

# Leisure-Time Physical Activity Patterns in the U.S. Diabetic Population

## Findings from the 1990 National Health Interview Survey—Health Promotion and Disease Prevention Supplement

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**OBJECTIVE** — Despite the scientific community's recognition of the importance of exercise, little is known about the epidemiology of exercise among persons with diabetes in the U.S. Our goals were to examine whether people with diabetes were more sedentary than people without diabetes, to examine the effect of activity limitations on the prevalence of exercise, and to examine whether the choice of activities differs among people with and without diabetes.

**RESEARCH DESIGN AND METHODS** — We examined the 1990 Health Promotion and Disease Prevention Supplement of the National Health Interview Survey to describe leisure-time physical activity patterns in a representative sample of the U.S. population with diabetes.

**RESULTS** — People with diabetes were less likely to report exercising regularly than people without this disease ( $34.3 \pm 2.2\%$  vs.  $40.9 \pm 0.5\%$ ,  $P < 0.05$ ). When the data were stratified by activity limitation status, no significant differences were observed. People with diabetes were equally likely to have engaged in exercise in the preceding 2 weeks and to have expended  $\geq 2,000$  kcal/week as people without diabetes. Walking was the activity of choice for both groups:  $49.2 \pm 2.1\%$  of people with diabetes reported walking during the previous 2 weeks compared with  $44.2 \pm 0.5\%$  of people without diabetes ( $P < 0.05$ ). People with diabetes were less likely to engage in jogging, aerobics, dancing, calisthenics, bicycling, weight lifting, several ball sports, and skiing than people without diabetes.

**CONCLUSIONS** — After adjusting for activity limitations and age, people with and without diabetes are equally likely to exercise. The majority of people with diabetes, like their nondiabetic counterparts, are not meeting national physical activity goals. Individuals with diabetes should be encouraged to exercise regularly in accordance with their capabilities, physical limitations, and personal interests.

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NIDDM, non-insulin-dependent diabetes mellitus; HDL, high-density lipoprotein; NHIS, National Health Interview Survey; IDDM, insulin-dependent diabetes mellitus.

The benefits of physical activity are well documented (1). Unfortunately, much of the U.S. population fails to exercise sufficiently to realize these potential health benefits (2). People with diabetes, particularly those with non-insulin-dependent diabetes mellitus (NIDDM), may benefit at least twofold: from an improvement of metabolic derangements, such as glucose homeostasis, and from a reduced risk of complications, especially cardiovascular disease.

Among people with NIDDM, exercise has been shown to improve glyce-mic control, improve insulin sensitivity, reduce fasting hyperinsulinemia, and reduce the need for oral hypoglycemic agents or insulin (3). Because physical inactivity has been shown to be an important risk factor for ischemic heart disease (1), exercise could also result in a reduced risk for mortality among people with diabetes through either improving the risk factor profile for ischemic heart disease or through an independent mechanism such as lowering the myocardial oxygen demand. The prevalence of a number of risk factors for cardiovascular disease that can be favorably influenced by physical activity are high among people with diabetes. These risk factors are increased levels of triglycerides and decreased levels of high-density lipoprotein (HDL) cholesterol (4), hypertension (5), being overweight (6), and elevated levels of fibrinogen (7). Among people with NIDDM, exercise has been shown to lower triglyceride levels (8) and improve HDL cholesterol levels (9), lower blood pressure (10), result in improved weight control (3), and decrease fibrinogen levels (11). In addition, depression, another condition for which exercise has been shown to improve symptoms, is more prevalent among people with diabetes. Furthermore, exercise can inhibit secondary platelet aggregation (12), which is thought to be increased among people with diabetes (7).

