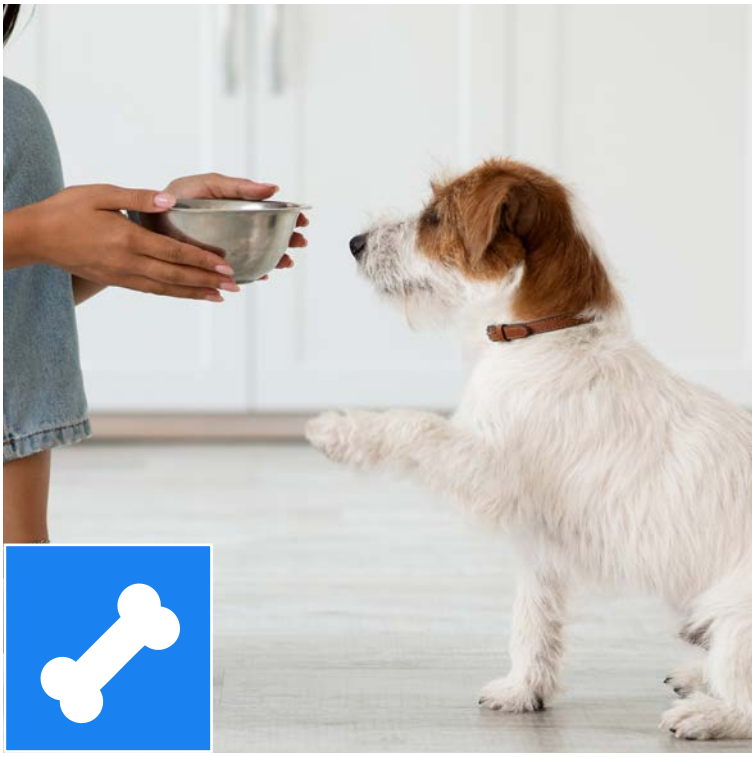
- **15% of small dogs are fed only wet food,** while 9% of large dogs are fed only wet food (Ipsos, 2025).
- **57% of small dogs eat wet and dry food** on a regular basis (either combined or in separate bowls), while 42% of large dogs eat wet and dry food (Ipsos, 2025).

The line between "pet food" and "people food" is increasingly blurred for pet parents of small and mini dogs. Globally, 48% of pet parents incorporate human food into their dog's diet. This practice is culturally entrenched in specific regions:

- **Australia:** 70% feed human food
- **United States:** 57% feed human food (Ipsos 2025)

Veterinarians often hear that small dogs are picky eaters. The data confirms this is not just a perception—it is a behavioral reality. Research identifies small dogs as significantly more food selective than larger breeds, displaying lower food focus (85.5% vs. 93.1%) and higher distractibility during meals (Bleakley, 2018).

Palatability is a key driver for consumer behavior. Pet parents prioritize foods with strong aromas and appealing textures to encourage consumption, often viewing the meal as a caregiving moment for their "baby" (Ipsos, 2025; Ipsos 2023).



Because these dogs are viewed as children, parents seek "human-grade" cues and functional benefits in diet for their pets. The Association of American Feed Control Officials (AAFCO) defines human grade as a product where every ingredient and the resulting product must be stored, handled, processed and transported in a manner that is consistent and compliant with regulations for current good manufacturing practices for human edible foods as specified in 21 CFR Part 117. This is a section of the Code of Federal Regulations enforced by the FDA that regulates current good manufacturing practice, hazard analysis and risk-based preventive controls for human food. There is a growing demand for pet foods enriched with probiotics, omega-3 fatty acids and antioxidants to address the specific concerns of the small dog parent, digestive sensitivity and skin health (Di Cerbo et al., 2017; Ipsos, 2025).

Veterinary Economics

For veterinary practitioners, the small dog represents a unique economic model defined by an inverse relationship between body mass and medical expense (Rover, 2025).

1. **Medication Costs:** Small dogs incur significantly lower pharmaceutical costs simply because drug dosages are weight-dependent. This creates an affordability gap that favors compliance. Chronic conditions requiring long-term medication (e.g., cardiac disease or dermatology) face lower financial barriers, implying higher adherence potential among small dog parents compared to those owning large breeds.

