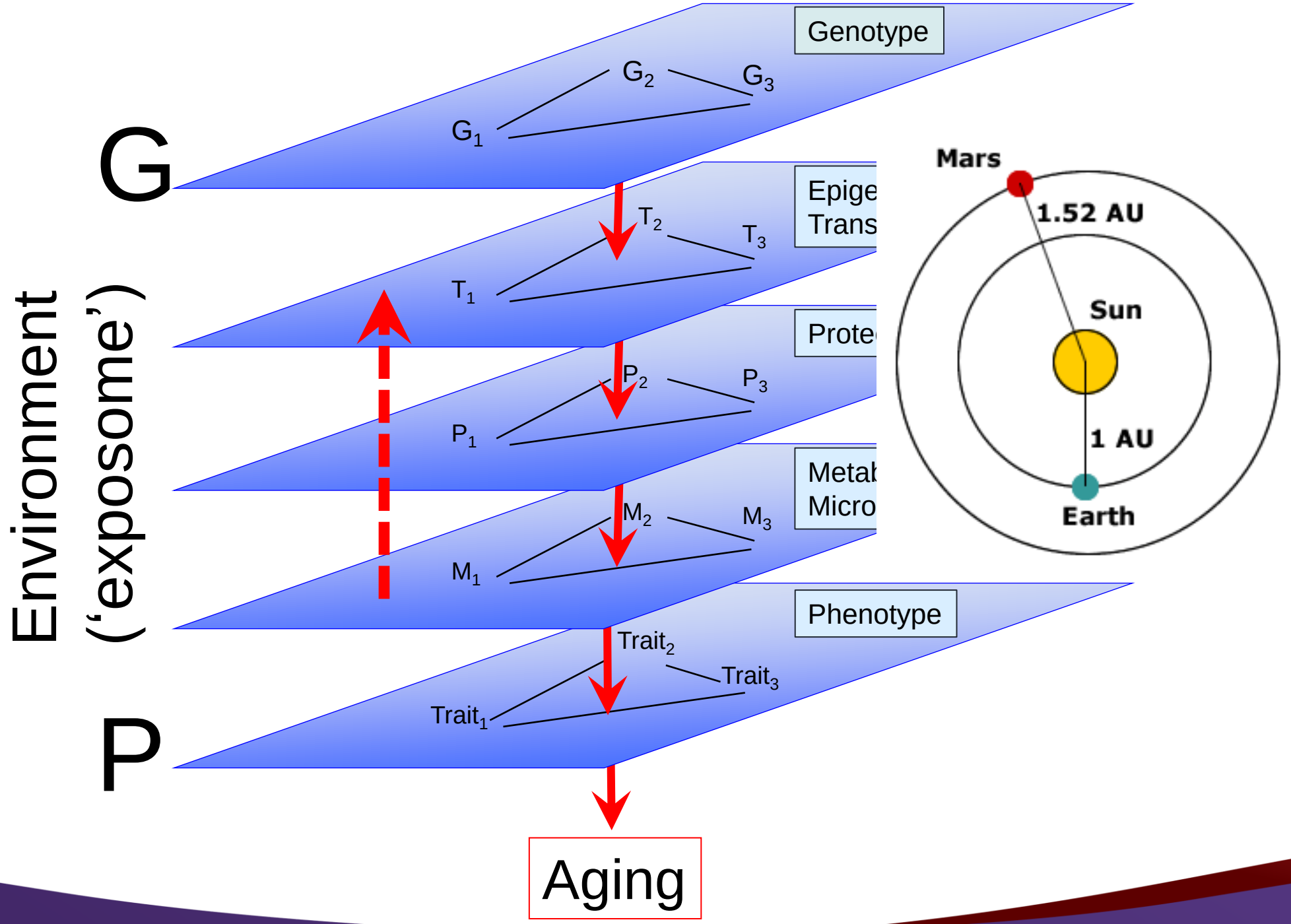
Dog Aging Project

LONGER, HEALTHIER LIVES.
TOGETHER.

