



## Reprint paper\*

# Health screening to identify opportunities to improve preventive medicine in cats and dogs

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## ABSTRACT

**Objectives:** To describe the results of a prevention campaign in terms of participation and pet health status and to identify opportunities to improve preventive medicine in cats and dogs.

**Methods:** An awareness campaign was designed to highlight the role of veterinarians and emphasise the benefits of a veterinary visit. Owners were invited to make an appointment for a free pet health check in a voluntarily participating veterinary clinic. Observations recorded by the veterinarians were entered in a database and subsequently analysed using simple descriptive statistics.

**Results:** A total of 5305 completed health check forms were analysed. The percentages of overweight and obese dogs and cats were 34 and 36%, respectively; this was the most common finding, followed by dental calculus (31% in dogs, 21% in cats). In total 67% of cats did not undergo flea control and 59% were not vaccinated.

**Clinical Significance:** Opportunities for increased quality of care are numerous given the high percentage of intact, unvaccinated or non-permanently identified pets and the low level of worm and flea control. Animal health should benefit from preventive measures, and improved management can be undertaken after early detection of diseases.

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## Introduction

In Belgium, the percentage of pets receiving veterinary care are estimated at 25 to 30% for cats and 40 to 55% for dogs (Degallaix 2014). Pets are rarely insured and there is no national database for medical care and frequency of disease or accidents. Many pets do not have basic preventive health care, as reported in the UK in the PDSA (2013). Because of the lack of routine check-ups, chronic diseases affecting old pets may not be detected early. In contrast, preventive medicine is currently developing and implementing specific

programs, for example vaccination, nutrition and geriatric health care are being actively recommended (World Small Animal Veterinary Association – WSAVA 2010, Freeman et al. 2011, Fortney 2012).

In this context, a major awareness campaign was designed in 2011 in the French-speaking part of Belgium (Brussels and south of Belgium).

The key principle was to offer owners the opportunity for their pet(s) to be given a physical health check free of charge. After an evaluation of preventive health care (vaccination, flea and worm control, body condition score and quality of diet and health status), clinical recommendations were given by the veterinarian.

Several objectives were taken into account in the development, set-up and design of the campaign: (1) to promote the roles of the veterinarian and regular visits for a complete

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health check-up, preventive medicine and to stimulate health care follow-up; (2) to analyse the data of the animals participating in the campaign and to obtain figures on preventive medicine and health status from a large pet population; and (3) to communicate the results to veterinarians and owners.

This report presents the main results of the campaign in terms of participation, pet health status and opportunities for the improvement of preventive medicine in dogs and cats.

## Materials and methods

### Design of the prevention awareness campaign

After preparation and agreement on the mechanism and design, the French-speaking Small Animal Veterinary Association of Belgium (SAVAB) informed all veterinary practices of the campaign's mechanism and objectives by post, e-mail and with a dedicated website (<http://www.saisondelaprevention.be>) providing the participation form, registration rules, and practical support in running the campaign. Veterinarians were invited to register on a voluntary basis and be listed as participants. By doing so, they agreed to allow prior and newly registered owners to present their pet(s) for a free health status check-up during the month of February 2011.

Practical support consisted of materials that explained the campaign to participating veterinarians, an invitation letter, leaflets, a frequently asked questions document, a waiting room poster, written information for the owners, and the health check form and a pet health guide to be distributed after the free health check. Another website, dedicated to owner registration, allowed them to provide their written consent and stated that no treatment or vaccination would be provided for free.

The health check form contained three parts (Table 1). The first part recorded owner details: name and address, animal description and questions about diet, housing, travel, vaccination, means of identification, veterinary visits, and parasite prevention including deworming status. The second part contained the data collected from physical examination, including bodyweight in kg (BW), body condition score (BCS) on a 5-point scale, and by system: Items 1 to 10 listed on the health check form. After physical examination, the veterinarian was also required to assess vaccination and deworming status, and the adequacy of the diet. For each item/system, the veterinarian selected "normal" or "abnormal" and added remarks. It must be noted that in

animals receiving veterinary care, veterinarians completed the form using terms such as "previously identified condition" or "treated for disease."

