

The Epidemiology of Walking for Physical Activity in the United States

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ABSTRACT

EYLER, A. A., R. C. BROWNSON, S. J. BACAK, and R. A. HOUSEMANN. The Epidemiology of Walking for Physical Activity in the United States. *Med. Sci. Sports Exerc.*, Vol. 35, No. 9, pp. 1529–1536, 2003. **Purpose:** The purpose of this paper was to describe the epidemiology of walking for physical activity among respondents to the U.S. Physical Activity Study. Correlates of walking among people who never walk for physical activity, those who walk regularly, and people who walk occasionally were compared. **Methods:** Data on walking, personal and environmental correlates, and sociodemographics were collected via telephone using a modified random-digit-dialing technique on a national sample. Three categories were analyzed: Regular walkers were those who met public health recommendations by walking ($5 \times \text{wk}^{-1}$ and 30 min at a time), occasional walkers were those who walked for physical activity but did not meet this recommendation, and never walkers were those who never walked for physical activity. Multiple logistic regression resulting in odds ratios (OR) and 95% confidence intervals were calculated. **Results:** Thirty-four percent of this population were regular walkers, 45.6% occasional walkers, and 20.7% never walkers. Walkers reported using neighborhood streets, shopping malls, and parks for walking. Regular walkers had more self-confidence and more social support than occasional or never walkers. Occasional and never walkers reported time as a barrier more than regular walkers (OR 1.91 and 2.36). Never walkers were more likely (OR 3.25) to report feeling unhealthy and more likely (OR 4.43) to report lacking energy to exercise. **Conclusion:** Our results identify important information that can be used to help guide future interventions that promote walking as a form of physical activity. An ecological approach that combines individual (e.g., self-confidence), interpersonal (e.g., social support), and community aspects (e.g., improve streets for walking) may be the most beneficial. **Key Words:** DETERMINANTS, EXERCISE, ENVIRONMENT, CORRELATES

The health benefits of physical activity are well established. Physical activity contributes to a lower risk of cardiovascular disease, some cancers, Type 2 diabetes, osteoarthritis, and osteoporosis (28). As with vigorous physical activity, moderate-intensity activity has been shown to provide many health benefits (21,28,18). Brisk walking, defined as walking at ≥ 3.5 mph, is one example of a moderate physical activity (25). Positive outcomes of brisk walking include long-term maintenance of weight loss (2,10), increasing high-density lipoprotein (2,10,15,22), reducing blood pressure (8), and decreasing the risk of death from cardiovascular disease and cancer (12,18,19,26), while incurring a comparatively lower risk of injury (14). Walking is encouraged as one of the most accessible ways to be physically active (13) and is the most commonly reported

leisure-time physical activity (LTPA) in the United States (28). Additionally, walking for physical activity has been shown to be relatively common among groups that are typically sedentary (e.g., the elderly and low-income groups) (25).

The 1996 Surgeon General's Report recommended that persons of all ages obtain "a minimum of 30 min of physical activity of moderate intensity (e.g., brisk walking) on most, if not all, days of the week" (28). Despite promotion of physical activity, its known health benefits, and the relative accessibility of walking (i.e., can be done in many locations, is free, and requires no special equipment), more than one quarter of the American population remains completely inactive (6).

The overall goal of this report was to describe the epidemiology of walking for physical activity among respondents to the U.S. Physical Activity Study. Our specific objectives were to: 1) report who walks and how much they walk for physical activity; 2) identify places where people are most likely to walk for physical activity; and 3) compare and contrast personal and environmental barriers among regular walkers, occasional walkers, and never walkers.

METHODS

Sampling. Sampling methods for this survey have been discussed elsewhere (7) but described here in brief. Data were collected via telephone survey, using a modified ver-

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sion of the sampling plan of the Behavioral Risk Factor Surveillance System (BRFSS). A random-digit-dialing technique, using a national sample to collect data was used. Because physical inactivity is known to be higher in low-income individuals (25), this segment of the population was over-sampled. To do this, zip codes were over-sampled that had $\geq 32\%$ of residents below the Federal poverty level. The random-digit-dialing sample that was utilized for this project can be best characterized as a single-stage *epsem* (Equal Probability Selection Method) sample of all residential telephone numbers (including listed, unlisted, and unpublished numbers) in the defined sample frame. Every potential telephone number within the defined sample frame had a known and equal probability of selection.

