Journal of Physical Activity and Health, 2011, 8, 436-444
© 2011 Human Kinetics, Inc.

The Impact of Dog Walking on Leisure-Time Physical Activity: Results From a Population-Based Survey of Michigan Adults

Mathew J. Reeves, Ann P. Rafferty, Corinne E. Miller, and Sarah K. Lyon-Callo

Background: The extent to which dog walking promotes leisure-time physical activity (LTPA) remains unresolved. We describe the characteristics of people who walk their dog, and assess the impact on LTPA. ***Methods:*** Information on dog ownership, dog walking patterns, total walking activity and LTPA were assessed in the 2005 Michigan Behavioral Risk Factor Survey. Multiple logistic regression was used to generate adjusted odds ratios (AOR) for the effect of dog walking on total walking and LTPA. ***Results:*** Of 5902 respondents 41% owned a dog, and of these, 61% walked their dog for at least 10 minutes at a time. However, only 27% walked their dog at least 150 minutes per week. Dog walking was associated with a significant increase in walking activity and LTPA. Compared with non-dog owners, the odds of obtaining at least 150 minutes per week of total walking were 34% higher for dog walkers (AOR = 1.34, 95% CI = 1.13 to 1.59), and the odds of doing any LTPA were 69% higher (AOR = 1.69, 95% CI = 1.33 to 2.15). ***Conclusions:*** Dog walking was associated with more walking and LTPA, however a substantial proportion of dog owners do not walk their dog. The promotion of dog walking could help increase LTPA.

Keywords: physical activity, dog ownership, public health, walking behavior

Promoting and maintaining adequate levels of physical activity in the U.S. population remains a major public health priority.[1–3] Leisure-time physical activity (LTPA) is defined as: Physical activities performed by a person that are not required as essential activities of daily living and are performed at the discretion of the person. The activities include sports participation, exercise conditioning or training, and recreational activities such as walking, dancing and gardening.[1] A common public health recommendation is that persons obtain either at least 30 minutes a day of moderate-intensity activity on 5 or more days a week, or at least 20 minutes a day of vigorous-intensity activity on 3 or more days a week.[1–3] However in the U.S., fewer than half of adults achieve this recommended level of LTPA.[4] Walking for physical activity is common,[5–7] and walking is widely promoted as a LTPA because it is readily accessible and can be undertaken by the majority of adults.[3,8] Dog ownership is also common—about 40% of households have a dog,[9] and there are several reported health and social benefits to dog ownership;[10] for example, in one study the acquisition of a dog was associated with owners reporting fewer minor health problems and higher levels of well being.[11]

There is strong evidence that dog ownership can provide important benefits in terms of promoting walking behavior—the majority of studies have shown a positive association between dog ownership and walking,[12–15] and several studies have shown a positive association between dog walking and increases in the level of LTPA.[12,16,17] However, only a minority of these studies have examined the direct effects of dog walking per se, as opposed to dog ownership,[12,16,17] and relatively few studies have been conducted in U.S. populations.[14,16,18]

The goals of this study were to describe the frequency of dog walking in a population-based survey of adults in Michigan, to identify human and animal characteristics associated with dog walking, and to assess the overall impact of dog walking on the level of total walking and LTPA.

Methods

Data Source

We analyzed data from the 2005 Michigan Behavioral Risk Factor Survey (MiBRFS). Michigan participates in the national Behavioral Risk Factor Surveillance System (BRFSS), which is coordinated by the Centers for Disease Control and Prevention (CDC) and is composed of annual, state-level, random digit dialed telephone surveys of adults.[19] The 2005 MiBRFS was conducted across the calendar year among a representative statewide sample of adults aged 18 years and older; the BRFSS CASRO response rate was 51.1%.[20]

Reeves is with the Dept of Epidemiology, Michigan State University, East Lansing, MI. Rafferty, Miller, and Lyon-Callo are with the Bureau of Epidemiology, Michigan Dept of Community Health, Lansing, MI.

Measures

The annual MiBRFS questionnaire includes the core CDC BRFSS instrument and additional state-added questions, which focus on Michigan-specific data needs and interests such as physical activity and walking. To assess the total amount of walking performed outside of work respondents to the 2005 MiBRFS were asked: "In a usual week, do you walk for at least 10 minutes at a time for recreation, exercise, to get to and from places, or for any other reason when you are not working?" If the response was positive, follow-up questions were asked on the usual number of days per week the respondent walked and the total time per day usually spent walking. To assess dog ownership and walking, respondents were first asked whether they currently had a dog, and then dog owners were asked a series of questions including whether they walked the dog, the usual frequency and duration of dog walking, and the breed and age of the dog. (See Appendix for questionnaire.) For mixed breed dogs, respondents were asked to describe the size of their dog relative to common breeds: small or toy (eg, Terrier or Pug), medium (eg, Cocker Spaniel or Beagle), large (eg, Labrador or Shepherd), or extra large (eg, Great Dane or Newfoundland). Respondents who owned more than 1 dog were asked to provide information on the youngest dog. Dog owners who did not walk their dog were asked the main reason why they did not walk their dog.

