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TITLE: Cohort Profile: The 'Bristol Cats Study' (BCS)—a birth cohort of kittens owned by UK households

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36 The 'Bristol Cats Study' (BCS) cohort was set up with the aim of collecting data
37 prospectively from owners and veterinarians (with owner permission) that could be used
38 to advance veterinary knowledge of these, and other, common feline disorders through
39 examining possible links between owner- and/or veterinary-reported disorders and
40 environmental exposures. To date, publications based on data collected from the BCS
41 cohort include analysis of factors associated with owner reports of lower urinary tract
42 signs (LUTS) (i.e. straining/apparent difficulty urinating, passing blood when urinating
43 and/or vocalising (e.g. meowing) before or during urination)⁽¹¹⁾, owner-reported road
44 traffic accidents (RTA)⁽¹²⁾ involving their cat and overweight/obesity⁽¹³⁾ (defined as body
45 condition score 4 or 5 on a 5-point scale). These conditions were hypothesised to often
46 not result in presentation of the cat to a veterinarian (LUTS and fatal RTAs) or not be
47 recorded in the veterinary clinical notes (overweight/obesity), hence the value of the
48 BCS owner-reported data. Examples of hypotheses that have been tested, numbers of
49 cats with data available for analyses and statistical power calculations are summarised
50 in Table A of the Supplementary data at IJE online. Other analyses that are underway
51 include a nested case-control study of risk factors for gingivitis in cats aged 3-4 years
52 and testing faecal samples for parasites.⁽¹⁴⁾ Analyses of other outcome are envisaged
53 and buccal swabs are being collected to facilitate future prevalence studies, subject to
54 identification of variants, sufficient statistical power and funding.

55

56 The long-term aims of the BCS are to use multivariable regression models to quantify
57 the strength of associations between environmental exposures and common disorders
58 of cohort cats in senior (11-14 years) and geriatric (>15 years) life stages.⁽¹⁵⁾ Details of
59 hypotheses to be tested and the number of cats estimated to be available for future
60 analyses of CKD, hyperthyroidism and cognitive dysfunction are available in Table A of
61 the Supplementary data at *IJE online*.

62

63 Peer-reviewed veterinary research publications often report work conducted at
64 veterinary referral centres, which can result in a 'referral bias'.^(16, 17) Data collected from
65 first opinion practices^(18, 19) have other limitations, including a lack of information on

66 lifestyle and those intrinsic to veterinary record keeping. In addition, some animals may
67 attend multiple veterinary practices, or move to a practice that is not participating in a
68 particular study. Sometimes animals with a disorder might not be presented to a
69 veterinarian,⁽²⁰⁾ whilst an estimated 13.6% of UK pet cats are not even registered with a
70 veterinary practice.⁽²¹⁾ Consequently, prevalence estimates reported from studies using
71 veterinary practice/referral centre data might under-or over-estimate the prevalence of
72 diseases if disease prevalence varies according to veterinary registration status.
73 Prospective longitudinal studies offer a number of advantages over cross-sectional and
74 retrospective studies. Cross-sectional studies provide results based only on a point-in-
75 time sample of the population, whereas longitudinal studies allow critical evaluation, and
76 following over time, of events occurring prior to the outcome under investigation. The
77 relatively long life-span of UK pet cats dictates the need for longitudinal studies to better
78 understand benefits of preventive medicine on health outcomes in later life.

79
80 The original study team of Jane Murray and Tim Gruffydd-Jones (both at the University
81 of Bristol) were aware of the impact and value of the Avon Longitudinal Study of Parents
82 and Children (ALSPAC)⁽²²⁾ that was being run by researchers at the University of Bristol.
83 Following a series of meetings with one of the Directors of the ALSPAC study, and
84 ethical approval from the University of Bristol (Reference: UIN/13/026), the Bristol Cats
85 Study (BCS) was launched in June 2010.

