



# Prevalence and factors associated with overweight and obesity in cats in veterinary hospitals in France during the COVID-19 pandemic

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## Abstract

**Objectives** The present study aimed to determine the evolution of the percentage of overweight and obese cats during the COVID-19 pandemic in France, and to identify factors associated with excess weight to inform the development of targeted prevention strategies.

**Methods** Cat owners visiting the veterinary hospitals of Maisons-Alfort and Toulouse between 2020 and 2022 for their pets' vaccinations were invited to answer a comprehensive questionnaire to gather general information about themselves and their cat, including details of its lifestyle, activity and diet. Only healthy adult cats were included in the study. During the vaccination consultation, veterinarians recorded the body condition score, muscle condition score and weight of each cat. This study followed a protocol adapted from a French study conducted in 2006 to allow analysis of any changes over time.

**Results** Of the 274 cats included in the study, 9.1% were underweight, 43.4% had an ideal body condition and 47.5% were overweight. Factors positively linked to overweight included age, being crossbred, being a male and having an owner who underestimated the cat's body condition. Living with a child and having a high activity score as rated by the owner were associated with ideal body condition. The prevalence of cats with a sedentary lifestyle and the number of overweight cats had both increased since the previous study in 2006. Additionally, changes in cats' diets and lifestyles over time, including those influenced by the COVID-19 pandemic, have led to an increase in exclusive dry food consumption compared with the 2006 study.

**Conclusions and relevance** Important changes in cats' diet and lifestyle occurred between 2006 and 2020–2022. This study emphasises the need for further investigation into the duration of the impacts of the COVID-19 pandemic on feline wellbeing. Educating owners on their cat's body condition and encouraging cats to be active can be effective strategies for maintaining feline health in response to ongoing global changes.

## Plain language summary

This study aimed to understand how the number of overweight and obese cats in France changed during the COVID-19 pandemic and to identify factors contributing to cats becoming overweight. Understanding the factors leading to obesity in cats is important because it impacts their health and quality of life. Societal transformations over time and during the COVID-19 pandemic have altered people's routines and lifestyles, potentially affecting their pets. This study focuses on how these changes impacted cats' body condition.

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From 2020 to 2022, cat owners visiting veterinary hospitals in Maisons-Alfort and Toulouse for their pets' vaccinations were asked about their own and their cat's lifestyle, activity and diet. Only healthy adult cats were included. Veterinarians recorded each cat's weight, body condition and muscle condition, using a method from a previous study to allow comparison of changes over time. The study included 274 cats. It found that 9.1% were underweight, 43.4% had an ideal weight and 47.5% were overweight. Overweight cats were often older, male, mixed breed and had owners who underestimated their weight. Cats with an ideal weight were more likely to live with children and be more active. During the pandemic, changes in diet and lifestyle, such as increased dry food consumption and reduced activity, could have led to more overweight cats, similar to trends seen in humans. These findings highlight the need for ongoing research into the long-term effects of the COVID-19 pandemic on pet health. Educating owners about maintaining their cats at a healthy weight and encouraging more activity can help keep cats healthy in the face of lifestyle changes.

**Keywords:** COVID; diet; France; nutrition; obesity; overweight

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## Introduction

Cats have undeniably secured their place as the most beloved pets in France, with an increasing population of 15 million feline companions in 2020.<sup>1</sup> However, despite their popularity, research on French cats remains scarce, with the last comprehensive study on their overweight status dating back to 2006.<sup>2</sup> Just like in humans, the prevalence of overweight and obesity in cats is a growing concern, as it has been linked to various diseases, such as urinary disorders, diabetes mellitus, neoplasia, skin diseases, locomotor disorders, respiratory disorders and trauma.<sup>3–6</sup> Moreover, obesity has been shown to significantly impact both the quality of life and the lifespan of cats.<sup>7</sup>

Recent studies conducted in veterinary practices across Europe have raised significant concerns regarding the prevalence of excess body weight in cats. Notably, studies from Sweden conducted between 2013 and 2015<sup>4</sup> and Italy published in 2021<sup>8</sup> have reported alarmingly high prevalence rates of 45% and 51%, respectively. While the last study conducted in France revealed a prevalence rate of 26.8%, it is reasonable to assume that the prevalence of excess body weight among French cats has likely increased, given the rising prevalence of human obesity and the comparative rates across Europe.<sup>9</sup> In light of the far-reaching societal transformations since 2006 and those triggered by the COVID-19 pandemic, it becomes imperative to reevaluate the prevalence of overweight and obesity in French cats.

