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Published in:
Veterinary Record

Publication date:
2024

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The final published version is available direct from the publisher website at:
[10.1002/vetr.4958](https://doi.org/10.1002/vetr.4958)

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Citation for published version (APA):

Wills, A., & James, L. (in press). The perception and utilisation of veterinary services by rodent owners in the United Kingdom. *Veterinary Record*. <https://doi.org/10.1002/vetr.4958>

1 **The perception and utilisation of veterinary services by rodent owners in the**
2 **United Kingdom**

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22 ABSTRACT

23 **Background:** There is limited research on how rodent owners use and perceive
24 veterinary services, and the demand for pet insurance for these species.

25 **Methods:** An online survey of rodent owners (guinea pigs, hamsters, rats, gerbils,
26 and mice) measured owner confidence in recognising signs of illness, opinions on
27 and utilisation of veterinary services and demand for pet insurance.

28 **Results:** 1700 respondents completed the survey. Rat owners had increased
29 confidence in recognising signs of illness as did owners who acquired their pet from
30 a breeder or rescue centre. Most respondents had utilised veterinary services, with
31 owners perceiving exotics specialists to have increased knowledge. Economic
32 challenges with accessing veterinary care were common. Where rodents were
33 purchased for children, the amount owners were willing to spend on veterinary care
34 was significantly less.

35 **Limitations:** Responses may have been biased towards keen owners who self-
36 selected to participate in the survey. Respondents were predominantly female which
37 may have affected willingness to access and pay for veterinary services.

38 **Conclusion:** Veterinary spending was not affected by income, however, owners who
39 purchased their pet for children were less willing to pay for veterinary services and
40 pet insurance.

41 INTRODUCTION

42 Rodents have historically been regarded as disposable pets (1), however
43 expectations for high quality veterinary care have increased alongside ownership
44 numbers (2). Rodents are popular pets, with UK ownership figures in 2023 as
45 follows: guinea pigs (1,000,000), hamsters (900,000), rats (600,000), gerbils
46 (500,000) and mice (200,000) (3). While rodents are well studied as laboratory
47 species, disease prevalence in pet rodents is comparatively poorly documented (4).
48 Diagnosis of diseases in rodents may be challenging for veterinarians due to
49 reduced clinical exposure to these species and a paucity of information on their
50 common disorders (5). Additionally, rodents are evolutionarily adept at masking

51 signs of illness and smaller species have a reputation for being difficult to handle (6).
52 Some recent studies have documented the common diseases of guinea pigs (7,8)
53 and hamsters (5), but peer-reviewed literature remains limited. Research has also
54 examined the husbandry of pet guinea pigs in the UK identifying issues with housing
55 and provision of correct diet and companionship (9). Research has demonstrated
56 that demographic factors including gender and earnings affect the housing provided
57 to pet rabbits (10). In addition, rabbits purchased for children as a 'starter pet' were
58 less likely to receive regular healthcare, and owners had lower willingness-to-pay for
59 veterinary treatment (11). Similarly, owners with children, and those with a dog or
60 cat, had a weaker bond with their rabbits (12). It is unknown whether the same
61 applies to pet rodents since these species are also commonly purchased for children
62 (13), and whether reason for purchase impacts on owner willingness to pay for
63 veterinary services.

64 Rodents are usually meticulous groomers and can remove external evidence of
65 underlying illness (14), so regular health checking by owners is important to detect
66 minor changes. Additionally, interactions between conspecifics may affect feeding
67 behaviours (15). Anorexia is a common sign of illness (16), and enclosure sharing
68 can make it difficult for owners to monitor the feed intake of each pet. Interestingly,
69 research has shown that more guinea pig owners would seek rapid treatment for
70 skin parasites than for serious presentations like anorexia (9). This suggests that
71 owners may lack the ability to prioritise severity of symptoms meaning animals may
72 be presented to the veterinarian in a more debilitated state.