Because of the high prevalence of disability among people with diabetes (13), they can be expected to participate

Table 1—Characteristics of respondents

	Total				Not limited				Limited			
	Diabetes		No diabetes		Diabetes		No diabetes		Diabetes		No diabetes	
	%	n	%	n	%	n	%	n	%	n	%	n
Total	100	1,632	100	38,933	100	785	100	32,303	100	847	100	6,630
Age (years)												
18–24	1.5	25	12.1	4,714	2.3	18	13.7	4,414	0.8	7	4.5	300
25–34	5.8	94	24.4	9,504	8.9	70	27.2	8,778	2.8	24	11.0	726
35–44	9.0	146	21.2	8,267	12.0	94	22.4	7,247	6.1	52	15.4	1,020
45–54	14.0	228	12.8	4,965	14.0	110	12.6	4,072	13.9	118	13.5	893
55–64	24.1	394	11.1	4,316	22.2	174	9.8	3,157	26.0	220	17.5	1,159
65–74	28.1	458	10.7	4,151	25.6	201	8.7	2,800	30.3	257	20.4	1,351
>75	17.6	287	7.8	3,016	15.0	118	5.7	1,835	20.0	169	17.8	1,181
Sex												
Men	39.4	643	41.8	16,291	42.2	331	42.4	13,680	36.8	312	39.4	2,611
Women	60.6	989	58.2	22,642	57.8	454	57.7	18,623	63.2	535	60.6	4,019
Race												
White	75.6	1,233	84.0	32,717	77.3	607	84.1	27,163	73.9	626	83.8	5,554
Black	22.7	370	13.2	5,145	20.8	163	12.9	4,168	24.4	207	14.7	977
Other	1.8	29	2.8	1,071	1.9	15	3.0	972	1.7	14	1.5	99
Education (years)												
<12	44.0	713	20.8	8,099	33.6	262	17.8	5,753	53.6	451	35.5	2,346
12	34.8	564	37.8	14,691	40.1	313	38.5	12,404	29.9	251	34.6	2,287
>13	21.3	345	41.4	16,066	26.4	206	43.7	14,095	16.5	139	29.9	1,971
Health status												
Excellent	7.2	117	34.9	13,547	12.4	97	40.1	12,924	2.4	20	9.4	623
Very good	15.5	252	29.7	11,540	23.3	183	32.1	10,329	8.2	69	18.3	1,211
Good	33.8	550	24.5	9,510	43.9	344	22.9	7,373	24.4	206	32.3	2,137
Fair	27.2	443	8.1	3,161	17.7	139	4.6	1,465	36.0	304	25.7	1,696
Poor	16.4	267	2.8	1,077	2.7	21	0.4	136	29.1	246	14.2	941
Limitation												
Unable major activity	19.9	324	4.5	1,758								
Limited in major activity	17.8	290	6.3	2,433								
Limited other	14.3	233	6.3	2,439								
Not limited	48.1	785	83.0	32,303								

Numbers for education and health status do not add up to totals because of missing data.

less in exercise as a group than the general population. Although most studies have suggested that people with diabetes may be less active (14–22), some have not shown such a difference (23,24). Of these studies, only two have been conducted in the U.S. One was a study of retired people in southern California (14), and the other was a study of Pima Indians in Arizona (22).

Therefore, we are not aware of any

previous studies on physical activity patterns of a nationally representative sample of the diabetic population in the U.S. Such data are clearly desirable to assess adherence to recommendations for physical activity, compare diabetic and nondiabetic populations, and follow time trends in physical activity patterns of the diabetic population.

Participants in the 1990 National Health Interview Survey (NHIS) Health

Promotion and Disease Prevention supplement were asked to provide information about their participation in sports and exercise. We examined this database to 1) describe physical activity patterns in a representative sample of the U.S. population with diabetes, 2) examine whether people with diabetes were more sedentary than people without diabetes, 3) examine the effect of activity limitations on the prevalence of exercise, and 4) exam-

Table 2—Age-adjusted participation rates in physical activity and energy expenditure among participants with and without limitation

	Total		Not limited		Limited	
	Diabetes	No diabetes	Diabetes	No diabetes	Diabetes	No diabetes
Any exercise in preceding 2 weeks	69.0 ± 1.8	72.2 ± 0.5	73.7 ± 2.0	74.1 ± 0.5	63.4 ± 3.5	65.0 ± 1.0
Regular exercise	34.3 ± 2.2	40.9 ± 0.5*	38.3 ± 2.5	42.4 ± 0.5	28.8 ± 3.9	32.9 ± 1.0
Exertion of ≥2,000 kcal/week	19.7 ± 1.9	21.5 ± 0.4	21.2 ± 2.3	22.3 ± 0.4	18.2 ± 3.8	18.2 ± 0.8

Data are % ± SE. \*  $P < 0.05$  (people with diabetes versus people without diabetes).

ine whether the choice of activities differs between the groups.