Companion Dogs as a Model of Aging

Daniel Promislow
Department of Lab Medicine and Pathology, UW School of Medicine
Department of Biology, University of Washington
promislo@uw.edu https://www.dogagingproject.org


Genotype
G
G_1
G_2
G_3
Epige
Trans
T_1
T_2
T_3
Prote
P_1
P_2
P_3
Metab
Micro
M_1
M_2
M_3
Phenotype
P
$Trait_1$
$Trait_2$
$Trait_3$
Environment
('exposome')
Aging

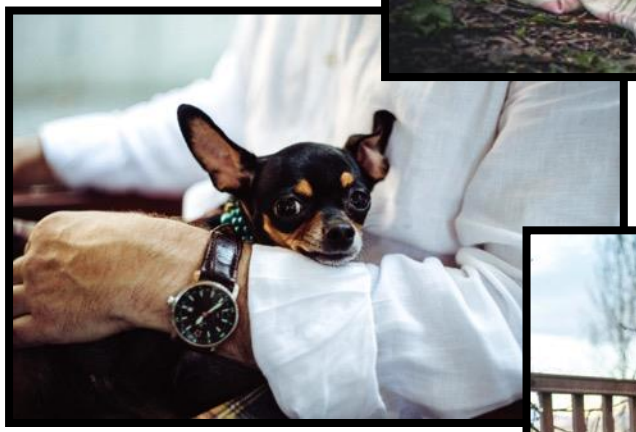
Mars
1.52 AU
Sun
1 AU
Earth

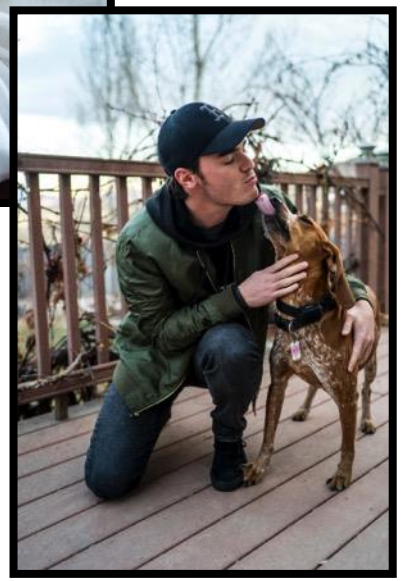
Why dogs?

Maddy: 5 years & 10 years

Lily: 8 months & 15 years

http://www.amandajones.com/

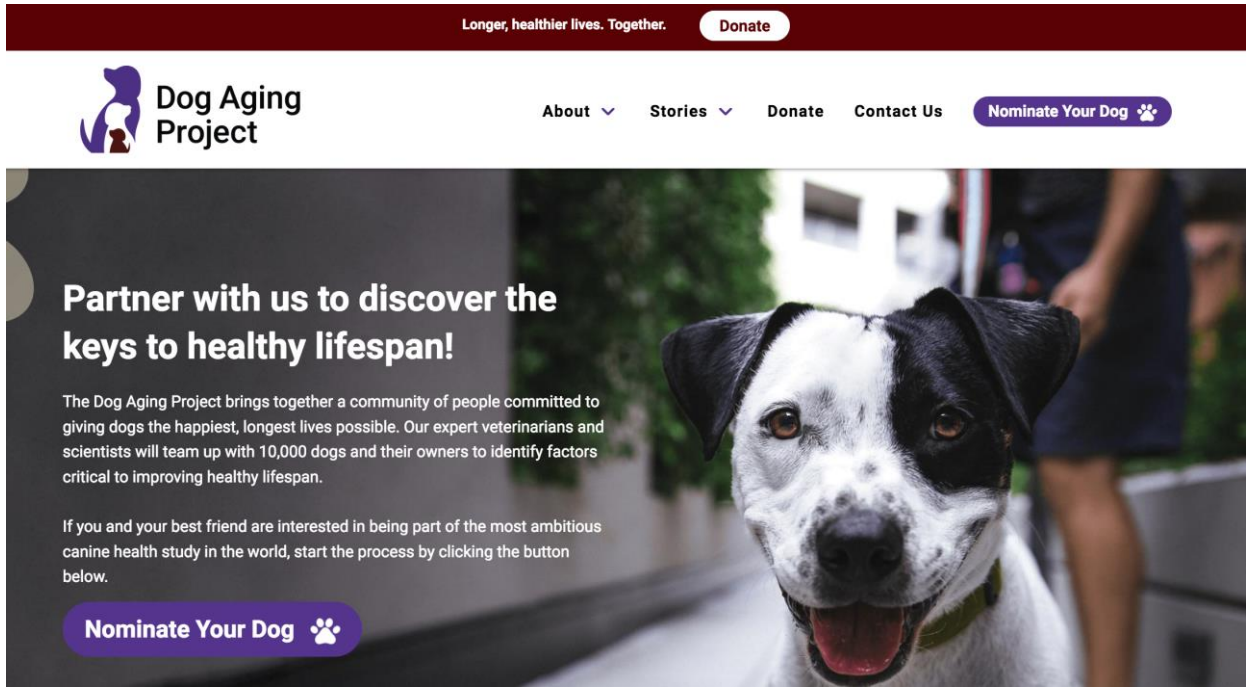




- Accelerated and well-documented life course
- Morbidity, mortality and environment shared with humans
- Sophisticated health care system
- People love dogs