73 To date, there is limited research on how rodent owners access and perceive
74 veterinary services. Research investigating practices of rat owners identified that
75 79% had utilised veterinary services, but a lack of veterinarian knowledge was
76 reported (17). This could be due to a low frequency of rodents presented which
77 would decrease the opportunity for experiential learning (18), or limited veterinarian
78 training with exotics which may impact veterinarian knowledge and confidence when
79 treating them (19). A survey-based study of guinea pig owners found that 74.4% took
80 their guinea pig to a veterinarian if they believed they were unwell (9), however, one
81 study reported that only 25.8% of hamsters had been presented to a veterinarian
82 (20). This could be a result of good health in hamsters, however, as prey species

83 they may be hiding signs of illness. Owners may also be reluctant to spend money
84 on rodents, due to their short lifespan or they may be perceived as a 'cheap' pet (4)
85 with veterinary care deemed unnecessary. A lack of routine vaccinations or
86 microchipping may also mean less rodents are presented to veterinarians in
87 comparison to dogs, cats and rabbits, reducing the likelihood of diseases being
88 diagnosed at an early stage (4,17).

89 Pet insurance assists in the cost of diagnostic testing and treatment for
90 unforeseeable health conditions, where the insurance company reimburses the
91 owner following a claim submission (21). Since 2021, the UK cost of living crisis has
92 impacted veterinary practices, with 56% of veterinarians stating that clients cannot
93 afford sporadic veterinary bills, and 9% of owners delayed presenting their ill pet to a
94 veterinarian due to inadequate funds (22). Advanced veterinary care is associated
95 with considerable expense, and optimal outcomes may be restricted by a client's
96 financial situation. Pet insurance may alleviate these challenges by increasing the
97 ability to undertake necessary treatment interventions (23). In 2019 in the UK, 57%
98 of dogs and 37% of cats were insured, with approximately 80 companies offering pet
99 insurance (23). In 2014 in the UK, 11.7% of pet rabbits were insured (24), but it is
100 likely that less rodents are insured and more recent data are needed. Rodent
101 owners' willingness to purchase insurance may be limited by the lack of companies
102 offering insurance plans and the lifespan of these species. To the authors'
103 knowledge, there have been no previous publications directly examining demand for
104 exotic pet insurance in the UK.

105 The aim of the present study was to ascertain the extent to which rodent owners in
106 the UK utilise veterinary services and their perceptions of the quality of services
107 offered.

108 **METHODS**

109 An online survey was created and was open from the 1st November to the 25th
110 November 2023. Social media platforms, such as Facebook and LinkedIn, were
111 used to recruit participants. This survey was also shared on the social media
112 accounts of a UK based lay press publication, 'The Guinea Pig Magazine.'
113 Convenience and snowball sampling were utilised through sharing the survey in

114 rodent-specific Facebook groups, as well as on the researcher's personal platform
115 and non-pet groups to help mitigate the participation bias seen in rodent groups. This
116 study was approved by the Hartpury University Ethics Committee (ETHICS2023-14).

117 *Survey design*

118 An online quantitative survey consisting of 22 questions was created on Microsoft
119 Forms to assess rodent owner opinions of veterinary services and their confidence in
120 recognising illness. Respondents were asked to provide demographic data including
121 their gender, age and yearly income. Data were also collected on what species of
122 rodent the respondent owned, if they also owned a cat and or dog, where they
123 acquired the pet and whether it was purchased for a child.

124 Respondents were asked to provide their opinion on and prior experience of various
125 aspects of veterinary care and services including whether they had presented their
126 pet to a vet (including an exotics specialist), their confidence in the veterinarian and
127 their willingness to pay for veterinary care and or pet insurance. Questions also
128 explored why respondents had or had not chosen to purchase insurance for their pet
129 and where cats and or dogs were also owned whether these species were insured.
130 Participants were also asked their opinion on the cost of veterinary services,
131 including medication and consultation costs.

132 The survey asked respondents to rate their agreement with the statement 'I am
133 confident in assessing when my pet is ill' and they were also presented with a range
134 of clinical signs and behaviours and asked whether these were signs of illness (yes
135 or no options). The number of correct responses were totalled to give each
136 participant a score out of nine for this question.