The COVID-19 pandemic left an indelible mark on the daily lives of both people and their companion animals. Alterations in exercise habits, a rise in home-cooked meals and increased indoor activities represent just a few examples of how the pandemic may have shaped the lifestyle of humans.<sup>10,11</sup> Moreover, the pandemic underscored the importance of the human-cat connection, with a rise in both emotional closeness and cat-owner interactions

during lockdown periods.<sup>12</sup> However, lifestyle changes were already underway before the pandemic, with growing concerns about road traffic and outdoor safety driving more cat owners to adopt exclusively indoor living for their pets.<sup>13</sup> This shift, along with altered human routines, could plausibly influence feline weight and overall wellbeing, similar to how such changes have been linked to weight gain in humans.<sup>14,15</sup>

To address this pressing issue, one of the most effective approaches is to identify the risk factors associated with excess body weight in cats. By identifying these factors and intervening before overweight occurs, it becomes possible to regulate and control the weight of cats more effectively. Existing literature has highlighted several factors that contribute to overweight in cats, ranging from intrinsic factors such as age,<sup>16,17</sup> sex,<sup>3,18</sup> neutering status,<sup>8,19</sup> crossbreeding and British shorthair purebred cats,<sup>20</sup> to owner-related factors including misperception of the cat's body condition score (BCS)<sup>8,21</sup> and dietary practices.<sup>22</sup> Environmental factors, such as living without children<sup>2</sup> and reduced activity levels,<sup>4</sup> have also been associated with feline obesity.

The objectives of this study were two-fold: first, to reassess the prevalence of excess body weight in French cats and compare this with the data from 2006 and, second, to identify the factors associated with overweight among cats. The aim was to provide valuable insights to assist veterinarians in adjusting their discussions on overweight for the present cat population and offering better guidance to owners. Through the understanding of the specific factors contributing to feline obesity, a collective effort can be made to improve cats' welfare.

## Materials and methods

### *Data collection*

Between 2020 and 2022, cat owners visiting the veterinary hospitals in Toulouse and Maisons-Alfort, France, were

invited to participate in this study. Only healthy cats aged over 1 year were recruited as growth and chronic diseases influence energy requirements.<sup>23</sup> Cats not accompanied by their main owner were excluded from the study.

Before any interaction with the veterinary staff, owners were asked to complete a comprehensive questionnaire in the waiting room. Then, the attending veterinarian recorded the cat's weight and BCS. For cats with multiple visits during the study period, only data from the initial consultation were included in the analysis.

### Questionnaire

The questionnaire, previously used as an online survey by Hoummady et al,<sup>24</sup> was adapted for in-person completion (see supplementary material, File S1). It can be separated into five parts: general cat information, owner's information, lifestyle, activity and diet.

The general cat information section included questions about the cat's age, breed, neutering and age at neutering. The lifestyle and activity section included questions about the place of living, presence of a child or other animals and time spent outdoors. The owners were also asked to rate their cat's activity from 0 ('not at all active') to 10 ('extremely active'), which was considered a quantitative variable for statistical analysis.

The owners' information section consisted of questions regarding the primary owner, as well as potential secondary owner(s), including their age. The respondent was also asked to assess their cat's body condition using a five-category scale: 'very skinny', 'a bit skinny', 'ideal weight', 'a bit fat' or 'very fat'. These categories were then compared with corresponding BCS ranges: 1–2; 3–4; 5; 6–7; and 8–9, respectively. This approach allowed the classification of owners' perception into three categories: 'underestimation', 'good estimation' and 'overestimation'.

The diet section included questions about the food type (homemade or processed, dry or canned, grain-free, vegan ...), the place of purchase of food, the distribution mode, rewards and leftovers.