Dog owners were classified as dog walkers if they reported that they usually walked their dog for at least 10 or more minutes at a time. Information on dog ownership and dog walking were combined to create the following 3-level "dog ownership-walking status" variable: (1) owns a dog and walks it for at least 10 minutes at a time (*Dog Walker*), (2) owns dog but does not walk it or walks the dog for less than 10 minutes at a time (*Dog Owner Non-Walker*), and (3) does not own a dog (*Non-Dog Owner*). The weekly duration of dog walking was calculated by multiplying usual minutes per walk by the frequency of dog walking per week. Regular dog walking was defined as walking the dog for 150 minutes or more per week. The weekly duration of total walking was calculated similarly (ie, the number of days per week multiplied by the usual minutes per day of total walking). The weekly duration of total walking was coded as 0 for those who reported not walking for at least 10 minutes at a time. Regular total walking was defined as walking for 150 minutes or more per week while not a work.

Four BRFSS physical activity indicators based on core CDC physical activity questions were also used in the analysis. Any LTPA was based on a positive response to the question, "During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?" Information on moderate and vigorous LTPA was obtained from the following 2 questions:

1) "Now, thinking about the moderate activities you do when you are not working in a usual week, do you do moderate activities for at least 10 minutes at a time, such as brisk walking, bicycling, vacuuming, gardening, or anything else that causes some increase in breathing or heart rate?"
2) "Now, thinking about the vigorous activities you do when you are not working in a usual week, do you do vigorous activities for at least 10 minutes at a time, such as running, aerobics, heavy yard work, or anything else that causes large increases in breathing or heart rate?"

If the respondent answered yes to either of the above 2 questions, follow-up questions on usual frequency per week and duration per day were asked. Definitions of regular moderate and regular vigorous LTPA were based on public health guidelines.[1,3] Regular moderate LTPA was defined as participating in moderate physical activities for at least 30 minutes a day on at least 5 days per week. Regular vigorous LTPA was defined as participating in vigorous physical activities for at least 20 minutes a day on at least 3 days per week. Finally, general health status was measured with the question, "Would you say that in general your health is excellent, very good, good, fair, or poor?"

Statistical Analysis

Most statistical analyses were performed using SUDAAN (RTI, Research Triangle Park, NC 2008), which accounted for the complex sampling design. Analysis weights were calculated to include the inverse of the probabilities of selection and were poststratified to the Michigan adult population by age, race, and sex. Prevalence estimates and 95% confidence intervals (CI) were calculated for dog ownership-walking status and regular dog walking (≥150 min/wk) by the respondents' demographic characteristics (ie, age, sex, race-ethnicity, education, and household income) as well as by the dog characteristics (ie, size and age). SUDAAN chi-square tests (analogous to Pearson chi-square) were used to assess overall differences in prevalence within human and dog characteristics. To further characterize the demographic profile of dog walkers we used multivariable logistic regression analysis to identify significant predictors of dog walking among only those who owned a dog. We calculated medians and interquartile ranges (IQR) (ie, 25th percentile–75th percentile) for the weekly duration of dog walking by respondent's demographic characteristics, as well as for the duration of total walking by dog ownership-walking status. Finally, median and IQR estimates for the frequency, duration, and weekly duration of dog walking were generated by dog characteristics (ie, size and age). SUDAAN does not have a suitable method to test for differences in medians, so as an alternative, we calculated nonparametric Kruskal Wallis chi-square tests using the NPAR1WAY procedure in SAS (Version 9, Cary, NC). However, this approach does not take into account sampling design or weights.

The prevalence of regular total walking (>150 minutes a week) and the 4 indicators of overall physical activity (ie, any LTPA in the past month, regular moderate

physical activity, regular vigorous physical activity, and either regular moderate or regular vigorous physical activity) were examined by dog ownership-walking status; pairwise *t* tests were used to determine statistical significance. In addition, logistic regression analysis was used to generate unadjusted and adjusted odds ratios (AOR) and 95% CI for these 5 outcomes. Dog ownership-walking status was the primary exposure variable of interest in these models, and age, sex, race-ethnicity, education, household income, and general health status were first included as potential confounding variables in all models. Subsequently, interaction terms between the 3-level dog ownership-walking variable and the other model covariates (ie, age, race, gender, education, and income) were tested for each of the 5 outcomes of interest.

