Variant Analysis of Long Lived Golden Retrievers

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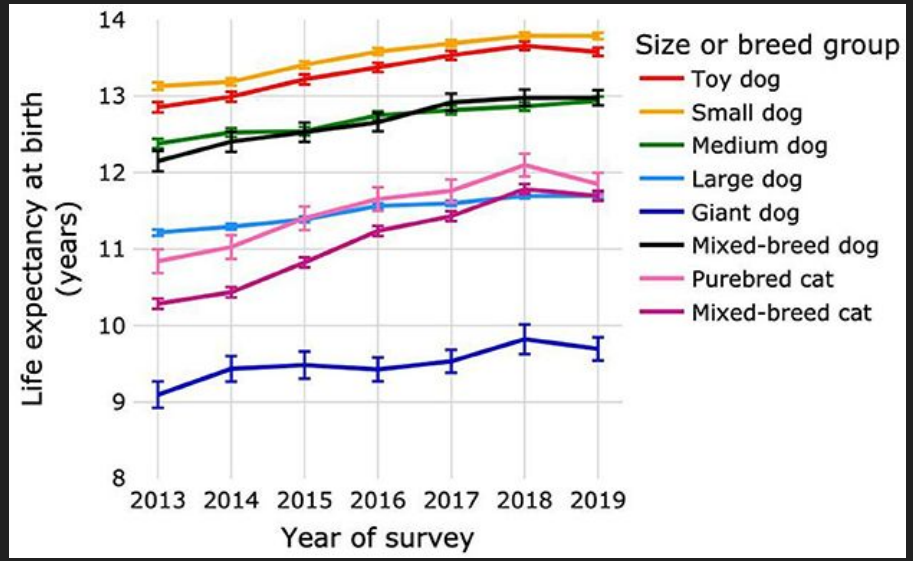
Dog Life Expectancy

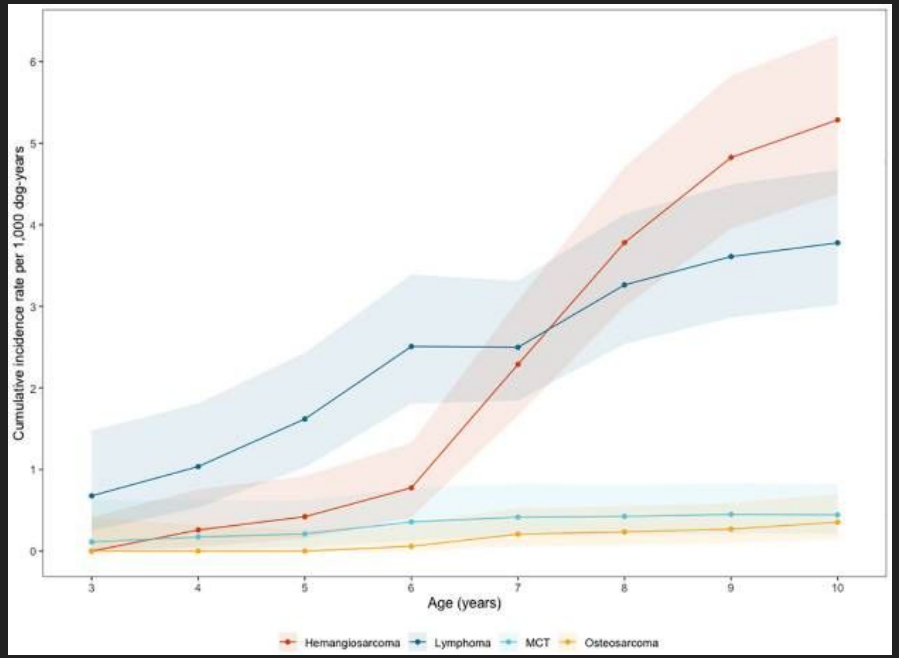
- On average the life expectancy of dogs is largely dictated by size
- Small and toy dogs living the longest at 13-14 years
- Medium and mixed breed dogs averaging 12-13 years
- Large dogs averaged 11-12 years
- Giant dogs Averaged 9-10 years