### Clinical assessment

Body condition assessment of cats was conducted using the validated nine-point BCS scale.<sup>25</sup> To ensure consistency and reproducibility, all veterinarians participating in the study underwent comprehensive training in BCS scoring. Before commencing the study, veterinarians from each veterinary hospital dedicated a day to train together, assessing the BCS of 30 cats and reaching a consensus on their ratings. This rigorous training process aimed to establish consistency among the veterinarians in evaluating the cats' body condition. Cats with a BCS <5 were categorised as underweight, while a BCS of 5 indicated an ideal body condition.<sup>25</sup> Cats with a BCS >5

were classified as overweight, encompassing those with a BCS of 8–9/9, which can also be classified as obese.<sup>26</sup>

An attempt to assess muscle condition score (MCS) was made with the use of a muscle condition scoring scale.<sup>27</sup> However, the scores showed a strong correlation with the veterinary school attended by the evaluating veterinarians, suggesting a lack of interobserver agreement. As a result, MCS was excluded from the analysis.

### Statistical analysis

All statistical analyses were conducted using R, version 4.2.2 (R Foundation). The dependent variable was body condition categorised as ideal (used as the reference in the statistical analyses) or overweight, rather than BCS, as both an increase and a decrease in BCS can be associated with health issues.<sup>16</sup> Due to the low number of underweight cats, this group was excluded from the analysis, resulting in a comparison solely between overweight and ideal body condition cats. Categorical variables with  $P < 0.2$  for  $\chi^2$  and continuous variables with  $P < 0.2$  for  $t$ -test were selected for the multivariable analysis.<sup>20</sup> The veterinary school and animals' identification were included as random effects in the analysis.<sup>20</sup> The final mixed-effects logistic regression model was built using a stepwise backward elimination process based on the Akaike information criterion. The remaining variables were sex, neutering status, age, presence of children in the household, purebred status, activity score and the accuracy of body condition estimation by the owner. Cases with missing data in these variables had to be excluded and 240 cats remained in the final analysis. The model's validation was evaluated by visualising the residuals vs fitted values plot. Multicollinearity was checked using variance inflation factors.<sup>8</sup> Type-III ANOVA was conducted to obtain  $P$  values.  $P < 0.05$  was considered statistically significant.

## Results

### Cat population description

The total population comprised 274 cats. A majority of the cats (74%) were classed as young adults (1–6 years), 13% were mature adults (7–10 years) and 13% were senior cats (10 years and older).<sup>28</sup> Most (88.7%,  $n = 243$ ) were crossbred, with Siamese (2.6%,  $n = 7$ ), Birman (1.8%,  $n = 5$ ) and Persian (1.5%,  $n = 4$ ) being the most represented purebreeds. Male cats accounted for 48.5% of the population and female cats for 51.5%. The majority of the cats (92.0%) were neutered. Within the population, 9.1% ( $n = 25$ ) of the cats were underweight (BCS <5), 43.4% ( $n = 119$ ) were at their ideal weight (BCS = 5) and 47.5% ( $n = 130$ ) had excess body weight (BCS >5); 2.9% of the total population were classified as obese (BCS >7). A full description of the population can be found in the supplementary material (File S2).

**Table 1** Significant results from univariable analysis

Characteristic	Ideal, n = 119	Overweight, n = 130	P value*
Purebred	20 (17%)	7 (5.4%)	0.004
Food type			0.007
Dry	65 (56%)	79 (63%)	
Canned	8 (6.9%)	0 (0%)	
Mix	43 (37%)	46 (37%)	
'Light' diet	80 (69%)	107 (85%)	0.003
Begging behaviour	21 (18%)	39 (31%)	0.021
Owner perception			<0.001
Underestimation	12 (10%)	54 (42%)	
Good	97 (82%)	71 (55%)	
Overestimation	10 (8.4%)	5 (3.8%)	
Age (years)**	2.92 (1.75–5.79)	4.54 (2.67–7.98)	<0.001
Activity score**	6.00 (5.00–8.00)	5.00 (4.00–7.00)	<0.001

\* $\chi^2$  test for categorical variables, *t*-test for continuous variables

\*\*Median (interquartile range)

### Housing and ownership

The majority of the pet owners (37.6%, *n* = 103) were young adults, aged 18–25 years; 35.0% of the owners were aged 26–40 years and 17.5% were aged 41–60 years. A smaller percentage (8.8%) were over 60 years old, and 1.1% did not provide their age. The majority of cat owners lived in apartments (65%) rather than houses (33%); 77% of households comprised more than one individual and 28% of the cats lived with at least one child. Interestingly, 41% of the cats did not have any access to the outdoors.