86
87 The BCS has been set up and maintained with a small budget. Until December 2014,
88 consumables for the study were funded through profits of Continuing Professional
89 Development (CPD) courses for veterinarians run at the University of Bristol. Cats
90 Protection (the United Kingdom (UK)'s leading feline welfare charity) has funded staff
91 time (Jane Murray's post) since the study launch. Since December 2014, The
92 WALTHAM Centre for Pet Nutrition (a division of Mars Petcare) has funded the study
93 administrator post. Additional funding that has been used to support research students
94 and staff working with BCS data, and to cover some of the consumable costs, has been
95 obtained from the Biotechnology and Biological Sciences Research Council, British

96 Small Animal Veterinary Association Petsavers, The Langford Trust for Animal Health &
97 Welfare, and Zoetis.

98
99 This report describes recruitment and the first six years of follow-up of the BCS cohort.
100 The intention is that follow-up of the cohort will continue for the lifetime of the enrolled
101 cats. Identifying environmental risk factors that can be monitored or avoided could lead
102 to better management of feline health by owners, and hence improved health and
103 welfare for cats.

104

105 **Who is in the cohort?**

106 Cat owners (themselves aged 18 years or more) could register 8-16 week-old kittens
107 with the BCS between June 2010 and December 2013 (inclusive). During 2010,
108 registration of pet cats was limited to owners living in the Bristol ('BS') postcode region.
109 This geographical restriction was imposed to facilitate visits from researchers to
110 participating households (e.g. to validate questionnaire data and/or to collect more
111 detailed data), and to aid engagement with participating cat owners through BCS
112 conferences/open days. At the end of 2010, only 146 cats had been recruited, so
113 registration was extended across the UK. Advantages of recruiting over a larger area
114 can include access to a wider range of environments (rural, suburban, urban,
115 metropolitan), demographics, and socio-economic strata, in addition to increasing the
116 sample size. To date, analyses^(11,12,13,20,23) have not incorporated geographical
117 restriction of cohort (pre/post 2011) as a potential explanatory variable, but future
118 analyses can assess whether geographical restriction is a potential confounder. During
119 2010, recruitment was limited to just one kitten per household (requested to be the
120 kitten with the name that was first alphabetically) to avoid having to account for
121 clustering at the household level in analysis; however, multiple kitten registration per
122 household was allowed from January 2011 onwards to increase the size of the cohort.
123 Inclusion of more than one cat per owner (or household) in analyses introduces the
124 potential of hierarchical clustering of data. Two-level random intercept models will be
125 used to account for this clustering through assigning level 1 to cat identification and
126 level 2 to owner identification.

127

128 Cat owners were recruited into the BCS using a variety of advertising methods. These
129 included asking veterinarians to add BCS leaflets to kitten packs issued to owners when
130 kittens were presented for vaccination, posters displayed in veterinary practices, pet
131 shops and libraries, advertising through websites used by cat owners (e.g. animal
132 welfare organisation websites), in publications aimed at veterinarians and cat owners,
133 and via social media (Facebook and Twitter). There are no plans to continue or extend
134 the recruitment of cats to the study.

135

136 **Eligible sample**

137 No national database or compulsory registration of pet cats exists in the UK, hence we
138 cannot provide accurate details regarding the eligible sample. In 2011, two studies
139 estimated that there were between 10,114,764 (95% confidence intervals 9,138,603-
140 11,090,924)¹ and 11,916,000 pet cats owned by households in the UK.⁽³⁾ Evidence of
141 association between some household factors (e.g. presence of one or more dogs in the
142 household, presence of children aged 11-15 years, highest level of qualification
143 achieved by household members, and age and gender of householders) and cat
144 ownership have been reported,⁽²⁴⁻²⁶⁾ hence comparison of BCS cohort demographic
145 data with UK census data is likely to be meaningful. A comparison of cat, owner and
146 household demographic data obtained from the BCS cohort and from three other
147 sources of UK pet cat demographic data is provided in Table B in the Supplementary
148 data at *IJE* online.

149

150 Data from the BCS cohort were obtained from self-completed questionnaires (see
151 Supplementary data; some data were missing. As self-selected participants in a feline
152 cohort study, compared with the eligible population, the BCS cohort is hypothesised to
153 have a higher proportion of cats that are pure bred, registered with a vet, insured, and
154 microchipped. However, despite potential differences between the demographics of the
155 cohort and the wider population of cats in the UK, these differences are more likely to
156 lead to biased measures of incidence than biases in effect measures.

157

158

159 **How often have they been followed up?**

160 Self-completed questionnaires were completed by owners at registration, when their
161 cats were aged 2-4 months (Questionnaire 1, (Q1)), and have subsequently been
162 issued to owners within about two weeks of their cats reaching the following ages: 6
163 months (Questionnaire 2, (Q2)), 12 months (Questionnaire 3, (Q3)), 18 months
164 (Questionnaire 4, (Q4)), 30 months (Questionnaire 5, (Q5)), 4 years (Questionnaire 6,
165 (Q6)), and annually thereafter. By May 2016, all cats remaining in the study had
166 reached 30 months of age.

