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and health outcomes: German  
longitudinal evidence

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**THE RELATIONSHIP BETWEEN PET OWNERSHIP AND  
HEALTH OUTCOMES:**

GERMAN LONGITUDINAL EVIDENCE

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### *Abstract*

Previous cross-sectional and intervention studies have suggested that pet owners may enjoy better physical and mental health than non-owners. This paper presents longitudinal evidence from a major national representative longitudinal survey: the German Socio-Economic Panel (SOEP). Because the data are longitudinal, it is possible to assess the impact on health outcomes (measured by number of doctor visits) of longer term pet ownership, and also of gaining and losing a pet. An unexpected finding was that all health benefits appear to accrue to homeowners only. The main result, then, is that homeowners who have owned a pet for five years or more make significantly fewer doctor visits than non pet owners. However, losing a pet appears to impose immediate health costs. The results hold after controlling for other variables associated with use of health services, and also for health status at baseline. They still hold when a proxy for unobserved heterogeneity is included in equations.

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# **THE RELATIONSHIP BETWEEN PET OWNERSHIP AND HEALTH OUTCOMES:**

## **GERMAN LONGITUDINAL EVIDENCE**

The German Socio-Economic Panel Survey (SOEP) provides new evidence on the benefits of pet ownership for human health. So far as we know, this is the first survey of the general population which, because it is longitudinal, enables researchers to detect whether owning a pet improves health outcomes. Many previous studies have claimed that pets produce health benefits, but the claim has been disputed, either because the studies were cross-sectional and so could not establish causal direction, or because they were small scale interventions in which specific groups (mainly older and institutionalised people) were given a pet. The people concerned might well have known or suspected that the aim was to improve their health and this could have affected their survey responses.

Previous research in the US, Britain, Canada and Australia has shown plausible evidence of a linkage between pet ownership and better human health. But most studies were cross-sectional, and while they indicated possible benefits, their design made it impossible to know whether owners enjoyed better health as a consequence of having a pet in the home, or whether people who were healthier in the first place tended to acquire pets (Anderson, Reid & Jennings, 1992; Headey, 1999; Headey & Krause, 1999; Robinson, 1995; Marx, 1984; Garrity & Stallones, 1998). An apparent breakthrough was made by Friedmann et al (1980) who found that patients who owned pets were much less likely to die in the year following a heart attack than patients with no pet at home. The methods used in this study were criticised by Wright and Moore (1982) but it has since been replicated on a larger scale and the finding seems fairly well established (Friedmann, 1995).

There have been several investigations of physiological and exercise related responses to the presence of pets in the home. Blood pressure and other autonomic responses to mild mental stress are lowered by the presence of a pet dog (Friedman et al, 1993; Allen et al, 1991, 2002; Kingwell et al, 2001). Watching fish swim peacefully around in an aquarium can have the same effect (De Schriver & Riddick, 1990). Further, one

recent study showed that, while ace inhibitor (ACE) therapy lowers resting blood pressure, the presence of a pet is more effective if mild mental stress occurs (Allen et al, 2001). Finally, dog owners average higher levels of exercise than matched groups of non-owners and this has measurable health benefits (Bauman & Schroeder, 2001).

We now review previous studies which did have a longitudinal design. An important British study by Serpell (1991) showed that people who had not recently owned a dog or cat and then acquired one, or were given one by the researchers, showed improvements over the next ten months in their health, psychological well-being, self-esteem and exercise levels; this compared with a control group who did not get a pet. Results were clearly statistically significant but the study is open to the potential criticism that some subjects may well have guessed that they were given a pet to improve their health and their survey responses could have been affected. This objection cannot be levelled at Siegel's (1990) study of 938 American Medicaid enrollees, some of whom owned pets and some did not. During the follow-up period it was found that pet owners were less distressed by adverse life events and made fewer doctor visits. Similarly, Raina et al (1998) found that elderly people who had pets declined less in physical and mental health in a one year period than a matched group without pets. However, in this study the people who had pets were somewhat healthier than non-owners when research began, and this casts some doubt over results.

It should be noted that several studies have found no relationship between pet ownership and health, or have concluded that the sequence is probably that people who enjoy good health are more likely to get pets (Beck & Katcher, 1984; Goldemeier, 1986; Jorm et al, 1997; Parslow & Jorm, 2003; Lawton, Moss & Moles, 1984; Miller & Lago, 1989; Ory & Goldberg, 1983; Robb & Stegman, 1983). However, all these studies were limited to small samples and specific population groups rather than applying to the general population.

