

eTable 1: Number of age group clusters identified by the adaptive branch pruning algorithm for cat and each breed size category of dog, across the 21 combinations of ‘diagnosis threshold’ and ‘age deep split’ used in the sensitivity analysis

eTable 2: Frequency with which age group splits were identified by the adaptive branch pruning algorithm for cat and each breed size category of dog, across the 21 combinations of ‘diagnosis threshold’ and ‘age deep split’ used in the sensitivity analysis. The split occurs between the ages given, so a split at 4-5 years would mean a new cluster starting at 5 years old. Blank cells imply a zero count.

eTable 3: Previously published adult life stages for dogs and cats.

eTable 4: Diagnosis clusters identified by the adaptive branch pruning algorithm for cat and each breed size category of dog, along with how these can be interpreted with respect to the age clusters (life stages)

eFigure 1: Profiles (showing the diagnosis count per pet-year at-risk at each year of age) placed in each diagnosis cluster for cat. The profiles have been scaled by division by the root mean square in order to fit onto the same set of axes. The darker line in each panel shows the mean profile for that cluster. Cluster names correspond to those used in eTable 4.

eTable 5: Diagnosis clusters for each ailment for each species / breed size. Since the diagnosis clusters are assigned letters sequentially within species / breed size, and do not necessarily align in their interpretations across species / breed size, cells are coloured according the interpretation of the cluster (as given eTable 4) flowing approximately from blue (diseases common the in young) to yellow (diseases common in the old) as described in the key. Blank (white) cells mean that the disease was not sufficiently common in that species / breed to be included in the analysis.

eFigure 2: Trajectory of ages 1 to 15 years on the first three principal components (PCs) of the disease profiles for Cat. Each age point is numbered and joined sequentially to show the trajectory more clearly. Points are coloured according to the life stages identified by the bi-clustering analysis (blue = youth, green = early midlife, yellow = late midlife, orange = senior, red = super-senior).

eFigure 3: Trajectories of ages 1 to 15 years on the first three principal components (PCs) of the disease profiles for each breed size of dog, with A – D representing Toy, Small, Medium and Large respectively. Each age point is numbered and joined sequentially to show the trajectory more clearly. Points are coloured according to the life stages identified by the bi-clustering analysis (blue = youth, green = midlife, orange = senior, red = super-senior).

Species	Size Category	Number of Age Clusters		
		3	4	5
Cat	N/A	3	8	10
Dog	Toy	4	11	6
	Small	3	15	3
	Medium	0	12	9
	Large	4	17	0

eTable 1: Number of age group clusters identified by the adaptive branch pruning algorithm for cat and each breed size category of dog, across the 21 combinations of ‘diagnosis threshold’ and ‘age deep split’ used in the sensitivity analysis

Species	Size Category	Location of Age Splits									
		4-5 yrs	5-6 yrs	6-7 yrs	7-8 yrs	8-9 yrs	9-10 yrs	10-11 yrs	11-12 yrs	12-13 yrs	13-14 yrs
Cat	N/A	18					16		15		21
Dog	Toy			14	3		10		17		21
	Small			13	6		9		15		20
	Medium		15	6			19		11		21
	Large		12		9		17		15	6	

eTable 2: Frequency with which age group splits were identified by the adaptive branch pruning algorithm for cat and each breed size category of dog, across the 21 combinations of ‘diagnosis threshold’ and ‘age deep split’ used in the sensitivity analysis. The split occurs between the ages given, so a split at 4-5 years would mean a new cluster starting at 5 years old. Blank cells imply a zero count.

Species	Life Stages and Ages	References
Cat	Adult: 3-7 years, Senior: 8-11 years, Geriatric: 12+ years	a
	Prime: 3-6 years, Mature: 7-10 years, Senior: 11-14 years, Geriatric: 15+ years	b
	Young Adult: 1-6 years, Mature Adult: 7-10 years, Senior: >10 years	c
	Adult: 1-7 years, Mature: 7-12 years, Geriatric/Senior: 12+ years	d, e
Dog	0-20 pounds (0-9.5 kg) Adult: 3-7 years, Senior: 8-10 years, Geriatric: 11+ years	a
	21-50 pounds (9.5-23.1 kg) Adult: 3-6 years, Senior: 7-9 years, Geriatric: 10+ years	
	51-120 pounds (23.1-55 kg) Adult: 3-5 years, Senior: 6-7 years, Geriatric: 8+ years	
	Over 120 pounds (over 55 kg) Adult: 3 years, Senior: 4-5 years, Geriatric: 6+ years	
	Medium/Small (<50 pounds or 22.7 kg) Senior: 7-10 years, Geriatric: 11+ years	f
	Giant/Large (50+ pounds or 22.7 kg) Senior: 6-8 years, Geriatric: 9+ years	g
All, except large breed dogs (over 50 pounds or 22.7 kg) Middle age: 7-8 years		