Instrumentation and data collection. The survey instrument was developed using a combination of questions from the BRFSS, the National Health Interview Survey, and other recent surveys (3,4,11,23). When valid and reliable scales were documented in the literature and available, these scales were used intact. The BRFSS questions used in our study have been tested for psychometric properties and found to be valid and reliable in measuring walking during a "usual week." For example, 1-wk test-retest reliability has ranged between 0.42 and 0.61 ($P < 0.001$) (16). These data suggest that the BRFSS questionnaire is as reliable and valid as any others in use. Many of the other questions were tested for reliability in a large study, and most kappa scores matching responses from time one to time 2 fell in the adequate range or higher (5). In a few cases, adaptations were made from in-person to telephone administration (e.g., asking a "yes/no" question rather than a checklist that would be used in an in-person interview). The final instrument contained a total of 90 questions (including skip patterns), with an average administration time of 30 min. Interviews were completed between September 1999 and January 2000 for 1818 men and women (Table 1). Our sample was equally distributed in the Northeast, Midwest, and Western regions of the United States (22%, 23%, 24%, respectively), and 31% of the sample came from the Southeastern region. Interviewers with previous surveying experience underwent 16 h of training before conducting the interviews. The interviewers used random selection to determine who would answer the survey if more than one adult resided in the household. Four attempts were made to reach a respondent in an eligible household. The response rate was calculated according to the method of the Council of American Survey Research Organization (CASRO) and was based on the ratio of completed interviews to the sum of completed interviews, refusals, and a standard fraction of numbers that were working but were either ring-no answer or busy after multiple attempts. The CASRO response rate was 61%. The main reasons of refusal for this survey were "no time" and "not interested." This questionnaire and survey methods received approval from the university's Institutional Review Board and each participant was read an informed consent agreement before completing the survey.

Newly developed questions (BRFSS module) on physical activity behavior focused on moderate and vigorous physi-

cal activity in the domains of occupational physical activity, time spent in nonoccupational walking, moderate-intensity recreational activities, and vigorous-intensity recreational activities. These questions are designed to estimate compliance with new public health recommendations (28) and have been previously tested for reliability and validity (1).

Analyses. The data were analyzed using SPSS version 10.0. Walking as a form of physical activity was grouped into one of three categories for the relationships examined in this paper: 1) regular walkers were defined as those who met public health recommendations by walking ($5 \times \text{wk}^{-1} \times 30$ min per time); 2) occasional walkers were those who reported walking at least 10 min at a time during the past week but do not walk enough to meet the public health recommendation for moderate-intensity physical activity; and 3) never walkers were those who responded "no" to the question "In a usual week, do you walk for at least 10 min at a time while at work, for recreation, exercise, to get to and from places, or for any other reason?" These classifications are similar to the classifications of physical activity used by the Centers for Disease Control and Prevention with data from the BRFSS. Physical activity status is classified as "recommended" (meeting physical activity recommendations), "insufficient" (doing some physical activity but not enough to meet recommendations), or "inactive" (doing no physical activity) (20).

Frequencies and percentages were computed for the three categories of walking by sociodemographic characteristics (gender, age, race, education, income, employment, and urban/rural environment). Frequencies, percentages, and chi-square statistics were calculated for both personal and environmental barriers by walking status. A 95% confidence interval (CI) was computed for each percentage. These CI provide an interval that with 95% probability will contain the true value of the percentage. Odds ratios (OR) were calculated using regular walkers as the reference group for never walkers and occasional walkers. An OR of 1.00 would indicate no difference in rates compared with the reference group, a number less than 1.00 indicates that the comparison group is less likely to be affected by the factor being analyzed than the reference group, and an OR of greater than 1.00 shows that the comparison group is more likely to be affected by the factor being analyzed than the reference group. Lack of statistical significance of these OR is determined by the presence of 1.00 in the 95% CI. Because previous research indicates a disparity in physical activity level by age, race, and education level (23), multivariate OR were calculated adjusting for these variables. Multivariate-adjusted OR and 95% CI were calculated to compare the level of walking by various factors as follows. Personal factors included: reported high self-confidence (defined by a "very confident" or "somewhat confident" response to the question "How confident are you that you could become physically active or maintain your current level of activity?"; reported high outcome efficacy (defined by an "agree or strongly agree" response to the question "If you exercise regularly you can

TABLE 1. Frequency of walking behavior by sociodemographic characteristics, U.S. Physical Activity Study, 1999–2000.