Results

A total of 5902 respondents were asked the initial total walking question. Seventy-five respondents (1.3%) reported that they were unable to walk for 10 minutes at a time and were eliminated from the analysis, and an additional 8 respondents had missing data for dog ownership and/or dog walking, leaving a working sample size of 5819. Forty-one percent of respondents owned a dog, and of these, 61% walked their dog for at least 10 minutes at a time. The demographic characteristics of the 3 dog ownership-walking status groups (ie, *Dog Walker*, *Dog Owner Non-Walker*, and *Non-Dog Owner*) are shown in Table 1. Sex was the only demographic variable that was not statistically associated with dog ownership-walking status. The prevalence of dog walking declined with age but increased with increasing education and income. Dog walking was noticeably higher in white non-Hispanics.

Among the 2170 dog owners, the multivariable logistic regression model found that age and education were independently associated with dog walking, whereas gender, race and income were not (data not shown). Dog walking was much higher in younger age groups and those with greater education. For example, the adjusted odds of dog walking was 2.2 times higher in those aged 18 to 24 years compared with those aged over 65 years, and college graduates were 2.3 times more likely to walk their dog, compared with persons who did not have a high school diploma. Among dog owners, the most common reason reported for not walking their dog was that the dog self-exercised or was an outside dog (reported by 43%). Other reasons given included: someone else was responsible for walking the dog (11%), no time or interest (9.1%), dog was too ill behaved or too strong (8.3%), dog was too old or unable to walk (8.8%), and the respondent was too old or unable to walk (7.8%). Living in an unsafe neighborhood was cited as reason by only 1.4% of respondents.

Among dog owners who reported walking their dog, the median frequency of dog walking was 3 times per week (IQR 2 to 6), and the median duration of each walk was 25 minutes (IQR 15 to 29). The median weekly duration of dog walking was 85 minutes (IQR 37 to 173) (Table 2). The overall prevalence of regular dog walking (defined as at least 150 minutes per week) was 27% (Table 2). Respondents' age was statistically significantly associated with both measures of weekly dog walking ($P < .001$). The median weekly duration of dog walking was high among young dog owners, declined in middle age (ie, 35 to 44 years), and then increased noticeably in persons aged 65 years and older. The prevalence of regular dog walking showed a similar pattern with age (Table 2).

The impact of dog walking on the amount of total walking and 4 other measures of LTPA is shown in Tables 3 and 4. Dog walking was associated with a substantial and statistically significant increase in the amount of regular total walking (defined as ≥ 150 minutes of walking per week); 46% of dog walkers met this threshold, compared with 30% of dog owners who did not walk their dog and 38% of non-dog owners (Table 3). Corresponding differences in the median weekly duration of total walking were observed among these 3 groups (Table 3). A similar effect of dog walking on LTPA was observed, with substantial and statistically significant increases in all 4 measures of LTPA for the dog walking group (Table 3). The impact of dog walking on total walking activity and LTPA were preserved after adjusting for potential confounding variables using multiple logistic regression analysis. However, the adjusted ORs for the effect of dog walking were all attenuated somewhat compared with the crude or unadjusted estimates (Table 4). Compared with the non-dog owner group, the adjusted OR for regular total walking was statistically significantly 34% higher for the dog walking group; the adjusted ORs for the 4 LTPA measures were all statistically significantly greater as well (varying between 41% and 69% higher). Interestingly, compared with the group who did not own a dog, dog owners who did not walk their dog were about two-thirds as likely to meet the threshold for regular total walking or participate in any LTPA (adjusted OR = 0.68 for both measures) (Table 4). None of the interaction terms involving the 3-level dog ownership-walking variable and other covariates (ie, age, race, gender, education, and income) were statistically significant when tested in the final multivariable models.

The effect of the size and age of the dog on walking behaviors are shown in Table 5. There were only a small number of extra large dogs (n = 38) so these were combined with large dogs (ie, >45 lbs). There was no overall effect of dog size on the prevalence of dog walking among all dog owners or on the weekly frequency of dog walking. However, larger dogs tended to be walked longer than smaller breeds (median 26 mins versus 20 mins per walk; Kruskal Wallis chi-square *P*-value = 0.005). The age of the dog was significantly related to the prevalence of dog walking among all dog owners (chi-square *P*-value = 0.01); younger dogs (ie, ≤1 yr) were more likely to be walked while geriatric dogs (≥10 years) were less likely to be walked. These same trends were observed for the median weekly duration of dog walking, which were longer for very young dogs but shorter for very old dogs (99 mins and 59 mins, respectively; Kruskal Wallis chi-square *P*-value = 0.03) (Table 5).