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- b. Feline Advisory Bureau. *WellCat for life veterinary handbook*. Tisbury, Wiltshire, UK: Feline Advisory Bureau, 2008; 5.
- c. Quimby J, Gowland S, Carney HC, et al. 2021 AAHA/AAFP Feline Life Stage Guidelines. *J Feline Med Surg*. 2021 Mar;23(3):211-233. Erratum in: *J Feline Med Surg*. 2021 Aug;23(8):NP3.
- d. Perez-Camargo G. Feline decline in key physiological reserves: implications for mortality, in *Proceedings*. Nestle Purina Companion Animal Nutrition (CAN) Summit, Focus on Gerontology 2010; 6-13.
- e. Twedt DC. The feline decline: what's normal, what's not. In: *The Science of Aging: Inside and Out*. Wilmington DE: Gloyd Group, 2004; 6-14.
- f. Bellows J, Colitz CMH, Daristotle L, et al. Defining healthy aging in older dogs and differentiating healthy aging from disease. *J Am Vet Med Assoc* 2015; 246: 77-89.
- g. Epstein M, Kuehn NF, Landsberg G, et al. AAHA Senior care guidelines for dogs and cats. *J Am Anim Hosp Assoc* 2005; 41: 81-91.

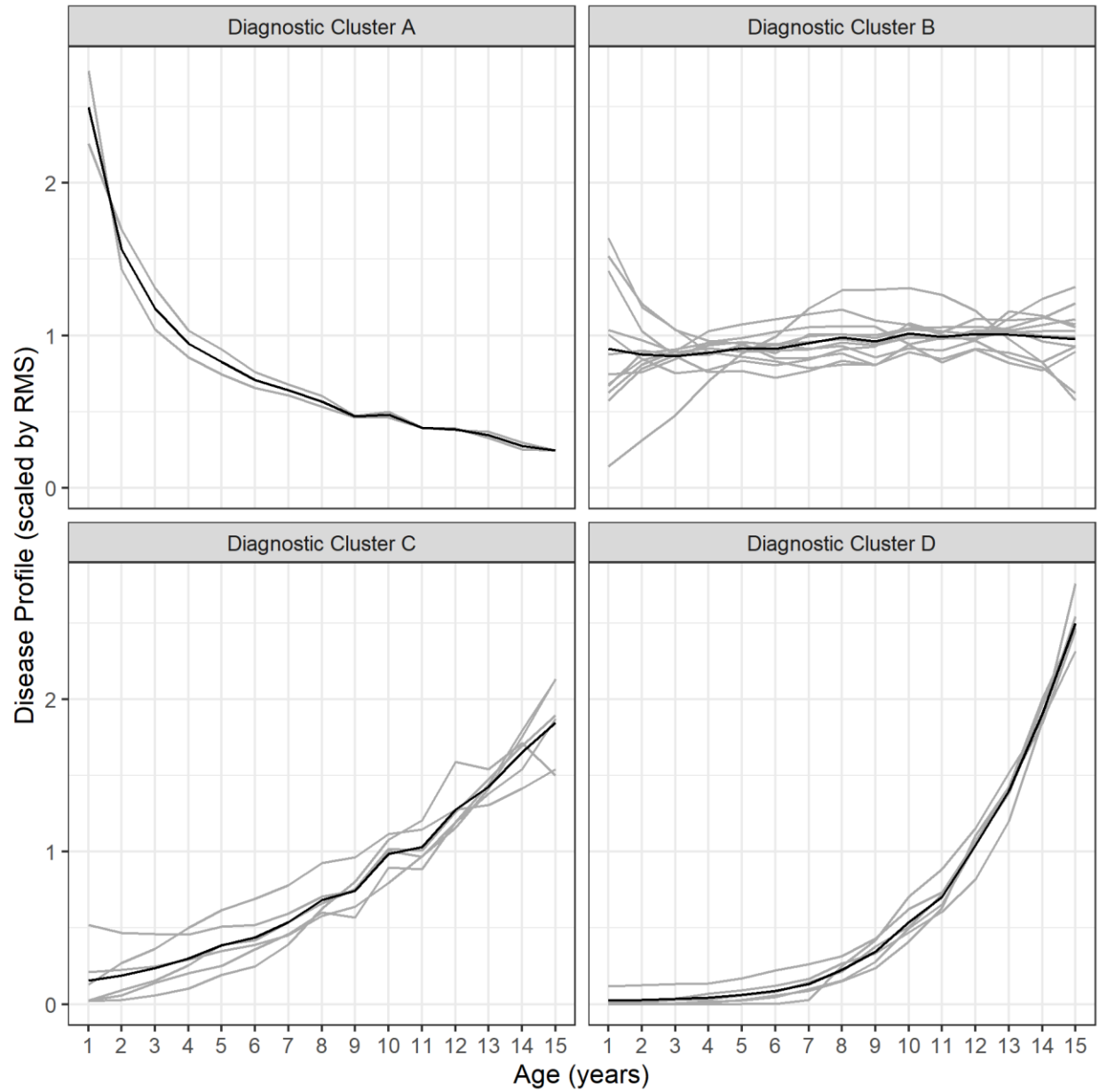
eTable 3: Previously published adult life stages for dogs and cats.