Characteristic	Never Walkers ^a		Occasional Walkers ^b		Regular Walkers ^c	
	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)
Total	376	20.7 (17.1, 25.0)	829	45.6 (42, 49)	611	33.6 (29.8, 37.3)
Gender						
Female	259	19.6 (15.6, 23.6)	550	46.1 (42.2, 48.9)	410	33.6 (29.8, 37.3)
Male	117	21.2 (17.6, 25.3)	279	45.1 (42.7, 49.4)	201	33.7 (29.9, 37.4)
Missing 2 (0.1%)						
Age group (yr)						
18–29	73	15.0 (11.3, 18.6)	234	48.1 (44.7, 51.5)	179	36.8 (32.9, 40.6)
30–44	100	18.2 (14.2, 22.1)	235	42.9 (39.5, 46.2)	213	38.9 (35.0, 42.8)
45–64	118	24.6 (20.2, 28.9)	216	45.1 (41.7, 48.4)	145	30.3 (26.7, 33.9)
65+	80	27.2 (22.7, 31.7)	141	48.0 (44.5, 51.4)	73	24.8 (21.4, 28.7)
Missing 11 (0.6%)						
Race/ethnicity						
White	183	18.9 (14.9, 22.9)	437	45.1 (41.7, 48.4)	350	36.1 (32.2, 39.9)
Black	130	23.8 (19.4, 28.1)	244	44.7 (41.3, 48.0)	172	31.5 (27.8, 35.2)
Other*	61	20.7 (16.6, 24.7)	145	49.3 (45.9, 52.7)	88	29.9 (26.2, 33.5)
Missing 8 (0.4%)						
Education						
< HS grad	98	29.7 (25.0, 34.3)	152	46.1 (42.7, 49.4)	80	24.2 (20.8, 27.6)
HS grad	110	19.0 (16.2, 24.3)	275	47.7 (44.3, 51.1)	160	33.3 (29.5, 37.0)
Some college	93	20.3 (16.2, 24.3)	233	38.5 (35.1, 41.8)	195	41.2 (37.3, 45.1)
College grad	75	11.9 (8.6, 15.2)	168	44.1 (40.7, 47.4)	176	44.1 (40.2, 48.0)
Missing 3 (0.2%)						
Employment						
Employed	180	16.7 (12.9, 20.4)	490	45.5 (42.1, 48.9)	408	37.5 (33.7, 41.3)
Not employed	195	26.5 (22.0, 30.9)	337	45.9 (42.5, 49.3)	203	27.6 (23.4, 31.0)
Missing 5 (0.3%)						
Income						
<10K	102	29.7 (25.1, 34.3)	148	42.8 (39.4, 46.1)	408	37.5 (33.6, 41.3)
10K–<20K	87	23.0 (18.7, 27.2)	179	47.4 (44.0, 50.8)	203	27.6 (24.0, 31.1)
20K–<35K	66	16.9 (13.1, 20.7)	177	45.3 (41.9, 48.6)	148	37.9 (34.1, 41.7)
>35K	77	15.3 (11.7, 18.9)	233	46.4 (43.0, 49.8)	192	38.2 (34.3, 42.0)
Missing 201 (11.1%)						
Urban/rural location						
Urban	153	17.2 (13.4, 21.0)	421	47.2 (43.8, 50.5)	318	35.7 (31.9, 39.4)
Suburban	23	24.7 (20.3, 29.0)	33	35.5 (32.5, 38.8)	37	39.8 (35.9, 43.7)
Rural	90	23.8 (19.4, 28.1)	186	49.2 (45.8, 52.6)	102	27.0 (23.5, 30.5)
Between	64	21.6 (17.4, 25.7)	136	45.9 (42.5, 49.2)	96	32.4 (28.7, 36.1)
Missing 159 (8.7%)						
Correlates						
High self-confidence	287	77.2 (72.9, 81.4)	729	88.0 (85, 90.2)	589	96.7 (95.2, 98.1)
High outcome efficiency	230	87.8 (84.5, 91.1)	786	94.6 (93.1, 96.1)	581	95.1 (93.3, 96.8)
<10 sedentary h.wk ⁻¹	124	33.0 (28.2, 37.8)	247	29.8 (26.7, 32.9)	221	36.2 (32.4, 40.0)
Nonsmoking	191	50.9 (45.8, 55.9)	489	59.1 (55.5, 62.4)	351	57.4 (53.5, 61.3)
High PASS	189	50.8 (45.7, 55.9)	473	58.5 (55.1, 61.8)	369	61.3 (57.4, 65.2)

* Other category included American Indian/Alaskan Native, Asian/Pacific Islander, and Hispanic.

^a Never walkers were defined as those who responded “no” to the question “In a usual week, do you walk for at least 10 minutes at a time while at work, for recreation, exercise, to get to and from places, or for any other reason?”

^b Occasional walkers were defined as those who answered “yes” to the question “In a usual week, do you walk for at least 10 minutes at a time while at work, for recreation, exercise, to get to and from places, or for any other reason?” but did not meet the criteria for the physical activity recommendation by walking an accumulated 30 minutes 5 d a week.

^c Regular walkers were defined as those who walk enough to meet the physical activity recommendation of walking an accumulated 30 min., 5 d a week.

reduce your chance of getting heart disease”); less than or equal to 10 h·wk⁻¹ of sedentary behavior (cumulative total of reported reading, TV, computer in leisure-time), and nonsmoking status (defined as currently not smoking cigarettes); and high social support for physical activity (defined by a score of 4 or higher on a 5-point scale of five questions measuring physical activity social support). Additionally, frequencies and percentages for locations used in walking for physical activity and characteristics were computed for both occasional and regular walkers. Other personal barriers (e.g., no time, afraid of injury) were assessed in scale form and dichotomized for analysis (i.e., strongly agree and agree were combined as were disagree and strongly disagree responses). Environmental barriers (e.g., heavy traffic, no sidewalks) were also assessed and the responses dichotomized.

RESULTS

Approximately 34% of the population were identified as regular walkers, 45.6% were occasional walkers, and 20.7% were never walkers. (Table 1) The percentages among the three groups of walking behavior varied little between men and women. As expected, the oldest age category (65+) contained the largest percentage of never walkers and the lowest percentage of regular walkers. The youngest age group (18–29) had the least number of never walkers. The greatest percentage (38.9%) of regular walkers was in the 30–44 age category. Among racial/ethnic groups, 36.1% of whites were categorized as regular walkers, as compared with black and other racial/ethnic groups at 31.5% and 29.9%, respectively. Our data indicate that the higher the education level, the lower the prevalence of never walking,

TABLE 2. Locations used in walking for physical activity, Physical Activity Study, 1999–2000.