The third part of the health check form presented the follow-up care recommendations based on the abnormalities noted and also recorded any follow-up appointment made (e.g. blood or urine analysis, X-ray, therapy or surgery). For each animal presented, more than one disease could be recorded. Animals presenting without any obvious disease and with a BCS of 3/5 were considered healthy. Veterinarians were asked to be as precise and thorough as possible when completing the form. Owners received a written summary of the problems and recommendations.

Before the campaign, the health check form was tested at the veterinary faculty of Liège for 2 weeks. Thirty completed health check forms were obtained from four internal medicine residents and minor changes were made to specify the type of housing and the usual diet.

In order to participate, pet owners were asked to register themselves and their pets through the online website or via the call centre and to confirm their understanding of both the definition of the free health check and the participation rules. They had to print the health check form (Table 1) and take it to a participating veterinarian, to make an appointment, and to have the form completed by the veterinarian during the check. The forms returned by the veterinarians would then be collected by the SAVAB, processed and analysed by the Faculty of Veterinary Medicine, and a donation would be made (1 for each form collected) to the Guide Dogs for The Blind Association ([www.scaledogs.be](http://www.scaledogs.be)).

In order to inform pet owners of the prevention campaign, a broad media campaign was developed and launched from January 15 to February 20, 2011. The campaign was open to all dogs and cats whether they had visited a veterinarian previously or not. Participating owners and veterinarians were informed that the data resulting from the health check would be used for epidemiological analyses to study the population (Table 1).

### Data collection

The returned forms were encoded in an Access® (Microsoft) database by two veterinary students. These students (fourth year of the curriculum) were trained for 3 hours and coached by two senior veterinarians (first and co-author of this paper). They were randomly selected to process half

Table 1. Content of the health check form completed by the veterinarian

Season of Prevention 2011 – Health check form			
<b>Date:</b>			
<b>Owner</b>		<b>Identification</b>	<b>Visit to a vet</b> (in the last 12 months)
Name:		<input type="checkbox"/> Microchip	<input type="checkbox"/> Yes
Surname:		<input type="checkbox"/> Tattoo	<input type="checkbox"/> No
City:	City code:	<input type="checkbox"/> None	<input type="checkbox"/> Animal never visited a vet
Email:			
<b>Animal</b>		<b>During the last 12 months</b>	
Name:		Travel abroad: <input type="checkbox"/> Yes <input type="checkbox"/> No	If Yes: country:
Species: <input type="checkbox"/> Dog <input type="checkbox"/> Cat		Deworming: <input type="checkbox"/> Yes <input type="checkbox"/> No	If Yes: frequency:
Breed:		External anti-parasites: <input type="checkbox"/> Fleas <input type="checkbox"/> Ticks <input type="checkbox"/> Others	Frequency:
Birth date:	Age (years):		
<b>Environment</b>		<b>Diet</b>	<b>Bodyweight (kg):</b>
<input type="checkbox"/> City <input type="checkbox"/> Country		<input type="checkbox"/> Home-made diet	<b>Body condition score (BCS)</b>
<input type="checkbox"/> Apartment <input type="checkbox"/> Outdoor access		<input type="checkbox"/> Commercial diet	<input type="checkbox"/> 1 (very thin)
<b>Gender</b>		<b>Type:</b>	<input type="checkbox"/> 2 (thin)
<input type="checkbox"/> F <input type="checkbox"/> SF <input type="checkbox"/> M <input type="checkbox"/> CM		<input type="checkbox"/> dry <input type="checkbox"/> wet	<input type="checkbox"/> 3 (normal)
		<input type="checkbox"/> Mixed diet (home-made + commercial)	<input type="checkbox"/> 4 (overweight)
			<input type="checkbox"/> 5 (obese)
<b>Clinical examination</b>	<b>Normal</b>	<b>Observed problems</b>	<b>Remarks</b>
1. BW /BCS			
2. Skin			
3. Mouth – Teeth			
4. Ears & hearing			
5. Cardiac system			
6. Respiratory system			
7. Gastro-intestinal system			
8. Urinary system			
9. Genital system			
10. Locomotor system			
11. Vaccination status (last 12 months)			
12. Deworming status			
13. Diet adapted to health/life/age			
14. Follow-up Recommendation			
An appointment has been taken with the owner at this date:     /     /			
<b>Stamp, date and signature of the vet:</b>		To be sent to SAVAB before the end of March For each completed form, 1 euro will be given to the association SCALE dogs, to support the training of guide dogs for the blind. Data of this form will be collected and analysed in collaboration with the Companion animal Nutrition Unit of the Veterinary Faculty of the University of Liège.	

of the forms and allowed to request guidance from senior veterinarians for doubtful records to ensure accurate data entry.