Table 1 Percent Distribution of Dog Ownership-Walking Status* Among Michigan Adults

		Dog walker		Dog owner non-walker		Non-dog owner	
	Total n†	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
Total	5819	1317	25.3 (23.9–26.7)	853	16.1 (14.9–17.3)	3649	58.6 (57.1–60.2)
Age (in years)‡							
18–24	281	89	33.1 (27.5–39.3)	44	18.0 (13.5–23.6)	148	48.9 (42.7–55.1)
25–34	648	186	29.0 (25.3–33.1)	96	14.5 (11.8–17.8)	366	56.4 (52.1–60.7)
35–44	1000	343	33.0 (29.8–36.3)	164	17.1 (14.6–19.9)	493	50.0 (46.5–53.4)
45–54	1242	347	27.0 (24.4–29.9)	239	20.2 (17.7–23.0)	656	52.7 (49.5–55.9)
55–64	1125	214	19.7 (17.3–22.4)	159	15.3 (13.1–17.8)	752	65.0 (61.8–68.0)
≥65	1496	134	8.8 (7.3–10.4)	146	10.5 (8.9–12.5)	1216	80.7 (78.4–82.8)
Sex							
Male	2235	502	25.6 (23.4–27.9)	322	16.7 (14.8–18.7)	1411	57.8 (55.3–60.3)
Female	3584	815	25.0 (23.3–26.8)	531	15.6 (14.2–17.0)	2238	59.4 (57.5–61.3)
Race-ethnicity‡							
White non-Hispanic	4953	1207	28.3 (26.7–29.9)	768	17.5 (16.2–18.9)	2978	54.2 (52.5–55.9)
Black non-Hispanic	500	46	10.5 (7.6–14.3)	38	7.1 (4.7–10.5)	416	82.4 (77.9–86.2)
Other non-Hispanic	208	36	18.6 (12.9–26.0)	27	13.9 (9.2–20.5)	145	67.5 (59.4–74.7)
Hispanic	116	19	16.3 (9.7–26.0)	15	18.1 (10.4–29.5)	82	65.6 (54.1–75.5)
Education‡							
< High school	469	68	17.4 (13.3–22.5)	79	17.4 (13.5–22.1)	322	65.2 (59.4–70.5)
High school graduate	1849	371	24.1 (21.6–26.7)	323	20.2 (18.0–22.7)	1155	55.7 (52.8–58.6)
Some college	1686	389	25.9 (23.3–28.6)	268	16.9 (14.8–19.2)	1029	57.2 (54.3–60.1)
College graduate	1800	487	28.6 (26.2–31.2)	181	10.5 (9.0–12.4)	1132	60.8 (58.1–63.5)
Household income‡§							
< $20,000	824	115	16.9 (13.5–21.0)	108	14.2 (11.2–17.8)	601	68.9 (64.3–73.1)
$20,000–34,999	1112	204	21.3 (18.4–24.6)	150	15.1 (12.6–18.1)	758	63.5 (59.8–67.1)
$35,000–49,999	855	163	21.2 (17.9–24.9)	157	20.9 (17.6–24.6)	535	57.9 (53.8–62.0)
$50,000–74,999	949	267	28.1 (25.0–31.6)	152	17.1 (14.4–20.1)	530	54.8 (51.1–58.5)
≥$75,000	1260	426	35.2 (32.3–38.3)	187	14.7 (12.7–17.1)	647	50.0 (46.9–53.2)

* Mutually exclusive classification of dog ownership and dog walking that includes 3 levels: owns dog and walks dog for at least 10 minutes at a time, owns dog but does not walk it for at least 10 minutes at a time, and does not own dog.

† Total unweighted sample size of demographic subpopulations.

‡ Dog ownership-walking status was associated with age, race-ethnicity, education, and household income (chi-square $P < .0001$).

§ Household income was not reported for 14% of respondents.