Species	Breed Size	Diagnostic Cluster	Diagnoses	Possible Interpretation
Cat	N/A	A	Healthy Pet; Tapeworm	Diagnoses primarily of youth
		B	Fleas; Conjunctivitis; Respiratory Disease, Feline Upper; Gingivitis; Dermatitis; Otitis Externa, Medical; Cystitis; Dental Calculus; Periodontal Disease Grade 1; Aggressive Behavior; Overweight; Obesity	Diagnoses common to all life stages or most common in midlife
		C	Periodontal Disease Grade 2; Malaise; Diabetes Mellitus; Periodontal Disease Grade 3; Periodontal Disease Grade 4; Murmur	Diagnoses most common from late midlife onwards
		D	Underweight; Geriatric Pet; Arthritis; Nuclear Sclerosis; Hyperthyroidism; Renal Failure, Chronic	Diagnoses of senior and (especially) super senior life stage
Dog	Toy	A	Underweight; Renal Failure, Chronic; Cataract, Non-surgical; Cataract, Surgical; Arthritis; Geriatric Pet; Heart Failure, Congestive	Diagnoses of senior and (especially) super senior life stage
		B	Periodontal Disease Grade 4; Murmur; Nuclear Sclerosis; Neoplasia, Dermal; Skin Tumors; Keratoconjunctivitis Sicca; Corneal Pigmentation; Tracheal Collapse; Coughing; Hepatopathy; Growth/Lump; Periodontal Disease Grade 3; Gingival Recession; Intervertebral Disc Disease, Medical; Cyst, Skin; Seizures	Diagnoses of senior life stage onwards
		C	Corneal Ulcer, Medical; Malaise; Conjunctivitis; Lameness; Periodontal Disease Grade 2; Gingivitis	Diagnoses most common from midlife onwards
		D	Dermatitis, Atopic Allergic; Dermatitis; Otitis Externa, Medical; Patellar Luxation, Surgical; Patellar Luxation, Medical; Dental Calculus; Anal Sacs, Full (Otherwise Normal); Periodontal Disease Grade 1; Overweight; Epiphora; Underbite; Fleas; Gastroenteritis, Conservative	Diagnoses common to all life stages / more common in midlife
		E	Healthy Pet; Deciduous Teeth, Retained	Diagnoses primarily of youth
	Small	A	Renal Failure, Chronic; Underweight; Cataract, Non-surgical; Heart Failure, Congestive; Cataract, Surgical; Arthritis; Osteoarthritis; Periodontal Disease Grade 4; Geriatric Pet	Diagnoses of senior and (especially) super senior life stage