Characteristic	Neighborhood Streets		Shopping Mall		Parks		Walking/Jogging Trail		Treadmill	
	Occasional (N = 829) % (95% CI)	Regular (N = 611) % (95% CI)	Occasional (N = 829) % (95% CI)	Regular (N = 611) % (95% CI)	Occasional (N = 829) % (95% CI)	Regular (N = 611) % (95% CI)	Occasional (N = 829) % (95% CI)	Regular (N = 611) % (95% CI)	Occasional (N = 829) % (95% CI)	Regular (N = 611) % (95% CI)
Gender										
Female	63.1 (59.8, 66.3)	69.8 (66.1, 73.4)	30.7 (27.6, 33.8)	37.6 (33.8, 41.4)	30.7 (27.5, 33.8)	33.9 (30.1, 37.7)	24.1 (21.2, 27.0)	26.4 (22.9, 29.9)	25.2 (22.2, 28.2)	25.9 (22.9, 29.4)
Male	67.8 (64.6, 70.9)	72.1 (68.6, 75.6)	43.7 (40.3, 47.0)	32.3 (28.8, 38.8)	24.4 (21.5, 27.3)	38.7 (35.2, 42.2)	22.8 (19.9, 25.7)	29.0 (25.4, 32.5)	22.6 (19.8, 25.4)	27.8 (24.2, 31.4)
Age (yr)										
18–29	68.7 (65.5, 71.9)	69.3 (69.1, 76.4)	42.2 (38.8, 45.6)	40.2 (35.7, 43.7)	33.0 (29.8, 36.2)	39.1 (35.6, 42.5)	28.7 (25.6, 31.8)	27.9 (24.4, 31.3)	26.1 (23.1, 29.0)	29.6 (25.8, 33.3)
30–44	64.3 (61.0, 67.6)	72.8 (69.1, 76.4)	39.1 (35.8, 42.4)	33.8 (30.1, 37.5)	31.3 (28.1, 34.4)	37.1 (33.4, 40.8)	25.2 (22.2, 28.2)	31.0 (27.3, 34.7)	22.2 (19.4, 25.0)	27.2 (23.9, 30.4)
45–64	59.2 (55.8, 62.5)	69.7 (66.1, 73.2)	35.7 (32.4, 38.9)	33.1 (29.5, 36.6)	20.2 (17.5, 22.9)	35.2 (31.6, 38.7)	19.2 (16.5, 21.2)	26.9 (23.3, 30.4)	20.7 (17.9, 23.4)	27.6 (24.1, 31.1)
65+	66.9 (63.6, 70.1)	68.5 (65.2, 71.8)	41.0 (37.6, 44.3)	37.0 (33.7, 40.3)	18.0 (15.3, 20.6)	21.9 (18.6, 25.2)	15.1 (12.7, 17.5)	23.3 (20.0, 26.6)	25.9 (22.9, 28.8)	20.5 (17.1, 23.9)
Race										
White	62.3 (59.0, 65.6)	66.3 (62.3, 69.3)	33.1 (29.9, 36.3)	28.6 (25.6, 31.6)	23.1 (20.2, 25.9)	30.0 (26.9, 33.0)	20.8 (18.0, 23.6)	26.6 (23.7, 29.6)	23.4 (20.5, 26.3)	26.3 (22.5, 29.8)
Black	68.1 (64.9, 71.2)	77.3 (73.9, 80.7)	47.9 (44.4, 51.3)	48.6 (45.2, 51.9)	26.5 (23.4, 29.5)	42.4 (39.0, 45.8)	26.1 (23.1, 29.0)	26.7 (23.3, 30.0)	25.6 (22.6, 28.5)	26.0 (22.5, 29.4)
Other*	66.9 (63.7, 70.1)	73.9 (70.3, 77.5)	43.7 (40.3, 47.0)	38.6 (34.9, 42.2)	37.3 (34.0, 40.1)	43.4 (39.7, 47.0)	25.4 (22.4, 28.3)	37.5 (33.9, 41.1)	20.4 (17.6, 23.7)	33.0 (29.4, 36.6)
Education										
< HS	69.4 (66.2, 72.5)	71.3 (67.7, 74.9)	41.2 (37.8, 44.5)	54.2 (50.6, 57.8)	23.6 (20.7, 26.4)	38.8 (35.2, 45.7)	19.6 (16.9, 22.3)	26.3 (22.7, 29.9)	14.2 (11.8, 16.6)	18.8 (15.5, 22.1)
HS grad	64.7 (61.4, 67.9)	70.0 (66.7, 73.3)	45.6 (42.2, 48.9)	33.0 (29.7, 36.3)	27.9 (24.8, 30.9)	35.5 (32.2, 38.8)	23.2 (20.3, 26.0)	30.0 (26.7, 33.3)	19.2 (16.5, 21.9)	23.1 (20.2, 26.0)
Some college	56.3 (52.9, 59.9)	74.4 (70.9, 77.9)	41.0 (37.6, 44.3)	37.8 (34.3, 41.3)	29.1 (26.0, 32.2)	33.8 (30.3, 37.7)	26.4 (23.3, 29.4)	29.2 (25.7, 32.7)	29.1 (26.0, 32.2)	28.7 (25.4, 31.9)
College grad	65.5 (62.2, 68.7)	66.5 (62.9, 70.1)	25.7 (22.7, 28.7)	28.6 (24.9, 32.2)	23.4 (20.5, 26.2)	36.4 (32.8, 40.0)	21.6 (18.8, 24.4)	26.1 (22.5, 29.7)	31.1 (27.9, 34.2)	33.0 (29.2, 36.7)
Income										
<10K	58.1 (54.7, 61.4)	80.2 (76.8, 83.6)	44.2 (40.8, 47.5)	48.8 (45.4, 52.2)	28.6 (26.5, 31.7)	35.4 (31.9, 38.8)	19.0 (16.3, 21.7)	25.0 (21.5, 28.4)	15.0 (12.6, 17.4)	22.9 (19.2, 26.7)
10–<20K	65.8 (62.6, 69.0)	65.2 (61.4, 68.9)	41.6 (38.2, 44.9)	46.9 (42.9, 50.9)	22.5 (19.6, 25.3)	40.2 (36.3, 44.1)	22.5 (19.6, 25.3)	31.3 (27.6, 34.9)	20.8 (16.8, 22.2)	22.3 (19.3, 25.3)
20–<35K	63.9 (60.6, 67.1)	71.6 (68.0, 75.1)	42.0 (38.6, 45.3)	34.4 (30.8, 37.9)	28.7 (25.6, 31.8)	42.6 (39.0, 46.1)	27.0 (23.9, 30.3)	33.8 (30.3, 37.3)	19.5 (16.8, 22.2)	23.6 (20.2, 26.9)
>35K	69.5 (66.3, 72.6)	68.8 (65.3, 72.6)	34.5 (31.2, 37.7)	21.6 (18.1, 25.1)	25.9 (22.9, 28.9)	30.2 (26.7, 33.7)	22.0 (19.1, 24.8)	24.5 (21.0, 27.9)	34.1 (30.8, 37.3)	35.4 (32.1, 38.6)
Location										
Urban	72.8 (69.7, 75.8)	74.2 (70.5, 77.9)	41.0 (37.6, 44.3)	41.5 (37.8, 45.2)	34.5 (31.3, 37.7)	45.6 (41.9, 49.2)	25.5 (22.5, 28.5)	29.9 (26.2, 33.6)	26.0 (23.0, 28.9)	26.1 (22.6, 29.6)
Suburban	57.6 (53.3, 60.1)	73.0 (69.4, 76.6)	33.3 (30.1, 36.5)	16.2 (12.6, 19.8)	15.2 (12.7, 17.6)	24.3 (20.7, 27.9)	21.2 (18.4, 24.0)	24.3 (20.7, 27.9)	30.3 (27.2, 33.4)	21.6 (18.0, 25.2)
Rural	54.1 (50.7, 57.4)	66.7 (63.4, 70.1)	32.8 (29.6, 36.5)	27.5 (24.2, 30.8)	15.8 (13.8, 18.3)	19.6 (16.3, 22.8)	21.3 (18.4, 24.0)	20.6 (17.3, 23.9)	18.0 (15.4, 20.6)	25.5 (21.8, 29.2)
Between U/R	53.1 (49.7, 56.4)	69.8 (66.8, 72.8)	41.0 (37.6, 44.3)	35.4 (32.3, 38.4)	16.4 (13.8, 18.9)	29.2 (26.1, 32.2)	23.9 (20.9, 26.8)	34.4 (31.4, 37.4)	23.9 (20.9, 26.8)	32.3 (29.0, 35.5)