Table 2 Median Minutes Per Week Usually Spent Walking the Dog* and Prevalence of Regular Dog Walking (≥150 Minutes/Week) Among Michigan Dog Owners Who Walk Their Dog

		Median minutes/week spent walking dog	Regular dog walking (≥150 minutes/week)
	n	Median (IQR)	% (95% CI)
Total	1261†	85 (37–173)	27.4 (24.6–30.4)
Age (in years)			
18–24	87	86 (33–142) ‡	25.6 (17.3–36.1) §
25–34	183	81 (32–147)	25.5 (18.9–33.4)
35–44	330	64 (30–130)	20.2 (16.0–25.1)
45–54	332	78 (30–179)	28.8 (23.8–34.4)
55–64	201	102 (51–195)	35.2 (28.5–42.5)
≥65	124	175 (60–304)	54.1 (44.6–63.4)
Sex			
Male	487	79 (30–175)	27.6 (23.2–32.5)
Female	774	86 (41–167)	27.2 (23.9–30.9)
Education			
< High school	63	80 (38–144)	26.8 (15.7–41.8)
High school graduate	352	79 (30–142)	25.2 (20.1–31.2)
Some college	372	85 (40–178)	29.0 (23.9–34.6)
College graduate	472	84 (37–159)	27.8 (23.5–32.5)
Household income			
<$20,000	105	104 (54–186)	33.6 (22.5–46.8)
$20,000–34,999	192	87 (38–166)	27.0 (20.5–34.7)
$35,000–49,999	157	77 (36–136)	24.0 (17.2–32.5)
$50,000–74,999	260	85 (40–177)	30.3 (24.3–37.1)
≥$75,000	412	76 (37–139)	24.3 (20.0–29.1)

* Usual time spent walking the dog was calculated by multiplying the reported usual frequency of dog walking by the usual dog walking duration.

† Fifty-six dog walkers had missing data on frequency and/or duration of dog walking.

‡ Kruskal Wallis chi-square $P < .001$.

§ Chi-square $P < .0001$.

Discussion

This population-based survey found that about two-thirds of dog owners walked their dog, but only 27% of this group walked frequently enough and long enough to accrue at least 150 minutes of dog walking per week—a common benchmark of moderate physical activity that meets the minimum public health recommendations.[1–3] Not surprisingly, we found that dog walking contributed to a significant increase in the total amount of walking conducted per week—dog walkers walked about an hour more per week than dog owners who did not walk their dog, and about a half an hour more per week than non-dog owners. Of particular note in this study was the fact that dog walkers were more physically active—whether measured in terms of any LTPA, moderate LTPA, vigorous LTPA, or either of the previous 2—than either dog owners who did not walk or the non-dog owner group. For example, approximately 60% of dog walkers met the criteria for regular moderate and/or vigorous LTPA, compared with about 45% for the other 2 groups. The higher LTPA levels associated with the dog walking group remained after adjusting for demographic variables and health status.

Our finding that dog walking was directly associated with an increase in the total amount of walking agrees with several previous studies.[11,13–15,18] A large prospective study of elderly residents in the U.S. found that dog walkers were more than twice as likely to achieve recommended walking levels of 150 minutes per week, than dog owners who did not walk,[18] while a survey of over 350 adults in British Columbia found that dog owners participated in about double the number of total walking minutes per week than non-dog owners did.[13] A recent Australian study found that the odds of achieving 150 minutes of walking per week were at least 41% higher in dog owners compared with non-dog owners.[15] A 10 month prospective study conducted in Britain found that the acquisition of a new dog was associated with a sustained increase in the duration and number of recreational

Table 3 Total Walking and Leisure-Time Physical Activity (LTPA) Indicators by Dog Ownership-Walking Status

	Dog walker	Dog owner non-walker	Non-dog owner	Total
Total walking*				
Regular total walking (≥150 min/wk) (% [95% CI])	45.8 (42.5–49.1)[‡§]	29.7 (25.9–33.8)[§]	37.6 (35.6–39.6)	38.4 (36.8–40.0)
Total walking per week (median [IQR])	132 (57–240)[χ¶]	66 (na–178) [¶**]	93 (28–207)	99 (37–207)
Leisure-time physical activity[†] (% [95% CI])				
Any LTPA in past 30 days	87.6 (85.2–89.6)[‡§]	69.8 (66.1–73.4)[§]	76.4 (74.6–78.0)	77.6 (76.3–78.8)
Regular moderate LTPA (≥30 minutes on ≥5 days/week)	46.4 (43.1–49.7)[‡§]	34.6 (30.8–38.6)	35.4 (33.5–37.5)	37.7 (36.2–39.3)
Regular vigorous LTPA (≥20 minutes on ≥3 days/week)	37.2 (34.0–40.5)[‡§]	25.1 (21.6–28.9)	25.0 (23.2–26.9)	27.9 (26.5–29.4)
Regular moderate or vigorous LTPA	61.0 (57.8–64.2)[‡§]	45.0 (40.9–49.2)	46.5 (44.5–48.6)	49.6 (48.0–51.1)

* Minutes per week of total walking was calculated by multiplying reported frequency of days per week on which the respondent walked for at least 10 minutes at a time while not at work times usual cumulative duration of walking per day.