The Dog Aging Project

dogagingproject.org

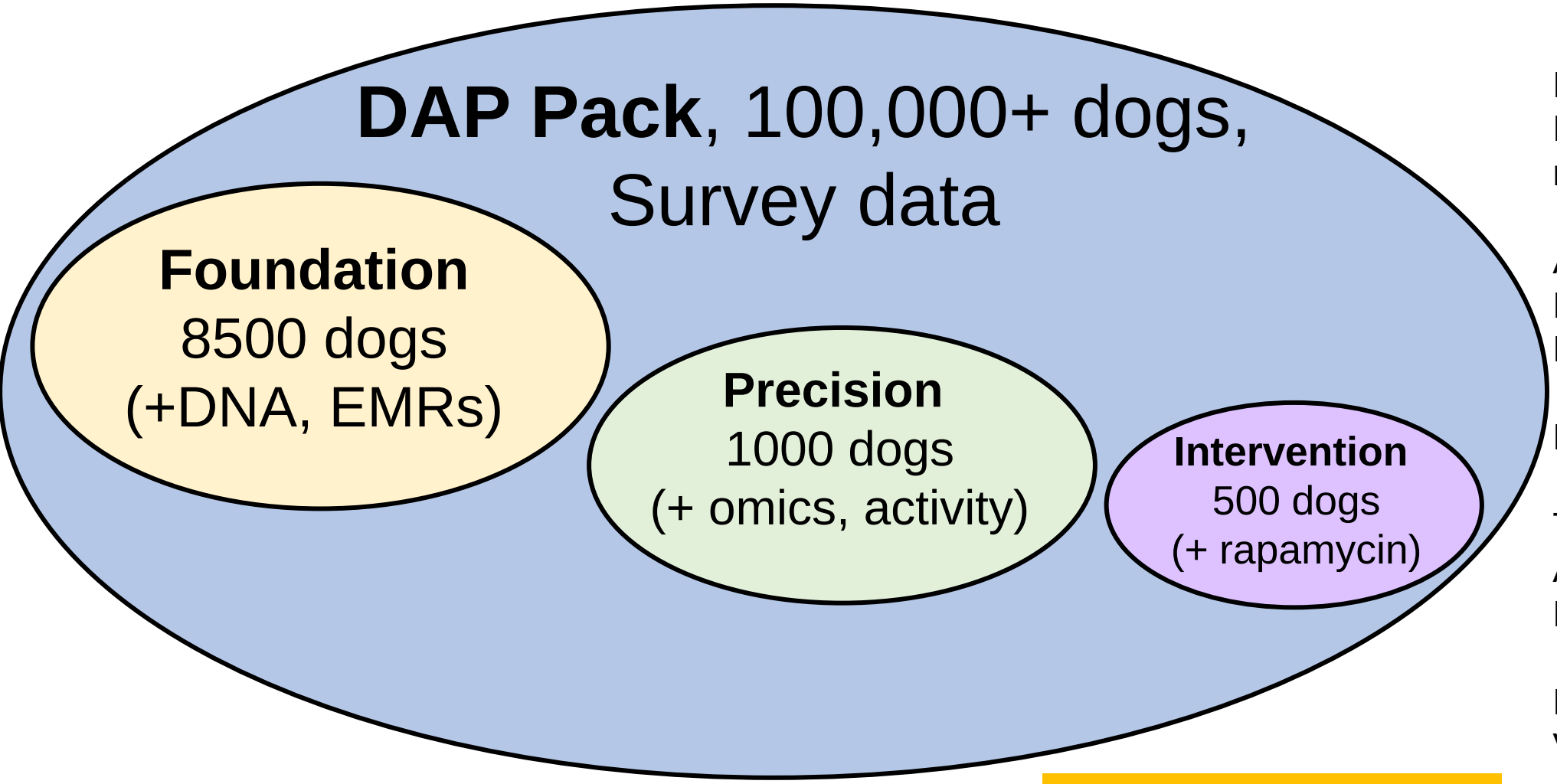


DAP is a long-term longitudinal study of the biological and environmental determinants of healthy aging.