### Diet

Fifty-eight percent of the cats ate only dry food and 3% ate exclusively canned food, while 35% consumed a combination of both dry and canned food, and the remaining 4% were fed a homemade diet. Cat food purchases were primarily made at supermarkets (44.7% for dry food and 54.4% for canned food), followed by pet stores (42.0% for dry food and 38.8% for canned food) and veterinary clinics (13.3% for dry food and 6.8% for canned food). In terms of dietary variety, 39% of cats were regularly fed meat or fish and 41% received commercial cat treats. The majority of cats never received treats (58.8%) or food intended for human consumption (68.6%). In relation to feeding schedules, 55% of cats had ad libitum access to food, 34% were provided with multiple meals per day and 11% were fed only once daily.

### Univariable analysis

The results of the univariable analysis revealed significant associations between several categorical variables and overweight status in cats. Crossbred cats (*P* = 0.004), cats eating only dry food (*P* = 0.007), cats eating 'light' food (*P* = 0.003), cats exhibiting begging behaviour (*P* = 0.021)

and cats with owners who underestimated their body condition (*P* < 0.001) were more likely to be overweight. Among continuous variables, age (*P* < 0.001) and activity score (*P* < 0.001) were significantly associated with overweight. The median age of cats with an ideal body condition was 2.9 years (interquartile range = 1.8–5.8 years) compared with 4.5 years (interquartile range = 2.7–8.0 years) for overweight cats (Table 1).

### Results from the multivariable analysis

The multivariable analysis included 240 cats. Age of the cat (odds ratio [OR] = 1.17, *P* = 0.002), being a male (OR = 1.89, *P* = 0.043) and having an owner who underestimated the cat's body condition (OR = 11.15, *P* < 0.001) were found to be factors associated with overweight. Being purebred (OR = 0.13, *P* = 0.001), the activity score (OR = 0.76, *P* = 0.002) and the presence of children in the household (OR = 0.43, *P* = 0.021) were found to be associated with ideal body condition (Table 2).

## Discussion

This study aimed to reassess the prevalence of overweight and obesity in French cats, given the absence of a comprehensive evaluation since 2006, amid rising human overweight rates.<sup>2,9</sup> Additionally, it sought to identify factors associated with feline overweight to address this growing concern. The study found that 47.5% of cats had excess body weight (BCS > 5), including 2.9% that were classed as obese (BCS > 7). Factors associated with overweight included age (in years), male sex and owners underestimating their cat's body condition. Conversely, factors associated with ideal body condition were being purebred, having higher activity scores and living with children.

**Table 2** Results of multivariable analysis

Predictors	n	Odds ratio	95% confidence interval	P value*
Age	240	1.17	1.06–1.29	0.002
Purebred (Yes)	27	0.13	0.04–0.42	0.001
Sex (Male)	128	1.89	1.02–3.51	0.043
Neutered (Yes)	229	1.38	0.41–4.66	0.607
Activity score	240	0.76	0.64–0.90	0.002
Children at home (Yes)	68	0.43	0.21–0.88	0.021
Owner perception				
(Underestimation)	66	11.15	4.65–26.71	<0.001
(Overestimation)	15	0.42	0.12–1.42	0.161

n = number of cats (total number for continuous variable, number in the category for categorical variable)

