



# THE UNIVERSITY *of* EDINBURGH

## Edinburgh Research Explorer

### **Sociodemographics of Pet Ownership among Adolescents in Great Britain: Findings from the HBSC Study in England, Scotland, and Wales**

**Citation for published version:**

Marsa Sambola, F, Muldoon, J, Williams, J, Lawrence, AB, M, C & Currie, C 2016, 'Sociodemographics of Pet Ownership among Adolescents in Great Britain: Findings from the HBSC Study in England, Scotland, and Wales' *Anthrozoos*, vol 29, no. 4, pp. 559-580. DOI: 10.1080/08927936.2016.1228756

**Digital Object Identifier (DOI):**

[10.1080/08927936.2016.1228756](https://doi.org/10.1080/08927936.2016.1228756)

**Link:**

[Link to publication record in Edinburgh Research Explorer](#)

**Document Version:**

Peer reviewed version

**Published In:**

*Anthrozoos*

**Publisher Rights Statement:**

This is an Accepted Manuscript of an article published by Taylor & Francis in ANTRHOZOOS on 22/11/2016, available online: <http://www.tandfonline.com/10.1080/08927936.2016.1228756>

**General rights**

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

**Take down policy**

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact [openaccess@ed.ac.uk](mailto:openaccess@ed.ac.uk) providing details, and we will remove access to the work immediately and investigate your claim.



1 Sociodemographics of pet ownership among adolescents in Great Britain:  
2 findings from the HBSC study in England, Scotland and Wales.

3 Ferran Marsa-Sambola<sup>a</sup>, Joanne Williams<sup>b</sup>, Janine Muldoon<sup>a</sup>, Alistair  
4 Lawrence<sup>c</sup>, Melanie Connor<sup>c</sup>, Chris Roberts<sup>e</sup>, Fiona Brooks<sup>d</sup> & Candace  
5 Currie<sup>a</sup>.

6 <sup>a</sup>Child and Adolescent Health Research Unit (CAHRU), University of St  
7 Andrew, St Andrews, UK.

8 <sup>b</sup>Department of Clinical Psychology, University of Edinburgh, Edinburgh, UK.

9 <sup>c</sup>Scotland's Rural College, West Mains Road, Edinburgh, UK.

10 <sup>d</sup>University of Hertfordshire, Hatfield, Hertfordshire, UK.

11 <sup>e</sup>Research and Evaluation Branch, Public Health Strategy Division,  
12 Department of Public Health and Health Professions, Welsh Assembly  
13 Government, Cardiff, UK.

14

15 Address for correspondence

16 Dr. Ferran Marsa-Sambola

17 Child and Adolescent Health Research Unit (CAHRU), University of St  
18 Andrew, St Andrews, KY16 9TF, UK.

19 E-mail: [fmarsa2@gmail.com](mailto:fmarsa2@gmail.com)

20

21

1

## 2 **ABSTRACT**

3 The aim of this study is to assess the prevalence of pet ownership among  
4 adolescents in Great Britain and identify any sociodemographic differences  
5 between pet owners and non-pet owners. A total of 14328 11- to 15-year-old  
6 adolescent from England, Scotland and Wales were included in the analysis.  
7 Results revealed 15-year-old adolescents were significantly more likely than  
8 11-year-old adolescents to own dogs (OR=1.146,  $p<0.001$ ) but less likely to  
9 own fish, reptiles or amphibians (OR=0.629,  $p<0.001$ ), and small mammals  
10 (OR=0.630,  $p<0.001$ ). 13-year-olds were significantly more likely than 11-  
11 year-olds to own dogs (OR=1.240,  $p=0.021$ ) and birds (OR=1.299,  $p=0.010$ ),  
12 but significantly less likely to own fish, reptiles or amphibians (OR=0.795,  
13  $p<0.001$ ). No gender differences were found. White adolescents were more  
14 likely than non-white adolescents to own all pet types. Those living in single  
15 parents families were significantly more likely than those living with two  
16 parents to own dogs (OR=1.186,  $p=0.013$ ) and cats (OR=1.319,  $p<0.001$ ).  
17 Furthermore, those who reported living in stepfamilies were also more likely to  
18 own cats (OR=1.428,  $p<0.001$ ). Adolescents with siblings were more likely to  
19 own cats (OR=1.391,  $p<0.001$ ), fish, reptiles or amphibians (OR=1.220,  
20  $p=0.037$ ) than adolescents without siblings. Adolescents with employed  
21 parents (both or one) were significantly more likely than those with  
22 unemployed parents to own dogs (OR=1.414,  $p=0.002$ ) and birds (OR=1.523,  
23  $p=0.018$ ). Adolescents from high affluence families were less likely than  
24 adolescents from low affluence families to own dogs (OR=0.888,  $p=0.037$ ),  
25 small mammals (OR=0.832,  $p=0.005$ ) and birds (OR=0.801,  $p=0.046$ ).

1 Furthermore, family affluence differences were found in different pet types.  
2 Differences in all pets types and siblings were also found in a proxy measure  
3 of attachment to pets.

4 This study provides evidence that pet ownership is related to several  
5 sociodemographic factors. These are relevant to take into account when  
6 performing HAI studies in adolescents.

7

8 **Keywords:** adolescents, family, pet ownership, socio-demographics, Great  
9 Britain.

## 10 **Introduction**

11 It is a common phenomenon that children and adolescents live with  
12 companion animals at home and school (Paul & Serpell 1992; Regan 2011).

13 It has been also described media have an important role in the influence pet  
14 ownership has on children and adolescents (Berns 2013). Previous research  
15 reports that between 25% and 50% of households in Western societies own  
16 companion animals (Barker et al. 2003; Downes, Canty & More 2009; Murray  
17 et al. 2010; Westgarth et al. 2013; Marsa-Sambola et al. 2015).

18 Interactions with companion animals have been shown to have positive  
19 benefits for general well-being of elderly people (Siegel 1990; Banks & Banks  
20 2002; Cherniack & Cherniack 2014) and in adult clinical populations (Lane,  
21 McNicholas & Collis 1998; Siegel et al. 1999; Allen, Kellegrew & Jaffre 2000;  
22 Zimolag & Krupa 2009; Grandgeorge et al. 2012; Hutton 2015). This research  
23 often fails to consider the influence that sociodemographic factors may have

1 in explaining these health benefits (Downes, Canty & More 2009; Müllersdorf  
2 et al. 2010; Murray et al. 2010; Westgarth et al. 2010). Westgarth et al (2010)  
3 therefore argue that there is a need to better understand which  
4 sociodemographic factors are associated with ownership of different types of  
5 pets in order that these factors can be controlled in study designs and in  
6 analysis of data related to HAI.

7 Previous research conducted with children and adolescents has reported that  
8 HAI may have some positive benefits in pre-adolescents and adolescents in  
9 relation to their socio-emotional development (Covert et al. 1985; Davis &  
10 Juhasz 1985; Guttman, Predovic & Zemanek 1985; Davis 1987; Mader, Hart  
11 & Bergin 1989). However, systematic differences may exist in the levels of pet  
12 ownership among children and adolescents in terms of sociodemographic  
13 variables (Melson 1988; Kidd & Kidd 1990; Westgarth et al. 2010; Westgarth  
14 et al. 2013). Previous research has assessed sociodemographic differences  
15 in pet ownership as a general measure (Siegel 1995) or considering mainly  
16 differences between ownership of dogs and cats among adults (Westgarth et  
17 al. 2007; Downes, Canty & More 2009; Murray et al. 2010) and children  
18 (Westgarth et al. 2010; Westgarth et al. 2013). It is likely other  
19 sociodemographic differences may exist with ownership of other types of  
20 companion animals.

21 According to Westgarth et al. (2010) the meaning of the term "pet ownership"  
22 may vary across different cultures and countries. In the majority of scientific  
23 studies conducted in Western countries in adults, children and young people  
24 the main criteria to define pet ownership are related to how the animal is fed ,  
25 where the pet lives, and whether it is stray, part-owned or free-roaming

1 (Downes, Canty & More 2009; Westgarth et al. 2010). Furthermore Westgarth  
2 et al. (2013) suggest the term pet ownership can have a different meaning for  
3 adults and children, dependent on who actually owns the animal. For example  
4 a pet can live in a household with children and be cared for by children but still  
5 be owned by an adult. In line with this, Westgarth et al. (2013) considered pet  
6 ownership in children as "living with a pet in the household in which they  
7 spent most of their time, or in the case of horses, the child feeling that the  
8 horse belonged to their household" (p. 8).

9 When considering the effects that different types of companion animals have  
10 in children and adolescents' lives, it is vital to consider the importance of  
11 attachment to pets (Crawford, Worsham & Swinehart 2006). Research has  
12 shown that adults (Friedmann, Son & Tsai 2000) and young pet owners  
13 (Albert & Bulcroft 1988; Marsa-Sambola et al. 2015) may feel emotionally  
14 connected to their pets in a similar way to humans. However, few studies in  
15 children and adolescents have assessed the influence of sociodemographic  
16 factors on attachment to pets (Westgarth et al. 2013; Marsa-Sambola et al.  
17 2015).

18 In our study, sociodemographic measures were selected for their potential  
19 relevance in predicting children's and adolescents' involvement with  
20 companion animals or because sociodemographic measures have been  
21 reported in previous research to have some relationship to pet ownership  
22 (Levinson 1978; Franti et al. 1980; Kidd & Kidd 1980; Salomon 1981; Cain  
23 1983; Covert et al. 1985; Marx et al. 1988; Melson 1988; Melson & Fogel  
24 1988; Westgarth et al. 2010; Westgarth et al. 2013).

1 Regarding influences on pet ownership, ethnicity has rarely been investigated  
2 (Esposito et al. 2011). According to Westgarth et al. (2013) this factor may  
3 have implications throughout the life course in relation to ownership and how  
4 children and adolescents perceive pets. The few studies that do exist report  
5 that a greater percentage of white adults and teenagers are pet owners, but  
6 only in comparison to black ethnic groups (Marx et al.1988; Siegel 1995;  
7 Brown 2003). Few gender differences in pet ownership have been reported in  
8 research conducted with children and early adolescents (Siegel 1995;  
9 Westgarth et al. 2010; Westgarth et al. 2013). Higher rates of ownership of  
10 dogs, cats, rodents, horses and other pets were found among 9- and 10-year-  
11 old girls in a study conducted in a deprived area of Liverpool (Westgarth et al.  
12 2013). Similar results were found in a UK Birth Cohort study, where girls  
13 reported higher rates of ownership of rabbits, small mammals, and cats  
14 (Westgarth et al. 2010).