Species	Breed Size	Diagnostic Cluster	Diagnoses	Possible Interpretation
		B	Murmur; Keratoconjunctivitis Sicca; Periodontal Disease Grade 3; Skin Tumors; Neoplasia, Dermal; Hepatopathy; Papilloma of Skin; Nuclear Sclerosis; Eyelid Margin Tumor; Growth/Lump; Lipoma; Gingival Recession; Seizures; Malaise; Corneal Ulcer, Medical; Coughing	Diagnoses of senior life stage onwards
		C	Diabetes Mellitus; Obesity; Fracture, Tooth; Periodontal Disease Grade 2; Intervertebral Disc Dis, Medical; Gingivitis; Lameness; Cystitis	Diagnoses most common from midlife onwards
		D	Conjunctivitis; Colitis, Conservative; Gastroenteritis, Conservative; Fleas; Otitis Externa, Medical; Dermatitis, Atopic Allergic; Periodontal Disease Grade 1; Overweight; Patellar Luxation, Medical; Epiphora; Dermatitis; Dental Calculus; Anal Sacs, Full (Otherwise Normal)	Diagnoses common to all life stages
		E	Healthy Pet; Deciduous Teeth, Retained	Diagnoses primarily of youth
	Medium	A	Nuclear Sclerosis; Hepatopathy; Papilloma of Skin; Neoplasia; Periodontal Disease Grade 3; Arthritis; Osteoarthritis; Murmur; Geriatric Pet; Heart Failure, Congestive; Periodontal Disease Grade 4; Cataract, Surgical; Cataract, Non-surgical; Renal Failure, Chronic; Underweight	Diagnoses of senior and (especially) super senior life stage
		B	Gingivitis; Seizures; Cystitis; Malaise; Coughing; Intervertebral Disc Dis, Medical; Periodontal Disease Grade 2; Corneal Pigmentation; Growth/Lump; Hypothyroidism; Keratoconjunctivitis Sicca; Neoplasia, Dermal; Skin Tumors; Eyelid Margin Tumor; Lipoma	Diagnoses of senior life stage onwards
		C	Overweight; Periodontal Disease Grade 1; Obesity	Diagnoses most common in midlife
		D	Healthy Pet; Underbite; Dermatitis, Atopic Allergic; Alopecia, Undetermined; Dermatitis; Colitis, Conservative; Conjunctivitis; Lameness; Otitis Externa, Medical; Patellar Luxation, Medical; Dental Calculus; Anal Sacs, Full (Otherwise Normal)	Diagnoses more common in youth / midlife

Species	Breed Size	Diagnostic Cluster	Diagnoses	Possible Interpretation
	Large	A	Periodontal Disease Grade 4; Underweight; Murmur; Cataract, Non-surgical; Periodontal Disease Grade 3; Geriatric Pet; Neoplasia; Arthritis; Hepatopathy; Osteoarthritis; Nuclear Sclerosis; Malaise	Diagnoses of senior and (especially) super senior life stage
		B	Periodontal Disease Grade 2; Hypothyroidism; Tooth, Worn; Growth/Lump; Lipoma; Eyelid Margin Tumor; Skin Tumors; Neoplasia, Dermal; Hip Dysplasia, Medical; Gingivitis; Fracture, Tooth	Diagnoses of senior life stage onwards
		C	Lameness; Dental Calculus; Periodontal Disease Grade 1; Obesity; Overweight	Diagnoses most common in midlife
		D	Anal Sacs, Full (Otherwise Normal); Otitis Externa, Medical; Dermatitis; Conjunctivitis; Colitis, Conservative	Diagnoses common to all life stages
		E	Healthy Pet	Diagnoses primarily of youth

eTable 4: Diagnosis clusters identified by the adaptive branch pruning algorithm for cat and each breed size category of dog, along with how these can be interpreted with respect to the age clusters (life stages)



eFigure 1: Profiles (showing the diagnosis count per pet-year-at-risk at each year of age) placed in each diagnosis cluster for cat. The profiles have been scaled by division by the root mean square (RMS) in order to fit onto the same set of axes. The darker line in each panel shows the mean profile for that cluster. Cluster names correspond to those used in eTable 4.

Ailment	Species & Breed Size				
	Cat	Dog			
		Toy	Small	Medium	Large
Aggressive Behavior	B				
Alopecia, Undetermined				D	
Anal Sacs, Full (Otherwise Normal)		D	D	D	D
Arthritis	D	A	A	A	A
Cataract, Non-surgical		A	A	A	A
Cataract, Surgical		A	A	A	
Colitis, Conservative			D	D	D
Conjunctivitis	B	C	D	D	D
Corneal Pigmentation		B		B	
Corneal Ulcer, Medical		C	B		
Coughing		B	B	B	
Cyst, Skin		B			
Cystitis	B		C	B	
Deciduous Teeth, Retained		E	E		
Dental Calculus	B	D	D	D	C
Dermatitis	B	D	D	D	D
Dermatitis, Atopic Allergic		D	D	D	
Diabetes Mellitus	C		C		
Epiphora		D	D		
Eyelid Margin Tumor			B	B	B
Fleas	B	D	D		
Fracture, Tooth			C		B