167

168 **Response rates**

169 Final response rates presently are available for Q1-Q5 for the 2203 BCS cohort cats.
170 The number and percentage of questionnaires (Q1-Q5) completed by owners of cohort
171 cats, and the number of cats leaving the study between ages at which questionnaires
172 were issued is summarised in Figure 1.

173

174 Questionnaires were completed for 87% of the cats enrolled on the study (and still
175 participating in the study), at age six months, and for 79%, 72% and 60% of the cohort
176 at age 12, 18, and 30 months, respectively. The proportion of cats retained at age six,
177 12, 18, and 30 months were 95%, 90%, 86% and 82%, respectively. Considering only
178 owners who still had cats registered on the study, questionnaire response rates
179 remained above 73% for the fifth questionnaire, which was completed when cats were
180 aged 30 months. Reasons for leaving the study are discussed later, and include
181 deceased and missing cats, and owners who withdrew from the studies for a variety of
182 reasons.

183

184 **Loss to follow up**

185 The BCS utilises a variety of engagement strategies to maximise retention of owners in
186 the study. Despite these strategies, some cats inevitably will be lost to the study, for
187 example due to mortality or because they have 'gone missing'. A summary of the
188 reasons reported by owners or recorded by the study team for cats leaving the study to

189 date (27/5/16) is presented in Table 1. The most common reasons for loss to follow up
190 include cat death from a road traffic accident (21.7%), loss of contact with the owner
191 (20.6%), and owner electing to leave study (20.4%). Owners also reported other
192 reasons for leaving the study, which are described in Table 1.

193
194 Multivariable logistic regression models were used to test for associations between
195 specific owner and cat variables and cats lost to follow up, excluding deceased and
196 missing cats, from the study between recruitment and age 18 months (Q4). Loss to
197 follow up was more likely for cats with owners aged less than 44 years, without a
198 degree or postgraduate qualification, with a household income of less than £30,000,
199 and/or with children in the household at time of Q1 completion. No evidence of
200 association was found for household tenure, source of cat, sex or breed of cat, or
201 presence of other cats in the household and the likelihood of having dropped out of the
202 study by 18 months.⁽²⁷⁾ This information is useful when assessing potential effects of
203 retention bias on results obtained from the BCS data, in addition to helping to direct
204 future retention strategies.

205

206 **What has been measured?**

207 Areas of data collection, which includes owner-completed questionnaires, data collected
208 from veterinarians (body condition scores, oral health scores, and clinical notes) and
209 non-invasive sampling carried out by owners is presented in Table C of the
210 supplementary data at *IJE* online. Visits to the homes of convenience samples of BCS
211 cat owners have been conducted to validate some owner-reported data (e.g. weight of
212 dry food fed to cats) and oral health scores assigned by the cats' veterinarian, and to
213 obtain more detailed data related to diets and feeding practices.

214

215 Links to electronic versions of questionnaires 1–7 (Q1–Q7) are available in the
216 Supplementary data at *IJE* online.

217

218

219 **Oral Health cards and Body condition score cards:** Since December 2012, an
220 annual Christmas card mailed to owners of BCS cats has included oral health and body
221 condition score cards (available as Supplementary data at *IJE* online) along with pre-
222 paid return envelopes. Owners are requested to take these cards with them to their
223 cat's annual vaccination and health check for completion by their veterinarian and return
224 by the owner.

225

226 On 27th May 2016, one or more sets of veterinary-completed oral health and body
227 condition score cards had been returned by the owners of 864 cats. Two sets of cards
228 had been received for 470 cats, three sets received for 181 cats and four sets received
229 for 29 cats. However, in some instances there were missing data on one of the cards
230 returned, for example if the veterinarian had been unable to examine the mouth of the
231 cat.

232

233 Table D in the supplementary data at *IJE* online provides details of the broad areas of
234 data collected by owner-completed questionnaires within the BCS to date and outlines
235 feline samples submitted by owners and data collected from veterinarians of study cats
236 that have been, or are being, collected for cats registered with the BCS.