137 The inclusion criteria for participants required them to be UK residents aged 18 or
138 above who currently owned a rodent (Guinea Pig, Hamster, Rat, Gerbil or Mouse). If
139 respondents owned multiple animals and or species, they were asked to respond for
140 the pet they had owned the longest. Participants were given the opportunity to
141 withdraw their responses up to the point of data processing by contacting the
142 researcher and quoting a six-digit identifier that they created when completing the
143 survey.

144 Closed-ended and five-point Likert-scale questions were utilised within the survey.
145 Some Likert-scale questions had an extra category of 'non-applicable' where
146 appropriate. One open-ended question was used to allow respondents who had
147 seen an exotics specialist to elaborate on this experience.

148 *Data analysis*

149 All statistical analyses were performed in IBM SPSS Version 29. Likert scales were
150 coded with 'strongly agree' = 1 through to 'strongly disagree' = 5. Participants were
151 given an overall score for their responses to the questions about signs of illness in
152 rodents. Data were considered non-parametric due to the ordinal and nominal nature
153 of the questions. A Spearman's test was used to identify if there was a correlation
154 between participants' reported confidence in identifying signs of ill-health and their
155 score for recognising symptoms. A chi-square test was applied to test if demographic
156 variables, such as age, are associated with willingness to buy pet insurance. Mann-
157 Whitney U and Kruskal-Wallis tests were used to identify significant differences
158 between demographic groups regarding their opinions of veterinary services. A
159 Kruskal-Wallis test was used to assess for differences between species owned in the
160 score attributed to respondents for correct identification of signs of ill health. Where
161 significance was identified in the Kruskal-Wallis test, Dunn's post-hoc tests with the
162 Bonferroni correction were applied to identify significant differences between groups.
163 The criterion of significance was set at $p < 0.05$.

164 **RESULTS**

165 *Respondent demographics*

166 A total of 1710 surveys were completed, 10 were excluded due to respondents
167 residing outside of the UK, resulting in 1700 surveys being analysed. These provided
168 information from the owners of 775 guinea pigs, 500 hamsters, 288 rats, 87 gerbils
169 and 50 mice. Most respondents identified as female (95%; $n=1614$), had a median
170 age of 25-34 and earned a median annual income of £20,001-£30,000. There were
171 respondents from all regions in the UK, most responses were gained from the South
172 West (13.9%; $n=236$). A pet shop was the most common location for obtaining

173 rodents (37%; n=644), with 17% (n=296) being purchased for children. In addition to
174 their rodents, 58% (n=975) owned a dog or a cat.

175 *Confidence in recognising ill health*

176 There was a statistically significant association between respondent age and
177 confidence in recognising ill health in pet rodents, ($H(5)=16.756$, $p=0.005$). Pairwise
178 comparisons showed no significant differences between individual groups. Similarly,
179 income ($H(5)=27.007$, $p<0.001$), species ($H(4)=22.205$, $p<0.001$) and where the pet
180 was obtained ($H(4)=32.208$, $p<0.001$) were significantly associated with confidence
181 in recognising ill health. People with an income of between £40,001 and £50,000
182 were less confident in assessing whether their pet was ill than those who earned
183 below £10,000 ($p=0.039$), between £10,001 and £20,000 ($p=0.020$) and those who
184 earned between £20,001 and £30,000 ($p=0.007$). In addition, those who earned
185 between £20,001 and £30,000 were more confident than those who earned between
186 £30,001 and £40,000 ($p=0.040$) and those who earned above £50,000 ($p=0.021$).
187 Rat owners had the highest confidence in assessing when their pet was ill, higher
188 than guinea pig owners ($p=0.001$) and hamster owners ($p<0.001$). People who
189 obtained their pet from a rescue centre ($p=0.002$) or breeder ($p<0.001$) were more
190 confident in assessing when their pet was ill than those who got their pet from a pet
191 shop. In addition, those who were gifted a pet were less confident than those who
192 obtained their pet from a breeder ($p=0.002$) or rescue centre ($p=0.003$). All other
193 pairwise comparisons were non-significant ($p>0.05$) and can be seen in
194 Supplementary Material 1.