2. **Food Costs:** While their energy needs are high, the volume of food a small dog requires is low. This fundamentally alters purchasing power. See table 6 for estimated cost comparison of feeding a dog by size in the U.S. (Ipsos, 2025).

   - While large breed owners are often economically constrained to dry kibble due to volume, small breed parents frequently "trade up" to higher-cost formats like wet, fresh, raw or therapeutic diets (Vety, 2025; Ipsos, 2025; Boya et al., 2015).



   - Veterinary professionals can be more assertive when recommending specific therapeutic foods. For a client feeding a 5-kg (11-lb) dog, the daily cost of a premium diet remains manageable, removing price as a primary barrier to better nutrition.

Table 6

Estimated Monthly Cost Comparison

By Size and Food Format

Dog Size	Dry Kibble	Wet/Canned Food	Fresh/ Raw Food
Small and Mini (1-25 lbs)	$20–$70	$40–$90	$78–$150
Medium (25–50 lbs)	$40–$120	$85–$150	$123–$314
Large (51–90 lbs)	$70–$200	$160–$375	$250–$495
Giant (91+ lbs)	$120–$350	$250–$400+	$400+

(Carlson, 2025; PW Consulting, 2025; Rover, 2025)

The veterinary relationship with small dog clients requires "soft care" interactions focused on easing the owner's anxiety as much as the dog's (WSM, 2019). In cultures like Japan, this bond can manifest as severe separation anxiety. Owners often feel intense guilt during pet hospitalizations, viewing the veterinarian not just as their dog's doctor, but as an essential partner in maintaining their own emotional stability (WSM, 2019).

Veterinarian visit frequency for small and mini dogs varies by region:

- **High frequency:** Globally, 50% visit "several times a year." This is highest in South Korea (62%), Mexico (55%) and Colombia (54%) (Ipsos, 2025).
- **Moderate frequency:** In the U.S. and France, owners tend to stick to a traditional annual schedule (43% and 45%, respectively) (Ipsos, 2025).
- **Reactive frequency:** When health issues arise, 39% of global pet parents increase their frequency, a behavior most prominent in Brazil (45%) (Ipsos, 2025).

Globally, the most common drivers for veterinary attention for small dog pet parents include:

- Bad breath/dental issues (17%)
- Aging-related issues (15%)
- Allergies (14%)
- Diarrhea (14%) (Ipsos, 2025)

Comparative data highlights that small dog parents are nearly twice as likely to report their dog to have dental issues as large dogs parents (17% vs. 10%). For the veterinary professionals, this is the single most defining health need for small and mini dogs, as flagged by 97% of veterinarians, followed distantly by cardiovascular health (57%) (Ipsos, 2025; MVR, 2025).

97% of vets say **dental issues** are the single most defining health need for small and mini dogs





Key Takeaways for Pet Parents

Veterinary & Ownership Facts

- Small dogs make up over 52% of global dogs and are overwhelmingly treated as children.
- Small dogs are often reported to be picky eaters, leading to more frequent mixing of wet food and human food.
- Small dogs eat smaller food volumes, which makes feeding premium or therapeutic diets much more affordable.

Key Takeaways for Veterinarians



Veterinary & Ownership Facts

- Lower medication dosages and food volume costs drive high client compliance for premium care for small dogs.
- Dental issues are the most common driver for small dog vet visits, flagged by 97% of veterinarians.



Hill's Small Paws Innovation Center:

Focus Areas in Small and Mini Dog Research

Building on the biological and clinical differences outlined in this report, Hill's Small Paws Innovation Center is advancing a dedicated research pipeline designed to decode the unique physiology of small and mini dogs. This initiative spans the following core domains: metabolism, oral health, the microbiome, longevity and cognition to define a new standard of care.



Precision Nutrition

- **Tailored Amino Acids:** Building on evidence that circulating levels of key essential amino acids differ significantly between small and large dogs (Middleton et al., 2017), Hill's is applying metabolomic insights to refine amino acid profiles in foods aimed specifically at small and mini dogs. The goal is to tailor recipes precisely to small dogs, reducing excess substrates that lead to proteolysis by gut microbiota.

