

Physical Activity in U.S. Adults With Diabetes and At Risk for Developing Diabetes, 2003

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OBJECTIVE — Given the risk of obesity and diabetes in the U.S., and clear benefit of exercise in disease prevention and management, this study aimed to determine the prevalence of physical activity among adults with and at risk for diabetes.

RESEARCH DESIGN AND METHODS — The Medical Expenditure Panel Survey is a nationally representative survey of the U.S. population. In the 2003 survey, 23,283 adults responded when asked about whether they were physically active (moderate or vigorous activity, ≥ 30 min, three times per week). Information on sociodemographic characteristics and health conditions were self-reported. Additional type 2 diabetes risk factors examined were age ≥ 45 years, non-Caucasian ethnicity, BMI ≥ 25 kg/m², hypertension, and cardiovascular disease.

RESULTS — A total of 39% of adults with diabetes were physically active versus 58% of adults without diabetes. The proportion of active adults without diabetes declined as the number of risk factors increased until dropping to similar rates as people with diabetes. After adjustment for sociodemographic and clinical factors, the strongest correlates of being physically active were income level, limitations in physical function, depression, and severe obesity (BMI ≥ 40 kg/m²). Several traditional predictors of activity (sex, education level, and having received past advice from a health professional to exercise more) were not evident among respondents with diabetes.

CONCLUSIONS — The majority of patients with diabetes or at highest risk for developing type 2 diabetes do not engage in regular physical activity, with a rate significantly below national norms. There is a great need for efforts to target interventions to increase physical activity in these individuals.

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The incidence of diagnosed diabetes increased 41% between 1997 and 2003, with rising obesity a major contributing factor (1). Physical activity is a cornerstone of lifestyle modifications aimed at preventing and managing type 2 diabetes and its related morbidities (2). Epidemiological studies have shown that physical activity reduces the risk of type 2 diabetes by 30% in the general population (3). Evidence from randomized controlled trials (4,5) has demonstrated that maintenance of modest weight loss

through physical activity and diet reduces the incidence of type 2 diabetes in high-risk individuals by as much as 40–60% over 3–4 years. The risk of mortality among individuals with diabetes is also inversely related to fitness level (6,7).

Regular activity is also an important component in public health efforts addressing the rising obesity epidemic and is one of the leading Healthy People 2010 indicators in the U.S. (8–10). The *Surgeon General's Report on Physical Activity and Health* (11) outlined the health benefits of

physical activity, which include not only achieving weight reduction and reducing the risk of developing diabetes but also reducing the risk of developing high blood pressure and dying from heart disease and enhancing overall psychological well being. Recent evidence suggests that aerobic exercise at levels consistent with public health recommendations is as effective as antidepressant medications in treating mild to moderate depression (12), a common comorbidity affecting approximately one-quarter of patients with diabetes (13) and hindering optimal diabetes self-care (14).

In 2003, an estimated 46% of Americans achieved recommended levels of daily moderate physical activity (15), which is nearing the 2010 goal of 50% (10). However, data on the prevalence of inactivity in people with diabetes and at highest risk for developing type 2 diabetes is limited (14,16–18). In a large health maintenance organization, 29% of patients with diabetes engaged in physical activity (≥ 30 min) once a week or less (14). In a survey of adults aged ≥ 55 years with type 2 diabetes, 55% of respondents reported no weekly physical activity (17). Recent data (18) from the National Health and Nutrition Examination Survey found that less than one-third of diabetic adults who can exercise voluntarily met recommended levels of physical activity. Yet, the awareness of the need for physical activity appears high among adults with diabetes, as approximately three-quarters recalled having been told at least once by a health care professional that they needed to exercise more (19).

The purpose of this research was to evaluate the prevalence of physical activity among all adults with diabetes and at risk for developing diabetes using a recent nationally representative sample and, importantly, to identify patient characteristics associated with the likelihood of being physically active.