15 The main reason for assessing why pet ownership can be gender related in  
16 adolescents is because previous studies have reported gender differences in  
17 attitudes towards animals. Girls have more positive attitudes towards animals  
18 than boys (Bjerke, Odegaardstuen & Kaltenborn 1998), have a higher  
19 aesthetic and anthropomorphic orientation towards animals (Kellert & Berry  
20 1987), and higher levels of attachment to pets (Vidovic, Stetic & Bratko 1999;  
21 Brown 2003; Marsa-Sambola et al. 2015). While some studies show no  
22 gender differences in care-giving activities or attachment to pets owned by  
23 young people (Melson 1988; Westgarth et al. 2013), others suggest that  
24 gender is a significant influence, particularly within the family context of pet  
25 care (Muldoon, Williams & Lawrence, 2014).

1 In relation to age, higher levels of pet ownership are said to exist in families  
2 with children in middle childhood, between 8- and 12-year-olds (Salomon,  
3 1981; Kidd & Kidd 1985; Melson & Fogel 1989; Paul & Serpell 1992). Others  
4 have suggested that pet ownership in general reaches a peak in families with  
5 adolescents (Albert & Bulcroft 1988). A decline in pupils' interest in animals  
6 with age has been identified, suggesting that 'natural' predispositions may  
7 give way to socio-cultural influences (Bjerke, Odegaardstuen & Kaltenborn  
8 1998; Prokop & Kubiak, 2008; Müllersdorf, Granström & Tillgren 2012).

9 Higher levels of family affluence and parental employment (both or one parent  
10 working) have been linked to higher prevalence of pet ownership (without  
11 specifying pet types) in middle childhood (Melson 1988; Bryant & Worley  
12 1989). Some studies suggest that children and early adolescents from affluent  
13 families are more likely to have companion animals because of the economic  
14 costs associated with pet ownership (Franti et al. 1980; Covert et al. 1985;  
15 Albert & Bulcroft 1988). The fact that parents work and therefore spend many  
16 hours away from home is a reason for acquiring a pet, as parents may view  
17 pets as a companion figure (Fifield & Forsyth 1999). However, other studies  
18 have found that dog ownership in the general population decreases as years  
19 of education or family affluence level increases (Eller et al. 2008; Downes,  
20 Canty & More 2009; Murray et al. 2010). Westgarth et al. (2010) found dog  
21 ownership in children was associated with higher levels of deprivation.

22 Family structure is also relevant to pet ownership. Paul and Serpell (1992)  
23 reported that children living in step-parent families were found to have  
24 significantly more companion animals than single-parent families. Bodsworth  
25 and Coleman (2001) found that children in single-parent families attached



1 more strongly with their dog than those in two-parent families. These  
2 outcomes are in line with the hypothesis that the attachment between a child  
3 and a companion animal can act as a protective factor for children  
4 experiencing inter-parental conflict (Strand 2004). However, another study  
5 conducted by Melson (1988), found that children living in two-parent families  
6 were more likely to own pets than single-parent families. Research on this  
7 variable is scarce.

8 In relation to the effect of siblings in studies conducted with children, some  
9 authors report that pet ownership in general is more common where there are  
10 fewer siblings (Covert et al. 1985; Melson 1988; Paul & Serpell 1992). These  
11 findings have been used by various authors to justify the possible role that  
12 pets have as companions or playmates for children (Levinson 1978; Kidd &  
13 Kidd 1985). However, other studies have not found evidence that having  
14 dogs, cats, rabbits, rodent, horses or other companion animals are linked to  
15 the presence or number of siblings a child has (Westgarth et al. 2013). The  
16 relationship between siblings and companion animals may be of particular  
17 benefit to families with adolescents where the family structure has changed,  
18 such as in stepfamilies or single parent families (Albert & Bulcroft 1988;  
19 Strand 2004; Müllersdorf, Granström & Tillgren 2012).

20 Given the relative paucity of studies on the sociodemographics of pet  
21 ownership among adolescents (Covert et al. 1985; Siegel 1995; Bjerke,  
22 Odegardstuen & Kaltenborn 1998; Müllersdorf, Granström & Tillgren 2012),  
23 we consider it relevant to assess which sociodemographic variables are  
24 important in determining pet ownership of different types of companion  
25 animals, as recent studies have identified sociodemographic differences in

1 different pets types in adults (Eller et al. 2008; Downes, Canty & More 2009;  
2 Murray et al. 2010) and children (Westgarth et al. 2010; Westgarth et al.  
3 2013). Our main aims were to:

4 (1) Test which sociodemographic characteristics (gender, age,  
5 ethnicity, family structure, presence of siblings, parental  
6 employment, and family affluence levels) are associated with  
7 different types of pet ownership in adolescents.

8 2) Test which sociodemographic characteristics (gender, age, ethnicity,  
9 family structure, presence of siblings, parental employment, family  
10 affluence levels and pet types) are associated with a proxy measure of  
11 attachment.

12

13

14

## 15 **Methods**

### 16 *Design*

17 Data are from national surveys conducted in 2009/2010 in England, Scotland  
18 and Wales as part of the Health Behaviour in School-aged Children: WHO  
19 Collaborative Cross-National Study (HBSC). The HBSC survey is conducted  
20 in member countries (currently 43 in Europe and North America) every four  
21 years (Currie et al. 2012). The methods employed in gathering these data are  
22 described in detail elsewhere (Currie et al. 2011). Parents gave consent for

1 their children to be part of the survey. Ethics Committees of the University of  
2 St Andrews, the University of Hertfordshire, and the University of Swansea  
3 approved the protocol. Data collection was anonymous and the demographic  
4 information collected did not permit identification of the individual student. The  
5 HBSC study uses a self-administered questionnaire, which was designed  
6 according to international standards (Roberts et al. 2009). All member  
7 countries are involved in a continuous process of development and validation  
8 of the survey. The survey is administered in a random sample of schools by  
9 teachers or researchers to students aged 11, 13 and 15 years old. Each  
10 country employed the same sampling strategy following the international  
11 protocol of the HBSC Study, which specifies a minimum sample of 1550 for  
12 each age group (11-,13- and 15-year-old adolescents)(Currie et al. 2011).  
13 Schools were stratified by country and by local authority, to achieve a  
14 representative sample of each region.

#### 15 *Sample characteristics*

16 For the purposes of analysis, the data were weighted by country, gender and  
17 age. The weighted sample is shown in Table 1: England (N=4306; 29.8%),  
18 Scotland (N=5058; 35%), and Wales (N=5073; 35.2%); Boys (N=7221; 50%),  
19 Girls (N=7215; 50%); 11-year-olds(N=4972; 34.4%), 13-year-olds(N=4943;  
20 34.3%) and 15-year-olds(N=4521; 31.3%).

21

22

INSERT TABLE 1 HERE

23

1 The majority of those surveyed were white (N=12206; 86.5%), living with both  
2 parents (N=9114; 66.9%), had siblings (N=13336; 92.4%) and with one or  
3 both parents employed (N=11675; 95.6%). Further sociodemographic  
4 variables are shown in Table 1.

5

6 INSERT TABLE 2 HERE

### 7 *Measures*

8 The HBSC survey includes multiple sociodemographic and health variables.  
9 For this paper, the following demographic measures were included in the  
10 analysis: gender (male; female), age (11-year-old; 13-year-old; 15-year-old),  
11 ethnicity (white; mixed; Asian; black; other), and family affluence (Family  
12 Affluence Scale). Due to small numbers and for statistical purposes, ethnicity  
13 data were collapsed into white (white) and non-white (mixed, Asian, black and  
14 other).

15 The Family Affluence Scale (FAS)(Batista-Foguet et al. 2004) was utilised to  
16 assess adolescents' absolute socio-economic status based on material  
17 markers and is related to commonly used indices of material deprivation  
18 (Carstairs & Morris 1990) and home affluence (Wardle, Robb & Johnson  
19 2002). The items include: a) Does your family own a car, van or truck? (no;  
20 yes, one; yes, two or more); b) Do you have your own bedroom for yourself?  
21 (no; yes); c) During the past 12 months, how many times did you travel away  
22 on holiday with your family? (not at all; once; twice; more than twice); d) How  
23 many computers does your family own? (none; one; two; more than two). For

1 our analysis, a composite FAS score was calculated (tertile classification).  
2 FAS has been recoded in previous research to create low, middle and high  
3 family affluence groups in order to examine the effect of relative or  
4 approximate SES position that more easily corresponds with classical SES  
5 groupings (Griesbach, Amos & Currie 2003; Holstein et al. 2004; Due et al.,  
6 2005; Vereecken et al., 2005; Boyce et al. 2006; Richter, Lepping & Gabhain  
7 2006; Richter & Leppin, 2007; Currie et al. 2008).

8 The following items were also chosen to gather information about  
9 adolescents' family structure and parental employment: "Who lives with you in  
10 the home where you spend most of the time?" (mother; father; stepmother;  
11 stepfather; other); "How many siblings do you have?" (none; one; two; three  
12 or more); "Does your father have a job?" (yes; no; don't know; don't have or  
13 see father); "Does your mother have a job?" (yes; no; don't know; don't have  
14 or see mother). Answers from the question "Who lives with you in the home  
15 where you spend most of the time?" were re-coded into three categories for  
16 statistical purposes (single-parent family; both parents; stepfamilies).  
17 Furthermore, the two questions related to parental employment were  
18 collapsed into a single variable with two categories: both or one parent  
19 employed and no parents employed.

20 Finally, the following pet ownership questions were included: "How many pet  
21 animals do you have now?" (none; one; two; more than two); "What type of  
22 pet animal(s) do you have now?" (I don't have a pet at the moment; dogs;  
23 cats; small mammals; fish, reptiles or amphibians; birds; others); "Do you  
24 have a pet that you think of as your own?" (yes; no). For statistical purposes,  
25 the first two questions were recoded as follows: "How many pets do you have

1 now?" (None; one; two or more); "What type of pet animal(s) do you have  
2 now?" (dogs=Yes/No; cats=Yes/No; small mammals=Yes/ No; fish, reptiles or  
3 amphibians=Yes/No; birds=Yes/No).