All data reported on the forms (Table 1) were included in the database. Breed data were entered using a menu list with the possibility of adding new breeds. Any breed combination was coded as a mixed breed. Diagnostic categories included the Items 1 to 10 used in the form (or location code) and diagnostic codes. The list of diagnostic codes was dynamic, and the number of terms and synonyms grew with participant use. This permitted all levels of definition of a sign or a diagnosis to be collected, from a vague problem (e.g. polyuria) to a specific diagnosis (e.g. known renal disease). Terms and codes were matched to the Systematized Nomenclature for Medicine and Veterinary Medicine to facilitate analysis and future comparisons (College of American Pathologists 2002).

### Statistical methods

The Access® database was used to generate prevalence estimates. The prevalence of the various disorders was calculated by dividing the number of cats or dogs for which the specific diagnostic code had been recorded at least once during the study by the total number of cats and dogs presented during the same period. Confidence intervals, with confidence levels of 95%, were estimated using an exact binomial method in a Microsoft® Excel spreadsheet (Clopper & Pearson 1934). No correction for multiple testing was performed, which reinforces the need to consider the results reported as significant with some caution. Associations

between age classes and various disorders were tested using Chi-square tests on the corresponding contingency tables. A value of <0.05 was considered significant.

## RESULTS

### Practice and owner participation

In total, 470 veterinary practices (791 veterinarians, 60% of the veterinarians registered as companion animal practitioners in the same area) registered to participate in the campaign. Among them, 350 veterinary practices returned at least one completed form. A total of 13,287 pet owners registered a total of 17,938 pets (57% dogs, 43% cats). A total of 5305 (56% dogs, 44% cats) completed health check forms were returned.

### Population description

Age distributions for cats (n=2260) and dogs (n=2929) are presented in Fig 1. Because of the observed asymmetry in the age distributions, medians were computed and values of 5.0 (IQR – 25th percentile subtracted from the 75th percentile – 6.7) and 4.5 (IQR 7.2) years were obtained for dogs and cats, respectively. The age of 12% of the dogs and 17% of the cats were below one year, while 41% of the dogs and 36% of the cats were above seven years of age. Medians of BW for the dog and cat populations were 12 (IQR 16) and 4 (IQR 4) kg, respectively. Table 2 presents data on gender and breed. Information on diet was provided for 2796 dogs and 2319 cats. For most cats (83%) and dogs (65%), the major diet component was a commercial food; 16% of cats and 30% of dogs were fed mixed diets (commercial

FIG 1. Age (year) distribution (%) for 2260 cats (■) and 2929 dogs (■) examined at private practices during the prevention campaign