RESEARCH DESIGN AND METHODS

The Medical Expenditure Panel Survey (MEPS) is cosponsored by the Agency for Healthcare Research

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Abbreviations: MEPS, Medical Expenditure Panel Survey.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

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Table 1—Physical activity recommendations

Population	Physical activity measures	Source
All adults	<p>Reduce the proportion of adults who engage in no leisure-time physical activity.</p> <p>Increase the proportion of adults who engage regularly, preferably daily, in moderate physical activity for at least 30 min per day.</p> <p>Increase the proportion of adults who engage in vigorous physical activity that promotes the development and maintenance of cardiorespiratory fitness ≥ 3 days per week for ≥ 20 min per occasion.</p> <p>Increase the proportion of adults who perform physical activities that enhance and maintain muscular strength.</p>	Healthy People 2010 Physical Activity and Fitness Objectives (10)
All adults	<p>Recommended physical activity: moderate-intensity activities in a usual week (i.e., brisk walking, bicycling, vacuuming, gardening, or anything else that causes small increases in breathing or heart rate) for at least 30 min per day, at least 5 days per week; or vigorous-intensity activities in a usual week (i.e., running, aerobics, heavy yard work, or anything else that causes large increases in breathing or heart rate) for at least 20 min per day, at least 3 days per week or both. This can be accomplished through lifestyle activities (i.e., household, transportation, or leisure-time activities).</p> <p>Insufficient physical activity: >10 min total per week of moderate- or vigorous-intensity lifestyle activities but less than the recommended level of activity.</p> <p>Inactivity: <10 min total per week of moderate- or vigorous-intensity lifestyle activities.</p>	Centers for Disease Control and Prevention (50)
Prevention/delay of type 2 diabetes	Modest physical activity (30 min daily).	2006 Standards of Medical Care in Diabetes (2)
Diabetes management	<p>To improve glycemic control, assist with weight maintenance, and reduce risk of cardiovascular disease, at least 150 min per week of moderate-intensity aerobic physical activity (50–70% of maximum heart rate) is recommended and/or at least 90 min per week of vigorous aerobic exercise ($>70\%$ of maximum heart rate). The physical activity should be distributed over at least 3 days per week and with no more than 2 consecutive days without physical activity.</p> <p>In the absence of contraindications, people with type 2 diabetes should be encouraged to perform resistance exercise three times a week, targeting all major muscle groups, progressing to three sets of 8–10 repetitions at a weight that cannot be lifted >8–10 times.</p>	2006 Standards of Medical Care in Diabetes (2)

and Quality and the National Center for Health Statistics and is a nationally representative survey of the U.S. civilian non-institutionalized population, collecting detailed information on demographic characteristics, income and education status, and self-reported health conditions and use of medical care services (20).

The sampling frame for the MEPS Household Component is drawn from re-

spondents to the National Health Interview Survey. The MEPS supplements and validates information on medical care and pharmacy events at the person level. Medical condition diagnoses are based on ICD-9-CM codes (21,22). The sample design of the MEPS includes stratification, clustering, multiple stages of selection, and disproportionate sampling (23). MEPS sampling weights incorporate ad-

justment for the complex sample design and reflect survey nonresponse and population totals from the Current Population Survey (23). Adult respondents to the year 2003 survey who reported about their physical activity were eligible for this study. Of 23,519 adult participants (aged ≥ 18 years) in 2003, 23,283 (99%) responded when asked about their physical activity.