4 The item "Do you have a pet that you think of as your own?" was used as a  
5 proxy measure of attachment to pets. In a previous study, this item was  
6 associated with a measure of attachment to pets (Marsa-Sambola et al.2015).

7 Items to assess pet ownership were developed by Muldoon and Williams  
8 (2010) during the early stages of a study designed to examine how to best  
9 promote a duty of care towards animals among children and young people.

10 Two small-scale empirical studies were carried out with children and young  
11 people in order to: inform the development of a school-based intervention and  
12 assess the utility/suitability of items/measures developed in the US context for  
13 UK-based children and young people. The first of these was qualitative; a  
14 series of focus groups that explored children's relationships with their pets  
15 and their perceptions of the ways in which they were cared for within the  
16 family (see Muldoon, Williams & Lawrence 2014). The second study involved  
17 a small survey (n=121) investigating the links between attitudes, attachment  
18 and empathy (Williams, Muldoon & Lawrence 2010). Together, these two  
19 studies provided an ideal opportunity to scope the possibility of developing  
20 items for assessing pet ownership (Muldoon & Williams 2010) and a succinct  
21 scale of attachment to pets published elsewhere (Muldoon & Williams 2010;  
22 Marsa-Sambola et al. 2015).

23 In our study, according to our previous pilot studies, the interpretation of  
24 whether an animal was a pet lay with the survey participants (adolescents),

1 although a list of common animals considered pets was provided. The word  
2 "own" was not employed in the item "What types of pet animals do you have  
3 now?" in order to avoid confusion in some participants. Adolescents could live  
4 with a pet that was considered "owned" by a different family member.  
5 Furthermore, the Item "Do you have a pet that you think of as your own?" was  
6 also developed through our pilot studies, where children distinguished  
7 between pets that were theirs vs. those of their parents or siblings. It showed  
8 where children had a strong connection to a particular pet, so we used it here  
9 as a proxy measure of attachment

#### 10 *Statistical analyses*

11 Percentages for each sociodemographic variable, pet ownership and types of  
12 pets were computed for England, Scotland and Wales using the Statistical  
13 Package for Social Sciences Version 21 for Windows (SPSS 2012).  
14 Percentages were calculated on actual responses.

15 Six multivariable binary logistic regression models of factors associated with  
16 the ownership of: dogs; cats; fish, reptiles or amphibians; birds and small  
17 mammals were tested. Five multivariable models were based on the item  
18 "What type of pet-animal do you have now?" with the following responses:  
19 dogs (Yes/No); cats (Yes/No); fish, reptiles or amphibians (Yes/No); birds  
20 (Yes/No) and small mammals (Yes/No). Each multivariable model was  
21 performed to predict the odds of a "Yes" response for each animal type by  
22 contrast with a "No" response, based on gender, age, ethnicity, family  
23 structure, presence of siblings, parental employment and family affluence

1 (FAS). As we were not able to identify specific pet types for category other  
2 pets, this was not analysed.

3 The last multivariable model was based on the item "Do you have a pet you  
4 think of as your own?" with the following responses: Yes/No. This model was  
5 performed to predict the odds of a "Yes" response by contrast with a "No"  
6 response, based on gender, age, ethnicity, family structure, presence of  
7 siblings, parental employment, family affluence (FAS) and pet types.

## 8 **Results**

### 9 *Pet ownership characteristics for the total sample*

10 Of the total sample, 9644(72%) reported that they currently owned a pet. Of  
11 those, 7932 (55.8%) felt they had a pet of their own. Regarding the number of  
12 pets owned, 3433 (25.6%) owned one pet and 6211 (46.4%) owned two or  
13 more pets. The most common pet among adolescents who had only one was  
14 a dog (N=1955, 56.94%) followed by a cat (N= 805, 23.48%) and then small  
15 mammals (N= 278, 8.09%). In the case of those who owned two or more pets,  
16 the most common combinations were dog and cat (N= 1502, 22.18%), dog  
17 and fish, reptile or amphibian (N= 803, 12.92%) and cat and small mammals  
18 (n=702, 11.30%) (see Tables 1 and 2).

19

20

-INSERT TABLES 1 & 2 HERE-

21

22



1

## 2 *Sociodemographic variation in pet ownership*

3 According to Westgarth et al. (2010) multivariable modelling of pet ownership  
4 data better accounts for confounding socio-demographic factors than  
5 univariate analyses, so this section presents six multivariable models with  
6 dichotomous outcomes of factors associated with the ownership of: dogs;  
7 cats; fish, reptiles or amphibians; birds; and small mammals reported.

8

### 9 *Dogs*

10 The multivariable model of pet dog is presented in Table 3, alongside  
11 univariable outcomes for comparison. Adolescents were more likely to report  
12 having pet dogs if they: were age 15 (OR=1.146,  $p<0.001$ ) and age 13  
13 (OR=1.240,  $p<0.001$ ) compared with age 11; were white (OR=7.712,  
14  $p<0.001$ ) compared with non-white adolescents; reported living with single  
15 parents (OR=1.186,  $p=0.013$ ) compared with adolescents living with both  
16 parents; parents were employed (OR=1.414,  $p<0.001$ ) compared with those  
17 who were not; and reported a medium family affluence level (OR=1.151,  
18  $p=0.012$ ) compared with those who reported a low family affluence level.  
19 Furthermore, those who reported a higher family affluence level were less  
20 likely to report owning pets (OR=0.888,  $p=0.037$ ) compared with those who  
21 reported a low family affluence level.

22

23

-INSERT TABLE 3 HERE-

1

## 2 *Cats*

3 The multivariable model of pet cat is presented in Table 4, alongside  
4 univariable results for comparison. Adolescents were more likely to report  
5 having pet cats if they: were white (OR=4.160,  $p<0.001$ ) compared with non-  
6 white adolescents; reported living in single parent families (OR=1.319,  
7  $p<0.001$ ) or stepfamilies (OR=1.428,  $p<0.001$ ) compared with those who  
8 reported living with both parents; and reported to have siblings (OR=1.391,  
9  $p<0.001$ ) compared with those who did not have siblings. Furthermore, those  
10 who reported a medium family affluence level were less likely to report having  
11 a cat than those who reported a low family affluence level (OR=0.883,  
12  $p=0.024$ ).

13

14 -INSERT TABLE 4 HERE-

15

## 16 *Fish, reptiles or amphibians*

17 The multivariable model of pet fish, reptiles or amphibians is presented in  
18 Table 5, alongside univariable outcomes for comparison. Adolescents were  
19 more likely to report having pet fish, reptiles or amphibians if they: were white  
20 (OR=2.695,  $p<0.001$ ) compared with non-white adolescents; reported living  
21 with siblings (OR=1.220,  $p=0.037$ ) compared with those who did not report  
22 living with siblings; and reported a medium family affluence level (OR=1.318,  
23  $p<0.001$ ) compared with those who reported a low family affluence level.

1 Furthermore, adolescents were less likely to report owning fish, reptiles or  
2 amphibians if they were age 13 (OR=0.795,  $p<0.001$ ) and age 15 (OR=0.629,  
3  $p<0.001$ ) compared with those who were age 11.

4

5 -INSERT TABLE 5 HERE-

6

### 7 *Small mammals*

8 The multivariable model of small mammal pets is presented in Table 6,  
9 alongside univariable outcomes for comparison. Adolescents were more likely  
10 to report having small mammals if they were white (OR=5.956,  $p<0.001$ )  
11 compared with non-white adolescents. Therefore, adolescents were less likely  
12 to report having small mammals if they were 15-years-old (OR=0.630,  
13  $p<0.001$ ) compared with those who were 11-years-old; and reported a higher  
14 family affluence level (OR=0.832,  $p=0.005$ ) compared with those who  
15 reported lower family affluence level.

16

17 -INSERT TABLE 6 HERE-

18

### 19 *Birds*

20 The multivariable model of pet bird is presented in Table 7, alongside  
21 univariate results for comparison. Adolescents were more likely to report  
22 having birds if they: were 13-years-old (OR=1.299,  $p=0.010$ ) compared with

1 those who were 11-years-old; were white (OR=3.229, p<0.001) compared  
2 with those who were non-white; and reported their parents were employed  
3 (OR=1.523, p=0.018) compared with those who reported their parents were  
4 not employed. Furthermore, adolescents were less likely to report owning  
5 birds if they reported a medium (OR= 0.806, p=0.037) or higher family  
6 affluence level (OR=0.801, p=0.046) compared with those who reported a low  
7 family affluence level.

8

9

-INSERT TABLE 7 HERE-

10

11 *Proxy measure of attachment to pets "Consider their pet as their own"*

12

13 The multivariable model of variable "consider pet as own" is presented in  
14 Table 8, alongside univariable results for comparison. Adolescents were more  
15 likely to report considering their pet as their own if they: reported living with  
16 siblings (OR=1.998, p<0.001) compared with those who reported they were  
17 not living with siblings and owning dogs (OR=2.171, p<0.001), cats  
18 (OR=1.869, p<0.001), fish, amphibian or reptiles (OR=2.255, p<0.001) and  
19 birds (OR=1.667, p<0.001) compared with those who reported owning small  
20 mammals.

21

22

-INSERT TABLE 8 HERE-

23

## 1 **Discussion**

2 Data from our study confirm that pet ownership is commonplace with 72% of  
3 families with 11- to 15-year-old adolescents in Great Britain reporting having  
4 at least one pet. Our findings are similar to previous studies conducted in the  
5 UK, Germany and Australia that have shown different sociodemographic  
6 factors associated with childhood and adolescents ownership for different  
7 types of companion animals (Paul & Serpell 1992; Headey & Grabka 2007;  
8 Westgarth et al. 2010; Müllersdorf, Granström & Tillgren2012; Westgarth et al.  
9 2013).