* Other category included American Indian/Alaskan native, Asian/Pacific Islander, and Hispanic.

TABLE 3. Walking status by personal and environmental correlates, U.S. Physical Activity Study, 1999–2000.

Walking Status	High Self-Confidence ^a	High Outcome Efficacy ^b	<= 10 Sedentary h-wk ^{-1c}	Nonsmoking ^d	High PASS ^e
	Adj OR (95% CI)* (N = 851)	Adj OR (95% CI) (N = 1698)	Adj OR (95% CI) (N = 593)	Adj OR (95% CI) (N = 1033)	Adj OR (95% CI) (N = 1032)
Regular walker ^e	1.00	1.00	1.00	1.00	1.00
Occasional walker ^f	0.29 (0.18–0.48)	1.00 (0.89–1.15)	1.37 (1.08–1.74)	1.16 (0.88–1.55)	0.95 (0.87–1.04)
Never walker ^g	0.14 (0.08–0.24)	1.11 (0.97–1.28)	1.28 (0.94–1.72)	1.27 (0.95–1.68)	0.74 (0.55–0.99)

^a High self-confidence was defined by a “very confident” or “somewhat confident” response to the question “How confident are you that you can maintain your current level of physical activity?”

^b High outcome efficacy was defined as responding “agree” or “strongly agree” to the question: “If you exercise regularly you can reduce your chance of getting heart disease. Do you?”

^c Sedentary hours were calculated by adding the reported hours watching television, reading, playing video games, or computer while not at work or school.