<u>DAP is all dogs</u>

- all ages
- all sizes
- mixed breed and purebred
- every state in the US

Dog Aging Project dogs



Health and Life Experience Survey + regular surveys

Annual vet check; EMR
Demography
Home and local environment
Behavior

Tissue/blood samples
Activity data
Necropsy/Pathology

Echocardiograms
Vet teaching hospitals

Centenarians (~300 dogs)

From genotype to phenotype

G

E

Project 2

Project 3

Project 1

G Whole genome sequencing/
Breed info

E
Air, water, green space
Home environment
Social setting
Diet, exercise, health care
Age, size, sex

Clinical chemistry
Metabolome
Epigenome
Microbiome
Transcriptome
FACS

P

Age-specific disease
Frailty, Comorbidity
Mortality
Fecundity

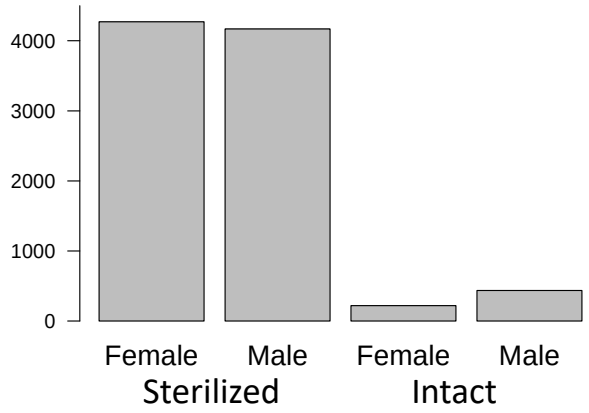
Project 4

The TRIAD Trail—Test of Rapamycin in Aging Dogs

Health and Life Experience Survey
Current size: >17,000 dogs x 4973 questions

Dog Demographics

Characteristics	(%) of subjects (N=10226)
Breed	
Purebred	5147 (50%)
Mixed breed	5079 (50%)
Sex, Spayed or Neutered	
Female, Spayed/Neutered	4749 (46%)
Male, Spayed/Neutered	4719 (46%)
Male, un-Spayed/un-Neutered	516 (5%)
Female, un-Spayed/un-Neutered	242 (2%)