Montoya (2023)

Golden Retriever Life Expectancy

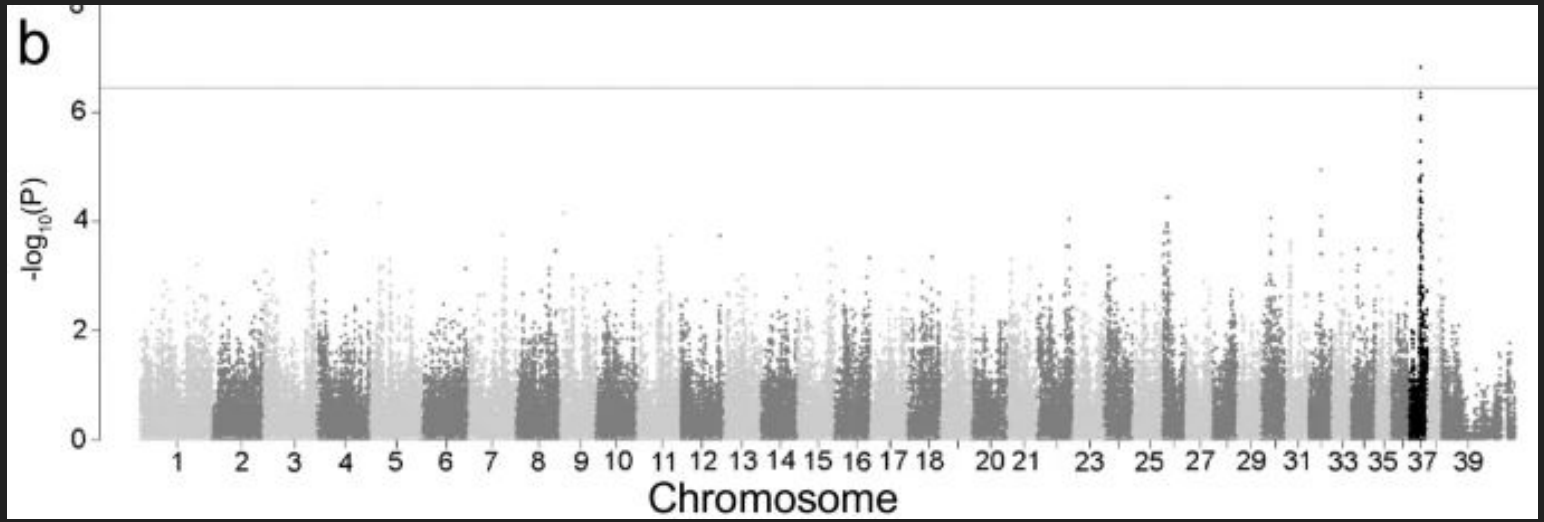
- Cancer related mortality accounted for 65% of all deaths
- Both hemangiosarcoma and lymphoma rates increase dramatically at the 6-8 year mark
- The life expectancy for Golden Retrievers is between 10 and 11 years when their body size falls squarely into the medium size group
- Life expectancy is therefore significantly less than predicted



Labadie (2022)

GWAS of Long Lived Golden Retrievers

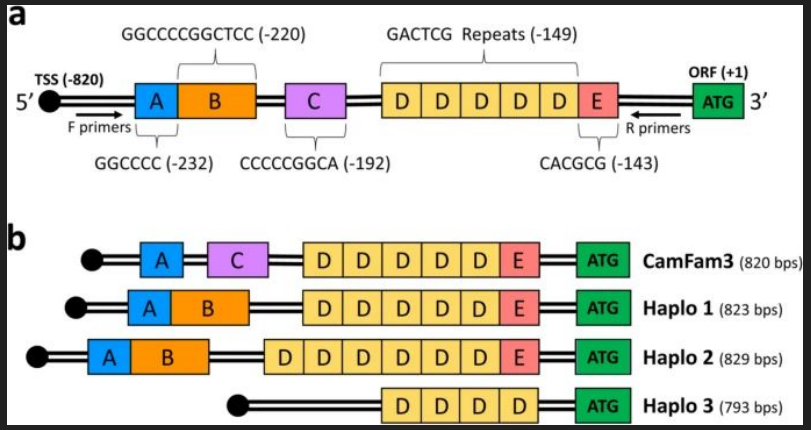
- GWAS of dogs that lived longer than 14 years and under 12 years showed significant variation on chromosome 37