Table 2—Unadjusted rates of self-reported physical activity among U.S. adults*

Selected characteristics	Unweighted	Physically active	P value
All adults	23,226	56.4 ± 0.6	
Sex			
Female	12,649	52.8 ± 0.7	<0.001
Male	10,577	60.3 ± 0.7	
Age-groups (year)			
18–29	5,555	62.3 ± 1.0	<0.001
30–39	4,566	57.7 ± 1.0	
40–49	4,689	55.8 ± 1.0	
50–59	3,564	54.9 ± 1.1	
60–69	2,265	55.9 ± 1.3	
70–79	1,723	52.2 ± 1.7	
≥80	864	36.8 ± 2.1	
Race/ethnicity			
White	18,234	57.5 ± 0.6	<0.001
Black	3,778	50.9 ± 1.2	
Hispanic	5,940	49.5 ± 1.3	
Asian	994	54.5 ± 1.9	
Geographic region			
Northeast	3,434	55.5 ± 1.3	0.01
South	9,109	54.5 ± 0.8	
Midwest	4,631	57.6 ± 1.4	
West	6,052	59.0 ± 1.2	
Education levels			
Less than high school	6,181	48.3 ± 1.0	<0.001
High school	11,153	56.0 ± 0.7	
Some college (<4 years)	1,440	59.2 ± 1.5	
College degree (4 years)	2,899	61.7 ± 1.1	
Graduate school (>4 years)	1,407	64.7 ± 1.4	
Income level			
Poor	3,986	46.9 ± 1.3	<0.001
Near poor	1,351	46.9 ± 2.1	
Low income	3,832	52.3 ± 1.3	
Middle income	6,873	56.2 ± 0.8	
High income	7,184	61.4 ± 0.7	
BMI (kg/m ²)			
Normal (18.5–24.9)	8,079	63.0 ± 0.8	<0.001
Overweight (25.0–29.9)	7,977	58.4 ± 0.7	
Obese, classes 1 and 2 (30.0–39.9)	5,290	47.3 ± 1.0	
Obese, class 3 (≥40)	835	34.1 ± 1.9	
Depression			
No	21,047	57.6 ± 0.6	<0.001
Yes	2,179	45.1 ± 1.2	
Physical functioning limitations			
No	19,076	60.1 ± 0.7	<0.001
Yes	4,128	38.5 ± 1.0	
Ever advised to exercise more			
No	7,957	49.0 ± 0.7	<0.001
Yes	14,997	60.7 ± 0.7	

Data are % ± SE or n. F tests were conducted to test for variation in rates of physical activity across subgroups.

*All data are based on the Medical Expenditure Panel Survey, 2003.

Physical activity

To ascertain physical activity, all adult respondents were asked if they “spend half an hour or more in moderate or vigorous physical activity at least three times a

week.” The general context of the questionnaire is “on average.” The MEPS glossary states, “moderate physical activity causes only light sweating or a slight or moderate increase in breathing or heart

rate and would include activities such as fast walking, raking leaves, mowing the lawn, or heavy cleaning. Vigorous physical activity causes heavy sweating or large increases in breathing or heart rate and would include activities such as running, race walking, lap swimming, aerobic classes, or fast bicycling” (24). The MEPS criterion for physical activity (level and duration) was consistent with 2003 recommendations for a “regular physical activity program, adapted to the presence of complications” (25) but less stringent than current public health measures (Table 1). Self-reported physical activity has been shown to have moderate validity in other national surveys (26).

Ascertainment of diabetes and diabetes risk factors

Self-reported information from the MEPS survey was used to determine whether a respondent had diabetes or risk factors for developing type 2 diabetes. Respondents were asked if they had ever been diagnosed with diabetes (excluding gestational diabetes). Adults with type 2 diabetes were not differentiated from type 1 diabetes, although it is estimated that >90% of adults with diabetes have type 2 diabetes (27). For type 2 diabetes risk factors, we selected clinical and demographic variables available in the MEPS survey, which were included in the American Diabetes Association’s list of risk factors (28). In addition to physical inactivity, other risk factors included age ≥45 years, non-Caucasian ethnicity, BMI ≥25 kg/m², diagnosis of hypertension (diagnosed on two or more different medical visits with high blood pressure), and history of cardiovascular disease (diagnosed with angina or angina pectoris, heart attack or myocardial infarction, or stroke or any other kind of heart disease or condition).