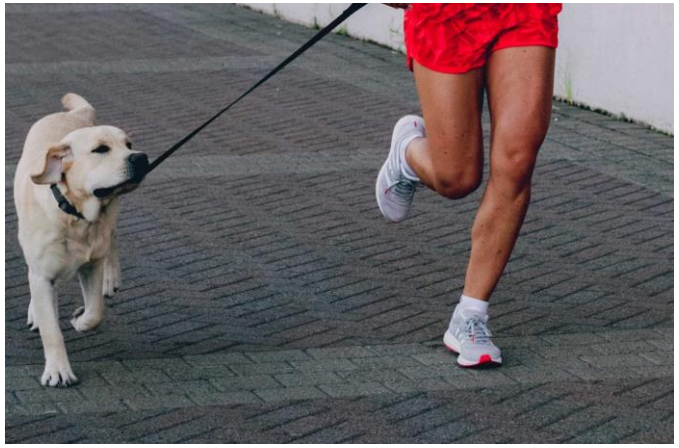


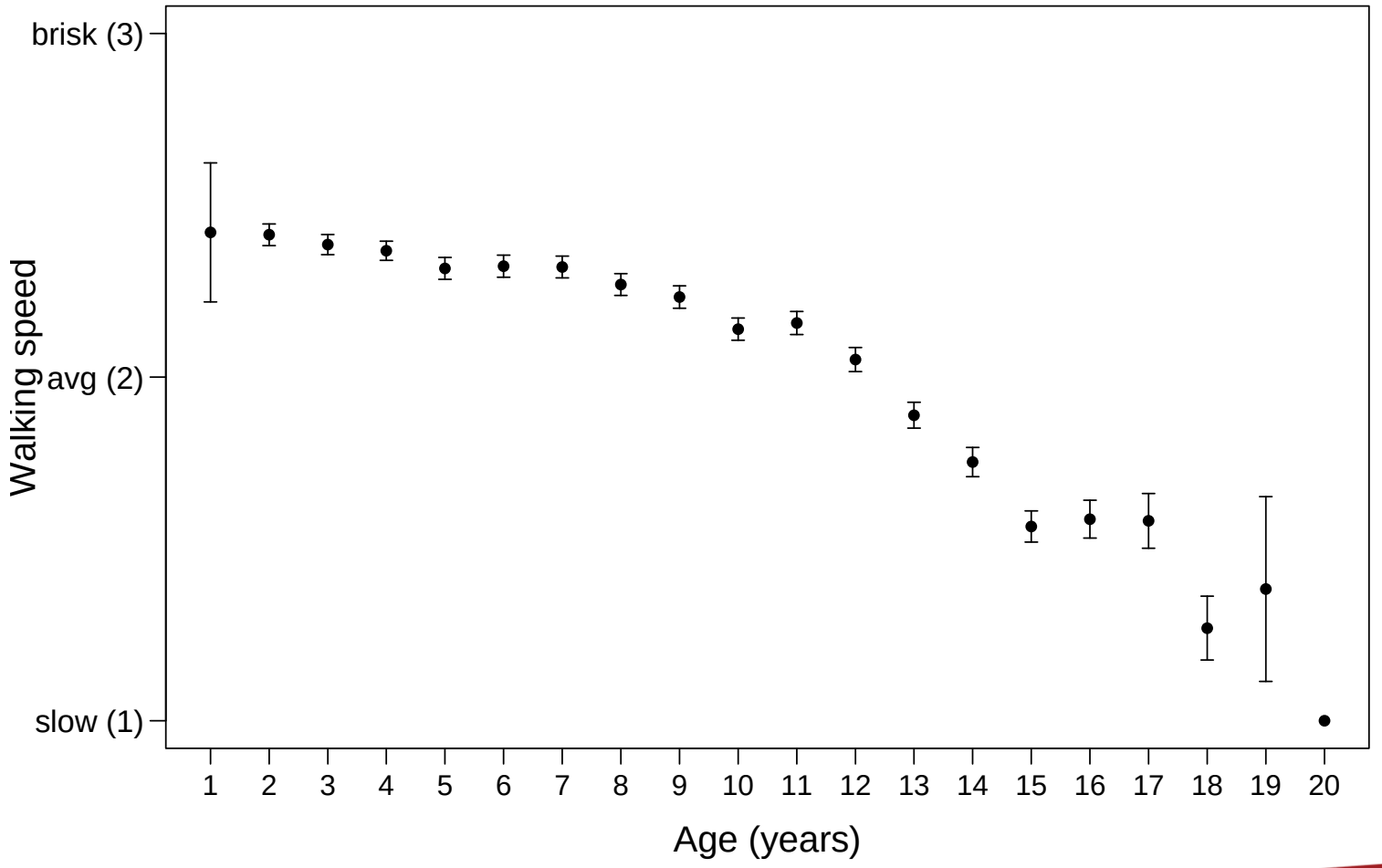
Chases birds given chance	
Never	2100 (21%)
Seldom	1960 (19%)
Sometimes	2359 (23%)
Usually	2081 (20%)
Always	1680 (16%)
Cannot answer	46 (<1%)
Primary component of diet	
Commercial, dry	8546 (84%)
Commercial, canned	401 (4%)
Home, cooked	391 (4%)
Commercial, frozen raw	356 (3%)
Other	187 (2%)
Home, raw	129 (1%)
Commercial, freeze-dried	117 (1%)
Commercial, semi-dry	99 (<1%)

Diagnosed Conditions

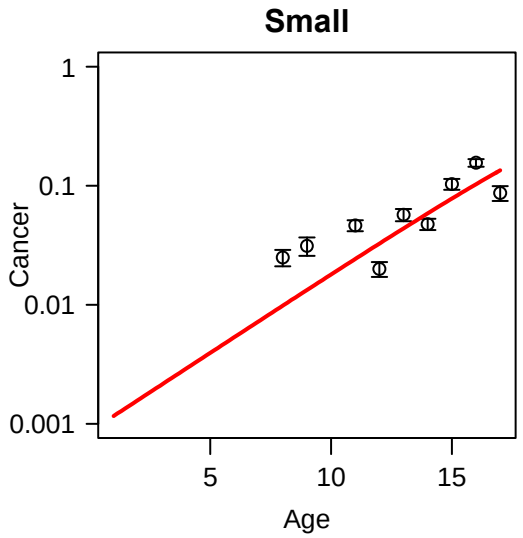
Characteristics	No. (%) of subjects (N=10226)
Skin disorders	2942 (29%)
Trauma	2926 (29%)
Dental or oral disease	2791 (27%)
Infectious or parasitic disease	2758 (27%)
Orthopedic disorders	1968 (19%)
Gastrointestinal disorders	1451 (14%)
Ear, nose, and throat disorders	1307 (13%)
Eye disorders	1304 (13%)
Toxic or controlled substance	1152 (11%)
Kidney or urinary disorders	771 (8%)
Cancer or tumors	635 (6%)
Cardiac disorders	583 (6%)
Neurologic disorders	496 (5%)
Respiratory disorders	365 (4%)