The immediate background to this article is that Headey previously reported survey results from both Australia and Germany showing statistically significant cross-sectional relationships between pet ownership and fewer annual doctor visits (Headey, 1999; Headey & Krause, 1999). In such research it is essential to control for other

variables which are known to affect health and use of health services in order to avoid reporting potentially upwardly biased estimates of the benefits of pets. Variables one must always adjust for are gender (women use services more) age (obviously older people are less healthy) and household income. Headey adjusted for these variables and still found fewer doctor visits by both genders and all age groups; even younger people whose health could hardly be a barrier to owning a pet. Even so, in the absence of longitudinal data, the direction of causation remained unknown, or to put it another way, it was not clear whether acquiring a pet would improve subsequent health and whether losing one would damage health.

This issue can now be addressed, given that in 2001 the same panel of German respondents, who had previously answered in 1996, were again asked about pet ownership, health and doctor visits, and in the intervening period many had gained and many had lost a pet.

The health outcome we seek to explain is survey respondents' reports of the number of doctor visits (general practitioners and all other doctors) they had made in the last three months.<sup>1</sup> Doctor visits appear to be as or more strongly affected by pet ownership than other health variables included in SOEP, including self-reported health status (a 5-point scale running from 'very good' to 'bad') and nights spent in hospital in the last year. Doctor visits appear to be a fairly good proxy for health, being correlated -0.40 with the self-report measure.

## **METHODS**

*Data source: The German Socio-Economic Panel (SOEP)*

SOEP is conducted by the German Institute for Economic Research in Berlin, one of the six economic think tanks charged with forecasting and advising the Federal Government (SOEP Group, 2001). The panel survey began in 1984 in West Germany and, just before reunification, was extended to East Germany in 1990. The initial sample included over 12,000 respondents with everyone aged 16 and over in sample households being interviewed. In the years 1995, 1998 and 2000 new samples were drawn which approximately doubled the initial sample size. The sample analysed here

comprises a balanced panel of about 10,000 respondents who answered all questions about health and pet ownership in both 1996 and 2001.

*Measures: health and pet ownership*

Questions about health are asked every year in SOEP but questions about pets have only been asked twice in special modules in 1996 and 2001. The pet sequence is that respondents are first asked whether they personally own a pet which they take care of themselves, and if they do, whether they own a dog, cat, bird, fish, horse or ‘other’ pet. We found that there was a statistically significant (0.05 level) Pearson correlation between ownership of all types of pet and measures of self-reported health and the measure of doctor visits. So rather than analyse the effects of each type of pet separately (which would have given small numbers for all but dogs and cats), we relied on a dichotomous (yes-no) measure of pet ownership.<sup>2</sup> We further divided survey respondents into four groups:

- ‘PetAlways’ – owned a pet now and five years ago
- ‘PetGain’ – owned a pet now but not 5 years ago
- ‘PetLoss’ – owned a pet 5 years ago but not now
- ‘PetNever’ – did not own now or 5 years ago.

In the regression analyses which follow, the PetNever group was used as a reference group or baseline, and the health of the other groups was compared with them. It was hypothesised that the PetAlways group would score highest on health measures (net of other variables), and that the PetGain would score next highest and show the largest gains in health in the last five years (or perhaps the smallest losses in health since everyone was five years older). There was no strong reason to expect any difference between the last two groups, although it seemed possible that, if pet ownership had lingering benefits, the PetLoss group would have better health than PetNever.

The measure of doctor visits in SOEP was: *Have you gone to a doctor within the last three months? If yes, please state how often.* The measure of self-reported health was: *‘How would you describe your current health – very good, good, satisfactory, poor, bad?’* This is the standard measure in many national and international surveys

and is usually found to correlate satisfactorily with medical evaluations (Schwarze et al, 2000).

#### *Data analysis: Poisson regressions*

Because the main dependent variable, doctor visits, is a 'count' variable (0, 1, 2 etc) rather than being normally distributed, Ordinary Least Squares (OLS) regression is not appropriate. Instead we use Poisson regression which is specifically designed for 'count' dependent variables (Winkelmann, 2000; Winkelmann, 2001). It should be noted that Poisson regressions generate log likelihood estimates, so that coefficients can be interpreted as percentages.

## **RESULTS**

First some basic information: in 1996 37.7% of Germans owned a pet (mostly a dog or cat or both) and by 2001 this had fallen slightly to 36.3%. Despite the small shift in the aggregate figure – and fortunately for our analysis of the health effects of change – over a thousand people had newly acquired a pet during the five years (11.4% of the sample) and even more no longer had a pet (12.8%). In 1996 people who owned a pet averaged 2.8 visits to the doctor in the last three months and non-owners averaged 3.0 visits. Everyone had aged five years by 2001, so more medical attention would have been expected, but in the event pet owners now went to the doctor 2.7 times a trimester on average, whereas non-owners went 3.2 times; that is 18.5% more often than owners.