## RESEARCH DESIGN AND METHODS

Since 1957, a representative sample of the civilian, noninstitutionalized U.S. population has been asked to participate in the NHIS each year. The methodology of this survey has been published (25). In 1990, a Health Promotion and Disease Prevention supplement was added to the survey. Respondents were asked to report on their participation in exercise and were asked about their participation in 24 specific activities (Table 5). People who were 75 years old or older were not asked any of the specific activity questions but instead were first asked if they had participated in any exercises, sports, or physically active hobbies during the previous 2 weeks. If a positive response was given, the respondent was then asked to name these activities along with the frequency and duration of these activities. In addition, people who were between 65 and 74 years were not asked specifically about nine sports that were considered more strenuous but were queried in a similar fashion as respondents who were 75 years or older.

An individual who answered affirmatively to the question "Do you now have diabetes?" was classified as having this disease. No other information concerning their condition was asked during this survey.

Respondents who were 18–69 years of age were asked whether any impairment or health problem kept them from performing certain activities such as

working and attending school. In addition, respondents who were 18 years or older were asked whether, because of any impairment or health problem, they needed the help of others with personal care needs. Based on their responses to these questions, respondents were classified into one of four groups. People who were unable to perform a major activity, who were limited in the kind or amount of a major activity, or who were limited in other activities were designated as having an activity limitation. All other respondents were considered to be free from activity limitations.

Estimates of weekly energy expenditure were obtained by multiplying three variables: a respondent's self-reported weight (in kilograms), the weekly time (in hours) spent in a specific activity, and the appropriate MET level assigned to that activity. MET levels were obtained from recently published tables (26). A cap of 70 h/week was imposed on records with exercise times in excess of this number. MET-hours were calculated by summing over all activities the products of weekly time spent in a specific activity and the appropriate MET level assigned to that activity.

Prevalence estimates and SE were obtained with the program SESUDAAN (27) that incorporates the complex sampling design in the calculations. When age adjusted, the data were directly adjusted to the 1980 census of the U.S. population.

**RESULTS**— A total of 1,632 people responded that they had diabetes. Char-

acteristics of these respondents and people without diabetes are shown in Table 1. People with diabetes were older and were more likely to be black, to be less educated, and to have fair or poor health. Fifty-two percent of people with diabetes and 17% of people without diabetes reported activity limitations.

Three measures of participation in exercise are presented for people with and without diabetes (Table 2). The criteria for two of the measures were established with questions: for any exercise in the preceding 2 weeks, "In the past 2 weeks, beginning Monday and ending this past Sunday, have you done any (of the following exercises, sports, or physically active hobbies)?" and for regular exercise, "Do you exercise or play sports regularly?" The last measure of participation was exerting ≥2,000 kcal/week of energy expenditure. People with diabetes were less likely to report regular exercise than people without diabetes. When the data were stratified by activity limitation status, the difference was 4.1%, which was not statistically significant. Both groups were equally likely to have engaged in exercise in the preceding 2 weeks and to have expended ≥2,000 kcal per week. A notable finding was the large difference in the percentage of respondents who reported exercising regularly and the percentage of respondents who reported engaging in any of the 24 activity-specific queries during the previous 2 weeks.