In the analyses, we defined cardiovascular risk factors as the presence of one or more of the following clinical conditions: history of cardiovascular disease, a diagnosis of hypertension, and/or hyperlipidemia. In the MEPS, 259 mutually exclusive clinical classification categories were mapped from ICD-9-CM codes to create clinically homogenous groupings (22). The current research used clinical classification categories 053 “disorders of lipid metabolism” to identify individuals with hyperlipidemia.

Table 3—Unadjusted rates of self-reported physical activity among U.S. adults diagnosed with diabetes or at risk for developing type 2 diabetes*

Health condition	Unweighted	Physical active	P value
Diabetes	1,825	38.5 (35.7–41.3)	<0.01
No cardiovascular risk factors†	469	46.0 (39.9–52.0)	
With cardiovascular risk factors†	1,355	36.1 (32.9–39.4)	
No diabetes	21,401	57.8 (56.6–58.9)	<0.001
No diabetes risk factors‡	4,741	64.9 (62.7–67.1)	
One diabetes risk factor‡	8,743	58.9 (57.3–60.4)	
Two diabetes risk factors‡	4,790	54.3 (30.0–32.5)	
Three diabetes risk factors‡	2,432	52.1 (42.4–46.6)	
Four diabetes risk factors‡	648	42.0 (37.7–46.2)	

Data are % (95% CI) or n. *All data are based on the Medical Expenditure Panel Survey, 2003. †Cardiovascular risk factors were history of cardiovascular disease, diagnosis of hypertension, and/or diagnosis of hyperlipidemia. ‡Type 2 diabetes risk factors were age ≥ 45 years, non-Caucasian ethnicity, BMI > 25 kg/m², diagnosis of hypertension, and history of cardiovascular disease.

Assessment of BMI and other covariates

We used self-reported information from the MEPS Household Component survey for the assessment of BMI, medical advice to exercise, and other covariates. Respondents were asked to estimate their current body weight and height; if a “doctor or other health professional ever advised you to exercise more?”; if they had “difficulties walking, climbing stairs, grasping objects, reaching overhead, lifting, bending or stooping, or standing for long periods of time”; and to report on current smoking status, age, sex, race, ethnicity, years of schooling, and income level (22). The Centers for Disease Control and Prevention formula was used to calculate BMI (29), and the National Heart, Lung, and Blood Institute classification scheme was used to define normal, overweight, and obese categories (30).

Because depression is common among individuals with diabetes (13) and is associated with physical inactivity (14), the relationship of depression with physical activity was also assessed in this study. A respondent was classified as having depression if they had a medical encounter coded with the three-digit ICD-9 code of 311 (depressive disorder) or 296 (episodic mood disorders, including major depression).

Data analysis

To adjust for the complex sample design, the current research used the MEPS person-level and variance adjustment weights using STATA 9.1 in all analyses to ensure nationally representative estimates. Given the MEPS sample design, *F* tests were conducted to test for variation in unadjusted rates of physical activity

across selected subgroups. Multiple logistic regression analysis was used to estimate the adjusted odds of being physically active among adults with and without diabetes after controlling for sex, age, race/ethnicity, education and income levels, region, BMI, cardiovascular risk factors, depression, physical limitation status, and receiving advice to exercise more.

RESULTS — Overall, 56% of adults reported that they were moderately to vigorously physically active three or more times a week (Table 2). Regular activity decreased with increasing BMI and varied with age. Physical activity was higher among respondents who were male, white, had higher education and income levels, reported previous medical advice to exercise more, and had no limitations in physical functioning. Among adults with diabetes, 39% reported they were physically active compared with 58% of those without diabetes (Table 3). The proportion of respondents without diabetes who reported being physically active decreased as the number of type 2 diabetes risk factors increased, until approximating the prevalence reported among individuals with diabetes. After adjusting for demographic, socioeconomic, and clinical characteristics, the most notable associations with regular activity, regardless of diabetes status, were the negative correlations with mental and physical health and the positive correlation with family income (Table 4).