237

238 **Key findings and publications**

239 Key findings of the study to date include identifying a strong association between
240 intended and actual age of neutering, and prevalences of obesity and lower urinary tract
241 signs (LUTS) within the cohort. Despite four months being the recommended age in the
242 UK for neutering pet cats^(28, 29) (to reduce the risk of unplanned pregnancies), only
243 14.1% of the cohort were neutered at (or before) four months of age, whereas at 12.5-
244 13 months of age, 73.5% were reported to have been neutered at (or before) six months
245 of age.⁽²¹⁾ If owners of cats enrolled on the BCS are more likely than cat owners that
246 are not enrolled on the BCS to be engaged with the veterinary profession (Table B,
247 supplementary data at *IJE online*), then these results provide strong evidence that there
248 is scope to increase awareness within pet owners and the veterinary profession
249 regarding the recommended age of neutering.

250

251 Seven per cent of owners reported their cats to be overweight or obese (defined as a
252 body condition score of 4 or 5 on a five-point scale) at around one year of age. The two
253 factors found to be independently associated with an increased risk of feline obesity at
254 age 12.5-13 months of age were cats with restricted or no outdoor access, and cats fed
255 dry food as the only or major (>50%) type of food in their diet.⁽¹³⁾ Obesity is a serious
256 health problem in pets just as it is in humans. Results from studies suggest that obese
257 cats are 3.9 times more likely to develop diabetes mellitus, 2.3 times more likely to
258 develop non-allergic skin conditions, and 4.9 times more likely to develop lameness
259 compared with optimal weight cats.⁽³⁰⁾ Although being overweight also may have
260 detrimental effects on health in itself, it leads to obesity in a substantial number of
261 cases: in a follow up study of a feline obesity prevalence study by Scarlett *et. al.*⁽³¹⁾
262 42% of initially overweight cats had gained weight 4 years later, whilst just 30% had lost
263 weight and 28% remained overweight.⁽³²⁾ Findings from the BCS cohort may be used
264 by owners to help reduce the likelihood of cats becoming overweight or obese.

265

266 The most recent publication investigated owner-reported LUTS in cats, defined as cats
267 whose owners had seen the cat urinating and reported one or more of the following
268 signs: straining/apparent difficulty urinating, passing blood when urinating and/or
269 vocalising (e.g. meowing) before or during urination. An increased risk at 18 months of
270 age was associated with cats with an indoor-only lifestyle, and for cats that had received
271 a change in diet between the ages of 12 and 18 months.⁽¹¹⁾ The prevalence of owner-
272 reported LUTS in our cohort was higher than previously reported in studies of cats
273 attending veterinary hospitals^(17,33) and the novel risk factor of change in diet suggests
274 that further investigation into the effects of diet (and possibly other) changes on
275 prevalence of LUTS is warranted.^(17, 33)

276

277 Four publications based on data collected from the cohort have been published by
278 February 2017; details of these publications are available on the Bristol Cats Study
279 website.⁽³⁴⁾

280

281 **What are the main strengths and weaknesses?**

282 The main strengths of the BCS cohort are the large sample size and high retention of
283 owners in the study over time. For instance, 72% of cats initially enrolled in the study
284 had their 18 month (approximately 548 days) questionnaires completed by their owners
285 (Figure 1). In comparison, researchers working on a longitudinal study of Labrador
286 Retriever dogs in the UK⁽³⁵⁾ reported that only 39-45% of owners were actively involved
287 in the study when dogs were aged 400 days or more. The collection of detailed
288 household, diet and management data enables variables associated with these factors
289 to be included in risk factor analyses, in contrast to studies based solely on data
290 obtained from veterinary records. Owner-reported observation of clinical signs enables
291 investigation of problems that are either not presented to veterinarians for investigation,
292 or only presented once the clinical signs become more chronic or more serious in
293 nature; hence data from this study can be used to identify factors with the potential to
294 provide early intervention of problems.

295

296 The main weaknesses of the study are that despite the size of the initial cohort, there is
297 not enough statistical power to investigate outcomes and/or exposures with a low
298 prevalence. Owner-reported data relating to clinical signs also must be interpreted with
299 caution, as there is potential for reporting bias. Because of this, owner reports are
300 compared with clinical data collected from veterinary practices to assess for bias
301 whenever possible.