Before analysing change, we now give some straightforward measures of association between pet ownership and health measures. The Pearson correlation between pet ownership and self-reported health in Germany was 0.06 in 2001, and between pet ownership and doctor visits it was  $-0.05$ . Given the large sample, these correlations were statistically significant, but of course the apparent relationships could be wholly or partly due to demographic variables also related to health and doctor visits.

#### *German pets and health: equations*

What model – what equations – can best enable us to assess whether pet ownership improves health outcomes?

The dependent variable is number of doctor visits.<sup>3</sup> In determining which variables to include on the RHS, the aim in principle was to include both measures of pet ownership and also variables which might affect doctor visits and/or pet ownership. Initially, in selecting the latter variables, we just included those widely known to covary with health and use of health services: gender ( $f=1$ ,  $m=0$ ), age and its quadratic, partnership status ( $partnered=1$ ,  $no\ partner=0$ ) and gross household income (see Table 1, col. 1). Women and older people are known to use health services more than men and older people. Those who have higher incomes tend to have better health and go to the doctor less than low income people. Based just on these ‘controls’, it appeared that pet owners made about 7% ( $p<0.05$ ) fewer doctor visits than non-owners.

### **Insert Table 1 here**

However, when we added a set of variables associated with ‘family’, the relationship disappeared (see Table 1, col. 2). The ‘family’ variables were household size, whether children under 16 were living in the household ( $children=1$ ,  $no\ children=0$ ), ethnicity ( $German=1$ ,  $non-German=0$ ), homeownership ( $owner=1$ ,  $renter=0$ ) and the quality of the respondent’s family network (close relationship to a relative not living in the family home= $1$ ,  $no\ close\ relationship=0$ ). Family characteristics were included because it was thought that larger families, especially those with children, might be more likely to have pets. It is widely believed in Germany, as elsewhere, that pets are ‘good for children’. It is also believed that, ideally, one needs a fairly large home to keep a pet (especially a dog or cat) and home ownership is strongly associated with the SOEP variable, ‘square metres of living space’ ( $r=0.56$ ).<sup>4</sup> The family network measure seemed worth including because it is known that people with close family and social networks tend to enjoy better health than those without (for a recent review see Ell, 1996). So we hypothesised that pets might serve as a part-compensation for lack of close human relationships and thus indirectly bring health benefits.

Now consider columns 3 and 4 of Table 1. It is clear that all of the health benefits due to pets flow to homeowners. Pet-owning homeowners made 10% ( $p<0.05$ ) fewer doctor visits than non-pet owning homeowners. In contrast, among renters there was

no significant relationship between pet ownership and number of doctor visits. These were unexpected findings; we are not aware of similar results for other countries. But it appears that in Germany, where about 50% of households own their own home and many others live in relatively small flats, only homeowners have a suitable domestic environment for keeping a dog or cat (as noted earlier, the huge majority of pets are dogs or cats). Homeownership of course is associated with larger families and the presence of children.

A further result in Table 1 is that having a strong family network outside the household in which one lives is not associated with fewer doctor visits. Also insignificant was an interaction term ( $\text{pet}=1 * \text{family network}=0$ ) designed to check whether a pet could compensate for a weak family network.

In Table 2 and subsequent pages analysis is confined to homeowners, and the results are longitudinal rather than static. Comparisons are made between the PetAlways, PetGain, PetLoss and PetNever groups. A key inclusion in Table 2 is a lagged (1996) measure of self-reported health status. The original 5-point scale has been reordered as a set of four dummy variables, with the lowest self-rating (health is 'bad') as the reference variable. The inclusion of the lagged measure of health is crucial because it means that, if we find that pet owners made significantly fewer doctor visits in 2001 than non-owners, we can say that this holds true, net of health status five years before. Or to put it another way, we can say that owning a pet improves health over time, compared with not owning one.

### **Insert Table 2 here**

The key result in Table 2 is that only medium to long term pet ownership reduces doctor visits. Only the PetAlways group – those who had owned a pet for five years or more – appear to benefit. They made about 13% fewer doctor visits than the PetNever reference group ( $p < 0.01$ ). The PetGain group was not significantly different from the reference group, although the signs of the coefficients in all equations were negative, indicating perhaps that benefits may be beginning to accrue. The reason why benefits flow primarily to longer term owners is presumably that it takes time to build

up a companionable relationship with one's pet (and in the case of a dog to gain the benefits of exercise).