10 Descriptive results from our study provide sociodemographic data taking into  
11 account the number of pets owned and animal type. Of the adolescents who  
12 reported having only one pet (25.6%), the most common was the dog  
13 (56.94%) followed by the cat (23.48%). In those cases where adolescents  
14 reported having two or more pets, dogs and cats were owned in combination  
15 with other pets. Our data confirm the high prevalence of dogs and cats in  
16 English, Scottish and Welsh households (Murray et al. 2010; PFMA 2013;  
17 Westgarth et al. 2013). We also found a lower prevalence of small mammals,  
18 fish, reptiles and amphibians, and birds among adolescents who reported  
19 owning only one animal, but a high prevalence of these three broad types of  
20 pet in combination with cats and dogs. Our results provide a detailed  
21 description of the various pet combinations that exist in households in  
22 England, Scotland and Wales with adolescents.

23 Murray et al. (2010) and Westgarth et al. (2010) argue that different pet types  
24 may be associated with different sociodemographic variables (gender, age,

1 ethnicity, family structure, siblings, parental employment, family affluence  
2 levels), and the findings reported here support this view.

3 No gender differences were found for all pets types. This is in line with  
4 previous research (Siegel, 1995; Vidovic, Stetic & Bratko 1999) but disagrees  
5 with the evidence that girls are more likely than boys to own dogs, cats,  
6 rodents and horses (Westgarth et al. 2013). Methodological differences  
7 between previous research and our study may help to clarify the lack of  
8 agreement in results. According to Paul and Serpell (1992) and Headey, Na &  
9 Zheng (2008), due to the fact that family structures may have both girls and  
10 boys, gender differences can be complicated when assessing family pet  
11 ownership overall (Müllersdorf et al. 2010; Müllersdorf, Granström & Tillgren  
12 2012).

13 Regarding age, we found that 15-year-olds were more likely to own dogs and  
14 less likely to own fish, reptiles or amphibians, and small mammals than 11-  
15 year-olds. Furthermore, we also found that 13-year-olds were more likely to  
16 own dogs, birds and less likely to own fish, reptiles or amphibians than 11-  
17 year-olds. These results partially support previous findings from research with  
18 children and young people (Salomon 1981; Kidd & Kidd 1985; Melson 1988;  
19 Siegel 1995; Müllersdorf et al. 2010). We believe this could be related with the  
20 types of activities adolescents may have with their companion animals.  
21 Adolescents in mid-adolescence may be mature enough to engage in outdoor  
22 activities with their pet dogs whereas early adolescents may be more  
23 interested in indoor activities at home with their fish, small mammals and  
24 birds.

1 Our analyses of ethnicity were limited given the small sample sizes of the  
2 different ethnic groups. However, we observed ethnicity was the single most  
3 significant factor affecting pet ownership. White adolescents were much more  
4 likely to own all types of pets than non-white adolescents (Mixed, Asian, Black  
5 and adolescents from other ethnicities). This finding supports previous studies  
6 conducted in the United States, assessing pet ownership among 12-to 17-  
7 year-old adolescents (Siegel 1995) and university students (Brown 2003). The  
8 findings also support research conducted in the UK that considered different  
9 types of companion animals (dogs, rodents and other pets) in 9- to 10-year-  
10 olds (Westgarth et al. 2013). Different religious and cultural conventions and  
11 beliefs are likely to shape the ways in which children and adolescents  
12 perceive and treat animals (Westgarth et al. 2013). Therefore, future studies  
13 are needed to assess which factors are related to pet ownership within  
14 different ethnic groups. Ethnicity is also clearly an issue that needs to be  
15 taken account of in any school based intervention aimed at improving  
16 attitudes and behaviour to animals in young people.

17 The assessment of family structure has shown that adolescents living in  
18 stepfamilies or with a single parent are more likely to own dogs (only in single  
19 parents families) and cats in comparison with adolescents who live with both  
20 parents. Accordingly, our findings conflict with Melson (1988), Kidd and Kidd  
21 (1990), and Fifield and Forsyth (1999). However, it partially concurs with Paul  
22 and Serpell's (1992) and Müllersdorf et al.'s (2010) studies. Both studies  
23 stated that stepparents tend to give companion animals to their sons or  
24 daughters to help them to adapt to the new family structure and to reduce  
25 feelings of loneliness. We argue that this may also apply to adolescents living

1 with single parents, given that our data shows that both groups are also more  
2 likely to own cats and dogs in comparison with adolescents who live with both  
3 parents. Furthermore, our study found no differences according to family  
4 structure in ownership of fish, reptiles or amphibians, birds and small  
5 mammals. This may be explained by the fact that behavioural and emotional  
6 interactions with companion animals such as inviting to sit pets on laps could  
7 be more likely to occur in cats and dogs, rather than with fish, reptiles,  
8 amphibians, birds, or small mammals.

9 In relation to the presence of siblings, some studies suggest that larger  
10 families are more likely to have companion animals (Messent & Horsfield  
11 1985; McHarg et al. 1995), while others point out that single children are more  
12 likely to own pets (Rost & Hartmann 1994) or that there is no difference  
13 (Melson 1988; Siegel 1995; Westgarth et al. 2013). We found adolescents  
14 with siblings were more likely to own cats and fish, reptile or amphibians.  
15 Melson (1988) suggests that younger children may use pets to express  
16 feelings and show behaviours that older children are able to direct towards  
17 their younger siblings, although given our sample, we were not able to study  
18 this aspect.

19 The results illustrate a relationship between parental employment and  
20 ownership of dogs and birds in families with 13 and 15 year old adolescents,  
21 perhaps reflecting the economic expense associated with having a  
22 companion animal (Covert et al. 1985; Albert & Bulcroft 1988; ASPCA 2012).  
23 Our results also partially agree with Melson (1988) and Fifield and Forsyth  
24 (1999). These authors state that parents who spend less time with their sons  
25 or daughters because of their jobs, could perceive an emotional deficit within



1 their children's environment and consider that a pet (without specifying any  
2 type of companion animal in particular) may partially compensate for their  
3 absence. However, another and complementary explanation could be that  
4 working parents may see pet ownership as a possible learning source and as  
5 a source of attachment. These parents may consider their adolescents  
6 adequately independent and responsible enough to care for a bird or a dog,  
7 particularly if the adolescent-pet interactions are likely to happen without the  
8 supervision of parents.

9 Analysis of the FAS revealed that family affluence levels were associated with  
10 different types of companion animals. Adolescents who reported medium  
11 family affluence levels were more likely to own dogs in comparison to those  
12 who reported lower family affluence levels. Furthermore, we also found  
13 adolescents who reported higher family affluence levels were less likely to  
14 own dogs. This agrees with other studies that dog ownership decreases as  
15 social class or educational levels increases among adults (Downes, Canty &  
16 More 2009; Eller et al. 2008; Murray et al. 2010) and children (Westgarth et al.  
17 2010; Westgarth et al. 2013). Cat ownership was associated with medium  
18 levels of family affluence. This outcome is difficult to compare with previous  
19 research conducted in children (Westgarth et al. 2010; Westgarth et al. 2013)  
20 and in the general population (Murray et al. 2010) due to methodological  
21 differences. Westgarth et al. (2010) reported cat ownership was associated  
22 with higher levels of family affluence levels only when education levels  
23 interacted with previous experiences of pet ownership during mothers'  
24 childhood. Westgarth et al. (2013) reported no differences in the deprivation  
25 score used in their study to assess the relationship between family affluence

1 and the ownership of cats. However, in the general population outcomes from  
2 Murray et al. (2010) found to be similar to Westgarth et al.'s study (2010),  
3 higher levels of education were related to cat ownership.

4 Adolescents who reported medium family affluence levels were more likely to  
5 own fish and less likely to own birds in comparison to those from less affluent  
6 families. Furthermore, we also found adolescents with high family affluence  
7 levels were less likely to own small mammals and birds. This is partially in line  
8 with Westgarth et al.'s study (2010), which found the likelihood of bird and  
9 rodent ownership decreased with higher maternal educational level and  
10 increased only for bird ownership with unskilled occupations reported by  
11 parents.

12 Results for fish, reptiles or amphibians are unique and cannot be compared  
13 with previous research. The only study examining socio-demographic  
14 variables related to fish ownership did not report the results model due to a  
15 low goodness of fit in their model (Hosmer-Lemeshow test=0.006) (Westgarth  
16 et al. 2010).

17 Overall, differences between the sociodemographic findings reported here  
18 and previous research may be explained by the use of different measures  
19 used to assess family affluence, such as the deprivation score scale  
20 (Westgarth et al. 2013), parental education, and types of skilled professions  
21 reported by parents (Westgarth et al. 2010). Further studies are necessary  
22 using a standard and reliable measure of family affluence such as the FAS  
23 (Batista-Foguet et al. 2004) to properly assess associations between different  
24 types of companion animals and family affluence levels. Furthermore, studies

1 should consider the influence that breeds of different types of companion  
2 animals, and the associated costs, may have in this association. Previous  
3 research already considered breeds in relation to dog ownership (Westgarth  
4 et al. 2013).

5 Finally, we found that those adolescents who reported owning dogs, cats, fish,  
6 reptiles, amphibians and birds were more likely than those who did not, to  
7 consider their pet as their own. This fits with the fact that through experience  
8 of living with companion animals, adolescents could become more  
9 emotionally connected to their pet animal than those adolescents who do not  
10 live with pets, or do not have a companion animal they consider to be their  
11 own (Kotrschal 2013). Research has shown that pet owners tend to feel  
12 connected to their companion animals in a similar way to human relationships  
13 (Albert & Bulcroft 1988; Friedmann, Son & Tsai 2000; Marsa-Sambola et al.  
14 2015). Undergraduate students in Kurdek's study (2008) evaluated their level  
15 of attachment to their dogs as similar to their family members. As stated by  
16 Zilcha-Mano, Mikulincer & Shaver (2011) companion animals can be  
17 accepting, openly affectionate, consistent, loyal and honest. Characteristics  
18 that suggest companion animals may act as attachment figures (Zilcha-Mano,  
19 Mikulincer & Shaver 2011; Kotrschal 2013).

20

21 Furthermore, we found that adolescents with no siblings were more likely to  
22 consider their pets as their own than those who reported having siblings. This  
23 is in line with the observation of Siegel (1995) and Westgarth et al. (2013)  
24 who suggested that adolescents without siblings assessed their relationship  
25 with their pets as more important than those who reported living with siblings.