In Table 3, we present age-, sex-, and race-specific estimates of participation in physical activity. Few consistently significant differences emerged. For the

Table 3—Participation rates in physical activity and energy expenditure among participants with and without limitation

	Total		Not limited		Limited	
	Diabetes	No diabetes	Diabetes	No diabetes	Diabetes	No diabetes
Any exercise in preceding 2 weeks						
Age (years)						
18–44	77.7 ± 2.7	76.3 ± 0.6	80.0 ± 3.0	76.8 ± 0.6	72.8 ± 5.9	71.2 ± 1.4
45–64	61.8 ± 2.3	69.8 ± 0.7*	65.4 ± 3.1	72.1 ± 0.8*	58.1 ± 3.2	60.4 ± 1.3
≥65	52.1 ± 2.2	61.5 ± 0.9*	67.1 ± 3.3	67.5 ± 0.9	41.1 ± 2.8	49.8 ± 1.3*
Sex						
Men	73.9 ± 2.7	75.4 ± 0.6	80.1 ± 3.1	76.8 ± 0.6	65.1 ± 4.9	68.8 ± 1.3
Women	65.0 ± 2.4	69.5 ± 0.6	68.4 ± 3.0	71.7 ± 0.6	61.8 ± 4.6	61.9 ± 1.2
Race						
White	69.1 ± 2.0	73.0 ± 0.6	74.0 ± 2.3	74.9 ± 0.6	63.2 ± 4.0	65.1 ± 1.0
Black	65.8 ± 3.9	66.3 ± 1.0	69.9 ± 4.7	67.7 ± 1.2	61.4 ± 6.5	62.4 ± 2.3
Regular exercise						
Age (years)						
18–44	39.6 ± 3.6	45.7 ± 0.5	42.8 ± 4.2	46.6 ± 0.5	32.7 ± 6.5	36.5 ± 1.4
45–64	28.8 ± 1.8	35.5 ± 0.7*	32.2 ± 3.1	37.0 ± 0.7	25.3 ± 2.7	29.5 ± 1.2
≥65	26.1 ± 1.9	33.1 ± 1.0*	35.0 ± 3.2	37.0 ± 1.1	19.5 ± 2.1	25.3 ± 1.2*
Sex						
Men	42.3 ± 3.4	43.9 ± 0.6	46.3 ± 4.0	45.2 ± 0.6	37.1 ± 6.0	35.0 ± 1.4
Women	28.1 ± 2.6	38.2 ± 0.6*	32.3 ± 3.2	39.8 ± 0.6*	20.4 ± 3.6	31.1 ± 1.1*
Race						
White	35.2 ± 2.5	41.8 ± 0.5*	38.7 ± 2.8	43.3 ± 0.6	31.0 ± 4.6	33.6 ± 1.0
Black	32.0 ± 4.7	33.5 ± 1.0	37.3 ± 5.3	34.6 ± 1.1	21.6 ± 6.0	26.7 ± 1.9
Exertion of ≥2,000 kcal/wk						
Age (years)						
18–44	25.7 ± 3.2	24.7 ± 0.5	25.9 ± 3.9	24.9 ± 0.5	25.0 ± 6.6	22.3 ± 1.2
44–64	13.7 ± 1.5	19.1 ± 0.6*	15.9 ± 2.4	20.2 ± 0.6	11.4 ± 2.0	14.8 ± 0.9
≥65	9.8 ± 1.3	14.0 ± 0.6*	14.4 ± 2.2	16.5 ± 0.8	6.4 ± 1.6	9.0 ± 0.7
Sex						
Men	30.3 ± 3.3	30.2 ± 0.6	31.3 ± 4.0	31.4 ± 0.6	29.9 ± 6.1	24.6 ± 1.2
Women	11.0 ± 2.2	13.4 ± 0.3	12.9 ± 2.5	13.9 ± 0.3	6.7 ± 2.6	12.3 ± 0.9*
Race						
White	21.0 ± 2.3	21.9 ± 0.4	22.4 ± 2.7	22.7 ± 0.4	20.2 ± 4.6	18.8 ± 0.8
Black	14.8 ± 3.5	18.8 ± 0.9	17.6 ± 4.2	19.6 ± 0.9	8.6 ± 4.6	13.7 ± 1.8

Data are % ± SE. \* P < 0.05 (people with diabetes versus people without diabetes).

combined sample, people with diabetes who were older than 44 years were less active than their nondiabetic counterparts for each of the three measures of participation in physical activity. However, among people without limitations, the only significant difference among 45- to 64-year-old respondents was noted in the percentage of participation in any of the specific activities during the prior 2 weeks. Diabetic women were less likely to report exercising regularly than nondiabetic women regardless of activity limita-

tion (Table 3). However, no significant differences were observed for the two other measures of participation.