^d Nonsmoking was defined as not currently smoking cigarettes.

^e Regular walkers defined as those who walk enough to meet the physical activity recommendation of walking an accumulated 30 min, 5 times a week.

^f Occasional walkers defined as those who answered “yes” to the question “In a usual week, do you walk for at least 10 minutes at a time while at work, for recreation, exercise, to get to and from places, or for any other reason?” but did not meet the criteria for the physical activity recommendation by walking an accumulated 30 min 5 d a week.

^g Never walkers defined as those who responded “no” to the question “In a usual week, do you walk for at least 10 minutes at a time while at work, for recreation, exercise, to get to and from places, or for any other reason?”

^h A High support for physical activity (PASS) was defined by a score of 4 or 5 on a 5 question series.

* An odds ratio of 1.00 would indicate no difference compared to the reference group, a number less than 1.00 indicates that the comparison group is less likely to be affected by the factor being analyzed than the reference group, and an odds ratio of greater than 1.00 shows that the comparison group is more likely to be affected by the factor being analyzed than the reference group. Lack of significance of these odds ratios is determined by the presence of 1.00 in the 95% confidence intervals. These rates were statistically adjusted for age, race, and education level.

and the higher rates of regular walking; 29.7% of respondents with less than a high school education never walked for physical activity, and only 23.8% were categorized as regular walkers. Comparatively, 20.3% of those with a college education were never walkers, and 41.2% of people in this category were classified as regular walkers. A higher percentage (26.5%) of those not employed reported never walking for physical activity than those employed (16.7%). Also, more respondents who were employed were regular walkers (37.5%) than respondents not employed (27.6%). A negative association was also observed when comparing walking status and income level. Thirty percent of people with a household income of less than \$10,000 never walked compared with 15.3% of those in the \$35,000 and above category. When living environments were analyzed using the 2000 U.S. Census Bureau definitions (27), the highest rates regular walkers came from a suburban population and the lowest rate from a rural population: 39.8% of respondents living in suburban areas were classified as regular walkers compared with 35.6% from urban areas and 27% from rural.

Locations used to walk for physical activity are reported for occasional and regular walkers. (Table 2) Over 60% of respondents who were walkers, either occasional or regular, reported using neighborhood streets for walking. More women who were regular walkers (37.6%) reported using malls for walking than men (32.3%). Twenty percent more black respondents (48.6%) reported using malls for regular walking than white respondents (28.6%). For regular walkers, more people with less than a high school education (54.2%) used malls for walking compared with those who were college graduates (28.6%). More male regular walkers (38.7%) used parks for walking than female regular walkers (33.9%), although the reverse was true for occasional walkers, where 30.7% of female occasional walkers used parks compared with 24.4% of men. People in the younger age categories, regardless of walking status, reported using

parks more than people in older age groups. Thirty percent of regular and 23.1% occasional walkers who were white reported using parks for walking. These percentages were substantially lower than those for black and other racial/ethnic group respondents using parks for walking. More walkers living in urban areas reported using parks than other living environments. Over twice the percentage of occasional walkers living in urban areas (34.5%) used parks for walking compared with only 15.8% of occasional walkers living in rural areas. Similarly, 45.6% of respondents living in urban areas use parks for regular walking, compared with only 19.6% of regular walkers in rural areas. Overall, 25% of walkers report using a treadmill for their walking. The percentage of people using a treadmill for walking increased with both education and income level. For example, 18.8% of people with less than a high school education who were regular walkers used a treadmill compared with 33% of regular walkers who were college graduates. Similarly, 22.9% of regular walkers with an income level of less than \$10,000 reported treadmill use, compared with 35.4% of those in the \$35,000 or more category. More regular walkers who lived between an urban and rural environment (32.3%) reported using a treadmill than people in rural, urban, or suburban sites.

Selected factors that may influence walking status were also evaluated (Table 3). Using logistic regression, a significant OR in self-confidence among the groups was found. Occasional walkers and those who never walked were much less likely to have the confidence to begin or increase their current physical activity levels than regular walkers (OR 0.29, 95% CI = 0.18–0.48) and 0.14, 95% CI = 0.08–0.24, respectively). Using a 5-point scale measuring social support for physical activity we found that those who never walked for physical activity reported less social support by friends and/or family members as compared with regular walkers. Occasional walkers were slightly more likely to report 10 or more hours of sedentary activity per week than

TABLE 4. Personal and Environmental Barriers Reported by Regular, Occasional, and Never Walkers, U.S. Physical Activity Study, 1999–2000.