1 No other sociodemographic differences were found in our proxy measure of  
2 attachment to pets. Although we present some data on sense of owning one's  
3 own pet, this variable is a proxy measure of attachment to pets. We were not  
4 able to measure attachment to pets in Wales and so we did not include it in  
5 this analysis. Data using a pet attachment measure (the Short Attachment to  
6 Pets Scale, SAPS) in England and Scotland is published elsewhere (Marsa-  
7 Sambola et al. 2015). Future research should replicate our study using SAPS  
8 or a similar pet attachment measure to explore sociodemographic influences  
9 on emotional attachment to pets among adolescents.

10 Despite the interesting outcomes obtained through six multivariable binary  
11 logistic regression models in a large and not convenience-based sample there  
12 are some limitations to consider. First, the data are self-reported, so we did  
13 not see the different pet types for confirmation, nor did we check with parents.  
14 Second, Items "What types of pet animals do you have now?", "How many pet  
15 animals do you have now?" and "Do you have a pet that you think of as your  
16 own?" were developed and adapted from previous studies with adolescents  
17 (Muldoon & Williams, 2009). However, in line with Westgarth et al. (2013), we  
18 acknowledge there is scope to refine the term pet ownership for future  
19 research to ensure adolescents' perspectives on pets, mainly considering  
20 where pets live and adolescents' sense of ownership feelings towards their  
21 pets.

22 Third, the majority of our variables (gender, ethnicity, family affluence, siblings  
23 and proxy measure of attachment to pets) were compared with the only two  
24 studies conducted in the UK on pet ownership in children (Westgarth et al.  
25 2010; Westgarth et al. 2013). There are limitations associated with these

1 studies that need to be considered. Westgarth et al.'s (2013) study was  
2 conducted with 9 to 10-year-old children in a region of Liverpool that has  
3 areas of high deprivation. Accordingly, it may not be possible to generalize  
4 their findings to other populations within Great Britain. Regarding Westgarth et  
5 al.'s (2010) study, we would like to highlight that the age range of children  
6 involved in this study was from 0 to 10 years, whereas in our study,  
7 participants ranged from 11 to 15 years. Fourth, the pet type "fish, reptile or  
8 amphibian" was created as a category for exotic pets according to the British  
9 Veterinary Association (2012). However, we acknowledge analysing these  
10 three pets types separately may lead to different findings from our current  
11 results.

12

### 13 **Conclusion**

14 Sociodemographic data associated with different types of pets in adolescents  
15 are important in order to form a better understanding of the socio-  
16 developmental impact of growing up with companion animals.

17 This study reveals that different types of pet ownership in Great Britain are  
18 related to some sociodemographic factors. There are predictable social and  
19 economic differences in adolescents who own pets and who therefore have  
20 the opportunity of experiencing this form of human-animal relationship. These  
21 factors should be considered when studying positive health benefits of HAI in  
22 adolescents.

23

1 **Competing interests**

2 The authors declare not competing interests

3

4

5 **Acknowledgments**

6 This study presents findings from the first stage of a three-year project ( "*An*  
7 *investigation of 13-17 year olds' attitudes and behaviour to animals and*  
8 *development and testing of interventions to promote the concept of Duty of*  
9 *Care*" -SMDO-ZGLD15) that aims to ascertain the most effective ways to  
10 promote a duty of care (DOC) towards animals among children and young  
11 people. The project was instigated by a call from the Department for  
12 Environment Food and Rural Affairs (DEFRA) for research in this area in line  
13 with recent changes in animal welfare law.

14

15 The national HBSC teams in England and Scotland are acknowledged as is  
16 the International HBSC Study (Dorothy Currie).

17

18

19

20

21

22

23 **References**

- 1 Albert, A. & Bulcroft, K. 1988. Pets, families, and the life course. *Journal of*  
2 *Marriage and the Family* 50(2): 543-552.
- 3 Allen, J. M., Kellegrew, D. H. & Jaffe, D. 2000. The experience of pet  
4 ownership as a meaningful occupation. *Canadian Journal of Occupational*  
5 *Therapy* 67(4): 271-278.
- 6 ASPCA 2012. Pet Care Costs. <https://www.aspca.org/adopt/pet-care-costs>.  
7 Accessed on September 1, 2015
- 8  
9 Banks, M. R. & Banks, W. A. 2002. The effects of animal-assisted therapy on  
10 loneliness in an elderly population in long-term care facilities. *The journals of*  
11 *gerontology series A: biological sciences and medical sciences* 57(7): 428-  
12 432.
- 13 Barker, S. B., Rogers, C. S., Turner, J. W., Karpf, A. S. & Suthers-McCabe, H.  
14 M. 2003. Benefits of interacting with companion animals a bibliography of  
15 articles published in refereed journals during the past 5 years. *American*  
16 *Behavioral Scientist* 47(1): 94-99.
- 17 Batista-Foguet, J. M., Fortiana, J., Currie, C. & Villalbi, J. R. 2004. Socio-  
18 economic indexes in surveys for comparisons between countries. *Social*  
19 *Indicators Research* 67(3): 315–332.
- 20 Berns, R. 2013. Ecology of the Child. In *Child, Family, School, Community:*  
21 *Socialization and Support*, 3-36, ed R. Berns Stamford, USA: Cengage  
22 Learning.

- 1 Bjerke, T., Odegardstuen, T. & Kaltenborn, B. 1998. Attitudes Toward Animals  
2 Among Norwegian Adolescents. *Anthrozoös* 11(2): 79-86.
- 3 Bodsworth, W. & Coleman, G. J. 2001. Child-companion animal attachment  
4 bonds in single and two-parent families. *Anthrozoös* 14: 216-223
- 5 Boyce, W., Torsheim, T., Currie, C. & Zambon, A. 2006. The family affluence  
6 scale as a measure of national wealth: validation of an adolescent self-report  
7 measure. *Social Indicators Research* 78: 473-487.
- 8
- 9 Brown, S. E. 2003. Ethnic variations in pet attachment among students at an  
10 American school of veterinary medicine. *Society & Animals* 11(1): 101-102.
- 11 British Veterinary Association 2012. Exotic pets policy.  
12 [http://www.bva.co.uk/News-campaigns-and-policy/Policy/Companion-](http://www.bva.co.uk/News-campaigns-and-policy/Policy/Companion-animals/Exotic-pets/)  
13 [animals/Exotic-pets/](http://www.bva.co.uk/News-campaigns-and-policy/Policy/Companion-animals/Exotic-pets/). Accessed on November 10, 2015.
- 14 Bryant, B. K. & Worley, P. eds. 1989. *People, Animals and the Environment*.  
15 Massachusetts: Delta Society.
- 16 Cain, A. 1983. A study of pets in the family system. In *New perspectives on*  
17 *our lives with companion animals*, 72-81, ed A. Katcher & A. Beck.  
18 Philadelphia: University of Pennsylvania Press.
- 19 Carstairs, V. & Morris, R. 1990. Deprivation and health in Scotland. *Health*  
20 *Bulletin* 48(4): 162-175.
- 21 Cherniack, E. P. & Cherniack, A. R. 2014. The benefit of pets and animal-  
22 assisted therapy to the health of older individuals. *Current Gerontology and*



1 *Geriatrics Research* <<http://dx.doi.org/10.1155/2014/623203>> Accessed on  
2 September 1, 2015.

3 Covert, A., Whiren, A., Keith, J. & Nelson, C. 1985. Pets, early adolescents  
4 and families. *Marriage and Family Review* 8: 95-108.

5 Crawford, E. K., Worsham, N. L. & Swinehart, E. R. 2006. Benefits derived  
6 from companion animals, and the use of the term "attachment".  
7 *Anthrozoös* 19(2): 98-112.

8 Currie, C., Levin, K., Kirby, J., Currie, D., van der Sluijs, W. & Inchley, J. 2011.  
9 *Health Behaviour in School-Aged Children (HBSC): Scotland National Report*.  
10 Edinburgh: Child and Adolescent Health Research Unit (CAHRU).

11 Currie, C., Molcho, M., Boyce, W., Holstein, B., Torsheim, T. & Richter, M.  
12 2008. Researching health inequalities in adolescents: the development of the  
13 Health Behaviour in School-Aged Children (HBSC) family affluence scale.  
14 *Social Science & Medicine* 66(6): 1429-1436.

15 Currie, C., Zanotti, C., Morgan, A., Currie, D., De Looze, M. E., Roberts, C.,  
16 Samdal, O., Smith, O. & Barnekow, V 2012. *Social determinants of health and  
17 well-being among young people. HBSC international report from the  
18 2009/2010 Survey. Health Policy for Children and Adolescents No. 6*.  
19 Copenhagen, Denmark: WHO Regional Office for Europe.

20 Davis, J. 1987. Preadolescent self-concept development and pet ownership.  
21 *Anthrozoös* 1: 90-94.

- 1 Davis, J. & Juhasz, A. 1985. The preadolescent pet bond and psychological  
2 development. *Marriage and Family Review* 8: 79-94.
- 3 Downes, M., Canty, M. J. & More, S. J. 2009. Demography of the pet dog and  
4 cat population on the island of Ireland and human factors influencing pet  
5 ownership. *Preventive Veterinary Medicine* 92(1): 140-149.
- 6 Due, P., Holstein, B. E., Lynch, J., Diderichsen, F., Nic Gabhain, S., &  
7 Scheidt, P., Currie, C. & Health Behaviour in School-Aged Children Bullying  
8 Working Group 2005. Bullying and symptoms among school-aged children:  
9 international comparative cross-sectional study in 28 countries. *European*  
10 *Journal of Public Health* 15: 128-132.
- 11
- 12 Eller, E., Roll, S., Chen, C.M., Herbarth, O., Wichmann, H.E., von Berg, A.,  
13 Kramer, U., Mommers, M., Thijs, C., Wijga, A., Brunekreef, B., Fantini, M.P.,  
14 Bravi, F., Forastiere, F., Porta, D., Sunyer, J., Torrent, M., Host, A., Halken,  
15 S., Carlsen, K.C.L., Carlsen, K.H., Wickman, M., Kull, I., Wahn, U., Willich,  
16 S.N., Lau, S., Keil, T., Heinrich, J. & Working Grp LENWP-B. 2008. Meta-  
17 analysis of determinants for pet ownership in 12 European birth cohorts on  
18 asthma and allergies: a GA(2)LEN initiative. *Allergy* 63:1491–1498.
- 19 Esposito, L., McCune, S., Griffin, J. A. & Maholmes, V. 2011. Directions in  
20 human–animal interaction research: Child development, health, and  
21 therapeutic interventions. *Child Development Perspectives* 5(3): 205-211.
- 22 Fifield, S. J. & Forsyth, D. K. 1999. A pet for the children: Factors related to  
23 family pet ownership. *Anthrozoos* 12(1): 24-32.