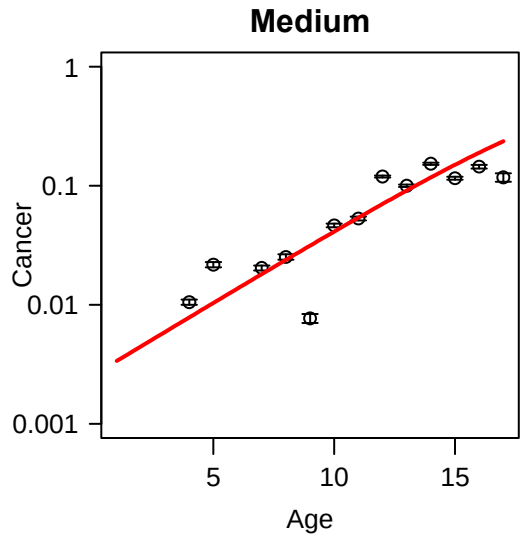
Walk speed

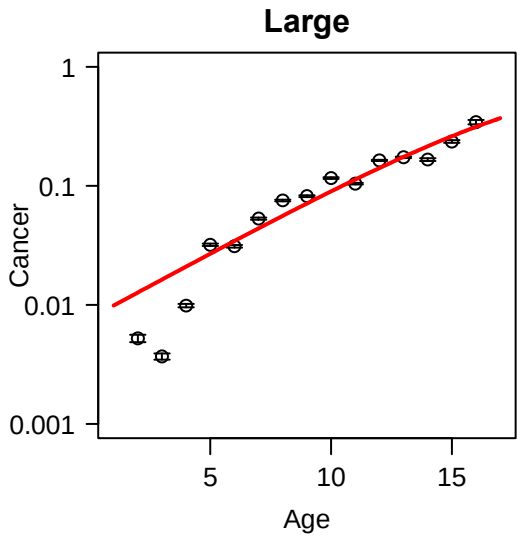


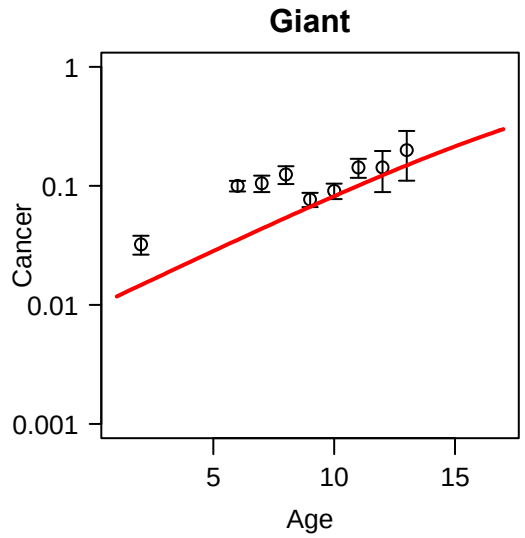

brisk (3)
avg (2)
slow (1)
Walking speed
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Age (years)

