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Guidelines for Reporting Dog Demographics

Background

There has been interest among the DAP Team in having a shared set of guidelines to use to describe the demographics of dogs in our reports. The following document has been developed to assist in this process. The intent of this document is to simplify these decisions, and to decrease the effort spent by each separate writing team in making decisions about these descriptions for each separate manuscript.

These guidelines are based on conventions in describing dog demographics, and data from prior work by some DAP investigators and others. These sources are imperfect. Ultimately, DAP analyses are likely to provide more physiologically relevant descriptors than are currently available. However, at this time those analyses are not available.

Importantly, these descriptive categories are not intended to be *analytic* categories, particularly for weight and age. In almost all cases, it is most appropriate to analyze weight and age as continuous variables. Additionally, there may be reasons for certain manuscripts or analytic objectives to describe the population in a different way. If a different descriptive structure is in the best interest of clarity of analysis for a given project, it should be used.

The descriptive categories that will be addressed below are:

Sex
Weight
Breed
Age
and **Lifestage**

Sex

There are four sexes in dogs:

- Female, intact (often abbreviated FI)
- Female, spayed (FS)
- Male, intact (MI)
- Male, castrated (MC)

While age at the time of sterilization is likely physiologically significant, at this time we are unable to substratify our participants by this factor. Thus, we will use their sex as recorded at the time of data collection when reporting on the demographics of the population. Substratification by age at the time of sterilization may become possible over time and that may impact these guidelines at a future date.

In Data Release 1.0, the DAP Pack has very small representation of intact dogs of either sex. Thus it may be appropriate to collapse the population into just male / female for analysis. However, description of the four sexes will be expected by readers with veterinary knowledge, so it will add clarity to explain that the groups have been collapsed, and why that was done.

Weight

There are two options that can be used for weight categories in descriptive tables or figures. Narrower categories in 5-kg increments can generally be used to provide greater resolution of the most common sizes of dogs in our data:

- 0-4.9 kg
- 5-9.9 kg
- 10-14.9 kg
- 15-19.9 kg
- 20-24.9 kg
- 25-29.9 kg
- 30-34.9 kg
- 35-39.9 kg
- 40-44.9 kg
- 45+ kg

OR

Broader categories in 10-kg increments may also be used. These larger 10-kg categories are being used to fill target strata in our sample-collection cohorts, and investigators may prefer to describe dogs in a way that matches cohort strata:

- <10 kg
- 10 - 19.9 kg
- 20 - 29.9 kg
- 30 - 39.9 kg
- ≥ 40 kg

In certain subgroups or cohorts, additional categories for weight may have been used (e.g., TRIAD dogs were subgrouped by weight categories that made equivalent dosing easier). Analyses limited to such subgroups should use those specific categories.

Breed

DAP investigators requested a way to describe the breed background of study dogs without listing each individual breed. There are no accepted clusters or groups of breeds based on relevant physiology or genetic ancestry (AKC groups are based on variable characteristics of use, history or other arbitrary factors). For this reason, these guidelines group breeds by weight categories for descriptive purposes. This use of weight also creates a parallel grouping strategy that can be used for dogs that are not AKC purebreds (i.e., mixed breed dogs, F1 hybrids, or dogs of breeds not recognized by AKC).

DAP investigators expressed concern about the possibility that dogs of the same breed might end up in different descriptive weight-based groups. If owner-reported weight is used for purebred dogs, this will happen. For some breeds, assignment by owner-reported weight may span three weight-based groups. For this reason a table was constructed that provides categories based on breed-standard weights for AKC-recognized breeds. Investigators who want to ensure that all members of a given breed are described in the same group can use this table to assign breed standard weights to AKC purebred dogs. Be advised that breed in HLES is owner-reported, and it is certain that some dogs are misclassified by their owners. Specifically, among dog breeds that have more than one size standard (e.g., toy vs

standard poodles) it is clear from the weight distribution of dogs within those breeds that some owners were imprecise in selection of breed from the drop-down menu, and dogs of more than one AKC size standard are reported as members of the same breed.

Owner-reported weight must be used to create descriptive groups for mixed breed dogs because there is no "standard" weight that can be applied. Please note that this creates a difference in the grouping strategy for AKC purebred dogs and mixed breed dogs, if the breed standard weight table is used.

- Toy and small AKC-recognized purebred dogs (<10 kg)
- Medium AKC-recognized purebred dogs (10 - 19.9 kg)
- Standard AKC-recognized purebred dogs (20 - 29.9 kg)
- Large AKC-recognized purebred dogs (30 - 39.9 kg)
- Giant AKC-recognized purebred dogs (≥ 40 kg)

- Toy and small non-AKC breed dogs (<10 kg)
- Medium non-AKC breed dogs (10 - 19.9 kg)
- Standard non-AKC breed dogs (20 - 29.9 kg)
- Large non-AKC breed dogs (30 - 39.9 kg)
- Giant non-AKC breed dogs (≥ 40 kg)

"Non-AKC breed" includes mixed breed dogs, F1 hybrids and purebred dogs recognized by organizations other than the AKC including those classified as Foundation Stock Service. These dogs are grouped according to their owner-reported weight.