195 Owners who purchased a rodent for a child were significantly less confident
196 ($U=156255.00$, $p<0.001$) in recognising signs of illness (2.01 ± 0.854) than those who
197 did not purchase their pet for a child (1.64 ± 1.153). There was a weak positive
198 correlation ($r=0.128$) between perceived confidence in recognising ill health and
199 score when recognising symptoms, with higher levels of perceived confidence
200 resulting in higher scores. There was a significant association ($H(4) = 51.615$,
201 $p<0.001$) between species owned and score for identifying signs of ill health. Rat
202 owners scored significantly higher (8.25 ± 0.049 , $p<0.001$) than guinea pig
203 (7.74 ± 0.040), gerbil (7.67 ± 0.131) and mouse owners (7.93 ± 0.178).

204

205 *The pet-owner bond*

206 Species owned affected the strength of the pet-owner bond ($H(4)=66.626$, $p<0.001$),
 207 with a significantly stronger bond for rats (1.19 ± 0.438) and guinea pigs (1.37 ± 0.605)
 208 compared to hamsters (1.53 ± 0.742), gerbils (1.69 ± 0.893) and mice (1.70 ± 0.839).
 209 Owners who purchased the pet for children had a weaker bond with their rodent
 210 ($U=153796.50$, $p<0.001$).

211 *Perceptions of different types of veterinary services*

212 Most respondents had presented their rodent to a veterinarian (77%, $n=1320$), 43%
 213 ($n=571$) had previously been referred to a specialist exotics vet or were already
 214 registered with one. Generally, owners were satisfied with the veterinarian's
 215 diagnosis (66%, $N=1700$), however, owners who presented their rodent to an exotics
 216 specialist veterinarian (2.08 ± 1.208) regarded them as more knowledgeable than
 217 those who presented to a general practice veterinarian (2.79 ± 1.251) ($U=285848.500$,
 218 $p<0.001$). Owners were also more confident with the diagnosis of an exotic specialist
 219 veterinarian (2.01 ± 1.153) compared to a general practice veterinarian (2.55 ± 1.245)
 220 ($U=270344.500$, $p<0.001$). Respondents who had been referred to an exotics
 221 specialist ($n=183$) provided insight into their opinions (Table 1). Abundance of
 222 veterinarian knowledge and confidence were common themes in addition to the
 223 expense of seeing specialist veterinarians. However, the wider variety of medications
 224 offered by exotics specialists was appreciated by owners. Some participants stated
 225 that exotic veterinarians were extremely compassionate, whilst others described the
 226 lack of compassion as the main negative aspect of their experience.

227 **Table 1.** Common themes identified from 'Could you briefly describe your
 228 experiences with a specialist exotics vet' ($n=183$), presented in descending order of
 229 number of responses that mentioned these areas.

230

Common Themes	Number of Responses
Confident/knowledgeable	77
Expensive	30
Negative emotional experience	12
Compassion (positive)	7
Compassion (negative)	6

Alternative medication offered	5
--------------------------------	---

231

232 *Perceptions of cost and willingness to pay for veterinary services*

233 Opinions regarding the affordability of medication significantly varied between age
234 groups ($H(5)=11.323$, $p=0.045$) and with species owned ($H(4)=10.866$, $p=0.028$).
235 Other demographic variables such as income did not significantly affect willingness
236 to pay for veterinary services ($p>0.05$). There was a statistically significant
237 association between age ($H(5)=35.105$, $p<0.001$), species ($H(4)=18.436$, $p<0.001$)
238 and where the pet was obtained ($H(4)=25.719$, $p<0.001$) and willingness to pay for
239 medication. There was a significant difference between guinea pig (2.96 ± 1.393) and
240 hamster owners (2.68 ± 1.422) with hamster owners finding the cost of medication
241 more reasonable ($p=0.013$). Respondents who were 18-24 were significantly more
242 willing to pay for medicine for their pet than those who were 25-34 ($p=0.037$), 35-44
243 ($p<0.001$), 45-54 ($p<0.001$) and 55 to 64 ($p=0.020$). Those who were 25-34 were
244 also significantly more willing to pay than those who were 45-54 ($p=0.024$). Rat
245 owners were significantly more willing to pay for medication than guinea pig
246 ($p=0.001$) or hamster owners ($p=0.007$). People who obtained their pet from a
247 rescue centre ($p<0.001$), breeder ($p=0.009$) or from another source ($p=0.007$) were
248 significantly more willing to pay for medication than those who bought their pet from
249 a pet shop. All other pairwise comparisons were non-significant ($p>0.05$) and are
250 presented in Supplementary Material 2.