\*Type-III ANOVA

While the sample size was relatively small, rigorous methodology and comprehensive multivariable analysis were employed, ensuring data reliability and identifying independent associations with overweight. The study population, primarily from veterinary university hospitals, may not fully represent the general cat and owner population in France, but comparability with previous hospital-based studies exists.<sup>2–4</sup> Moreover, one aim of the current study was to compare cats' lifestyles and body conditions with a study conducted in 2006, using the same study population.<sup>2</sup> While that study included cats aged 2 months to 1 year, which may not be ideal for the current research focus, it remains the only available data for comparison in France. Since the questionnaire was self-reported, responses may have been influenced by social desirability bias, where owners provide answers they believe are more acceptable, such as regarding treats, leftovers or activity score.<sup>29</sup> To minimise this bias, the questionnaire was completed anonymously, without the presence of veterinary staff,<sup>29</sup> and phrased in a non-judgmental manner.<sup>30</sup> Despite these limitations, this study contributes valuable epidemiological insights into the status of French cats, addressing a scarcity of scientific papers on feline nutrition in France.

This study highlighted significant shifts in the dietary and lifestyle patterns of cats over time and during the COVID-19 pandemic. Exclusive dry food consumption increased notably, rising from 36% in the 2006 study in France<sup>2</sup> to 58% in this investigation. Conversely, the prevalence of mixed feeding practices decreased sharply from 56% to 35%. A clear shift in food purchasing habits was observed, with supermarket purchases decreasing significantly: dry food purchases dropped from 79.9% to 44.7%, and canned food purchases fell from 94.8% to 54.4%. Concurrently, purchases from pet stores increased markedly, with dry food rising from 12.8% to 42.0% and canned food from 4.1% to 38.8%. Additionally, veterinary

clinics saw an increase in food purchases, with dry food rising from 7.2% to 13.3% and canned food from 3.0% to 6.8%. This trend is not surprising, given findings from a 2020 survey indicating that brand reputation and perceived product healthiness are more influential than price in purchasing decisions.<sup>31</sup> Consequently, despite potentially higher costs, pet owners are increasingly opting to buy pet food from pet stores and veterinary clinics rather than supermarkets. Meanwhile, the consumption of commercially prepared snacks increased significantly, from 1.2% to 41.2%. This figure is more consistent with findings from a 2020 survey conducted in English-speaking countries (Australia, Canada, New Zealand, the UK and the USA), which reported that 61.2% of cat owners fed commercial treats to their pets.<sup>32</sup> The rise in treat consumption in France may reflect the growing trend of cat humanisation, as owners increasingly seek to bond with their cats by offering them treats.<sup>32</sup> In contrast to a related dog study that noted changes in feeding frequency,<sup>33</sup> there was no observed alteration in cat feeding schedules. The majority of cats continued to be fed *ad libitum*, accounting for 55% in this study compared with 49% previously. A sedentary lifestyle has begun to emerge, with 41% of cats lacking outdoor access (vs 29% previously). This shift toward an exclusively indoor lifestyle aligns with findings from the UK, where the proportion of indoor-only cats increased from 15% in 2011 to 26% in 2019, largely due to concerns about road traffic and protecting cats from people.<sup>13</sup>

A 1-year increase in a cat's age was found to be associated with a 17% rise in the odds of being overweight. This finding is consistent with previous studies indicating that middle-aged cats are more prone to overweight and obesity than younger cats.<sup>5,8,17,20</sup> Interestingly, geriatric cats have often been linked to a decreased risk of overweight, potentially linked to an increase in maintenance energy requirement after reaching 11 years of age.<sup>34,35</sup> This phenomenon might be influenced by concurrent geriatric diseases, especially hyperthyroidism and kidney disease.<sup>8</sup> In this study, the cats were relatively young and assumed to be in good health, preventing these concurrent diseases from affecting the analysis. The heightened odds of overweight could be attributed to age-related decreases in activity, a trend already observed in dogs.<sup>36</sup>

Being purebred was identified as being associated with ideal body condition, consistent with prior research revealing an elevated risk of overweight among mixed-breed cats.<sup>3,37</sup> The association between breed and overweight is likely attributable, in part, to the genetic component of this condition, as demonstrated by Haring et al,<sup>38</sup> who highlighted the role of genetics in overweight development in cats. Additionally, owners of purebred cats may be more aware of the risks associated with overweight and take proactive steps to prevent it, possibly due to guidance provided by breeders.<sup>17</sup> The most

prevalent purebred breed in our study population was the Siamese, representing 22.6% of all purebred cats. Siamese cats are typically lean,<sup>18</sup> suggesting that breed standards may influence the observed association between being purebred and maintaining an ideal body condition.<sup>17</sup> However, the number of purebred cats excluding Siamese was too small to conduct a separate analysis and confirm this hypothesis.