There were no differences between groups in the mean number of bouts of exercise, the average number of minutes per bout of exercise, the mean total hours of exercise, the mean MET hours of exercise, and the proportion of people exercising at least six times during the previous 2 weeks. A smaller proportion of all people with diabetes exercised six or more sessions with a total duration

of at least 120 min during the previous 2 weeks than people without diabetes (Table 4).

Some differences were noted among the choice of activities between the groups (Table 5). Walking, yard work, calisthenics, bicycling, swimming, weight lifting, dancing, jogging, and aerobics were the preferred activities among both people with and without diabetes, although some minor differences in the rank order existed after the top four activities. Whereas people with diabetes were more

Table 4—Various age-adjusted measures of participation in exercise during a 2-week period

	Total		Not limited		Limited	
	Diabetes	No diabetes	Diabetes	No diabetes	Diabetes	No diabetes
Mean frequency (number of occasions)	9.4 ± 0.7	9.3 ± 0.1	10.2 ± 1.0	9.5 ± 0.1	8.0 ± 0.8	8.7 ± 0.3
Mean duration per occasion (mins)	39.7 ± 2.9	44.8 ± 0.6	42.3 ± 3.2	46.5 ± 0.6	38.5 ± 5.4	39.4 ± 1.4
Mean total hours	8.8 ± 0.9	8.8 ± 0.1	9.2 ± 1.1	9.0 ± 0.2	8.8 ± 1.7	8.1 ± 0.3
Mean MET-hours	36.9 ± 3.8	38.1 ± 0.6	38.9 ± 4.8	39.4 ± 0.7	35.9 ± 7.4	33.8 ± 1.4
≥6 occasions (%)	46.8 ± 2.0	50.6 ± 0.5	49.8 ± 2.4	51.9 ± 0.5	43.3 ± 3.7	45.0 ± 1.0
≥6 occasions and ≥120 min (%)	44.9 ± 2.0	49.1 ± 0.5*	48.6 ± 2.4	50.5 ± 0.5	40.7 ± 3.7	43.0 ± 1.0

\*P &lt; 0.05.

likely to engage in walking, they were less likely to engage in jogging, aerobics, dancing, calisthenics, golf, tennis, bicycling, yoga, weight lifting, basketball, soccer, and skiing than were people without diabetes.

**CONCLUSIONS**— Despite the publication of a position statement by the

American Diabetes Association and a consensus statement from the National Institutes of Health stressing the importance of exercise for people with diabetes, few data about leisure-time physical activity patterns among the diabetic population are available (28,29). The data in this report provide the most comprehensive

look at leisure-time physical activity patterns among diabetic people in the U.S. population. The data suggest that diabetes is not an important determinant of participation in leisure-time physical activity. However, differences in the choice of activities are apparent: people with diabetes are more likely to engage in walk-

Table 5—Age-adjusted participation rates in various physical activities among participants without limitation