251 A significant association was identified between willingness to pay for medication
252 and whether the rodent was purchased for a child ($U=153842.00$, $p<0.001$), with
253 owners who purchased for a child (1.48 ± 0.632) being less willing than those who did
254 not (1.17 ± 0.416). There was a significant difference ($U= 11889.50$, $p<0.001$) in
255 willingness to present a rodent to a veterinarian between respondents who
256 purchased the pet for a child (1.48 ± 0.666) and those who didn't (1.22 ± 1.528).

257 *Perceptions of and willingness to purchase pet insurance*

258 Most owners (57%, $n=971$) reported that they would not be willing to purchase pet
259 insurance for their rodent, 38% ($n=653$) would purchase insurance, and 4% ($n=76$)

260 already had insurance. The main reason in favour of insurance was financial
 261 protection (34.4%), with the main disadvantage being additional monthly costs
 262 (33.1%). Most rodent owners that also had a dog or cat (58%, n=975) had pet
 263 insurance for their dog or cat (69%, n=682). There was a statistically significant
 264 association between both region ($H(10)=19.742$, $p=0.032$) and income ($H(5)=11.197$,
 265 $p=0.048$) and owner perception of the importance of insuring dogs and cats over
 266 rodents. However pairwise comparisons found no significant differences between
 267 individual groups ($p>0.05$). There was a statistically significant association between
 268 age group and willingness to purchase insurance ($\chi^2(10)=19.612$, $p=0.03$) with
 269 significantly more 18–24-year-olds willing to purchase pet insurance and significantly
 270 less 35-44-year-olds willing to purchase insurance. Other demographic variables
 271 such as income did not significantly affect willingness to pay for pet insurance
 272 ($p>0.05$). There was also a statistically significant association between species
 273 owned and willingness to purchase insurance ($\chi^2(8)=24.832$, $p=0.002$) and where
 274 the pet was obtained and willingness to purchase insurance ($\chi^2(8)=27.172$, $p<0.001$;
 275 Table 2; Table 3). There was a significant association between having a dog or cat
 276 insured and having a rodent insured ($\chi^2(2)=57.691$, $p<0.001$). Significantly more
 277 owners that had their dog or cat insured had also insured their rodent. There was a
 278 significant association between whether the rodent was purchased for a child and
 279 willingness to purchase insurance ($\chi^2(2)=11.421$, $p=0.003$) with respondents who
 280 purchased the rodent for a child less likely to purchase pet insurance.

281 **Table 2.** Crosstabulation of 'Species' and 'Would you be willing to purchase pet
 282 insurance?' Adjusted residuals appear in parenthesis below observed frequencies.
 283 Significant adjusted residuals are presented in bold text.
 284

Species	'Would you be willing to purchase pet insurance?'		
	Yes	No	Already Have
Guinea Pig	311 (1.3)	418 (-2.4)	46 (2.7)
Hamster	202 (1.1)	279 (-0.7)	19 (-0.9)
Rat	84 (-3.5)	198 (4.4)	6 (-2.2)
Gerbil	36 (0.6)	47 (0.6)	4 (0.1)

Mouse	20 (0.2)	29 (0.1)	1 (0.9)