Barrier	Never Walkers ^a		Occasional Walkers ^b		Regular Walkers ^c		χ^2	
	%	OR* (95% CI)	%	OR (95% CI)	%	OR* (95% CI)		
Other discourage me	4.9	1.20 (0.65–2.24)	4.5	1.28 (0.78–2.13)	4.1	1.00	0.95	<i>P</i> = 0.62
Self-conscious about looks	12.7	1.14 (0.77–1.70)	11.6	1.03 (0.74–1.43)	11.3	1.00	0.48	<i>P</i> = 0.78
Afraid of injury	11.7	1.64 (1.02–2.62)	6.9	0.94 (0.61–1.45)	6.2	1.00	10.8	<i>P</i> = 0.004
No time	26.4	2.36 (1.68–3.29)	25.4	1.91 (1.45–2.52)	10.3	1.00	17.9	<i>P</i> = 0.000
Too tired	23.0	1.97 (1.39–2.77)	18.1	1.34 (1.00–1.79)	14.7	1.00	10.8	<i>P</i> = 0.005
No safe place	10.8	1.93 (1.17–3.18)	7.7	1.36 (0.87–2.12)	5.2	1.00	10.4	<i>P</i> = 0.005
No child care	4.7	0.94 (0.51–1.74)	4.2	0.87 (0.52–1.41)	4.9	1.00	0.38	<i>P</i> = 0.83
Bad weather	8.2	1.46 (0.88–2.42)	8.1	1.45 (0.95–2.20)	5.7	1.00	3.4	<i>P</i> = 0.19
Not in good health	18.4	3.25 (2.08–5.08)	18.2	1.29 (0.83–1.99)	15.6	1.00	47.2	<i>P</i> = 0.000
No energy	22.0	4.43 (2.88–6.79)	9.5	1.65 (1.10–2.51)	6.1	1.00	62.8	<i>P</i> = 0.000
Get enough exercise at work	15.6	0.47 (0.34–0.67)	23.3	0.74 (0.57–0.94)	28.2	1.00	20.2	<i>P</i> = 0.000
No motivation	21.0	2.39 (1.64–3.47)	13.4	1.37 (0.98–1.91)	10.5	1.00	21.5	<i>P</i> = 0.000
Don't like to exercise	15.7	1.88 (1.26–2.80)	12.1	1.21 (0.86–1.70)	10.0	1.00	7.1	<i>P</i> = 0.029
No sidewalks	43.4	1.42 (1.07–1.87)	37.8	1.16 (0.92–1.44)	34.0	1.00	8.59	<i>P</i> = 0.014
Heavy traffic	43.9	0.97 (0.75–1.26)	42.9	0.93 (0.76–1.16)	44.6	1.00	0.39	<i>P</i> = 0.82
Hills	37.2	0.76 (0.58–1.01)	43.2	0.97 (0.79–1.20)	43.9	1.00	4.8	<i>P</i> = 0.09
No street lights	28.5	0.82 (0.61–1.09)	24.5	1.00 (0.79–1.28)	24.5	1.00	2.45	<i>P</i> = 0.29
Unattended dogs	44.8	1.22 (0.94–1.58)	42.2	1.09 (0.89–1.36)	39.9	1.00	2.29	<i>P</i> = 0.32
Foul air	20.2	1.10 (0.80–1.53)	20.6	1.13 (0.87–1.48)	18.7	1.00	0.89	<i>P</i> = 0.64
Not enjoyable scenery	27.5	1.59 (1.15–2.20)	20.9	1.07 (0.82–1.41)	18.9	1.00	10.6	<i>P</i> = 0.005
No walk/jog trails	65.7	1.39 (1.05–1.84)	61.3	1.18 (0.96–1.47)	56.0	1.00	9.49	<i>P</i> = 0.009
Don't see people exercising	63.5	1.58 (1.20–2.08)	56.6	1.17 (0.94–1.45)	51.6	1.00	13.39	<i>P</i> = 0.001
High crime	23.0	1.27 (0.93–1.74)	21.5	1.17 (0.89–1.52)	19.0	1.00	2.44	<i>P</i> = .29

^a Never walkers defined as those who responded “no” to the question “In a usual week, do you walk for at least 10 minutes at a time while at work, for recreation, exercise, to get to and from places, or for any other reason?”

^b Occasional walkers defined as those who answered “yes” to the question “In a usual week, do you walk for at least 10 minutes at a time while at work, for recreation, exercise, to get to and from places, or for any other reason?” but did not meet the criteria for the physical activity recommendation by walking an accumulated 30 min 5 d a week.

^c Regular walkers defined as those who walk enough to meet the physical activity recommendation of walking an accumulated 30 min 5 d a week.

* An odds ratio of 1.00 would indicate no difference compared to the reference group, a number less than 1.00 indicates that the comparison group is less likely to be affected by the factor being analyzed than the reference group, and an odds ratio of greater than 1.00 shows that the comparison group is more likely to be affected by the factor being analyzed than the reference group. Lack of significance of these odds ratios is determined by the presence of 1.00 in the 95% confidence intervals. These rates were statistically adjusted for age, race, and education level.

regular walkers (OR 1.37, 95% CI = 1.08–1.74). There were no significant differences in smoking status and outcome efficacy among the groups.