Consistent with existing literature, male sex was associated with overweight. Previous hypotheses suggested that male cats' larger body frame might pose challenges for owners in assessing their body condition.<sup>37</sup> This hypothesis gains support from findings that long-legged cats also show associations with overweight,<sup>39,40</sup> implying that morphology potentially influences owners' perception of weight. Another hypothesis is that male cats may exhibit a greater propensity for weight gain compared with female cats.<sup>41</sup> To delve into these two hypotheses further, future studies should include morphometric measurements of cats to investigate the impact of morphology on owners' perceptions of body condition.

Surprisingly, no significant association between neutering and overweight was identified in this study. This finding might be attributed to the limited number of intact cats in the sample (only 8%), reducing the statistical power of the analysis. The connection between neutering and feline overweight has been long established,<sup>19</sup> and is well recognised by veterinarians who routinely caution owners after the neutering process. This result could also underscore the effectiveness of preventive campaigns and the adaptation of pet food to meet the specific dietary needs of neutered cats, including hypocaloric and satiety-enhancing diets.<sup>42</sup>

The activity score was generated by asking owners to rate their cats' activity levels on a scale of 0 ('not at all active') to 10 ('extremely active'). An increase in the activity score was associated with ideal body condition, with a 24% reduction in odds of being overweight for each one-unit rise in activity score. Engaging in physical activity is vital for several health reasons, including boosting the metabolic rate, enhancing energy expenditure and stimulating mental wellbeing,<sup>43</sup> and play improves feline welfare by allowing cats to express their innate hunting behaviours.<sup>8</sup> Notably, physical activity contributes up to 30% of a domestic cat's total daily energy expenditure.<sup>44</sup> Conversely, excess body weight can hinder cats' ability to engage in physical activity, potentially resulting in lower activity scores. Longitudinal studies are needed to better understand the causal relationship between weight and activity levels. Assessing feline activity remains challenging, as owners may unconsciously associate obesity with inactivity.<sup>40</sup> It may be worthwhile to explore objective methods for assessing activity; pedometers have proven effective in measuring activity levels in dogs, revealing a significant link between reduced walking and canine

obesity.<sup>45</sup> Nonetheless, the 11-point Likert scale employed in this study demonstrates relevance and potential for use in future research, with further evaluation of its correlation with objective measures being of interest.

As observed in the 2006 study conducted under similar conditions in France, the presence of children in the household was associated with ideal body condition.<sup>2</sup> This observation was previously linked to the notion that children serve as playmates for cats, and their interactions can disrupt the cat's resting periods, thereby enhancing feline activity.<sup>2,40</sup> Alternatively, it is conceivable that parents may redirect their attention away from the cat, focusing more on their child, potentially resulting in the cat missing a meal or receiving fewer treats.<sup>40</sup> Additionally, this result may highlight the stronger bond that childfree 'pet parents' have with their cats, as they appear to be more invested in the care of their pets.<sup>46</sup> Indeed, a closer relationship with owners has previously been linked to overweight in cats.<sup>22</sup> Conversely, a previous study found that the number of children was positively associated with giving more supermarket biscuits and table scraps.<sup>17</sup> This variation may be attributed to differences in how owners perceive the place of cats within the family across different countries. In future studies, it would be valuable to include inquiries about the human-animal relationship and the nature of interactions between cats and children. Investigating whether cats might contribute to mitigating overweight in children, adopting a One Health approach<sup>47</sup> could further validate hypotheses regarding playmate and activity enhancement.