285 **Table 3.** Crosstabulation of 'Where pet was obtained' and 'Would you be willing to
 286 purchase pet insurance?' Adjusted residuals appear in parenthesis below observed
 287 frequencies. Significant adjusted residuals are presented in bold text.
 288

Where Pet was Obtained	'Would you be willing to purchase pet insurance?'		
	Yes	No	Already Have
Pet Shop	284 (3.8)	330 (-3.8)	30 (0.3)
Rescue Centre	149 (-2.1)	261 (1.3)	26 (1.7)
Breeder	135 (-2.1)	251 (2.8)	11 (-1.9)
Gifted	11 (-0.7)	19 (-0.1)	4 (2.1)
Other	74 (0.2)	110 (0.3)	5 (-1.3)

289

290 DISCUSSION

291 This study aimed to ascertain rodent owner use and perceptions of veterinary
 292 services. Owners were generally confident in recognising symptoms of illness, with
 293 rat owners demonstrating the highest confidence and the strongest pet-owner bond.
 294 Increased veterinarian knowledge and confidence was reported from owners who
 295 presented to veterinarians who are specialists in exotics. Financial limitations
 296 associated with veterinary care were common, affecting willingness to purchase
 297 medication and pet insurance. Lastly, owners who purchased the pet for a child were
 298 less willing to partake in veterinary spending.

299 *Demographics*

300 Most respondents identified as female, which is consistent with many questionnaire-
 301 based studies (10,25,26). Women with no children develop stronger pet-owner

302 bonds and are more likely to own pets, which could provide motivation to fill out a
303 survey regarding their care (27,28). Respondents had a median age of 25-34, with
304 the least engagement from those aged 65+. Rodents were most commonly obtained
305 from a pet shop which is consistent with other studies of pet rodents (9,29). This
306 could be due to the convenience of being able to purchase both the pet and
307 resources simultaneously, or to enable prospective owners to seek advice (30).
308 Despite pet ownership being more likely in families with children (28), just 17% of the
309 rodents in the present study were purchased for children, however in previous
310 literature, 27-39% of rabbits were purchased for children (24,26). This discrepancy
311 may be due to species differences, with rabbits being a more popular pet for
312 children, but literature on how many rodents are purchased for children is currently
313 lacking.

314 *Confidence in recognising signs of ill health*

315 Owners were generally confident recognising symptoms of ill health, with a positive
316 correlation between perceived confidence and symptom recognition score, which
317 aligns with previous research of guinea pig owners (31). Rat owners had the highest
318 confidence in identifying signs of ill health, perhaps due to the strong bond pet-owner
319 bond observed for rats (17). Additionally, rats are a larger and slower species than
320 some of the smaller rodents (2), therefore handling is easier which may result in
321 more efficient health checking. Hamster owners were least confident in identifying
322 signs of ill health in their pets. Hamsters are nocturnal in captivity (32), whilst rats are
323 polyphasic sleepers (33), which may affect the frequency of owner interaction and
324 behaviour observation.

325 Acquiring a pet from a rescue centre or breeder was associated with higher
326 confidence in identifying signs of ill health than those who purchased from pet shops
327 or were gifted their rodent. This is consistent with research that demonstrated that
328 rabbit owners who acquired their pet from a rescue centre had the highest health
329 and welfare knowledge (34). While more research is needed, those who are more
330 likely to rescue may already possess enhanced knowledge on their species,
331 whereas those who were gifted a pet may have reduced confidence due to limited
332 time to complete prior research (35). Owners who purchased the rodent for a child
333 had reduced confidence in recognising illness in their pet. It may be that these pets

334 were more likely impulse purchases dependent on the child's interest, or because of
335 media trends (36). People with lower incomes were more confident in identifying
336 signs of ill health, it is unclear of the reasons for this, but these could be younger
337 people who may be purchasing the pet for themselves rather than for a child. These
338 individuals may therefore be more invested in their pet and likely to identify signs of
339 ill health.