- 1 Franti, C., Kraus, J., Borhani, N., Johnson, S. & Tucker, S. 1980. Pet  
2 ownership in rural northern California (El Dorado County). *Journal of the*  
3 *American Veterinary Medical Association* 176: 143–149.
- 4 Friedmann, E., Son, H. & Tsai, C. 2000. The animal-human bond: Health and  
5 wellness. In *Handbook on Animal-Assisted Therapy: theoretical foundations*  
6 *and guidelines for practice*, 41-58, ed. F. Aubrey & H. Fine. London, UK:  
7 Academic Press.
- 8 Grandgeorge, M., Tordjman, S., Lazartigues, A., Lemonnier, E., Deleau, M. &  
9 Hausberger, M. 2012. Does pet arrival trigger prosocial behaviors in  
10 individuals with autism. *PloS one* 7(8): e41739  
11 <doi:10.1371/journal.pone.0041739> Accessed on September 3, 2015.
- 12 Griesbach, D., Amos, A. & Currie, C. 2003. Adolescent smoking and family  
13 structure in Europe. *Social Science & Medicine* 56: 41-52.
- 14 Guttman, G., Predovic, M. & Zemanek, M. 1985. The influence of pet  
15 ownership on non-verbal communication and social competence in children.  
16 In *The Human-Pet Relationship*, 58-62, ed M. Zemanek. Vienna: Institute for  
17 Interdisciplinary Research on the Human-Pet Relationship.
- 18 Headey, B. & Grabka, M. M. 2007. Pets and human health in Germany and  
19 Australia: National longitudinal results. *Social Indicators Research* 80(2): 297-  
20 311.
- 21 Headey, B., Na, F. & Zheng, R. 2008. Pet dogs benefit owners' health: A  
22 'natural experiment' in China. *Social Indicators Research* 87: 481-493.

- 1 Holstein, B., Parry-Langdon, N., Zambon, A., Currie, C. & Roberts, C. 2004.  
2 Socioeconomic inequalities and health. In *Young people's health in context.*  
3 *Health policy for children and adolescents no. 4*, 165-172, ed. C. E. Currie, C.  
4 Roberts, A. Morgan, R. Smith, W. Settertobulte, O. Samdal, & V. Barnekow  
5 Rasmussen. Copenhagen, Denmark: WHO Regional Office for Europe.  
6
- 7 Hutton, V.E. 2015. Social Provisions of the Human—Animal Relationship  
8 amongst 30 People Living with HIV in Australia, *Anthrozoös* 28(2): 199-214.
- 9 Kellert, S. & Berry, J. 1987. Attitudes, Knowledge, and Behaviors toward  
10 Wildlife as Affected by Gender. *Wildlife Society Bulletin* 15(3): 336-371.
- 11 Kidd, A. H. & Kidd, R. M. 1980. Personality characteristics and preferences in  
12 pet ownership *Psychological Reports* 46: 939-949.
- 13 Kidd, A. H. & Kidd, R. M. 1985. Children's attitudes toward their  
14 pets. *Psychological Reports* 57: 15-34.
- 15 Kidd, A. H. & Kidd, R. M. 1990. Factors in children's attitudes toward pets.  
16 *Psychological Reports* 66(3): 775-786.
- 17 Kotrschal, K. 2013. Human-Animal Relationships: Attachment and Caregiving.  
18 In *Attachment to Pets: An Integrative view of Human-Animal Relationships*  
19 *with Implications for the Therapeutic Practice*, 130-140, ed H. Julius, A. Beetz,  
20 K. Kotrschal, D. Turner & Uvnas-Moberg. Gottingen, Germany: Hogrefe.
- 21 Kurdek, L. 2008. Pet dogs as attachment figures. *Journal of Social and*  
22 *Personal Relationships* 25(2): 247-266.

- 1 Lane, D. R., McNicholas, J. & Collis, G. M. 1998. Dogs for the disabled:  
2 benefits to recipients and welfare of the dog. *Applied Animal Behaviour*  
3 *Science* 59(1): 49-60.
- 4 Levinson, B. 1978. Pets and personality development. *Psychological Reports*  
5 42: 1031–1038.
- 6 Mader, B., Hart, L. & Bergin, B. 1989. Social acknowledgements for children  
7 with disabilities: Effects of service dogs. *Child Development Perspectives* 60:  
8 1529-1534.
- 9 Marsa-Sambola, F., Muldoon, J., Williams, J., Lawrence, A., Connor, M. &  
10 Currie, C. 2015. The Short Attachment to Pets Scale (SAPS) for Children and  
11 Young People: Development, Psychometric Qualities and Demographic and  
12 Health Associations. *Child Indicators Research* <DOI 10.1007/s12187-015-  
13 9303-9> Accessed on October 2, 2015.
- 14 Marx, M., Stallones, L., Garrity, F. & Johnson, P. 1988. Demographics of pet  
15 ownership among U.S. adults 21-64 years of age. *Anthrozoös* 2(1): 33-37.
- 16 McHarg, M., Baldock, C., Heady, B. & Robinson, A. 1995. *National People*  
17 *and Pets Survey*. Australia: Urban Animal Management Coalition.
- 18 Melson, G. 1988. Availability of and involvement with pets by children:  
19 Determinants and correlates. *Anthrozoös* 2: 45-52.
- 20 Melson, G. & Fogel, A. 1988. Learning to care. *Psychology Today* 1: 39-45.

- 1 Melson, G. & Fogel, A. 1989. Children's ideas about animal young and their  
2 care: A reassessment of gender differences in the development of nurturance.  
3 *Anthrozoös* 2: 265-273.
- 4 Messent, P. & Horsfield, S. 1985. Pet population and the pet-owner bond. In  
5 *The Human-Pet Relationship*, 9-17, ed M. Zemarek. Vienna: Institute for  
6 Interdisciplinary Research on the Human-Pet Relationship.
- 7 Muldoon, J. & Williams, J. 2009. *The development of the SAPS (Short*  
8 *Attachment to Pets Scale) for the Health Behaviour in School-aged Children*  
9 *(HBSC) Study*. St Andrews: University of St Andrews.
- 10 Muldoon, J. & Williams, J. 2010. *Developing questions for the HBSC study:*  
11 *Findings from the Defrafundedproject 'Promoting a Duty of Care towards*  
12 *animals among young people'*. Edinburgh: University of Edinburgh.
- 13 Muldoon, J., Williams, J. & Lawrence, A. 2014. Mum cleaned it and I just  
14 played with it': Children's perceptions of their roles and responsibilities in the  
15 care of family pets. *Childhood*. doi:10.1177/0907568214524457.
- 16 Murray, J. K., Browne, W. J., Roberts, M. A., Whitmarsh, A. & Gruffydd-Jones,  
17 T. J. 2010. Number and ownership profiles of cats and dogs in the UK. *The*  
18 *Veterinary Record* 166(6): 163-174.
- 19 Müllersdorf, M., Granström, F., Sahlqvist, L. & Tillgren, P. 2010. Aspects of  
20 health, physical/leisure activities, work and socio-demographics associated  
21 with pet ownership in Sweden. *Scandinavian Journal of Public Health* 38: 53-  
22 63.

- 1 Müllersdorf, M., Granström, F. & Tillgren, P. 2012. A survey of Pet- and Non-  
2 Pet-Owning Swedish Adolescents: Demographic differences and Health  
3 Issues. *Anthrozoös* 25(1): 49-60.
- 4 Paul, E. S. & Serpell, J. 1992. Why Children Keep Pets - the Influence of  
5 Child and Family Characteristics. *Anthrozoos* 5(4): 231-244.
- 6 PFMA. 2013. *Pet Population 2013*, from [http://www.pfma.org.uk/pet-  
8 population/](http://www.pfma.org.uk/pet-<br/>7 population/) Accessed on July 4, 2015.
- 9 Prokop, P., & Kubiato, M. 2008. Bad wolf kills lovable rabbits: children's  
10 attitudes toward predator and prey. *Electronic Journal of Science Education*  
11 12(1): 55-70.
- 12 Regan, P. 2011. Principles of Relationship Science. In P. Regan (Ed.), *Close  
13 Relationships* (pp. 3-21). Hove, UK: Routledge.
- 14 Richter, M. & Leppin, A. 2007. Trends in socio-economic differences in  
15 tobacco smoking among German schoolchildren, 1994-2002. *European  
16 Journal of Public Health* 17: 565-571.
- 17 Richter, M., Lepping, A. & Gabhainn, S. N. 2006. The relationship between  
18 parental socio-economic status and episodes of drunkenness among  
19 adolescents: findings from a cross-national survey. *BMC Public Health* 6: 289-  
20 299.
- 21
- 22 Roberts, C., Freeman, J., Samdal, O., Schnohr, C. W., de Looze, M. E. & Nic  
23 Gabhainn, S. 2009. The Health Behaviour in School-aged Children (HBSC)

1 study: methodological developments and current tensions. *International*  
2 *Journal of Public Health* 54 (2): 140-150.

3 Rost, D. & Hartmann, A. 1994. Children and their pets. *Anthrozoös* 7: 242-  
4 254.

5 Salomon, A. 1981. Animals and children: the role of the pet. *Canada's Mental*  
6 *Health* 29: 9-13.

7 Siegel, J. M. 1990. Stressful life events and use of physician services among  
8 the elderly: the moderating role of pet ownership. *Journal of Personality and*  
9 *Social Psychology* 58(6): 1081-1090.