Investigators who do not want to describe dogs by breed-standard-weight-based groups have several options.

- They can list the numbers of dogs in each individual breed in the dataset.
- They can list the top 10 (or top 20, etc.) most populous breeds in the dataset and then list the remainder of purebreds as a group, e.g.
    - Affenpinscher (n=561)
    - Beagle (n= 385)
    - etc.
    - All other purebreds (n=4356)
- They can list the members of individual breeds that account for a substantial proportion (e.g. 25%, 50%) of the dataset and then list the remainder of the purebreds as a group, e.g.
    - There were 14563 purebred dogs and 13977 mixed breed dogs. Nine breeds comprised 50% of the purebred dogs sample population, as follows
        - Labrador Retriever (n=3426)
        - German Shepherd (n=2988)
        - Schipperke (n=2109)
        - etc.
- They can simply enumerate owner-reported purebred and owner-reported mixed breed dogs as two large groups.

Using any of these descriptions, investigators can still describe the overall population by weight, independent of breed status. Also when using any of these descriptions, it may be valuable to include a Supplementary Table of all purebreds in the dataset used in a given manuscript.

Age

For purposes of describing the age of DAP dogs, categories of two-year increments can generally be used.

The first year of life has its own category because it is a year of rapid growth and development for all dogs, and there may be physiologic differences that would be eclipsed by a two-year category.

Additionally, in large (30 - 39.9 kg) and giant (≥40 kg) dogs, growth at a slower rate continues into the second year of life, and there may be continued behavioral maturation during this time as well. For analyses relevant to questions of growth, development, early life exposure, behavioral maturation, etc. the subgroups within the 1 to 2.9 year age group can be used to describe large and giant dogs.

- <1
- 1.0 to 2.9
    - subgroup A 1.0 - 1.9
    - subgroup B 2.0 - 2.9
- 3.0 to 4.9
- 5.0 to 6.9
- 7.0 to 8.9
- 9.0 to 10.9
- 11.0 to 12.9
- 13.0 to 14.9
- 15.0 to 16.9
- 17+

Lifestage

On average, small dogs live longer than large dogs, and often by a substantial margin. For this reason, simple chronological age is insufficient to describe the life stage (e.g., juvenile to adult to elderly) in dogs of various sizes.

There may be manuscripts for which it is of interest to describe the life stage of the DAP dogs. When that is desired, size will have to be taken into account. The American Animal Hospital Association recently promoted the following standard for life stages in dogs:

TABLE 1

Proposed Canine Life Stage Definitions

Stage	Definition (Length of Time)
Puppy	Birth to cessation of rapid growth (~6–9 mo, varying with breed and size)
Young adult	Cessation of rapid growth to completion of physical and social maturation, which occurs in most dogs by 3 to 4 yr of age
Mature adult	Completion of physical and social maturation until the last 25% of estimated lifespan (breed and size dependent)
Senior	The last 25% of estimated lifespan through end of life
End of life	Terminal stage (depends on the specific pathologies)

Prior to the launch of the DAP, several DAP investigators completed a pilot study of dogs to obtain demographic data about mortality rates and estimated lifespan from a population of US dogs attending private practices (not VTHs). We have reanalyzed those data to establish a median survival time for each of the 10-kg weight groups used in our cohort design.

We have used these MST estimates, previously published work about growth rates, and common sense to designate life stages for each weight group (below). These designations are imperfect. They are not analytic endpoints and they will not precisely describe the aging experience of all dogs. They are intended to facilitate understanding (our own and our readers') of the comparative lifestage experience of dogs of various sizes.

Investigators who wish to *describe* dogs by lifestage should use these categories. These categories are not sufficiently rigorously defined to be used for analytic purposes. These descriptions of lifestage will not be pertinent for all hypotheses or analyses, and investigators are welcome not to use them.

Size	**Puppy**	**Young Adult**	**Mature Adult**	**Senior**
Toy and Small	0 - 0.75 yr	> 0.75 - 3 yr	> 3 - 12 yr	> 12 yr
Medium	0 - 0.75 yr	> 0.75 - 3 yr	> 3 - 12 yr	> 12 yr
Standard	0 - 0.75 yr	> 0.75 - 3 yr	> 3 - 11 yr	> 11 yr
Large	0 - 1 yr	> 1.0 - 3 yr	> 3 - 10.5 yr	> 10.5 yr
Giant	0- 1.5 yr	> 1.5 - 3 yr	> 3 - 9.5 yr	> 9.5 yr