340 *Perceptions of veterinary services*

341 As rodents are popular pets, it is important for veterinarians to be knowledgeable
342 regarding their health and husbandry (37). In the present study, most rodents were
343 purchased for an adult and had been presented to a veterinarian. Furthermore,
344 owners who had utilised exotics specialist vets (either as first opinion or following
345 referral) had increased confidence in their expertise than respondents who had only
346 utilised general practice veterinarians. Whilst this finding supports the use of
347 specialist veterinarians for rodents, this may not be possible for all owners due to
348 accessibility of these veterinarians and cost. It has already been highlighted in
349 literature that affordability of veterinary care may be challenging for some owners
350 due to the range of cost intensive diagnostic and therapeutic options (38), limiting the
351 quality of care a veterinarian can provide, which can cause frustration for both
352 owners and veterinarians (39). The present study found that owner age was
353 associated with willingness-to-pay for medication, with significant differences
354 between younger adults and middle-aged adults. Despite middle-aged adults having
355 the highest average disposable income (40), their reduced willingness-to-pay may be
356 a result of alternative spending priorities especially if they have dependents. This
357 may also account for the lower willingness to present to a veterinarian and
358 willingness-to-pay for medication from owners who purchased the rodent for a child.
359 Interestingly, annual income was not associated with willingness to pay for veterinary
360 services in the present study.

361

362 The veterinarian-client bond affects the perception of care quality and value (41), yet
363 there were mixed reports of the compassion offered by referral exotic veterinarians in
364 the present study. Often, there is not a pre-existing rapport between the client and
365 referral veterinarian, which may affect the compassion shown due to limited

366 knowledge of the client's history (42). Subsequently, reduced trust in their ability to
367 offer compassionate care may present a barrier to seeking veterinary attention (43).
368 Successful treatment recommendations should be supported by empathy and trust;
369 however, confusion and poor veterinary support is more likely to result in a negative
370 experience (41). Rodents can deteriorate rapidly when unwell, therefore may be
371 presented in a more severe state, causing a worse prognosis (9), and subsequent
372 emotional distress in owners. Veterinarians often recommend twice yearly veterinary
373 check-ups to recognise early indicators of disease, allowing rapid therapeutic
374 intervention. However, only 22% of rabbits and 12.8% of guinea pigs receive regular
375 health checks (9,11), which indicates the frequency for other rodent species is likely
376 lower.

377

378 Despite presentation of rodents becoming more common in veterinary practices,
379 there are limited licenced therapeutics available for their use (44), which may impact
380 owner willingness-to-pay for medication. However, owners who utilised an exotic
381 veterinarian appreciated the wider variety of medications available.

382 *Pet insurance*

383 Whilst many pet owners were not willing to purchase pet insurance for their rodents,
384 there is still some demand for insurance. Although this demand is lower than in other
385 companion animals such as dogs, where 65% of owners would be willing to use
386 insurance (38), there has been an incline in interest for other species (45). In the
387 present study, 4% of rodents were insured. This is a low number relative to
388 ownership popularity, and a lot less than for dogs, cats and rabbits where 27.9%,
389 18.5% and 9.1% were insured respectively (46). This may be a result of reluctance
390 to spend money on animals which are commonly perceived as a 'cheap pet' (4).
391 Furthermore, companies offering insurance for rodents are much more limited than
392 for dogs, cats and rabbits, meaning owners may not be aware of the options
393 available or may lack confidence in less well-known insurance companies. Previous
394 research has also shown that 45% of owners would rather use savings to pay for
395 sporadic vet bills, which may also be the case for rodent owners (38). Hidden snags
396 in insurance policies may also deter owners from insuring their pets (47).

397 Rodent owners aged 18-24 were more likely to purchase pet insurance, which aligns
398 with research into dog owners where likelihood of purchasing pet insurance was
399 higher for younger owners (45). The present study found that having a cat or dog
400 insured was significantly associated with having a rodent insured for respondents
401 that owned multiple species. In previous research, dog and cat owners had a weaker
402 bond with their pet rabbits (12), which may cause owners to prioritise their spending
403 on dogs and cats (47), rather than rodents. Guinea pig owners were most likely to
404 already have insurance, whereas rat owners were less likely to purchase insurance.
405 Guinea pigs have the longest lifespan of the rodent species included in the present
406 study living an average of 5-7 years (48) whereas rats only live for approximately 2
407 years (17), which may influence the decision not to insure. Conversely, rat owners
408 were more willing to purchase medication for their pet compared to guinea pig and
409 hamster owners, potentially as a result of the stronger pet-owner bond.