[†] Based on BRFSS physical activity indicators.

[‡] Significantly different from dog owner nonwalkers (pairwise *t* test $P < .0001$).

[§] Significantly different from non-dog owners (pairwise *t* test $P < .01$).

χ Significantly different from dog owner nonwalkers (Kruskal Wallis chi-square $P < .0001$).

¶ Significantly different from non-dog owners (Kruskal Wallis chi-square $P < .0001$).

** SUDAAN was unable to compute the 25th percentile.

Table 4 Crude and Adjusted Odds Ratios for Total Walking* and Leisure-Time Physical Activity (LTPA) Indicators† by Dog Ownership-Walking Status

	Crude odds ratios‡		Adjusted odds ratios‡§	
	Dog walker	Dog owner non-walker	Dog walker	Dog owner non-walker
Regular total walking (≥150 minutes/week)	1.41 (1.20–1.65)	0.70 (0.57–0.86)	1.34 (1.13–1.59)	0.68 (0.55–0.85)
Any LTPA in past 30 days	2.19 (1.75–2.73)	0.72 (0.59–0.87)	1.69 (1.33–2.15)	0.68 (0.55–0.85)
Regular moderate LTPA (≥30 minutes on ≥5 days/week)	1.58 (1.35–1.85)	0.96 (0.79–1.17)	1.41 (1.19–1.67)	0.93 (0.76–1.13)
Regular vigorous LTPA (≥20 minutes on ≥3 days/week)	1.78 (1.50–2.11)	1.00 (0.81–1.25)	1.42 (1.18–1.71)	0.96 (0.77–1.21)
Regular moderate or vigorous LTPA	1.80 (1.54–2.11)	0.94 (0.78–1.13)	1.53 (1.29–1.82)	0.90 (0.74–1.09)

* Minutes per week of total walking was calculated by multiplying reported frequency of days per week on which the respondent walked for at least 10 minutes at a time while not at work times usual cumulative duration of walking per day.

† Based on BRFSS physical activity indicators.

‡ Reference group is non-dog owners i.e., those that do not own a dog.

§ Adjusted for age, sex, race-ethnicity, education, household income, and general health status.

Table 5 Owners' Dog Walking Behavior by Dog Characteristics

	Among dog owners		Among dog owners who walk their dog				
	n	Proportion who walk their dog % (95% CI)	n	Frequency of dog walking median times/wk (IQR)	Duration of dog walking median min/walk (IQR)	Weekly duration of dog walking median min/wk (IQR)	Walks dog ≥150 min/wk % (95% CI)
Size of dog							
Small (<20 lbs)	577	59.3 (54.5–64.1)	340	3 (2–6)	20 (14–29)*	70 (37–145)	26.8 (21.8–32.6)
Medium (20–45 lbs)	545	60.7 (55.6–65.5)	320	3 (1–6)	20 (14–29)	74 (28–141)	25.0 (20.2–30.5)
Large/extra large (>45 lbs)	1009	62.0 (58.3–65.5)	599	3 (2–6)	26 (18–30)	86 (39–178)	28.8 (24.6–33.4)
Age of dog (in years)							
≤1	419	67.3 (61.8–72.3)†	268	3 (2–6)‡	23 (15–29)‡	99 (50–179)§	30.5 (24.6–37.1)χ
2–3	473	62.6 (57.0–67.8)	291	3 (1–6)	26 (18–30)	81 (37–178)	30.5 (24.5–37.2)
4–6	472	61.7 (56.4–66.7)	287	3 (1–6)	26 (15–30)	83 (36–148)	25.7 (20.2–32.1)
7–9	393	62.7 (56.9–68.3)	237	3 (2–6)	20 (14–29)	71 (37–140)	24.6 (18.5–31.8)
≥10	384	49.3 (43.3–55.4)	187	2 (1–6)	19 (14–28)	59 (20–135)	19.9 (14.7–26.3)

* Kruskal Wallis chi-square $P < .01$.

† Chi-square $P < .01$.

‡ Kruskal Wallis chi-square $P \leq .10$.

§ Kruskal Wallis chi-square $P < .05$.