10 Siegel, J. M. 1995. Pet ownership and the importance of pets among  
11 adolescents. *Anthrozoös* 8(4): 217-223.

12 Siegel, J. M., Angulo, F. J., Detels, R., Wesch, J. & Mullen, A. 1999. AIDS  
13 diagnosis and depression in the Multicenter AIDS Cohort Study: the  
14 ameliorating impact of pet ownership. *Aids Care* 11(2): 157-170.

15 Strand, E.B. 2004. Interparental Conflict and Youth Maladjustment: The  
16 Buffering Effects of Pets. *Stress, Trauma, and Crisis: An International Journal*  
17 7(3): 151-168.

18 Vereecken, C. A., Inchley, J. C., Subramanian, S. V., Hublet, A. & Maes, L.  
19 2005. The relative influence of individual and contextual socio-economic  
20 status on consumption of fruit and soft drinks among adolescents in  
21 Europe. *European Journal of Public Health* 15: 224-232.

22



- 1 Vidovic, V., Stetic, V. & Bratko, D. 1999. Pet ownership, type of pet and socio-  
2 emotional development of school children. *Anthrozoös* 12(4): 211–217.
- 3 Wardle, J., Robb, K. & Johnson, F. 2002. Assessing socioeconomic status in  
4 adolescents: the validity of a home affluence scale. *Journal of Epidemiology*  
5 *and Community Health* 56(8): 595-599.
- 6 Westgarth, C., Boddy, L. M., Stratton, G., German, A. J., Gaskell, R. M.,  
7 Coyne, K. P., Bundred, P., McCune, S. & Dawson, S. 2013. Pet ownership,  
8 dog types and attachment to pets in 9-10 year old children in Liverpool, UK.  
9 *BMC Veterinary Research* 9: 102-112.
- 10 Westgarth, C., Heron, J., Ness, A. R., Bundred, P., Gaskell, R. M., Coyne, K.  
11 P., German, A.J., McCune, S. & Dawson, S. 2010. Family Pet Ownership  
12 during Childhood: Findings from a UK Birth Cohort and Implications for Public  
13 Health Research. *International Journal of Environmental Research and Public*  
14 *Health* 7(10): 3704-3729.
- 15 Westgarth, C., Pinchbeck, G.L., Bradshaw, J.W.S., Dawson, S., Gaskell,  
16 R.M. & Christley, R.M. 2007. Factors associated with dog ownership and  
17 contact with dogs in a UK community. *BMC Veterinary Research* 3:5-15.
- 18 Williams, J., Muldoon, J. & Lawrence, A. 2010. Children and their pets:  
19 Exploring the relationships between pet ownership, pet attitudes, attachment  
20 to pets and empathy. *Education and Health* 28(1): 12-16.
- 21 Zilcha-Mano, S., Mikulincer, M. & Shaver, P. R. 2011. An attachment  
22 perspective on human–pet relationships: Conceptualization and assessment

1 of pet attachment orientations. *Journal of Research in Personality* 45(4): 345-  
2 357.

3 Zimolag, U. U. & Krupa, T. 2009. Pet ownership as a meaningful community  
4 occupation for people with serious mental illness. *American Journal of*  
5 *Occupational Therapy* 63(2): 126-137.

6

7

8

9

10

11

12

13

14

15

16

17

18

19

1

Table 1.Characteristics of the sample.

Variable	N(%)	Variable	N(%)
Country		FAS*	4858(33.7)
England	4306(29.8)	Low Fas	4711(32.6)
Scotland	5058(35)	Medium FAS	4867(33.7)
Wales	5073(35.2)	High FAS	
Gender		Pet Ownership	
Girls	7215(50)	Yes	9644(72)
Boys	7221(50)	No	3752(28)
Age		Number of pets	
11	4972(34.4)	None	3752(28)
13	4943(34.3)	One	3433(25.6)
15	4521(31.3)	Two or more	6211(46.4)
Ethnicity		Consider pet as their own	
White	12206(86.5)	Yes	7392(55.8)
Non-white	1909(13.5)	No	5849(44.2)
Mixed	381(2.7)	Families	
Asian	951(6.7)	Stepfamilies	1794(13.2)
Black	451(3.1)	Single Parents	2708(19.9)
Other	126(0.9)	Both Parents	9114(66.9)
Siblings		Parent's employment	
No	1098(7.6)	Employed	11675(95.6)
Yes	13336(92.4)	Non employed	532(4.4)

2 \*FAS = Family Affluence Scale

3

4

5

6

7

8

9

10

11

12

1

Table 2. Characteristics of pet ownership

Pet ownership (Combinations)	N(%)
1 pet	
Dog	1955(56.94)
Cat	805(23.48)
Small Mammal	278(8.09)
Fish, reptiles and amphibians	233(6.78)
Bird	90(2.62)
Others	72(2.09)
2 or more pets	
Dog and Cat	1502(24.18)
Cat and Small Mammal	702(11.30)
Small Mammal and Bird	431(6.94)
Dogs and Fish, reptiles and amphibians	803(12.92)
Cat and Fish, reptiles and amphibians	434(6.98)
Dog and Bird	275(4.42)
Bird and Fish, reptiles and amphibians	87(1.40)
Dog and other	184(2.96)
Cat and other	114(1.83)
Bird and other	1(0.01)
Bird and cat	47(0.75)
Dog, Cat and Small Mammal	252(4.05)
Cat, Small Mammal and Fish, reptiles and amphibians	181(2.91)
Dog, Cat and other	160(2.57)
Dog, Cat and bird	114(1.83)
Dog, Cat and Fish, reptiles and amphibians	543(8.74)
Cat, Small Mammal, Fish, reptiles and amphibians and Bird	59(0.94)
Small Mammal, Fish, reptiles and amphibians and Bird	67(1.19)
Small Mammal, Cat, Dog and other	56(0.90)
Bird, Cat, Dog and Small Mammal	39(0.62)
Bird, Fish, reptiles and amphibians and Other	81(1.30)
Cat, Small Mammal, Fish, reptiles and amphibians, Bird, Other	6(0.09)
Bird, Cat, Dog, Small Mammal and Fish, reptiles and amphibians	73(1.17)

2

3

4

5

Table 3. Multivariable binary logistic regression model of dog ownership

Variables			Dogs			
	No	Yes	Univariable Analyses OR(95%CI)	P	Multivariable Analyses OR(95%CI)	P
<b>Gender</b>						
Girl	2826(49.5)	2879(50.1)	1		1	
Boy	2871(49.8)	2890(50.2)	0.988(0.918-1.063)	0.747	0.685(0.901-1.071)	0.689
<b>Age</b>						
11	2124(54.0)	1808(46.0)	1		1	
13	1933(48.6)	2048(51.4)	1.244(1.139-1.359)	<0.001	1.240(1.113-1.381)	<0.001
15	1640(46.2)	1912(53.8)	1.369(1.250-1.500)	<0.001	1.146(1.0321.273)	<0.001
<b>Ethnicity</b>						
Non-white	1453(85.1)	254(14.9)	1		1	
White	4020(42.5)	5434(57.5)	7.721(6.717-8.875)	<0.001	7.712(6.582-9.036)	<0.001
<b>Family structure</b>						
Mother and father	3575(50.3)	3538(49.7)	1		1	
Single parents	1075(49.6)	1093(50.4)	1.363(1.218-1.525)	<0.001	1.186(1.037-1.356)	0.013
Stepfamilies	641(42.6)	864(57.4)	1.028(0.933-1.131)	0.579	1.095(0.969-1.238)	0.145
<b>Siblings</b>						
No siblings	306(39.4)	471(60.6)	1		1	
Siblings	5390(50.4)	5296(49.6)	0.638(0.550-0.740)	<0.001	0.866(0.727-1.032)	0.108
<b>Parental employment</b>						
No	196 (43.4)	255(56.6)	1		1	
Yes	4487(48.7)	4733(51.3)	1.234(1.020-1.493)	0.030	1.414(1.133-1.764)	0.002
<b>FAS*</b>						
Low FAS	1913(50.2)	1898(49.8)	1		1	
Medium FAS	2084(54.8)	1722(45.2)	1.274(1.165-1.394)	<0.001	1.151(1.032-1.284)	0.012
High FAS	1700(44.2)	2149(55.8)	0.832(0.761-0.911)	<0.001	0.888(0.795-0.993)	0.037

Hosmer-Lemeshow=0.543, n=11466

\*FAS = Family Affluence Scale

Table 4. Multivariable binary logistic regression model of cat ownership

Variables			Cats			
	No	Yes	Univariable Analyses OR(95%CI)	P	Multivariable Analyses OR(95%CI)	P
<b>Gender</b>						
Girl	3505(66.6)	1755(33.4)	1		1	
Boy	3503(65.8)	1822(34.2)	0.963(0.888-1.044)	0.359	0.955(0.871-1.048)	0.332
<b>Age</b>						
11	2496(67.9)	1182(32.1)	1		1	
13	2410(65.4)	1273(34.6)	1.126(1.019-1.245)	0.020	1.040(0.930-1.162)	0.493
15	2102(65.2)	1122(34.8)	1.114(1.011-1.228)	0.029	1.052(0.938-1.180)	0.387
<b>Ethnicity</b>						
Non-white	5288(61.6)	3301(38.4)	1		1	
White	1475(87.1)	218(12.9)	4.233(3.648-4.913)	<0.001	4.160(3.563-4.858)	<0.001
<b>Family structure</b>						
Mother and father	4438(68.4)	2052(31.6)	1		1	
Single parents	1258(60.7)	816(39.3)	1.403(1.266-1.554)	<0.001	1.319(1.166-1.491)	<0.001
Stepfamilies	836(59.9)	560(40.1)	1.448(1.286-1.631)	<0.001	1.428(1.279-1.593)	<0.001
<b>Siblings</b>						
No siblings	390(55.5)	313(44.5)	1		1	
Siblings	6615(67.0)	3263(33.0)	1.465(1.354-1.546)	<0.001	1.391(1.182-1.636)	<0.001
<b>Parental employment</b>						
No	291(69.0)	131(31)	1		1	
Yes	5521(65.1)	2960(34.9)	0.838(0.678-1.035)	0.100	0.855(0.678-1.079)	0.188
<b>FAS*</b>						
Low FAS	2347(65.7)	1225(34.3)	1		1	
Medium FAS	2448(69.2)	1087(30.8)	0.851(0.770-0.940)	<0.001	0.883(0.793-0.984)	0.024
High FAS	2213(63.6)	1265(36.4)	1.095(0.993-1.207)	0.069	1.048(0.942-1.166)	0.391