410 Acquiring a rodent from a pet shop was associated with reduced willingness-to-pay
411 for medication but was associated with increased willingness to purchase insurance.
412 Owners who acquired their pet from a breeder or rescue centre were less likely to
413 get their pet insured. Reasons for this are unclear, however, rescued pets may have
414 pre-existing medical conditions (49), which may deter owners from taking out
415 insurance if these conditions cannot be covered. Purchasing a pet for a child was
416 associated with reduced willingness to purchase insurance. This could be a result of
417 the perception that these species are a 'starter pet', which has been found to
418 significantly lower the chance of providing regular healthcare in rabbit owners who
419 purchased the pet for a child (11). Previous research also showed that owners with
420 children had a weaker bond with their pets, which ultimately affects the perceived
421 value of the animal, possibly consequently affecting consumer spending (50).

422 *Limitations and future research*

423 The main limitation of this study was that the sample population may have an
424 overrepresentation of enthusiastic, knowledgeable owners, which is common in pet-
425 based questionnaires (9,10,20). However, as many of these respondents had utilised
426 veterinary services, the data are meaningful. This limitation could be addressed in
427 future work by conducting a nationally representative study of rodent owners. Further
428 study regarding opinions of veterinary services for rodents utilising a qualitative

429 approach could allow for deeper understanding of the experiences and reasoning of
430 participants (51). Future work could utilise focus groups to gain opinions of pet
431 owners and veterinarians on the care of rodents (52). As the present study asked
432 participants to complete the survey for one pet, further research could consider how
433 the number of pets owned affects owner spending on veterinary care, as some
434 rodent species require conspecific company and the number of animals owned may
435 alter spending behaviour. Similarly, the research conducted by owners prior to
436 acquiring their rodents could be investigated in relation to veterinary service
437 utilisation, as those who impulse purchased their pets may show different frequency
438 of presentation compared to experienced owners, as seen in rabbit owners (26). In
439 the present study, owners self-rated their knowledge of signs of ill health in their
440 pets, however, it is possible they did not accurately rate their own knowledge. Future
441 work could compare owner reported awareness of the health and husbandry of
442 rodents to their actual knowledge. In this study, the survey asked about experiences
443 with vets that specialise in exotics, but participants were not asked what
444 qualifications, if any specialists they had seen had held. This is something that could
445 be explored in further work to distinguish between veterinarians holding specialist
446 qualifications and those that just have an interest and expertise in rodents.

447 In conclusion, owners generally perceived themselves to be knowledgeable on
448 symptoms of ill health in their pets. Perception of veterinarian knowledge was higher
449 for owners who had presented their pet to exotics specialist veterinarians. Annual
450 income did not affect willingness to pay for veterinary services in the present study.
451 However, where rodents were purchased for children, owners were less confident in
452 identifying signs of illness, less willing to spend money on veterinary care and less
453 likely to purchase pet insurance. This does present a concern about the welfare of
454 rodents purchased as pets for children and more work is required to explore this
455 issue further.

456 **Author Contributions** Lucy James and Alison Wills both contributed to study design.
457 Lucy James administered the survey and analysed the data. Lucy James and Alison
458 Wills both contributed to the manuscript creation.

459 **Acknowledgements** The authors would like to thank all the rodent owners who took
460 part in the survey.

461 **Conflict of Interest Statement** This project did not receive any funding from any
462 agency in the public, commercial or not-for-profit sectors.

463 **Ethics Statement** Ethical approval for this study was granted by Hartpury University
464 Ethics Committee on 27.10.2023 (ETHICS2023-14).

465 **Data Availability Statement** The data that support the findings of this study are
466 available on reasonable request by contacting the corresponding author.

467

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