302

303 **Can I get hold of the data? Where can I find out more?**

304 Although the data are not available via open access or via a formal application process,
305 researchers wishing to collaborate and initiate research based on the Bristol Cats Study
306 data are invited to contact Jane Murray (Jane.Murray@bristol.ac.uk) to discuss
307 research ideas and access to data.

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309 **Profile in a nutshell**

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- The Bristol Cats Study (BCS) is the first study of a birth cohort of kittens in the world.
- 2203 pet kittens (aged 8-16 weeks) living in the UK were recruited via their owners to the BCS between June 2010 and December 2013.
- Owners complete questionnaires when their cats are aged 2-4 months, 6 months, 12 months, 18 months, 2.5 years, 4 years and annually thereafter. Questionnaire data include cat and owner demographic information, household data, management data, cat behaviour, clinical signs of disease, body condition scores, veterinary treatment and preventive care.
- Additional data collected from owners responding to requests for further data/samples includes:
 - Non-invasive samples (buccal swabs, faecal samples and hair).
 - Body condition scores and oral health scores assigned annually by the veterinarians of study cats and submitted via owners.
 - Clinical notes from veterinary practices of study cats.
- In May 2016, 1701 cats and 1356 owners were still registered on the BCS, representing 77.2% of the original cohort of 2203 cats.
- Collaborations with researchers from other institutions within and outside the UK are ongoing and further collaborations are welcomed.

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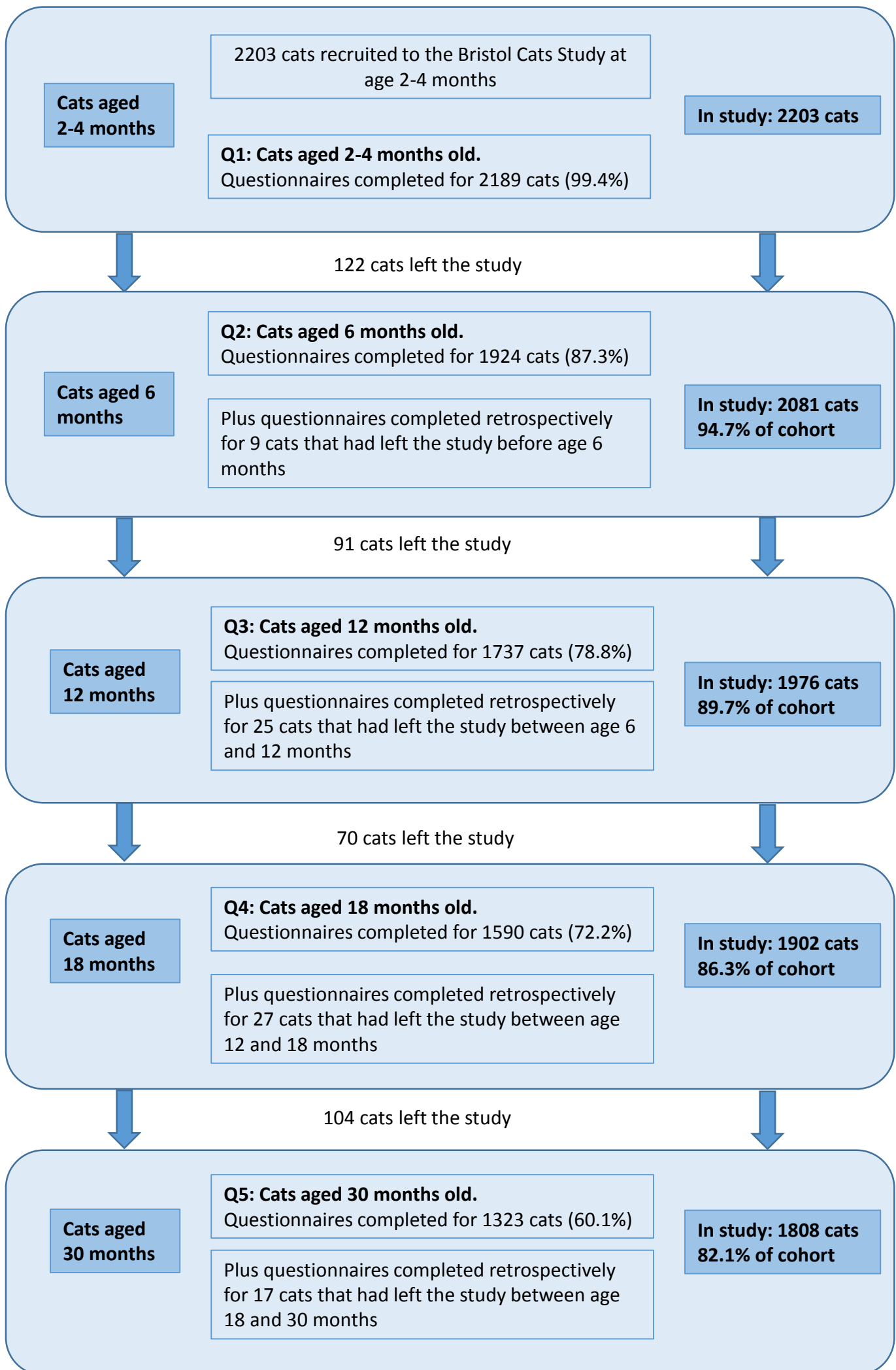
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434