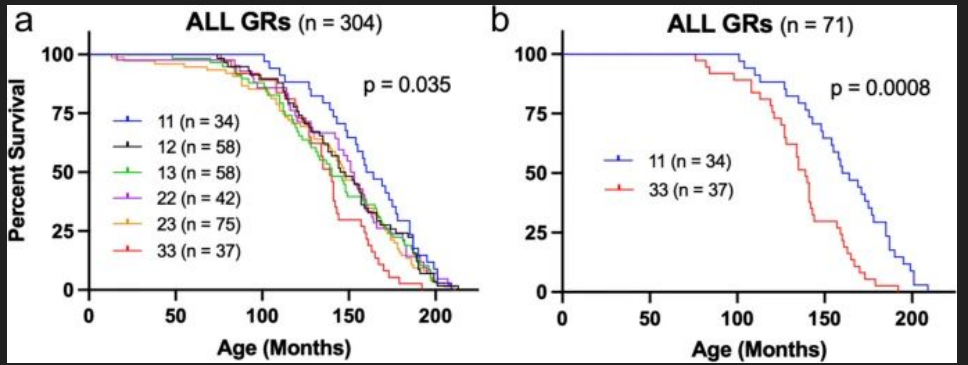


Rebhun (2024)

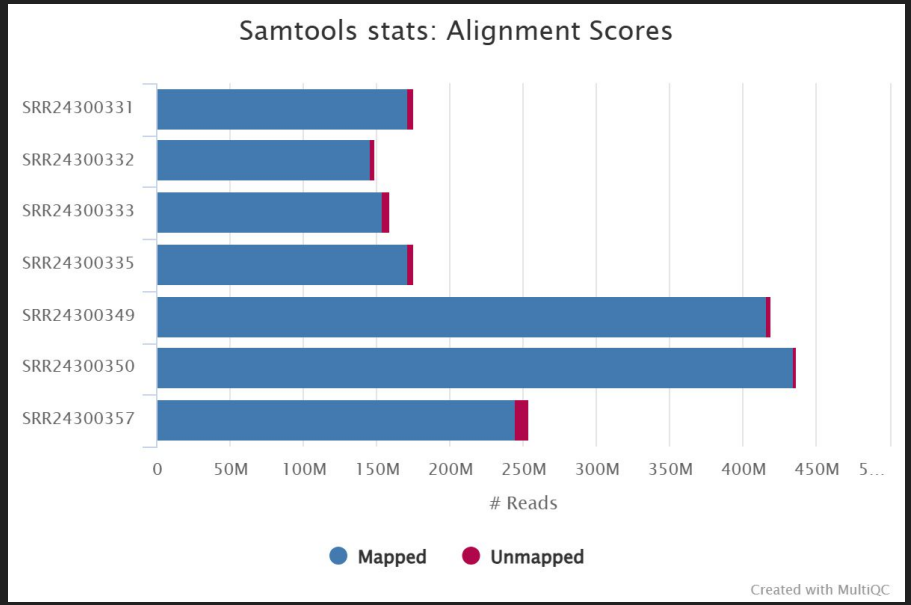
Whole Genome Sequencing - Variant Detection

- 4 dogs that lived longer than 14 years were compared to dogs that lived less than 12 years
- Chr37.18000042–20145745 was the region of interest identified in the GWAS study
- With the help of sanger sequencing that dogs homozygous for haplotype 3 lived significantly shorter and that dogs homozygous for haplotype 1 live significantly longer