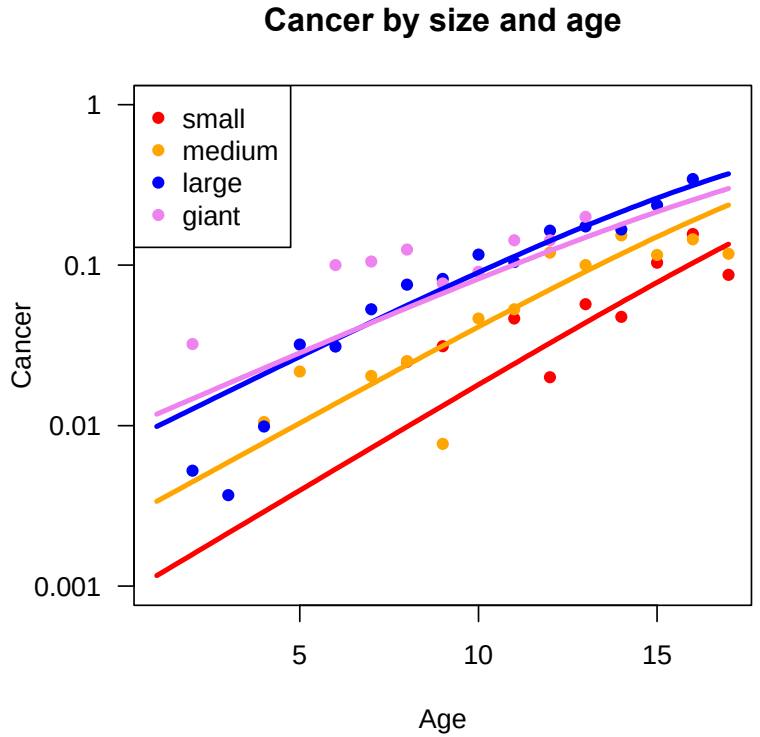
Cancer


Small
Cancer
1
0.1
0.01
0.001
5
10
15
Age

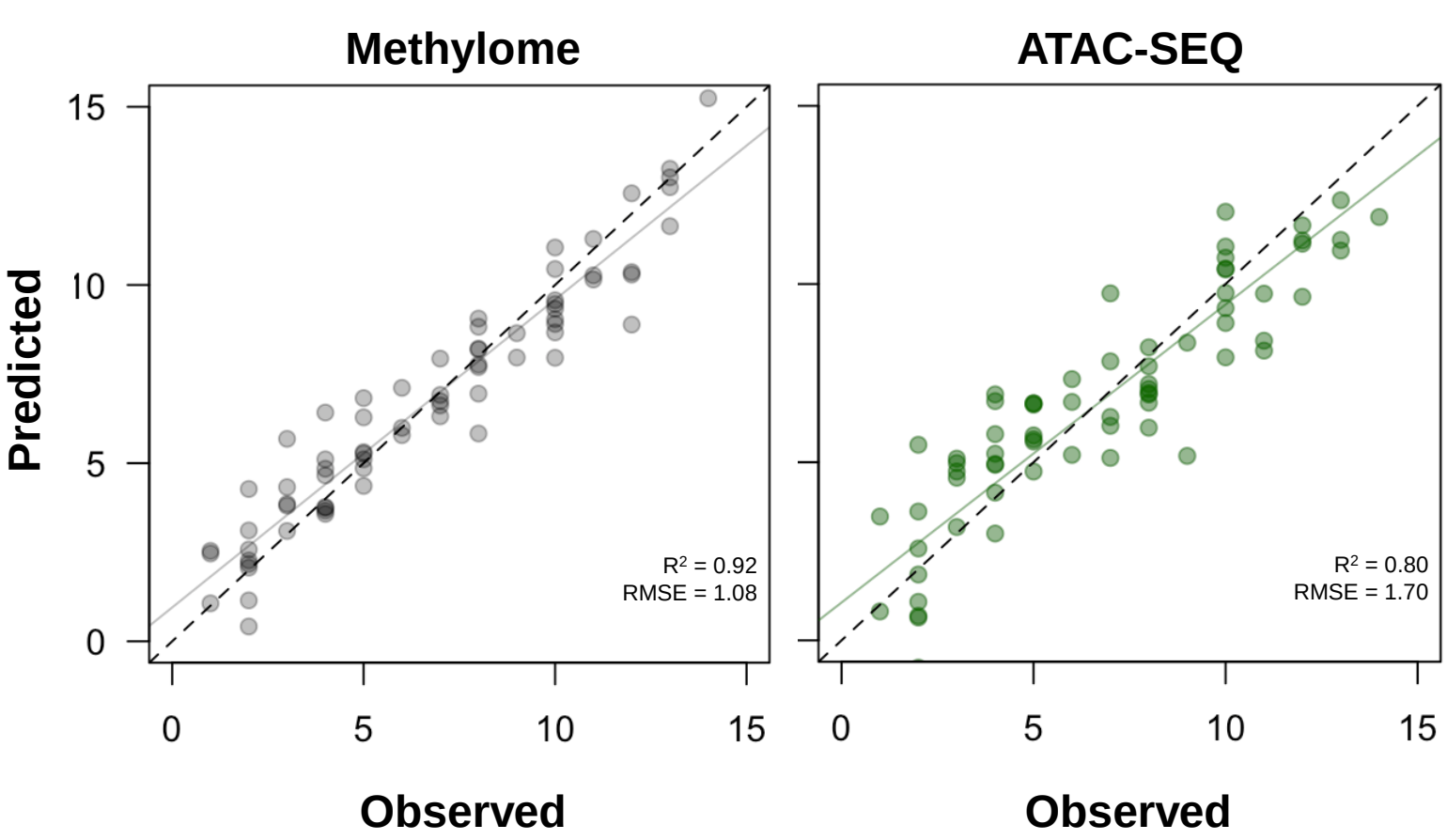

Medium
Cancer
1
0.1
0.01
0.001
5
10
15
Age

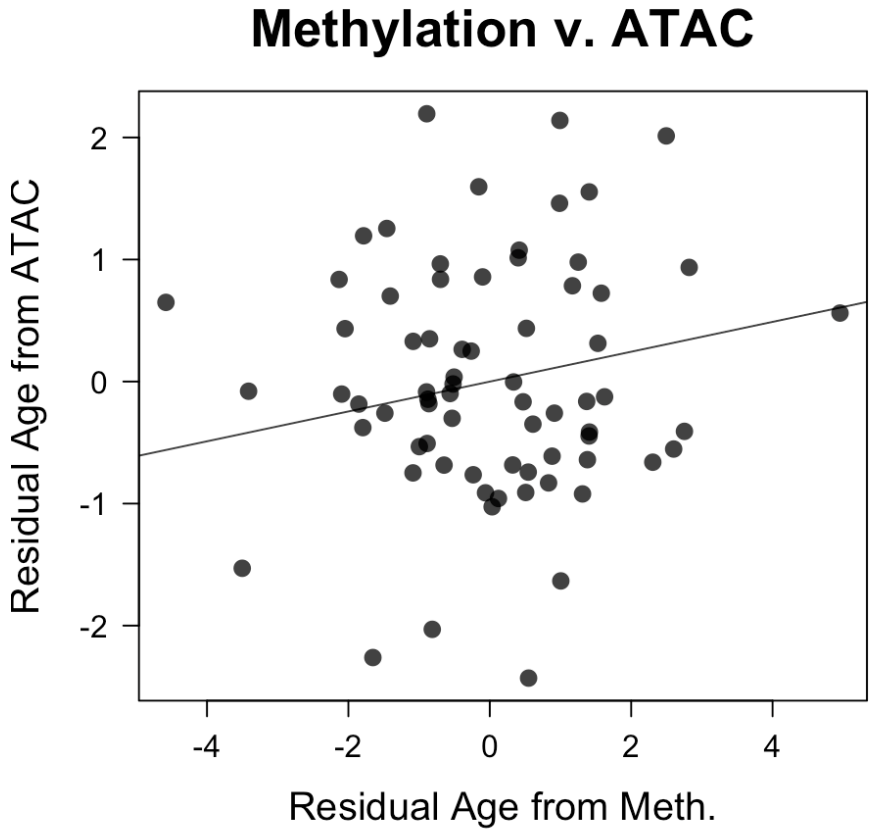

Large
Cancer
1
0.1
0.01
0.001
5
10
15
Age


Giant
Cancer
1
0.1
0.01
0.001
5
10
15
Age


Cancer by size and age
small
medium
large
giant
Cancer
1
0.1
0.01
0.001
5
10
15
Age

Canine Epigenetic Clock





Kelly Jin

Building bridges with DAP

1. Dogs as a model for Alzheimer's Disease
2. Impact of early-life experience on aging trajectory
3. Environmental stressors in dogs
4. Effect of socioeconomic status
5. Mechanisms of aging/Systems biology
6. Dogs as a translational bridge

Major gaps

1. The lab world ≠ the real world
2. What happens as dogs age? (Veterinary geriatrics)
3. Integrated, interdisciplinary study of aging
   - Evolution, Ethics, Environment, Early-life
   - Systems biology as bridge between G/E and P
4. Science in crisis
   - Open data
   - Community science
   - In dog we trust

The Dog Aging Project is a collaborative, interdisciplinary, nationwide team

Arizona State University
Broad Institute
Colorado State University
Fred Hutchinson Cancer Res Ctr
Iowa State University
North Carolina State University
Oregon State University
Princeton University
Purdue University
Seattle Children's Research Inst
Texas A&M University
University of Arizona
University of Georgia
University of Washington
Washington State University

Acknowledgements

Kate Creevy (TAMU), Matt Kaeberlein (UW)

The DAP Team Scientists and Staff

The Promislow Lab

Ron Kohanski
Francesca Macchiarini
Felipe Sierra (ret.)

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North Carolina State
Bruce Keene

Oregon State
Nicole LeBlanc
Kate Scollan

University of Georgia
Mandy Coleman
Gregg Rapoport

Washington State
O. Lynne Nelson
Pamela Lee

Dog Aging Project

THANK YOU

Let us know if you have any questions or suggestions!

www.dogagingproject.org