χ Chi-square $P < .10$.

walks,[11] while another recent Australian study found that the new acquisition of a dog was associated with a 31 minute per week increase in walking for recreation.[21]

Whether dog ownership or dog walking is associated with greater compliance with recommended levels of LTPA is less well studied. Our finding that dog walkers participated in more LTPA, both overall and at both moderate and vigorous intensity levels, agrees with a recent U.S. study of neighborhood residents in Seattle and Baltimore.[16] This study used accelerometers to determine that dog owners who reported walking their dogs were more likely to meet recommended levels of moderate and vigorous physical activity (ie, 53% compliance), compared with both non-dog owners (46% compliance) and dog owners who did not walk (33% compliance).[16] The British Columbia study also found that dog ownership was associated with increased levels of both mild and moderate levels of LTPA,[13] however, an Australian study found that dog ownership was associated with achieving recommended levels of overall LTPA only when the dog was walked at least 5 times a week.[12] Similarly, another Australian study found that only dog owners who walked their dogs for more than an hour a week achieved more LTPA that non-dog owners.[17] Not surprisingly, we found that younger dogs (≤1 year of age) were more likely to be walked than older dogs, but we also found that larger breed dogs (>45 lbs) were walked for a longer duration than smaller dogs. The Australian study by Schofield and colleagues found that owners of small dogs undertook significantly less leisure-time walking than owners of larger dogs,[12] while the British Columbia study found no effect of dog size on total walking minutes.[13]

The strengths of this study include the fact that it is based on a large, representative population-based survey that included specific questions to address dog walking as opposed to just dog ownership. Limitations include those that apply to all random digit dialed telephone surveys including the potential for noncoverage and response (selection) biases. As previously mentioned the statistical analysis of medians using SAS did not take into account the complex sampling design and weighting. Finally, we note a small wording difference between the state-added and CDC BRFSS questions that address walking activity. The state-added question which was used to assess the total amount of walking performed outside of work, specifically mentioned transportation activities (ie, "to get to and from places"). In contrast, the CDC question that was used to assess moderate-physical activity, specifically mentions "brisk walking" as one of the example activities, but does not mention walking for transportation per se. However, given the fact that the CDC moderate-physical activity question is not designed as a direct measure of walking activity, the impact of these inconsistencies are minor.

In summary, we found that dog walking contributed to a meaningful increase in the amount of total walking and LTPA conducted by dog owners. For example, dog walkers walked about an hour more per week than dog owners who did not walk their dog. There are an estimated 72 million dogs in 43 million households the U.S.[22] Given that our data indicate that more than a third of dogs are not walked, and of those that are, only 27% are walked at least 150 minutes a week, pet dogs represent a legitimate intervention point to increase participation in walking and overall LTPA among those who already own a dog. It should be noted however, that intervention studies designed to increase dog walking among dog owners are lacking; research on practical approaches to achieve this objective are needed. In addition, our results indicate that almost 60% of respondents did not currently have a dog, and of these, one-quarter were sedentary and only 38% were regular walkers. These findings suggest that public health campaigns that promote the appropriate and responsible acquisition of a dog along with promotion of dog walking may also represent a logical mechanism to increase LTPA.

Acknowledgments

We would like to thank Larry Hembroff, PhD, and the staff of the Office for Survey Research, Institute for Public Policy and Social Research at Michigan State University for conducting the 2005 Michigan Behavioral Risk Factor Survey. We would like to acknowledge the help of Nancy Postorino-Reeves DVM for assistance with the development of the dog walking questions, and Robert Matulonis for help with the preparation of the manuscript. Data collection for the 2005 MiBRFS was supported, in part, by Cooperative Agreement #U32/CCU522826 from the Centers for Disease Control and Prevention. The contents of this manuscript, however, are solely the responsibility of the authors and do not necessarily represent the official views of CDC.