The percentage of perceived personal and environmental barriers were calculated for all three levels of walkers (Table 4). Those who never walked were significantly more concerned about being injured during physical activity than regular walkers. This difference was not significant for occasional walkers. Significant differences were seen among the groups for perceived lack of time to be physically active. Those who never walked were over twice as likely to report the absence of time as a barrier (OR = 2.36, 95% CI = 1.68–3.29), and occasional walkers were almost twice as likely to report absence of time (OR 1.91, 95% CI = 1.45–2.52) as a barrier compared with regular walkers. Although the only other significant differences between occasional walkers and regular walkers were lacking the energy to exercise and getting enough exercise at work, there were many more significant differences between those who never walked and regular walkers. Never walkers were more likely to report being too tired, lacking motivation, and disliking physical activity than regular walkers. The greatest differences between these two groups were in perceived poor health and lack of energy to exercise. Respondents who never walked were over three times as likely (OR = 3.25, 95% CI = 2.08–5.08) than regular walkers to report feeling unhealthy, and over four times as likely (OR = 4.43, 95% CI = 2.88–6.79) to report no energy to exercise. Although there were no significant differences between occasional

walkers and regular walkers in environmental barriers to walking for physical activity, those who never walked were about 1.5 times more likely than regular walkers to report lack of sidewalks, no enjoyable scenery, lack of walking/jogging trails, and not seeing people exercising in their neighborhood.

Finally, we looked at walking status by responses to questions on whether the respondent changed their walking behavior since they began using the resource that was the main place for walking (e.g., walking trail). Forty-five percent of regular walkers and 50% of occasional walkers stated that they walked more since using their neighborhood resource.

DISCUSSION

Our data show that 33.6% of the surveyed population reported they attained the recommended levels of physical activity by walking. As with other data (17,24), our survey identified a younger, white, and more educated population to be the most likely to be regularly physically active (i.e., regular walkers). Education level is a strong correlate in many health behaviors. In this study, education level was the sociodemographic factor showing the greatest differences among the groups. Almost twice as many college-educated respondents walked regularly as compared with those who did not complete high school.

Over 60% of the respondents who were either occasional or regular walkers reported using neighborhood streets as their

main location for walking for physical activity. Also, lack of sidewalks was a significant barrier among those who never walked. Perhaps an improvement of streets and sidewalks would encourage more people to walk in their neighborhood. Shopping malls and parks were also reported as popular places to walk among certain sociodemographic groups and should be considered as potential intervention sites for these groups (e.g., younger, nonwhite, and lower education and income). Future research should be conducted on these walkers to identify factors (environmental or personal) that promote their adherence to a regular walking regime. These factors can then be used to plan programs for occasional walkers and those who never walk for physical activity.

In addition to personal correlates, examination of environmental correlates revealed significant differences between regular walkers and those who never walked. Those who never walked were less likely to report adequate sidewalks, enjoyable scenery, and walking trails than regular walkers. These results may provide important foci for future environmental interventions. Providing places to walk (e.g., building walking trails, improving sidewalks and street lighting) may be the impetus for individuals who have never walked to begin this behavior.

Much like the results of previous studies (17,24), analysis of personal correlates revealed lack of time as a major influence in walking status. Those who never walked were over twice as likely to say they didn't have time to be physically active as regular walkers. Although "I don't have time" may be a ubiquitous reason for not being physically active, further exploration of this explanation is needed. Past research identifies that even those who are regularly physically active report "not having enough time" (7). Perhaps it is not a matter of lack of time but lack of priority that is the true barrier, and this concept should be assessed in the future.

Two other correlates analyzed in this study were self-confidence and social support. Both of these were found to be important factors in walking status. Those who reported never walking also reported low self-confidence in becoming physically active. These results concur with past research that states self-confidence and social support are two significant correlates of physical activity (9,24). Additionally, they reported less social support for physical activity than regular walkers. Both self-confidence about physical activity and social support for physical activity are two factors that can be changed or influenced with proper intervention.

Those who never walked for physical activity also reported being in poor health and lacking energy to exercise as compared with regular walkers. Because of the cross-sectional design of this survey, temporality cannot be determined. We do not know whether poor health and lack of energy are results of not being physically active or whether physical inactivity initiates poor health and lack of energy. Because walking can be

done with relative ease for most people and can be done at a multitude of speeds, distances, and intensities, it seems to be the "ideal" physical activity for someone who is in less than favorable health. Additionally, promotion of walking as a way to improve health and gain energy is a very important message to people who never walk.

There are several limitations to consider when interpreting our data. First, we relied on self-reported telephone survey data, for which there are several potential biases (e.g., possible under-representation of lower SES segments of the population). To address this limitation, we over-sampled lower income populations across the United States. Also, because our data are cross-sectional, causal relations cannot be inferred. In spite of these limitations, the present investigation provides nationwide, population-based data examining the epidemiology of walking for physical activity.

CONCLUSIONS

These results describes the characteristics of people who walk for physical activity and their walking behavior. If these findings are corroborated with multiple studies, including study designs that measure behavior change over time, the following suggestions take on added importance:

1. Neighborhood streets seem to be a popular place for walking for physical activity by regular and occasional walkers. Additionally, those who never walked were more likely to report barriers to walking on neighborhood streets (e.g., no sidewalks, poor lighting). Enhancing already-existing resources such as streets may be an important aspect of getting people to walk or walk more.

2. As researchers have begun to consider (8), programs to enhance walking for physical activity should assess and address personal barriers such as perceived lack of time. Promotion of "short bouts" of walking or encouraging walking for physical activity as a priority are examples.

3. Two important mutable factors that may influence walking for physical activity are self-confidence and social support. Interventions to increase walking should include components to enhance these factors.

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