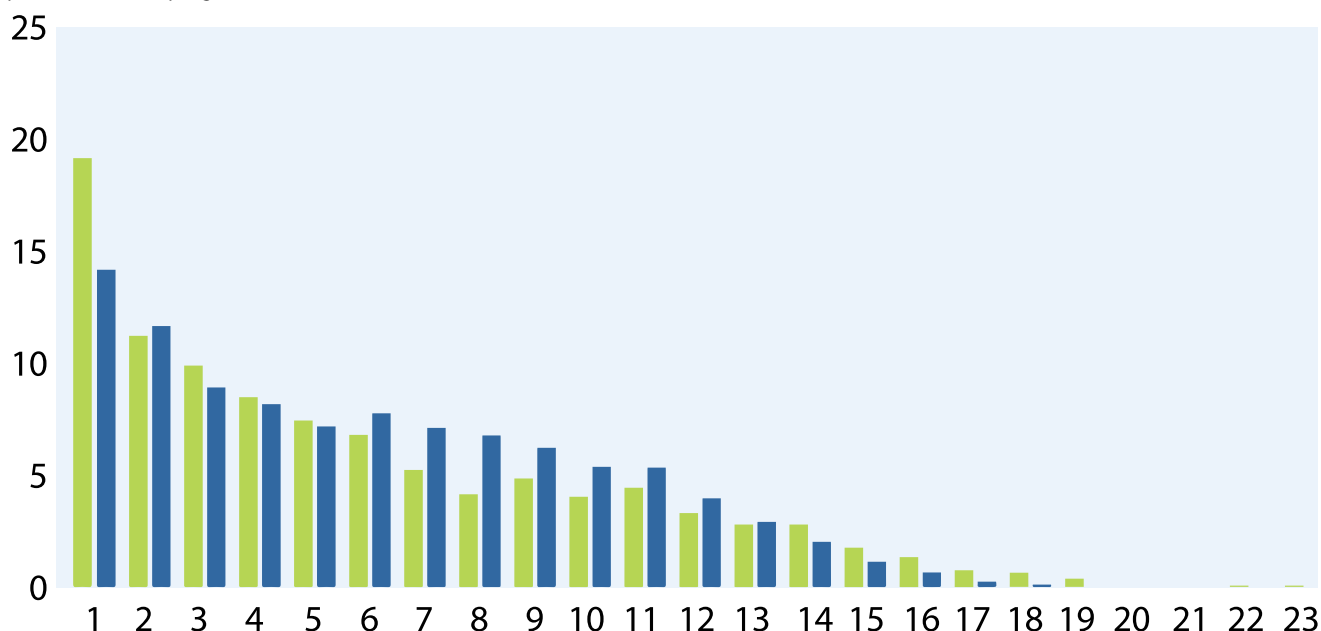


Table 2. Summary of dog and cat characteristics [gender (%) and breed (%)]

	Dogs	Cats	
Gender (%)	(n=2474)	(n=1974)	
Intact males	36	11	
Neutered males	14	36	
Intact females	28	17	
Neutered females	22	36	
Breeds (%)	(n=2888)	(n=2178)	
Mixed breeds	23	18	
Pure breeds	77	82	
<i>Bichon</i>	7.8	<i>Domestic shorthair</i>	68
<i>Yorkshire terrier</i>	6.3	<i>Persian</i>	2.7
<i>Labrador retriever</i>	4.2	<i>Siamese</i>	2.6
<i>Golden retriever</i>	3.7	<i>British shorthair</i>	2.1
<i>Jack Russel terrier</i>	3.7	<i>Burmese</i>	1.7
<i>Shih-tzu</i>	3.5	<i>Other breeds</i>	4.9
<i>Chihuahua</i>	3.3		
<i>Border collie</i>	2.5		
<i>Cocker spaniel</i>	2.5		
<i>German shepherd</i>	2.3		
<i>French and English bulldogs</i>	2.1		
<i>Other breeds</i>	35.1		

and homemade). Few cats (0.8%) and dogs (5%) were fed homemade diets only. Animals were determined to be overweight or obese when the BCS were 4 and 5, respectively (Table 1). A majority of dogs (62%) and cats (58%) presented with a normal BCS of 3/5, 28% of them with a BCS of 4/5 and thus 4.5% of dogs and 7.9% of cats were considered obese with a BCS of 5/5. Only 5% of the dogs and 6% of the cats were considered thin or very thin.

### Preventive medicine

According to the forms completed by the veterinarians, based on the declarations of the owners, 66% of dogs and 43% of cats had been seen by a veterinarian during the last year; 7% of dogs and cats never had a visit to a veterinarian and the remainder (27% of dogs and 50% of cats) had not been seen by a veterinarian during the last year. Data are presented for dogs and cats in Table 3.

Because of the high percentage of unidentified or unvaccinated animals, the data were studied separately based on whether the animals had received veterinary care (at least one visit to the veterinarian during the previous 12 months) or not. The percentages of animals that had received veterinary care, without being vaccinated, identified or dewormed, are presented in Table 3.