Table 1. Reasons for cats having left the Bristol Cats Study

Reason for leaving the Bristol Cats Study	Number of cats (27/5/16)
Road traffic accident (RTA)	107
Cat missing	38
Feline infectious peritonitis (FIP)	9
Died (other reason or non-specified)	58
Rehomed / fostered on / returned to breeder	57
Owner elected to leave study	101
Lost contact with owner	105
Other	0
Reason unknown / not given	19
Total	494
Number in cohort	2203
Percentage of cohort	22.4%

Figure 1. Numbers of questionnaires completed from the first five questionnaires that were issued to owners of cats registered on the Bristol Cats Study (BCS) when their cat(s) reached specific ages (questionnaires 1-5 (Q1-5)). The numbers of cats leaving the study at each time point are also provided.



Outcome and actual ^a / estimated ^b prevalence (%)	Examples of exposures hypothesised to be associated with an increased odds of outcome	Actual ^a / expected ^b frequency of exposure in controls in univariable analysis	Number of cats with data for the outcome variable available for univariable analysis ^c	Actual ^a / expected ^b number of cats available for multivariable analysis, after the removal of cats with missing data for variables of interest after the univariable analysis	Minimum odds ratio to be detected with 80% power and 95% level of confidence ^d
Published analyses					
Cat not neutered by 6.5 months of age (23%) ¹	At age 2-4 months, owner stated no intention to neuter by 6 months of age	23%	679	543 (80.0% of 679) (127 cases and 416 controls)	2.0
Cat overweight or obese by 12.5 months of age (7%) ²	'Dry' food only diet	21%	966	768 (79.5% of 966) (52 cases and 716 controls)	2.4
Cat has owner- reported lower urinary tract signs at 18 months of age (4%) ³	Indoor only lifestyle at 18 months	19%	1030	829 (80.5% of 1030) (33 cases and 796 controls)	2.9
Cat has been involved in a road traffic accident by 12.5 months of age (4%) ⁴	Black coat colour	14%	1181	770 (65.2% of 1181) (26 cases and 744 controls)	2.7
Analyses in progress					
Cat has gingivitis at age 3-4 years (13%)	No opportunity to hunt	19%	317	187 (59.0% of 317 cats)	2.7
	'Wet' food constitutes at least 50% of diet	49%		(83 cases and 104 controls)	2.5
Potential future analyses					
Cat has signs of chronic kidney disease aged 11- 14 years (>11%) ^e	Moderate/severe dental disease Frequent/annual vaccination history	25-50% exposure amongst controls	991 ^f	545 ^g (60 cases and 485 controls)	2.3
Cat has signs of cognitive	Environmental enrichment (e.g.	25-50% exposure	991 ^f	545 ^g (152 cases)	1.9

dysfunction aged 11-14 years (28%) ^h	<p>playing with toys, company and interaction with people, food-hunting games)</p> <p>Diet (e.g. enriched with antioxidants, feeding diets formulated for senior cats)</p> <p>Exposure to brominated flame retardants, (in particular polybrominated diphenyl ethers) (e.g. in new furniture)</p> <p>No/little exposure to early-life stressors including: agonistic interactions with other household cats and spending time in a rehoming organisation</p>	amongst controls		393 controls)	
Cat has signs of hyperthyroidism aged 11-14 years (>9%) ⁱ	<p>Diet</p> <ul style="list-style-type: none"> • Sea food flavoured cat food • Tinned cat food (bisphenol: used to coat inside of the tins) <p>Exposure to brominated flame retardants, (in particular polybrominated diphenyl ethers) (e.g. in new furniture)</p>	25-50% exposure amongst controls	991 ^f	545 ^g (49 cases and 496 controls)	2.4

¹ Welsh, C. P., Gruffydd-Jones, T.J. and Murray, J.K. (2013) The neuter status of cats at four and six months of age is strongly associated with the owners' intended age of neutering. *Vet. Rec.*, 172(22) 578.