	Total				No limitation				Limitation			
	Diabetes		No diabetes		Diabetes		No diabetes		Diabetes		No diabetes	
	%	n	%	n	%	n	%	n	%	n	%	n
Walking	49.2 ± 2.1	1,629	44.2 ± 0.5	38,859*	51.9 ± 2.5	784	45.0 ± 0.5	32,239*	47.3 ± 3.9	845	42.9 ± 1.0	6,620
Jog	4.9 ± 1.0	1,629	8.4 ± 0.2	38,861*	6.5 ± 1.4	784	8.9 ± 0.2	32,240	1.6 ± 0.9	845	4.4 ± 0.4	6,621*
Hike	2.6 ± 0.7	1,629	3.7 ± 0.2	38,862	2.6 ± 0.9	784	3.8 ± 0.2	32,241	2.6 ± 1.1	845	3.5 ± 0.3	6,621
Yard work	25.6 ± 2.1	1,629	27.9 ± 0.6	38,862	28.9 ± 2.5	784	29.2 ± 0.6	32,241	21.1 ± 3.4	845	22.9 ± 0.8	6,621
Aerobics	4.0 ± 0.9	1,629	6.8 ± 0.2	38,862*	5.0 ± 1.2	784	7.2 ± 0.2	32,237	2.2 ± 1.1	845	3.8 ± 0.3	6,621
Dancing	5.3 ± 1.1	1,629	7.8 ± 0.2	38,861*	5.5 ± 1.4	784	8.1 ± 0.2	32,240	5.1 ± 1.8	845	6.8 ± 0.5	6,621
Calisthenics	13.8 ± 1.4	1,629	18.3 ± 0.3	38,861*	14.6 ± 1.7	784	18.8 ± 0.3	32,240*	12.5 ± 2.5	845	15.5 ± 0.7	6,621
Golf	2.6 ± 0.7	1,629	4.7 ± 0.2	38,861*	3.6 ± 1.0	784	5.1 ± 0.2	32,240	1.6 ± 1.1	845	2.8 ± 0.3	6,621
Tennis	0.8 ± 0.4	1,629	2.6 ± 0.1	38,861*	0.8 ± 0.4	784	2.8 ± 0.1	32,240*	0.7 ± 0.7	845	1.0 ± 0.2	6,621
Bowling	3.5 ± 1.0	1,629	4.7 ± 0.2	38,861	3.5 ± 1.1	784	4.9 ± 0.2	32,240	3.8 ± 1.5	845	3.7 ± 0.4	6,621
Bicycling	7.5 ± 1.2	1,629	11.1 ± 0.3	38,861*	9.8 ± 1.7	784	11.4 ± 0.3	32,240	3.1 ± 0.9	845	9.2 ± 0.6	6,621*
Swimming	7.1 ± 1.2	1,629	8.6 ± 0.2	38,861	6.3 ± 1.3	784	8.8 ± 0.3	32,240	9.3 ± 2.6	845	8.1 ± 0.5	6,621
Yoga	0.3 ± 0.2	1,629	0.8 ± 0.1	38,859*	0.3 ± 0.2	784	0.8 ± 0.1	32,239*	0.4 ± 0.4	845	1.2 ± 0.2	6,620
Weight lifting	5.9 ± 1.1	1,629	9.3 ± 0.2	38,865*	5.8 ± 1.4	784	9.6 ± 0.2	32,243*	6.3 ± 2.0	845	6.8 ± 0.5	6,622
Basketball	3.2 ± 0.8	1,629	5.6 ± 0.2	38,865*	3.8 ± 1.1	784	5.8 ± 0.2	32,243	1.9 ± 1.0	845	3.3 ± 0.4	6,622
Baseball	2.3 ± 0.8	1,629	3.4 ± 0.1	38,865	2.7 ± 1.0	784	3.6 ± 0.1	32,243	1.8 ± 1.0	845	2.4 ± 0.3	6,622
Football	2.1 ± 0.7	1,629	1.4 ± 0.1	38,865	2.1 ± 0.9	784	1.5 ± 0.1	32,243	2.0 ± 1.2	845	0.8 ± 0.2	6,622
Soccer	0.2 ± 0.2	1,629	0.9 ± 0.1	38,865*	0.3 ± 0.3	784	1.0 ± 0.1	32,243*	0.0 ± 0.0	845	0.6 ± 0.1	6,622*
Volleyball	1.8 ± 0.8	1,629	2.5 ± 0.1	38,865	2.5 ± 1.2	784	2.6 ± 0.1	32,243	0.4 ± 0.4	845	1.5 ± 0.2	6,622*
Handball	0.9 ± 0.5	1,629	1.6 ± 0.1	38,865	1.0 ± 0.6	784	1.7 ± 0.1	32,243	0.8 ± 0.8	845	0.7 ± 0.2	6,622
Skating	0.7 ± 0.4	1,629	1.0 ± 0.1	38,865	0.9 ± 0.6	784	1.0 ± 0.1	32,243	0.4 ± 0.4	845	0.7 ± 0.2	6,622
Skiing	0.0 ± 0.0	1,629	1.2 ± 0.1	38,864*	0.1 ± 0.1	784	1.3 ± 0.1	32,242*	0.0 ± 0.0	845	0.7 ± 0.1	6,622*
Other 1	5.5 ± 1.1	1,628	5.5 ± 0.2	38,817	5.9 ± 1.3	783	5.3 ± 0.2	32,198	4.9 ± 1.9	845	6.6 ± 0.5	6,619
Other 2	0.2 ± 0.1	1,628	0.3 ± 0.0	38,817	0.1 ± 0.1	783	0.3 ± 0.0	31,198*	0.5 ± 0.4	845	0.5 ± 0.1	6,619