References

1. Physical Activity Guidelines Advisory Committee. *Physical activity guidelines advisory committee report, 2008*. Washington, DC: U.S. Department of Health and Human Services; 2008.
2. U.S. Department of Health and Human Services. *Healthy people 2010: understanding and improving health.* Vol 1 & 2. 2nd ed. Washington DC: U.S. Government Printing Office; November 2000.
3. US Department of Health and Human Services. *Physical activity and health: a report of the Surgeon General*. Atlanta, GA: Centers for Disease Control and Prevention; 1996.
4. Kruger J, Kohl HW, Miles IJ. Prevalence of regular physical activity among adults—United States, 2001 and 2005. *MMWR Morb Mortal Wkly Rep*. 2007;56(46):1209–1212.
5. Siegel PZ, Brackbill RM, Heath GW. The epidemiology of walking for exercise: implications for promoting activity among sedentary groups. *Am J Public Health*. 1995;85(5):706–710.
6. Rafferty AP, Reeves MJ, McGee HB, Pivarnik JM. Physical activity patterns among walkers and compliance with public health recommendations. *Med Sci Sports Exerc*. 2002;34(8):1255–1261.
7. Simpson ME, Serdula M, Galuska DA, et al. Walking trends among U.S. adults: the Behavioral Risk Factor Surveillance System, 1987-2000. *Am J Prev Med*. 2003;25(2):95–100.
8. Centers for Disease Control and Prevention. Division of Nutrition, Physical Activity, and Obesity. Programs and Campaigns June 20, 2008; http://www.cdc.gov/NCCDPHP/DNPA/programs/index.htm. Accessed January 20, 2009.

9. Beck AM, Meyers NM. Health enhancement and companion animal ownership. *Annu Rev Public Health*. 1996;17:247–257.
10. McNicholas J, Gilbey A, Rennie A, Ahmedzai S, Dono JA, Ormerod E. Pet ownership and human health: a brief review of evidence and issues. *BMJ*. 2005;331:1252–1254.
11. Serpell J. Beneficial effects of pet ownership on some aspects of human health and behaviour. *J R Soc Med*. 1991;84(12):717–720.
12. Schofield G, Mummery K, Steele R. Dog ownership and human health-related physical activity: an epidemiological study. *Health Promot J Austr*. 2005;16(1):15–19.
13. Brown SG, Rhodes RE. Relationships among dog ownership and leisure-time walking in Western Canadian adults. *Am J Prev Med*. 2006;30:131–136.
14. Yabroff KR, Troiano RP, Berrigan D. Walking the dog: is pet ownership associated with physical activity in California? *J Phys Act Health*. 2008;5(2):216–228.
15. Cutt H, Giles-Corti B, Knuiman M, Timperio A, Bull F. Understanding dog owners' increased levels of physical activity: results from RESIDE. *Am J Public Health*. 2008;98(1):66–69.
16. Coleman KJ, Rosenberg DE, Conway TL, et al. Physical activity, weight status, and neighborhood characteristics of dog walkers. *Prev Med*. 2008;47(3):309–312.
17. Bauman AE, Russell SJ, Furber SE, Dobson AJ. The epidemiology of dog walking: an unmet need for human and canine health. *Med J Aust*. 2001;175:632–634.
18. Thorpe RJ, Jr, Simonsick EM, Brach JS, et al. Dog ownership, walking behavior, and maintained mobility in late life. *J Am Geriatr Soc*. 2006;54(9):1419–1424.
19. Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System. July 21, 2008; http://www.cdc.gov/brfss/. Accessed January 20, 2009.
20. Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System. 2005 Summary Data Quality Report. http://www.cdc.gov/brfss/technical_infodata/quality.htm. Accessed January 20, 2009.
21. Cutt HE, Knuiman MW, Giles-Corti B. Does getting a dog increase recreational walking? *Int J Behav Nutr Phys Act*. 2008;5:17.
22. American Veterinary Medical Association. U.S. Pet Ownership & Demographics Sourcebook (2007 Edition). http://www.avma.org/reference/marketstats/ownership.asp. Accessed January 20, 2009.

Appendix—Dog Ownership and Walking Questions

- Do you currently have a dog?
- Do you walk your dog?
  - *If no,* What is the main reason you don't walk your dog?
  - *If yes,* How many times per day or per week do you usually walk your dog?
- When you walk your dog, how many minutes or hours do you usually walk?
- Because you have a dog do you think that overall you walk a lot more than you otherwise would, somewhat more, somewhat less, a lot less, or about the same as you would if you did not have a dog?
- Compared with when you walk without your dog, when you walk with your dog do you usually walk a lot faster, somewhat faster, somewhat slower, a lot slower, or about the same speed?
- Compared with when you walk without your dog, when you walk with your dog do you usually walk a much longer distance, a somewhat longer distance, a somewhat shorter distance, a much shorter distance, or about the same distance?
- What breed is your dog?
- *If mixed breed, or respondent does not know,* How would you describe the size of your dog? Would you say small or toy sized such as a Terrier or Pug, medium sized such as a Cocker Spaniel or Beagle, large sized such as a Labrador Retriever or Shepherd, or extra large sized such as a Great Dane or Newfoundland?
- How old is your dog?