Dog Size and Patterns of Disease History Across the Canine Age Spectrum

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INTRODUCTION

- In humans, age is the single greatest predictor of disease risk for most causes of mortality.
- In dogs, both age and body size are major predictors of risk of many diseases.^{1,2,3,4}
- Dogs from <u>larger</u> size classes tend to have a <u>shorter</u> lifespan. However, different size classes of dogs tend to manifest with different diseases.^{1,4}
- Over time dogs in larger size classes are not accumulating *more* conditions, but rather *different* conditions.

OBJECTIVES

• To understand which conditions manifest differently across age and size

METHODS

- We used the curated 2020 release of the **HLES** data containing **27,541** survey records collected on or before December 31st, 2020.
- In the Health Status instrument, dog owners are asked questions if their dogs have ever been diagnosed with various medical conditions.
- Among those 19 conditions asked, we focused on 13 of interest that were present in 500 or more dogs: skin disorders, infectious or parasitic disease, orthopedic, GI, eye, ear/nose/throat, kidney/urinary, cancer, cardiac, neurologic, liver/pancreas, respiratory, and endocrine disorders.
- **Poisson** regression with robust standard errors was used to model lifetime **prevalence** of each disease category.

RESULTS



Age (years)

- The proportion of dogs with a history of skin conditions was much higher in larger dogs, and increased at a consistent rate across age.
- In contrast the prevalence of a history of cardiac conditions was greater in smaller dogs, and increased more sharply across age for smaller dogs.

dult	Older Adult (7-10)	$\begin{array}{c} \text{Senior} \\ (11+) \end{array}$	Overall
9	N=7666	N=6413	N=27541
5%) 76)	$2556~(33\%)\ 440~(6\%)$	2342~(37%) 912~(14%)	$7915~(29\%)\ 1567~(6\%)$
$<\!30$	30 to < 40	>=40	Overall
219	N = 5167	N = 2335	N = 27541
29%) 4%)	$1621 \ (31\%) \ 177 \ (3\%)$	$766~(33\%)\ 56~(2\%)$	$\begin{array}{c} 7915 \ (29\%) \\ 1567 \ (6\%) \end{array}$

- larger dogs including: conditions.
- size.
- lifespan for larger dogs.

¹Fleming, J. M., K. E. Creevy and D. E. Promislow (2011). "Mortality in north american dogs from 1984 to 2004: an invesMgaMon into age-, size-, and breedrelated causes of death." J Vet Intern Med 25(2): 187-198.

²Hoffman, J. M., K. E. Creevy, A. Franks, D. G. O'Neill and D. E. Promislow (2018). "The companion dog as a model for human aging and mortality." Aging Cell 17(3): e12737.

³Chase, K., P. Jones, A. MarMn, E. A. Ostrander and K. G. Lark (2009). "GeneMc mapping of fixed phenotypes: disease frequency as a breed characterisMc." The Journal of heredity 100 Suppl 1: S37-41.

⁴Creevy, K. E., S. N. Austad, J. M. Hoffman, D. G. O'Neill and D. E. Promislow (2016). "The Companion Dog as a Model for the Longevity Dividend." Cold Spring Harb Perspect Med 6(1): a026633.



CONCLUSION

• Many conditions were reported **more commonly** with **increasing weight** category including :

skin, orthopedic, gastrointestinal, ear/nose/throat, cancer, neurologic, and endocrine conditions.

• Some conditions were reported less commonly for

eye, cardiac, liver/pancreas, and respiratory

• The proportion reporting a history of urinary conditions did not vary by weight.

• Adjustment for sex, pure/mixed breed status, and census division did not change the patterns by age or

• These observed trends may provide beginning insights into which conditions contribute to shorter

REFERENCES