The factor most strongly associated with overweight in cats was underestimation of the cat's body condition. Cats whose owners underestimated body condition had 11.15-fold higher odds of being overweight. This result aligns with previous studies, which have also emphasised the significant impact of owner perception, revealing similar odds ratios (10.41).<sup>2</sup> When owners are unaware of their pet's overweight status, they are less likely to initiate weight loss interventions and monitor risk factors.<sup>48</sup> A previous study has highlighted a concerning trend: many cat owners reported not receiving guidance from their veterinarians regarding their pet's overweight condition.<sup>8</sup> Veterinarians should routinely document BCS and body weight during consultations,<sup>49</sup> and every owner should leave the consultation being aware of their pet's body condition.

We did not find any association between dietary factors, such as feeding treats, fish or meat, and dry food, and overweight or obesity in this cat population. Previous studies have linked feeding treats<sup>50</sup> and fish or meat<sup>22,39</sup> with excess body weight, as these foods contribute to overall caloric intake. However, one study found that feeding fish or meat was associated with an ideal body condition, possibly because the cats showed disinterest in their main diet and consumed less of it.<sup>17</sup> Dry food has

also been associated with excess body weight in several studies,<sup>4,19,51</sup> with the hypothesis that canned food may reduce voluntary energy intake due to its higher water content. In our study, however, after controlling for confounding factors, dry feeding was no longer associated with overweight in the multivariable analysis.

Compared with the prepandemic cat population, which also was from a veterinary hospital, there was an increase in overweight cats (44.5% excluding obese cats, compared with 19%) and a decrease in obesity (2.9% compared with 7.8%). Unfortunately, with only eight obese cats in this study, it was not possible to distinguish the factors associated with overweight from those linked to obesity. Although the literature on this topic is limited, neutering has been identified as a factor associated with overweight but not necessarily obesity.<sup>5</sup> The higher percentage of neutered cats in the current study (92% vs 61% in the previous one) could explain the rise in overweight prevalence, even though this study did not find neutering to be a statistically significant factor, possibly due to limited statistical power. Additionally, public awareness campaigns may have primarily impacted obesity, as social movements promoting body positivity and self-acceptance, despite being overweight, have proliferated on social media since 2006.<sup>52</sup> The decrease in obesity prevalence might suggest improved communication from veterinarians regarding obesity-related health risks, or it could indicate that owners are less likely to seek veterinary care for their obese cats. Thus, this study underscores the significance of assessing temporal and COVID-19-related changes in the wellbeing of cats and the importance of further research in this area.

In the light of these findings, it is important to note that previous research has suggested that cats with a BCS between 6 and 8 tend to have the longest survival and lifespan.<sup>7</sup> However, greater longevity does not always correspond to improved quality of life.<sup>7</sup> Cats that live longer while suffering from chronic diseases may experience diminished welfare. Therefore, future research should aim to explore the balance between longevity and welfare to provide a more comprehensive understanding of feline health outcomes.

## Conclusions

The study highlights the need to investigate the evolving trends in feline wellbeing, particularly the changes in cats' diets, lifestyles and the increasing prevalence of overweight cats over time. Moreover, the findings highlight the importance of recognising the impact of owner perception for implementing early intervention strategies, such as educating owners during consultations and conducting teaching sessions at the clinic. Finally, encouraging cats to be active can be an effective strategy to maintain feline health in response to ongoing global changes.

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**Supplementary material** The following files are available as supplementary material:

File S1. Complete questionnaire.

File S2. Full description of the population.


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**Ethical approval** The work described in this manuscript involved the use of non-experimental (owned or unowned) animals. Established internationally recognised high standards ('best practice') of veterinary clinical care for the individual patient were always followed and/or this work involved the use of cadavers. Ethical approval from a committee was therefore not specifically required for publication in *JFMS*. Although not required, where ethical approval was still obtained, it is stated in the manuscript.

**Informed consent** Informed consent (verbal or written) was obtained from the owner or legal custodian of all animal(s) described in this work (experimental or non-experimental animals, including cadavers, tissues and samples) for all procedure(s) undertaken (prospective or retrospective studies). No animals or people are identifiable within this publication, and therefore additional informed consent for publication was not required.

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