² Rowe E, Browne W, Casey R, Gruffydd-Jones T, Murray J. (2015) Risk factors identified for owner-reported feline obesity at around one year of age: dry diet and indoor lifestyle. *Prev. Vet. Med.*, **121**, 273-281.

³ Longstaff, L., Gruffydd-Jones, T.J., Buffington, C.A. T., Casey, R.A. and Murray, J.K. (2016) Owner-reported lower urinary tract signs in a cohort of young cats. *J. Feline Med. Surg.*, 1-10. DOI: 10.1177/1098612X16643123 10.1016/j.pretvetmed.2015.07.011. [Epub ahead of print]

⁴ Wilson, J., Gruffydd-Jones, T.J. and Murray, J.K. (*in press*) Risk factors for road traffic accidents in cats up to age 12 months that were registered between 2010-2013 with the UK pet cat cohort ('Bristol Cats'). *Veterinary Record*.

^a Actual: based on Bristol Cats dataset available for analysis (published or analysis in progress)

^b Expected: estimated based on peer-reviewed research (planned analyses)

^c Some published analyses^{1,2} have been based on data available at the time of analysis, rather than on the entire cohort. Not all cats have had data available for the outcome variable (e.g. if the owner had not cat seen the cat urinating³, resulting in a reduced dataset.

^d Power calculations were carried out prior to analyses; however, post-hoc calculations are presented in this table for published/ongoing analyses using Sampsizet
<http://sampsizet.sourceforge.net/iface/s3.html#cc> [Accessed December 12, 2016].

^e Finch, N.C., Syme, H.M. and Elliott, J. (2016) Risk factors for development of chronic kidney disease in cats. *J Vet Intern Med*, **30**, 602-610.

^f Allowing for loss to follow up (at a rate of 85 cats/year based on 2014-2016 data). Currently 1671 cats (aged 3-6 years) remain in the study (14/11/16). In 8 years' time, the cohort will be aged 11-14 years. Estimate 680 more cats will have left the study (85x8=680), thus 991 cats will remain in the study.

^g Based on the assumption that 55% of cats remaining in the study will have no missing data for the outcome variable or explanatory variables included in the multivariable analysis.

^h Gunn-Moore, D., Moffat, K., Christie, L.A. and Head, E. (2007) Cognitive dysfunction and the neurobiology of ageing in cats. *Journal of Small Animal Practice*, **48**, 546-553.

ⁱ Stephens, M.J., O'Neill, D.G., Church, D.B., McGreevy, P.D., Thomson, P.C. and Brodbelt, D.C. (2014) Feline hyperthyroidism reported in primary-care veterinary practices in England: prevalence, associated factors and spatial distribution. *Veterinary Record*, doi: 10.1136/vr.102431

Table B. Cat, owner and household demographic data from the BCS cohort (N=2203) and from three other data sources of cat and cat owner demographic information.

	2007 study of cat-owning households in the UK ¹	PDSA Pet Animal Welfare report ¹ (n=5317)	Cats visiting English veterinary practices ⁴	BCS data (cohort recruited 2010-2013)	
	Number (%) of cats	% of cats	Number (%) of cats	Number (%) of cats	
Breed					
Mixed breed	682 (92.4)	No data available	126723 (89.0)	1636 (77.1)	
Persian	22 (3.0)		1942 (1.4)	12 (0.6)	
Siamese	7 (0.9)		1318 (0.9)	40 (1.9)	
British shorthair	5 (0.7)		3380 (2.4)	118 (5.6)	
Burmese	3 (0.4)		1321 (0.9)	26 (1.2)	
Oriental	3 (0.4)			13 (0.6)	
Abyssinian	2 (0.3)			1 (<0.1)	
Bengal	2 (0.3)		1466 (1.0)	36 (1.7)	
Norwegian Forest	2 (0.3)			15 (0.7)	
Maine Coon	0 (0.0)			71 (3.3)	
Ragdoll	1 (0.1)		1215 (0.9)	42 (2.0)	
Birman	0 (0.0)		834 (0.6)	16 (0.8)	
Other pure breeds	9 (1.2)		4160 (2.9)	97 (4.6)	
Number of cats in household					
One	350 (49.5)		56%	No data available	466 (21.5)
Two or more	357 (50.5)	44%	1702 (78.4)		
Gender of cat					
Male	359 (50.1)	No data available	39273 (48.6)	1131 (52.2)	
Female	357 (49.9)		41557 (51.4)	1034 (47.8)	
Household income					
<£10,000 per annum	60 (14.4)	No data available	No data available	180 (8.9)	
≥£10,000 per annum	357 (85.6)			1834 (91.1)	