Hosmer-Lemeshow=0.211, n=10585

\*FAS = Family Affluence Scale

Table 5. Multivariable binary logistic regression model of fish, amphibian or reptile ownership

Variables	Fish, amphibian or reptile					
	No	Yes	Univariable Analyses		Multivariable Analyses	
			OR(95%CI)	P	OR(95%CI)	P
<b>Gender</b>						
Girl	3611(70.10)	1542(29.90)	1		1	
Boy	3673(70.20)	1557(29.80)	0.992(0.912-1.079)	0.856	0.995(0.905-1.093)	0.910
<b>Age</b>						
11	2463(66.90)	1217(33.10)	1		1	
13	2508(69.80)	1087(30.20)	0.877(0.794-0.968)	0.009	0.795(0.711-0.899)	<0.001
15	2312(74.40)	796(25.60)	0.697(0.627-0.775)	<0.001	0.629(0.559-0.709)	<0.001
<b>Ethnicity</b>						
Non-White	1449(85.50)	246(14.50)	1		1	
White	5594(66.70)	2794(33.30)	2.942(2.551-3.393)	<0.001	2.695(2.303-3.155)	<0.001
<b>Family structure</b>						
Mother and father	4437(68.70)	2024(31.30)	1		1	
Single parents	1449(73.70)	517(26.30)	1.067(0.941-1.210)	0.311	1.027(0.888-1.189)	0.718
Stepfamilies	901(67.30)	439(32.70)	0.783(0.699-0.877)	<0.001	0.882(0.769-1.010)	0.069
<b>Siblings</b>						
No siblings	447(65.70)	233(34.30)	1		1	
Siblings	6835(70.50)	2866(29.50)	1.245(1.057-1.467)	0.009	1.220(1.012-1.471)	0.037
<b>Parental employment</b>						
No	286(66.80)	140(33.20)	1		1	
Yes	5726(68.70)	2607(31.30)	1.093(0.888-1.346)	0.401	1.200(0.954-1.510)	0.120
<b>FAS*</b>						
Low FAS	2507(72.00)	975(28.00)	1		1	
Medium FAS	2578(74.60)	876(25.40)	1.459(1.318-1.615)	<0.001	1.318(1.170-1.4840)	<0.001
High FAS	2199(63.80)	1248(36.20)	0.873(0.785-0.972)	0.013	0.898(0.794-1.016)	0.088

Hosmer-Lemeshow=0.943, n=10383

\*FAS = Family Affluence Scale

Table 6. Multivariable binary logistic regression model of small mammal ownership

Variables	Small mammals					
	No	Yes	Univariable Analyses		Multivariable Analyses	
			OR(95%CI)	P	OR(95%CI)	P
<b>Gender</b>						
Girl	3812(75.2)	1260(24.8)	1		1	
Boy	3874(74.6)	1321(25.4)	0.969(0.887-1.060)	0.495	0.980(0.886-1.085)	0.706
<b>Age</b>						
11	2617(71.9)	1023(28.1)	1		1	
13	2633(73.8)	934(26.2)	0.907(0.817-1.006)	0.065	0.891(0.792-1.003)	0.057
15	2436(79.6)	624(20.4)	0.655(0.584-0.734)	<0.001	0.630(0.554-0.716)	<0.001
<b>Ethnicity</b>						
Non-White	1565(93.4)	110(6.6)	1		1	
White	5863(70.7)	2429(29.3)	5.880(4.820-7.173)	<0.001	5.956(4.762-7.448)	<0.001
<b>Family structure</b>						
Mother and father	4735(74.2)	1646(25.8)	1		1	
Single parents	1457(74.4)	501(25.6)	0.982(0.857-1.126)	0.866	1.008(0.875-1.162)	0.909
Stepfamilies	972(74.5)	332(25.5)	0.990(0.882-1.112)	0.798	0.940(0.802-1.102)	0.444
<b>Siblings</b>						
No siblings	474(73.3)	173(26.7)	1		1	
Siblings	7211(75.0)	2408(25.0)	0.917(0.765-1.098)	0.345	0.937(0.761-1.155)	0.531
<b>Parental employment</b>						
No	301(73.5)	108(26.5)	1		1	
Yes	6081(74.0)	2138(26.0)	1.024(0.817-1.282)	0.840	1.095(0.854-1.405)	0.480
<b>FAS*</b>						
Low FAS	2545(74.5)	872(25.5)	1		1	
Medium FAS	2713(78.4)	748(21.6)	1.156(1.038-1.286)	0.008	1.062(0.939-1.201)	0.336
High FAS	2427(71.6)	961(28.4)	0.805(0.720-0.900)	<0.001	0.832(0.730-0.947)	0.005

Hosmer-Lemeshow=0.900, n=10267

\*FAS = Family Affluence Scale



Table 7. Multivariable binary logistic regression model of bird ownership

Variables	Bird ownership					
	No	Yes	Univariable Analyses		Multivariable Analyses	
			OR(95%CI)	P	OR(95%CI)	P
<b>Gender</b>						
Girl	4433(92.1)	378(7.9)	1		1	
Boy	4437(92.2)	376(7.8)	1.006(0.867-1.168)	0.935	1.028(0.870-1.215)	0.747
<b>Age</b>						
11	3121(93.0)	237(7.0)	1		1	
13	3052(90.9)	306(9.1)	1.323(1.109-1.579)	0.002	1.299(1.065-1.585)	0.010
15	2696(92.7)	211(7.3)	1.031(0.850-1.250)	0.757	0.953(0.767-1.185)	0.667
<b>Ethnicity</b>						
Non-White	1620(97.1)	48(2.9)	1		1	
White	6968(91.0)	687(9.0)	3.347(2.484-4.511)	<0.001	3.229(2.326-4.483)	<0.001
<b>Family structure</b>						
Mother and father	5466(92.1)	471(7.9)	1		1	
Single parents	1712(92.6)	138(7.4)	0.933(0.766-1.137)	0.494	0.953(0.738-1.231)	0.713
Stepfamilies	1140(91.8)	102(8.2)	1.038(0.831-1.298)	0.092	0.810(0.635-1.032)	0.089
<b>Siblings</b>						
No siblings	555(92.4)	46(7.6)	1		1	
Siblings	8312(92.2)	708(7.8)	0.965(0.707-1.318)	0.825	0.898(0.630-1.280)	0.552
<b>Parental employment</b>						
No	345(87.8)	48(12.2)	1		1	
Yes	7081(92.2)	599(7.8)	1.643(1.201-2.248)	0.002	1.523(1.075-2.159)	0.018
<b>FAS*</b>						
Low FAS	2964(91.2)	288(8.8)	1		1	
Medium FAS	3018(93.2)	219(6.8)	0.749(0.624-0.900)	0.002	0.806(0.653-0.996)	0.037
High FAS	2887(92.1)	247(7.9)	0.881(0.738-1.052)	0.163	0.801(0.651-.987)	0.046

Hosmer-Lemeshow=0.531, n=9624

\*FAS = Family Affluence Scale

Table 8. Multivariable binary logistic regression model of consider one own pet.

Variables	Consider pet as their own					
	No	Yes	Univariable Analyses		Multivariable Analyses	
			OR(95%CI)	P	OR(95%CI)	P
<b>Gender</b>						
Girl	3750(55.0)	3070(45.0)	1		1	
Boy	4330(57.4)	3210(42.6)	1.108(1.035-1.187)	0.003	1.043(0.947-1.148)	0.364
<b>Age</b>						
11	2905(60.4)	1908(39.6)	1		1	
13	2875(56.9)	2180(43.1)	1.169(1.075-1.272)	<0.001	1.344(0.191-1.517)	0.500
15	2177(51.0)	2095(49.0)	1.448(1.329-1.577)	<0.001	1.153(0.025-1.295)	0.918
<b>Ethnicity</b>						
Non-White	518(31.9)	1106(68.1)	1		1	
White	7427(59.5)	5063(40.5)	0.313(0.281-0.350)	<0.001	0.836(0.686-1.020)	0.076
<b>Family structure</b>						
Mother and father	4967(53.6)	4301(46.4)	1		1	
Single parents	1645(61.0)	1052(39.0)	0.736(0.672-0.806)	<0.001	0.909(0.783-1.056)	0.401
Stepfamilies	1119(61.8)	691(38.2)	0.697(0.626-0.775)	<0.001	1.762(0.662-1.877)	0.702
<b>Siblings</b>						
No siblings	771(64.9)	417(35.1)	1		1	
Siblings	7314(55.5)	5867(44.5)	1.502(1.317-1.712)	<0.001	1.998(1.625-2.457)	<0.001
<b>Parental employment</b>						
No	307(60.1)	204(39.9)	1		1	
Yes	6690(56.0)	5263(44.0)	0.847(0.704-1.019)	0.079	0.785(0.604-1.021)	0.125
<b>FAS*</b>						
Low FAS	2690(53.2)	2362(46.8)	1		1	
Medium FAS	2391(57.4)	1774(42.6)	1.835(0.766-0.911)	<0.001	1.875(0.777-1.985)	0.665
High FAS	3004(58.3)	2150(41.7)	1.819(0.755-0.889)	<0.001	1.873(0.770-1.991)	0.286
<b>Pet types</b>						
Small mammals	2262(81.5)	513(18.5)	1		1	
Dogs	1903(68.3)	883(31.7)	2.046(1.806-2.318)	<0.001	2.171(1.891-2.493)	<0.001
Cats	1569(71.2)	635(28.8)	1.785(1.562-2.038)	<0.001	1.869(1.612-2.166)	<0.001
Fish	1449(67.4)	700(32.6)	2.130(1.867-2.430)	<0.001	2.255(1.952-2.606)	<0.001
Bird	353(71.5)	141(28.5)	1.761(1.417-2.189)	<0.001	1.667(1.302-2.134)	<0.001

Hosmer-Lemeshow=0.386, n=14360

\*FAS = Family Affluence Scale