All equations in Table 2 show a more or less zero coefficient for PetLoss. This result can be interpreted as showing that giving up a pet has more or less immediate health costs. So there is an asymmetry. Whereas the beneficial effects of gaining a pet take some time to be realised, losses can be immediate.

The second column of Table 2 shows that the benefits of pets are still clear even controlling for self-reported health status in 1996. That is, if in 2001 we compare pet-owning homeowners with non pet-owning homeowners who had similar health status in 1996, we find that the pet owners go to the doctor less often.

In Equation 2.3 in Table 2 an additional control was introduced – for current life satisfaction (measured on a 0-10 scale, where 0 meant 'very dissatisfied' and 10 meant 'very satisfied'). The idea was to control for the possibility that doctor visits and pet ownership could both be negatively related to an omitted (unobserved) variable something like 'overall satisfaction with life'. If this were the case, then the estimates linking pet ownership to fewer doctor visits could be biased. As it turned out, the results in columns 3-5 show that controlling for life satisfaction actually strengthens the central finding. The PetAlways group is now shown as going to the doctor 16% less than the reference group. It is also of some interest that life satisfaction itself is strongly negatively related to doctor visits ( $p < 0.001$ ).

The fourth equation is identical to the third, except that OLS regression is used. This was done solely to show that a more familiar technique yields essentially the same results. Again, only the PetAlways group appeared to gain significant health benefits.

The final equation addresses a methodologically difficult issue. It is just possible that one reason why some people gained a pet in 1996-2001 was that their health improved during the period, and that some of those who ceased to own a pet did so because their health declined.<sup>5</sup> These possibilities seem quite remote; after all, someone in poor or declining health could just select a pet which required little attention like a small cat or a fish. Methodologically, however, the issue is difficult

because pet ownership was only measured at two time points, so we don't know exactly when respondents gained or lost a pet. Consequently we cannot directly associate their decisions about pets with changes in health. However, to address the issue in a limited way, Table 2 column 5 restricts analysis to just the two groups whose pet ownership status did not change in 1996-2001; the PetAlways and PetNever groups. These people plainly did not make any decision to change their pet ownership status, either as a consequence of health changes or anything else. It transpired that, in this restricted comparison, the PetAlways group went to the doctor 16% less ( $p < 0.01$ ).<sup>6</sup>

## DISCUSSION

This paper has used longitudinal data from a large national population survey to assess whether retaining, gaining, losing and 'never' owning a pet are associated with health outcomes, as indicated by fewer annual doctor visits. Most previous studies, being cross-sectional, were open to the objection that it was possible that healthy people acquired pets, rather than that people became healthier as a consequence of pet ownership. We have found that the healthiest population group – the group which made the fewest doctor visits – were homeowner families who had owned a pet for at least five years and still retained it 'now'. People who had only acquired a pet in the last five years did not record statistically significantly fewer visits than people who had 'never' owned a pet, although in all equations they appeared to be making somewhat fewer visits than the reference group. Overall, the results can be interpreted as suggesting that giving up a pet has fairly immediate health costs, but that acquiring one takes time to produce benefits. How long it takes before maximum benefits are gained is a research issue to be resolved.

Why do the health benefits of pets accrue only to homeowners? It is suggested that folk wisdom may not be far wrong. Folk wisdom holds that it is better for people and their pets – or for cats and dogs at least – if pet owners have a fairly spacious home, which most homeowners do. The idea presumably is that it is better for both people and pets to have some personal 'territory' and not live right on top of each other. We have also found that some covariates of homeownership, including large family size

and having children in the home, are significantly associated with fewer doctor visits. Another piece of folk wisdom, we noted, is that pets are ‘good for children’.

Clearly, these are speculations. It is also a possibility that the associations found between fewer doctor visits, pet ownership and family characteristics are partly due to unobserved variables (unobserved heterogeneity) which covary with family characteristics. When a third wave of pet data becomes available in the SOEP (probably in 2007), it may be possible to estimate the effects (if any) of unobserved heterogeneity.

A concluding point: it seems possible that the mechanisms through which pets confer health benefits differ for different population groups. Older people, and shy or lonely people, perhaps gain most from companionship. Stressed people may be more inclined to relax. Otherwise sedentary people may be induced to take exercise if they have a dog. The finding that it takes several years of ownership before health benefits accrue perhaps suggests that, for some people, the immune system is involved. These are all issues worth continued investigation.