Table 3. Data for preventive medicine in dogs (n=2986) and cats (n=2319)

Preventive medicine - DOG	Number of answers	Problems*			Recommendation†	Treatment or appointment‡
		All dogs	No Vet care	Vet care		
Body weight - BCS >3	2525	847 (34%)	287 (12%)	560 (22%)	213 (25%)	0
No microchip	2830	388 (14%)	207 (7%)	181 (7%)	51 (13%)	0
Not vaccinated	2972	964 (32%)	631 (21%)	333 (11%)	431 (45%)	25 (6%)
No prevention against fleas	2479	1166 (47%)	417 (17%)	749 (30%)	57 (5%)	0
No prevention against internal parasites	2770	846 (31%)	449 (16%)	397 (15%)	319 (38%)	0

Preventive medicine - CAT	Number of answers	Problems*			Recommendation†	Treatment or appointment‡
		All dogs	No Vet care	Vet care		
Body weight - BCS >3	1877	682 (36%)	335 (18%)	347 (18%)	159 (23%)	0
No microchip	2115	1824 (86%)	1012 (48%)	812 (38%)	17 (0.9%)	0
Not vaccinated	2309	1351 (59%)	980 (43%)	371 (16%)	417 (31%)	11 (0.3%)
No prevention against fleas	1845	1239 (67%)	690 (37%)	549 (30%)	146 (12%)	0
No prevention against internal parasites	2170	979 (45%)	695 (32%)	284 (13%)	321 (33%)	0

Vet care: animals presented at a veterinary practice during the 12 months before the study

No Vet care: animals not presented at a veterinary practice during the 12 months before the study or animals never presented at a veterinary practice

\* Percentage of animals presenting with a problem

† Percentage of animals receiving the recommendation linked to the identified problem

‡ Percentage of animals receiving an appointment linked to the identified problem and the recommendation

Table 4. The most common disorders reported for 2986 dogs examined at private veterinary practices during the prevention campaign and the associations between age classes and disorder prevalence (P)

Disorder	Prevalence % total	95% CI	Prevalence % by age classes			Probability
			<24 months	Two to six years	Above Six years	
Body weight- BCS>3/5	33.5	31.7 to 35.7	9.8	38.5	51.7	<0.001
Dental calculus	31.1	29.5 to 32.8	7.2	29.4	49.2	<0.001
Otitis externa	14.0	12.8 to 15.3	13.1	13.6	15.0	0.459
Mammary tumours*	11.2	8.9 to 13.6	2.0	5.8	26.6	<0.001
Cataract	9.5	8.4 to 10.5	0.4	1.2	24.4	<0.001
Heart disease	6.4	5.5 to 7.3	1.2	2.2	14.4	<0.001
Osteoarthritis	5.4	4.5 to 6.2	0.5	1.2	13.1	<0.001
Lameness	5.4	4.5 to 6.2	3.9	5.0	6.9	0.013
Dry hair and dandruff	4.1	3.4 to 4.8	2.7	4.1	5.1	0.040
Gingivitis	3.4	2.8 to 4.0	0.3	2.3	6.8	<0.001
Respiratory tract diseases	3.2	2.6 to 3.9	1.7	2.4	5.1	<0.001
Lump	3.0	2.3 to 3.6	0.7	1.9	5.7	<0.001
Flea infestation	2.8	2.9 to 4.4	3.2	2.5	2.9	0.665
Moist dermatitis	2.8	2.2 to 3.5	0.5	3.1	4.1	<0.001
Atopic/allergic dermatitis	2.7	2.1 to 3.3	1.3	3.1	3.1	0.031
Conjunctivitis	2.6	2.0 to 3.2	2.9	1.5	3.7	0.004
Dermatitis	2.3	1.8 to 2.9	0.9	3.1	2.5	0.008
Patellar luxation	2.2	1.7 to 2.8	1.6	2.4	2.5	0.391
Anxiety	2.0	1.5 to 2.6	2.7	1.7	2.0	0.309
Disk disease	2.0	1.5 to 2.5	0.4	1.0	4.3	<0.001

\*Incidence of mammary tumours was calculated in entire females >12 months

### Disease prevalence

In total 27% of the dogs (8% not receiving veterinary care and 19% receiving veterinary care) and 31% of the cats (16% not receiving veterinary care and 15% receiving veterinary care) were considered healthy (having a BCS of 3/5 and no diagnostic codes). Tables 4 and 5 present summary statistics for the main diseases. Many reported disorders were common to both dogs and cats (e.g. flea infestation or conjunctivitis) and age-related. Overweight condition and obesity were the most commonly reported disorders for both species (Tables 3–5). In the dog, the frequency of mammary tumours was higher ( $P<0.001$ ) in entire (11.2%) than in neutered females (1.3%).