- **Supporting cell energy metabolism:** Hill's research has explored the enhanced dietary inclusion of L-carnitine, a cofactor that transports long-chain fatty acids into the mitochondria for energy oxidation, to provide support for aging cells. Research found that dietary L-carnitine, when included as part of a targeted nutritional blend (alongside medium-chain triglycerides and fish oil), successfully offsets natural age-related shifts in metabolic profiles; this energetic maintenance is vital for myocardial function, as the normal canine heart obtains approximately 60% of its total energy from the oxidation of long-chain fatty acids (Hall & Jewell, 2012; Sanderson, 2006).

- **One-Carbon Metabolism & Antioxidant Support:** Research indicates that small dogs naturally exhibit a lower baseline antioxidant status, which is likely an adaptation to their higher mass-specific metabolic rate generating more free radicals (Middleton et al., 2017). To address this, targeted inclusion of methyl donors, such as betaine to enhance one-carbon metabolism, may be beneficial. Hill's research shows that betaine supplementation elevates circulating levels of key metabolites like methionine and dimethylglycine, which may, in turn, boost overall antioxidant capacity of the dog (Jewell & Jackson, 2022).

The Microbiome

- **Fiber Utilization:** Parallel research is characterizing how differences in gastrointestinal anatomy influence prebiotic fiber utilization, ensuring nutrient use is optimized for the specific physiology of smaller dogs.

Oral Health

- Trials conducted at the center have proven that the size of kibble made with a unique fiber structure does not compromise efficacy for supporting the dental health of small and mini dogs. An appropriately designed smaller kibble delivers plaque and tartar control sufficient to earn the Veterinary Oral Health Council (VOHC) seal.

Cardiac Health

- Small and miniature dogs face a higher risk of cardiac disease over their lifetimes, making the identification of early molecular markers a clinical priority (Parker & Kilroy-Glynn, 2012; Nam et al., 2024; Amundson et al., 2025). Recent genetic research has identified specific changes in gene expression associated with inflammation and cardiac remodeling in dogs with heart murmurs, suggesting these markers could potentially serve as vital indicators for monitoring the progression of cardiovascular disease (Amundson et al., 2025).

Longevity & the Cognitive Challenge

- **Beyond Lifespan:** Leveraging established links between body size and lifespan (Kraus et al., 2013; Jimenez et al., 2020). At Hill's Small Paws Innovation Center, investigation into specific metabolic and oxidative stress markers is ongoing. Hill's is shifting research from learning the reasons behind small dog's long lifespan to learning more about enhancing their healthspan.

- **Protecting the Mind:** Informed by emerging data on size-related behavioral aging (Turcsán & Kubinyi, 2024), Hill's Small Paws Innovation Center is exploring nutritional strategies to preserve cognitive function in small and mini dogs. By studying marine sources of DHA and EPA, such as fish and algal oil, Hill's can precisely tailor omega-3 profiles to support brain health. Because small dogs face an elevated lifetime risk of canine cognitive dysfunction, these targeted nutrients aim to help keep their minds as sharp as their bodies for those extra years.



Conclusion

Small and mini dogs are not simply scaled-down versions of larger breeds; they are a cohesive, distinct biological group governed by their own metabolic rules. From their unique gut microbiomes and rapid puppyhood growth to their specific cardiac, endocrine and dental vulnerabilities, these tiny dogs require far more than just a smaller dose of standard medicine.

Because of their compact size and enduring puppy-like appeal, small and mini dogs often share an incredibly tight, highly attentive bond with their families. This deep emotional connection, paired with an inherently longer lifespan, gives veterinary teams and pet parents a unique opportunity: to work together not just to treat disease, but to actively protect a dog's quality of life over a decade and a half.

At Hill's, we are dedicated to decoding the specific needs of these tiny companions. By pioneering research into their unique metabolism, oral health and cognitive aging, we are building the exact science needed to support them. As the small dog population continues to grow, it is time to move beyond one-size-fits-all care. By embracing proactive veterinary medicine and precision nutrition, we can help support a small dog's exceptionally long lifespan and ideally match it to a high-quality lifespan.

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