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Table 1: Germany: Pet Ownership and Annual Doctor Visits

	Col.1 Eq. 1a	Col.2 Eq. 1b	Col.3 Eq. 1c	Col.4 Eq. 1d
	Dependent variable: number of doctor visits			
	All	All	Renters	Homeowners
<b>Pet owner</b>	<b>-.0664*</b>	<b>-.0128</b>	<b>.0561</b>	<b>-.1024*</b>
<b>Homeowner</b>	–	<b>-.1337***</b>	–	–
Female	.2411***	.2372***	.2740***	.1901***
Age	.0139**	.0084	.0047	.0173
Age squared	.0000	.0001	.0001	-.0001
Partnered	.0671*	.1163***	.1198**	.0925
HH size	–	-.0424*	-.0367	-.0445
Children	–	-.0745	-.0712	-.0787
Family network	–	.0341	.0202	.0464
German	–	-.1036*	-.1398**	.0390
Ln HH income	-.1634***	-.0639	-.0433	-.1043*
Education (yrs.)	–	.0051	.0037	.0090
Constant	.1304	-.3864	-.4713	-.5044
N	9461	8453	4476	3977
Pseudo R <sup>2</sup>	3,1%	3,4%	3,2%	3,5%

Source: SOEP (1996, 2001). Persons in private households only.

\*\*\*=sig. at 0.001; \*\*=sig. at 0.01; \*=sig. at 0.05.

Table 2: The Health Benefits of Pets for Homeowners: Poisson Regressions (exc. col. 4)

	Col.1 Eq. 2.1	Col.2 Eq. 2.2	Col.3 Eq. 2.3	Col.4 Eq. 2.4 (OLS)	Col.5 <sup>3</sup> Eq. 2.5
Dependent variable: number of doctor visits					
<b>PetAlways<sup>1</sup></b>	<b>-.1252**</b>	<b>-.1348**</b>	<b>-.1620**</b>	<b>-.0959**</b>	<b>-.1614**</b>
<b>PetGain</b>	<b>-.0566</b>	<b>-.0512</b>	<b>-.0596</b>	<b>-.0544</b>	–
<b>PetLoss</b>	<b>-.0150</b>	<b>-.0024</b>	<b>-.0160</b>	<b>-.0242</b>	–
Female	.1866***	.1580***	.1636***	.1961***	.1762***
Age	.0177	.0050	.0046	-.0130*	.0093
Age squared	-.0000	.0001	.0001	.0002***	.0000
Partnered	.0927	.1056	.1031	.0986**	.0951
HH size	-.0423	-.0467	-.0569*	-.0451**	-.1047**
Children	-.0826	-.0677	-.0490	-.0125	.0597
Family network	.0481	.0462	.0605	.0158	.0944*
German	.0444	.0027	-.0228	-.0274	.0349
Ln HH income	-.1058*	-.0455	-.0008	.0226	.0111
Education (yrs.)	.0087	.0157	.0146	.0069	.0084
Health 1996 (poor) <sup>2</sup>	–	-.3308***	-.2484*	-.1721*	-.3611***
Health 1996 (satisfactory)	–	-.6136***	-.4939***	-.3493***	-.6147***
Health 1996 (good)	–	-.9690***	-.7972***	-.5372***	-.9004***
Health 1996 (very good)	–	-1.1040***	-.8873***	-.5956***	-1.0162***
Life satisfaction	–	–	-.0799***	-.0543***	-.0770***
constant	-.5014	.1293	.2223	1.6030***	.2239
N	3992	3992	3986	3986	2949
Pseudo R <sup>2</sup>	3,5%	5,6%	6,1%	15,5%	6,6%

Source: SOEP (1996, 2001). Persons in private households only.

1. Reference group: PetNever in equation 2.

2. Reference group: Health 1996 (very bad).

3. In col. 5 the contrast is just between PetAlways and PetNever (reference group). The dependent variable is the log of doctor visits.

\*\*\*=sig. at 0.001; \*\*=sig. at 0.01; \*=sig. at 0.05.

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## End notes

<sup>1</sup> Objective measures of specific health conditions are not included in SOEP.

<sup>2</sup> This was done only after initial checks showed that owning multiple pets confers no additional health benefits.

<sup>3</sup> In order to check that results were not driven by the right tail of the distribution, all equations were re-run as probits with (a) doctor visits as a dummy variable and (b) split at the median. All results remained much the same.

<sup>4</sup> When the living space variable was also included in equations it was not significant precisely because it is so highly correlated with home ownership.

<sup>5</sup> It should be remembered, though, that institutionalised persons (some in very poor health) are not included in these analyses.

<sup>6</sup> However, this result does not rule out the possibility that further back in time (before 1996) decisions about pet ownership were affected by health status.