### Recommendations and follow-up

During the health checks, veterinarians wrote 2957 and 2467 recommendations for the dogs and the cats, respectively. The number of recommendations ranged from 0 (40%) to 5 in cats and from 0 (42%) to 7 in dogs; 29% of cats and 31% of dogs received one recommendation; the remaining animals (27% of dogs and 31% of cats) received more than one recommendation. The main recommendations

for the dogs were the following: vaccination (18% of all recommendations), changing the diet (17%), deworming (17%), further examination in internal medicine (11%), dental care (10%) and implementing a weight loss programme (7%). For the cats, the main recommendations were: deworming (20% of all recommendations), vaccination (20%), changing the diet (16%), flea control and further examination in internal medicine (9% each), dental care (8%) and neutering (6%). Veterinarian recommendations linked to known problems are presented in Table 3. Although pet identification is compulsory for dogs in Belgium, the recommendation was made for 1.7% of dogs and 0.9% of cats. Finally, 16% of dogs and 15% of cats were given an appointment for a follow-up visit.

### Discussion

The data presented in this study cannot be compared to any other study performed in Belgium as it is the first time that the campaign has been organised and the results recorded. While such information can sometimes be gained from questionnaire surveys, greater precision requires the

Table 5. The most common disorders reported for 2319 cats examined at private veterinary practices during the prevention campaign and the associations between age classes and disorder prevalence (P)

Disorder	Prevalence % total	95% CI	Prevalence % by age classes			Probability
			<24 months	Two to six years	Above Six years	
Body weight-BCS > 3/5	36.3	34.2 to 38.5	15.2	42.8	41.9	<0.001
Dental calculus	21.4	19.7 to 23.0	4.0	17.6	41.5	<0.001
Gingivitis	11.3	10.0 to 12.5	6.2	10.0	17.4	<0.001
Otodectes spp infestation	8.0	6.9 to 9.1	12.1	5.3	7.2	<0.001
Flea infestation	7.8	6.7 to 8.9	7.9	7.4	8.1	0.849
Otitis externa	5.5	4.5 to 6.4	4.0	6.1	6.0	0.152
Dry hair and dandruff	4.4	3.6 to 5.2	1.7	4.3	7.0	<0.001
Respiratory tract infection	3.9	2.9 to 4.4	3.9	4.0	3.7	0.946
Conjunctivitis	3.8	2.8 to 4.3	4.5	2.9	4.1	0.212
Teeth - broken or lack of-	3.3	2.6 to 4.0	1.6	2.3	6.0	<0.001
Hair loss	2.9	2.2 to 3.6	1.7	3.6	3.3	0.077
Feline miliary dermatitis	2.8	2.1 to 3.5	1.3	3.1	3.8	0.011
Atopic/allergic dermatitis	2.3	1.7 to 2.9	1.2	2.2	3.6	0.009
Heart disease	2.3	1.7 to 2.9	0.6	1.2	5.3	<0.001
Renal disease	2.0	1.5 to 2.6	0.1	0.7	5.2	<0.001
Osteoarthritis	1.6	1.1 to 2.2	0.1	0.5	4.4	<0.001
Dermatitis	1.5	1.0 to 2.0	0.7	2.0	1.6	0.124
Cataract	1.5	1.0 to 2.0	0.0	0.2	4.2	<0.001
Stomatitis	1.4	0.9 to 1.9	1.3	1.5	1.3	0.934
Feline urologic syndrome	1.2	0.8 to 1.7	0.7	1.0	1.9	0.120

\*Incidence of mammary tumours was calculated in entire females >12 months

direct assessment of the dog and cat population as made by the voluntarily participating veterinarians in this study. In the UK, the PDSA charity trust provides annual reports on the health and preventive care of pets in different areas of the country as an important tool that helps the veterinary profession understand and meet the needs of the owners and animals (PDSA 2013). One of the goals of the present study was to emphasise the importance of preventive care to owners and veterinary professionals; the data show this to be an important issue in veterinary medicine and also essential to public health (e.g. deworming in cats) (Macpherson 2013).

Pets "receiving veterinary care" were defined as those that had been seen by a veterinarian in the last year and in most practice management software programmes, these are also identified as "active patients" if presented during the last 13 months. During the free health check (as reported on the forms), 7% of owners declared that they had never been to a veterinarian. The accuracy of these data, and consequently the figures on the status of pets receiving veterinary care (presented at a veterinary practice during

the last year) cannot be entirely verified however, and thus, must be considered with caution as perhaps being under- or overestimated.