Ailment	Species & Breed Size				
	Cat	Dog			
		Toy	Small	Medium	Large
Gastroenteritis, Conservative		D	D		
Geriatric Pet	D	A	A	A	A
Gingival Recession		B	B		
Gingivitis	B	C	C	B	B
Growth/Lump		B	B	B	B
Healthy Pet	A	E	E	D	E
Heart Failure, Congestive		A	A	A	
Hepatopathy		B	B	A	A
Hip Dysplasia, Medical					B
Hyperthyroidism	D				
Hypothyroidism				B	B
Intervert Disc Dis, Medical		B	C	B	
Keratoconjunctivitis Sicca		B	B	B	
Lameness		C	C	D	C
Lipoma			B	B	B
Malaise	C	C	B	B	A
Murmur	C	B	B	A	A
Neoplasia				A	A
Neoplasia, Dermal		B	B	B	B
Nuclear Sclerosis	D	B	B	A	A
Obesity	B		C	C	C
Osteoarthritis			A	A	A
Otitis Externa, Medical	B	D	D	D	D

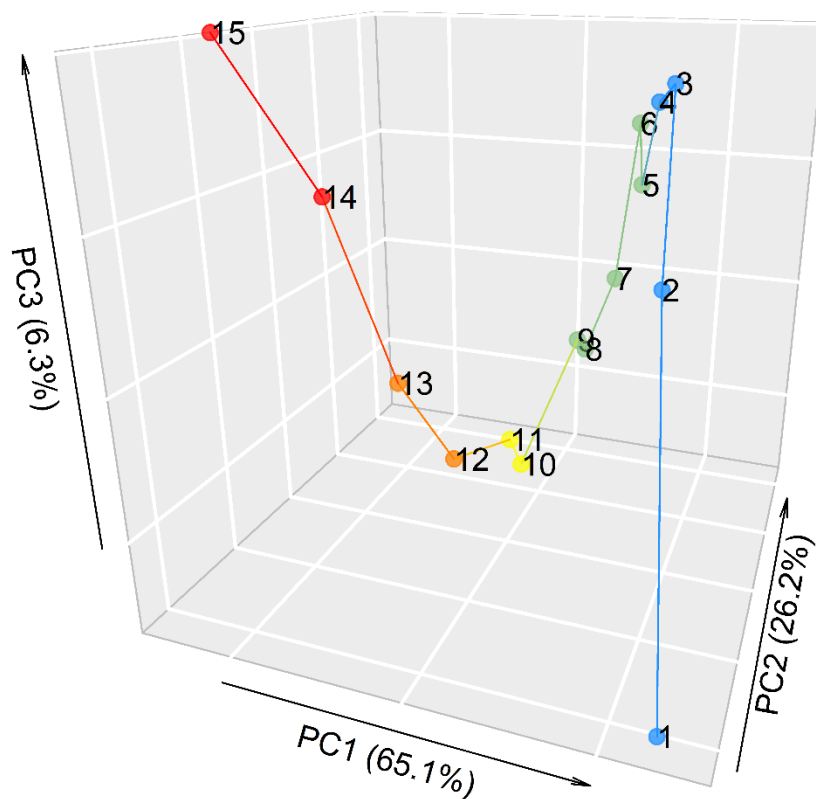
Ailment	Species & Breed Size				
	Cat	Dog			
		Toy	Small	Medium	Large
Overweight	B	D	D	C	C
Papilloma of Skin			B	A	
Patellar Luxation, Medical		D	D	D	
Patellar Luxation, Surgical		D			
Periodontal Disease Grade 1	B	D	D	C	C
Periodontal Disease Grade 2	C	C	C	B	B
Periodontal Disease Grade 3	C	B	B	A	A
Periodontal Disease Grade 4	C	B	A	A	A
Renal Failure, Chronic	D	A	A	A	
Resp. Disease, Feline Upper	B				
Seizures		B	B	B	
Skin Tumors		B	B	B	B
Tapeworm	A				
Tooth, Worn					B
Tracheal Collapse		B			
Underbite		D		D	
Underweight	D	A	A	A	A

Key:

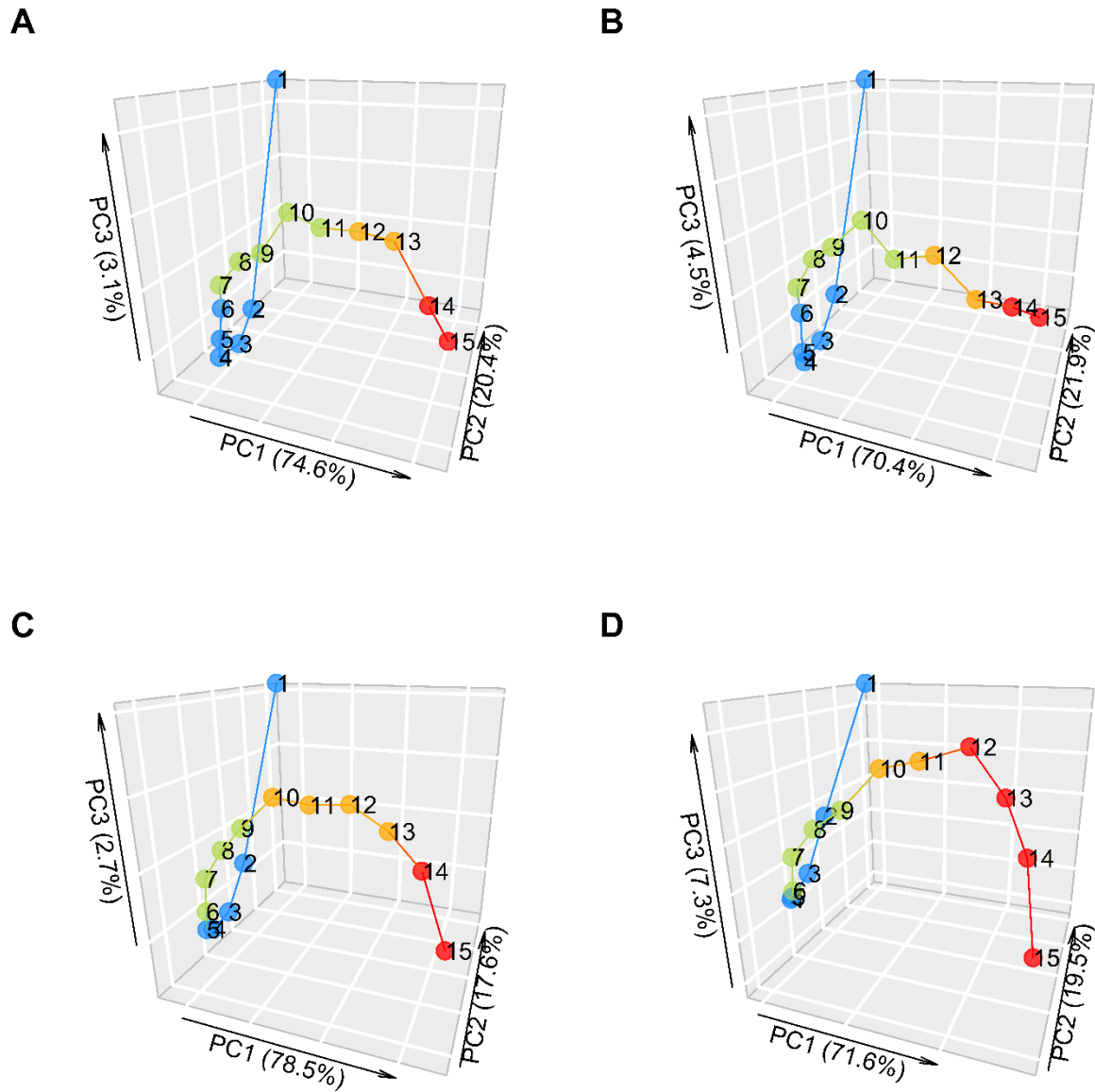
Colour	Interpretation
	Diagnoses primarily of youth
	Diagnoses more common in youth / midlife
	Diagnoses common to all life stages

Colour	Interpretation
	Diagnoses common to all life stages or more common in midlife
	Diagnoses most common in midlife
	Diagnoses most common from midlife onwards
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	Diagnoses of senior life stage onwards
	Diagnoses of senior and (especially) super senior life stage

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eFigure 2: Trajectory of ages 1 to 15 years on the first three principal components (PCs) of the disease profiles for Cat. The variation explained by each PC is shown in brackets. Each age point is numbered and joined sequentially to show the trajectory more clearly. Points are coloured according to the life stages identified by the bi-clustering analysis (blue = youth, green = early midlife, yellow = late midlife, orange = senior, red = super-senior).



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