Data are % ± SE. \*P &lt; 0.05.

ing and less likely to engage in activities other than walking than people without diabetes. It is encouraging to note that people with diabetes who are capable of exercising are doing so at levels comparable to those of people without diabetes.

Previous studies have shown that most of the U.S. population fails to exercise adequately (2). The data from this analysis confirm this finding. Only ~40% of participants in this survey reported exercising on a regular basis, and ~22% of the respondents spent 2,000 or more kcal/week, a level that has been shown to confer important health benefits (30).

Although the body of evidence at present suggests that people with NIDDM may derive more benefits from a physically active lifestyle than people with insulin-dependent diabetes mellitus (IDDM) (31), people with diabetes who do not have complications from their disease should be encouraged to participate in any exercise of their choice if proper contraindications and precautions are observed. Our analysis shows that walking, gardening, calisthenics, bicycling, and swimming are the preferred leisure-time activities among people with diabetes. Because walking is the exercise of choice for people with diabetes, health care providers should counsel their patients on the importance of proper foot care. Although bicycling and swimming have been suggested as ideal activities for people with diabetes (31), only about 8% of respondents bicycled and about 7% of respondents swam. In a study of physical activity among 60 people with diabetes, walking, indoor cycling, and swimming were the most popular activities (32). In the presence of complications, the choice of exercise should be tailored to avoid aggravating the disease or complicating condition. For example, in the presence of peripheral neuropathy, non-weight-bearing activities would be preferable. Because the benefits from exercise on glucose metabolism may be derived from repeated single bouts of exercise rather than long-term adaptations to exercise, people with diabetes, particularly NIDDM, should ex-

ercise regularly. Guidelines concerning various aspects of exercise prescription for diabetic patients are available elsewhere (29,31,33).

Several study limitations should be noted. The assignment of diabetes status was based on the self-report of the respondents, so misclassification because of erroneous reporting is possible. However, good agreement between self-reported diabetes and diabetes status ascertained from medical records has been found (34). Because no other information about respondents' condition was requested, the distinction between IDDM and NIDDM could not be made. In addition, the data set did not specifically contain information about any contraindication to exercise that is likely to be more prevalent among people with diabetes. We tried to circumvent this obstacle by separately analyzing those respondents free from activity limitations.

Because walking is the most commonly reported activity by both people with and without diabetes, walking is an important determinant of the various measures of physical activity reported in this study. However, self-reported information about walking may be less reliable than comparable information from other activities (35).

Nevertheless, these cross-sectional data from 1990 provided a snapshot of how people with diabetes exercise. These data should prove useful to individuals and groups who are interested in physical activity among diabetic patients and to those seeking to implement lifestyle modification programs in the diabetic community. The data suggest that, as is the case for the general population, ample room for improvement exists in the exercise habits of Americans with diabetes. Health care providers clearly have a large role to play in encouraging their patients to exercise in accordance with recommendations from the American Diabetes Association (29) and American College of Sports Medicine (36) and in helping them develop appropriate exercise programs based on individual ca-

pabilities, physical limitations, and personal interest. Because of potential complications from exercise for individuals with either IDDM or NIDDM, close coordination among the patient, the physician, and exercise physiologists in developing an exercise program is desirable. Clinicians should encourage their patients with diabetes who are capable of exercising to do so. Unfortunately, in one study, only 25% of people with diabetes reported receiving specific guidelines about exercise from health care professionals (32). Other studies have suggested that various barriers keep people with diabetes from exercising appropriately (37,38) and that adherence to physical exercise is difficult (39). In addition, advocate groups have an important role to play in informing diabetic patients of the benefits of physical activity.

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