One of the most interesting findings shows that a large proportion of pets receiving veterinary care received little preventive care. The proportion of unvaccinated animals – even against rabies which is compulsory – is high in both species. This can be partly explained by the design of the campaign, which aimed at stimulating the participation of owners who do not visit a veterinary practice regularly. However, the results are based on the health check forms and in most cases, recommendations might also be given orally.

The lack of preventive care was higher in the cat population than that in dogs. For example, 14% of the cats in the present study had a microchip; yet as many as 46% of cats in the UK had a microchip the same year (PDSA 2013). It appears that many veterinarians do not actively recommend microchipping, as shown by the low percentage (0.9%) of cat owners receiving such recommendation.

Neutering is generally considered as responsible pet ownership (RSPCA 2014); in the present study, 72% of cats were neutered when compared with only 36% of dogs. As of September 1, 2014, neutering and microchipping of all newborn cats (DSH and other breeds) is compulsory in Belgium, with derogations for professional breeders. The high percentage of entire bitches suffering from mammary tumours (26% of entire females older than six years) suggests that the role of neutering in young pet female dogs to reduce mammary cancer incidence should be re-considered, despite the limited published evidence that neutering protects against mammary neoplasia (Beauvais et al. 2012).

The discussion is limited to highly prevalent chronic diseases because the results do not reflect the usual work of a veterinary practice, given that the design of the campaign virtually excluded the participation of animals in acute conditions (e.g. gastrointestinal diseases or acute pain). The high percentage of overweight and obese dogs and cats, 34 and 36%, respectively, of the population studied, was not surprising. These conditions are common medical disorders in pets in the countries in which studies have been conducted (Lund et al. 1999, Colliard et al. 2009). In this study, it is also interesting to note that for this specific overweight indication, the correct recommendation of a weight loss plan including dietary management was given to only 25% of the affected dogs and 23% of the cats. Making an effective recommendation is nevertheless key to ensure the quality of care after assessments of nutritional status with BCS and BW (Wayner & Heinke 2006, AAHA 2011, Freeman et al. 2011).

The second key health issue identified was linked to oral health: dental calculus was common, and this was consistent with previous studies (Lund et al. 1999). Dental calculus has been associated with systemic disease (DeBowes 1998) and its key preventive and management principles are known (Logan et al. 2010). In the present study, most animals did not receive a recommendation in this regard. This gap observed between the diagnosis and the recommendation has also been well documented by another study (AAHA 2003). Awareness of this situation along with protocols and systematic health care team approaches within the practice may be considered for the improvement of compliance (Wayner 2010).

On the basis of physical examination, 27% of dogs and 31% of cats were considered healthy; however, it has been shown that apparently healthy middle-aged and old cats suffer from many diseases including high systolic blood pressure or crystalluria and that regular health checks, including further examinations, are beneficial (Verjans et al. 2011). A thorough clinical examination conducted at the time of routine vaccination also appeared to be an important element in maintaining animal health and welfare (Banyard 1998, WSAVA 2010). Screening elderly dogs also identified unrecognised and unreported health risk factors resulting in lifestyle modification and ongoing monitoring, as well as signs of age-related diseases. This results in diagnostic investigations, early diagnoses and surgical and medical interventions to improve quality of life (Davies 2012, Fortney 2012).

The data collection procedure adopted might raise some questions on the representativeness of the sample: voluntary participation of this kind is likely to introduce certain biases that might limit some of the conclusions drawn in the study. In summary, the results of this study suggest that there are numerous opportunities to improve preventive medicine and increase the quality of care in the pet population given the high percentage of intact, unvaccinated or unidentified animals and the low level of systematic preventive care against worms and fleas. At the same time, the most frequently reported problems can be managed by veterinarians, and preventive measures can be taken to avoid these in healthy pets through adequate communication and clear recommendations including application of WSAVA nutritional guidelines (Freeman et al. 2011).

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### *Conflict of interest*

None of the authors of this paper have a financial or personal relationship with other people or organisations that could inappropriately influence or bias the content of the paper. The study has been sponsored by Hill's Pet Nutrition Belgium, but the involvement of Hill's was limited to the design of the study, the surveys and the financial support for performing the study and the campaign.



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