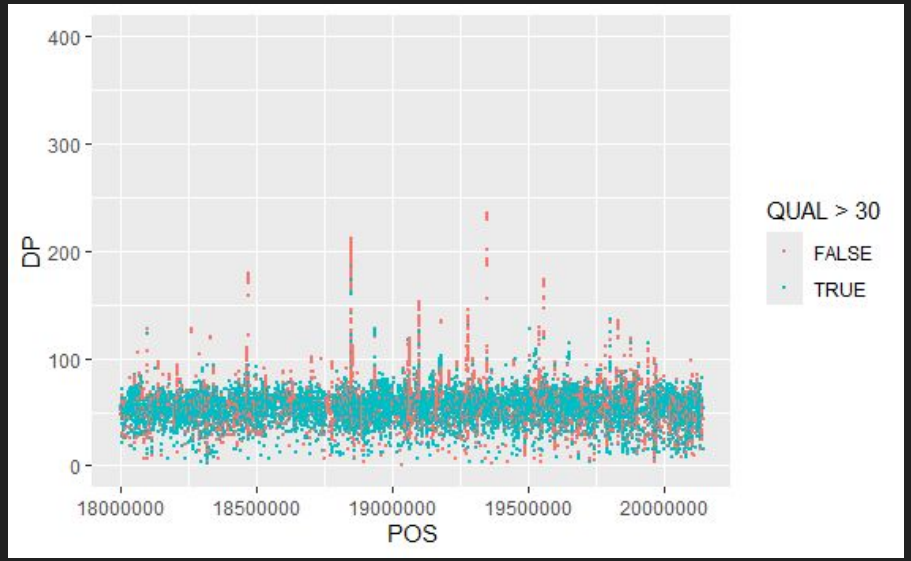
Repeat Analysis Issues



- 3 samples just couldn't be downloaded no matter what I did
- The SRA Runtable does not specify which samples are long lived and which are short lived
- To figure out which is which, I have to look at a specific location on chr37:18000042-20145745
- SRR2430049 and SRR2430050 are an entirely different data type from the others.

Variant Calling

- When I went to do the variant calling analysis, my bedtools query failed
- My best guess is that when I downloaded the genome initially the sequence wasn't formatted properly
- That turned out to be correct. Chromosome 37 is actually referred to in the genome as NC_006589.4.



Final Takeaways

- This dataset was a mess from start to finish - with 3 samples that NCBI just wouldn’t allow me to download and 2 additional samples that were run on a completely different instrument
- The fact that the researchers never listed which dog belonged in which category makes this analysis basically impossible to replicate
- So at this point I have all of the data and have basically no way to compare and contrast to figure out if I believe in the results

Resources

1. Montoya M, Morrison JA, Arrignon F, Spofford N, Charles H, Hours M-A and Biourge V (2023) Life expectancy tables for dogs and cats derived from clinical data. Front. Vet. Sci. 10:1082102. doi: 10.3389/fvets.2023.1082102
2. Labadie, J., Swafford, B., DePena, M., Tietje, K., Page, R., & Patterson-Kane, J. (2022). Cohort profile: The Golden Retriever Lifetime Study (GRLS). PloS one, 17(6), e0269425. https://doi.org/10.1371/journal.pone.0269425
3. Lewis, T. W., Wiles, B. M., Llewellyn-Zaidi, A. M., Evans, K. M., & O'Neill, D. G. (2018). Longevity and mortality in Kennel Club registered dog breeds in the UK in 2014. Canine genetics and epidemiology, 5, 10. https://doi.org/10.1186/s40575-018-0066-8
4. Rebhun, R.B., York, D., De Graaf, F.M.D. et al. A variant in the 5′UTR of ERBB4 is associated with lifespan in Golden Retrievers. GeroScience 46, 2849–2862 (2024). https://doi.org/10.1007/s11357-023-00968-2