Highest level of qualifications GCSE's/ O' levels or less A' levels or higher	260 (42.2)	No data available	No data available	274 (13.2)
	356 (57.8)			1805 (86.8)
				Data in rows below extracted from Q4 (18 months)
Cat registered with a vet				
No	84 (13.6)	16%	0%	12 (0.8)
Yes	532 (86.4)	84%	100%	1567 (99.2)
Cat insured				
No	No data available	No data available	63383 (70.5)	671 (43.5)
Yes	No data available	No data available	26585 (29.5)	870 (56.5)
Cat microchipped				
No	No data available	38%	No data available	154 (9.9)
Yes	No data available	62%	No data available	1405 (90.1)
Cat neutered				
No	69 (6.4) ^b	8%	2750 (3.4)	76 (4.8)
Yes	1010 (93.6) ^b	92%	78080 (96.6)	1498 (95.2)

^a Only percentages are available from the PDSA PAW report

^b Cats aged 12 months or more

Table C. Data collected by questionnaires completed by owners of cats registered with the Bristol Cats Study, from registration to June 2016. (Cats age 2-4 months to six years).

	Approximate age of cat	Data collected
Owner-completed questionnaires	2-4 months	Baseline cat/owner demographics
		Management of cat (indoor/outdoor access, diet)
		Veterinary care (preventative and for medical problems)
		Behaviour problems
	6 months	Changes in household
		Changes in management of cat (indoor/outdoor access, diet, plans to breed or neuter)
		Neighborhood and local traffic conditions
		Veterinary care (preventative and for medical problems)
		Changes in behaviour
		Owner satisfaction with; presence of symptoms of allergy
	12, 18 & 30 months	Changes in household
		Changes in management of cat (indoor/outdoor access, diet, plans to breed or neuter)
		Veterinary care (preventative and for medical problems, body condition score)
		Changes in behaviour
	4 years	Changes in household
		Changes in management of cat (indoor/outdoor access, diet)
		Veterinary care (preventative and for medical problems, body condition score)
		Changes in behaviour

		What is normal for your cat at the moment?
		Baseline mobility data
	5 years	Changes in household
		Changes in management of cat (indoor/outdoor access, diet)
		Veterinary care (preventative and for medical problems, body condition score)
		Changes in behaviour
		What is normal for your cat at the moment?
	6 years	Changes in household
		Changes in management of cat (indoor/outdoor access, diet)
		Veterinary care (preventative and for medical problems, body condition score)
		Changes in behaviour
		What is normal for your cat at the moment?
		Excessive grooming behaviours, scratching, signs and areas of skin irritation

Table D. Samples submitted for cats registered with the Bristol Cats Study, from registration to June 2016. (Cats age 2-4 months to six years).

	Approximate age of cat	Data collected
Oral health scores assigned by veterinarians	Annually from December 2012.	
Body condition scores assigned by veterinarians	Annually from December 2012.	
<i>Owner-collected samples</i>		
Buccal swabs	2011 and 2012	Samples received from 551 cats
	Summer 2016	Samples requested from owners from whom samples from their cats had not yet been collected
Faecal samples	6 and 30 months	One or two samples collected from 832 cats
Hair (collected by brushing)	Summer 2016	Samples requested
Clinical notes from veterinarians	Between September 2015 and September 2016	855 sets of clinical notes received to date (27/5/16) from vets whose owners had given signed consent for their cats' records to be accessed (n=1159).
	Annually	Requests to vets for the last 12 months of clinical notes for study cats with permission to access their veterinary records
Ongoing	Correspondence with owners via email and telephone is used to update records, for example with reports of mortality.	