The association of physical activity with several demographic and clinical factors varied between adults with versus without diabetes. For example, the association of sex, race/ethnicity, and educa-

tion status was evident in adults without diabetes but not in those with diabetes. Normal-weight individuals with diabetes were no more likely to be active than overweight or obese adults; whereas, in adults without diabetes, the likelihood of being active incrementally declined with each increasing BMI category. Lastly, prior advice from a health professional to exercise more was positively associated with current physical activity levels in nondiabetic individuals but had no association in those with diabetes.

CONCLUSIONS — The most concerning news from this study is that at a time when the prevalence of the disease is increasing, $< 40\%$ of adults with diabetes reported being regularly engaged in moderate or vigorous physical activity. These results confirm recent findings from National Health and Nutrition Examination Survey 1999–2002 (18) and suggest that no substantial improvement in physical activity has occurred over the last decade (16). This is disturbing because there is clear evidence of the health benefits of physical activity for the management of type 2 diabetes (2). Further, despite increased public health attention on the need for being physically active, the prevalence of physical activity reported by adults with diabetes in 2003 was no different from rates seen the year before (31). Moreover, the level of physical activity reported by respondents with diabetes was significantly lower on average than national norms for adults without diabetes.

The news is not particularly encouraging even in individuals without diabetes. While more than half of adults without diabetes reported being physically active, activity levels declined with increasing BMI and with increasing numbers of cardiovascular disease risk factors. Since there is a general trend toward increasing BMI and increasing cardiovascular disease risk factors in the U.S. population, this could suggest that physical activity levels will decrease in the future.

Because this is a cross-sectional analysis, it is impossible to determine why adults with diabetes are less active than their peers without the disease. Less physical activity may reflect the inertia of a lifetime of habits. These individuals likely have the same motivational barriers, including lack of interest and not enough time, as adults without diabetes (17,32,33). However, those with diabetes often have physical disabilities (34), per-

Table 4—Factors associated with self-reported physical activity among U.S. adults with and without diabetes*

Selected characteristics	Physically active†	
	Diabetes	No diabetes
Sex (Ref. = female)	1.14 (0.89–1.46)	1.29 (1.20–1.37)
Age-groups (years)		
20–29	1.00 (Ref.)	1.00 (Ref.)
30–39	0.85 (0.39–1.87)	0.84 (0.76–0.94)
40–49	0.92 (0.44–1.91)	0.82 (0.74–0.92)
50–59	0.80 (0.41–1.56)	0.85 (0.74–0.98)
60–69	0.86 (0.42–1.75)	0.96 (0.81–1.12)
70–79	0.85 (0.42–1.70)	0.95 (0.79–1.15)
≥80	0.54 (0.24–1.21)	0.50 (0.40–0.62)
Race/ethnicity		
White	1.00 (Ref.)	1.00 (Ref.)
Black	1.11 (0.75–1.64)	0.83 (0.73–0.93)
Asian	1.39 (0.42–4.57)	0.95 (0.53–1.70)
Hispanic (Ref. = no)	1.43 (0.98–2.07)	0.67 (0.59–0.76)
Geographic region		
Northeast	1.00 (Ref.)	1.00 (Ref.)
South	0.98 (0.65–1.48)	1.05 (0.92–1.21)
Midwest	1.04 (0.67–1.63)	1.11 (0.94–1.31)
West	1.52 (0.99–2.32)	1.25 (1.08–1.46)
Education levels		
Less than high school	1.00 (Ref.)	1.00 (Ref.)
High school	1.15 (0.87–1.51)	1.19 (1.07–1.31)
Some college (<4 years)	1.22 (0.68–2.20)	1.29 (1.10–1.52)
College degree (4 years)	1.14 (0.69–1.89)	1.32 (1.15–1.51)
Graduate school (>4 years)	0.89 (0.45–1.76)	1.51 (1.29–1.77)
Income level		
Poor	1.00 (Ref.)	1.00 (Ref.)
Near poor	1.54 (0.88–2.70)	1.00 (0.81–1.23)
Low income	1.53 (1.00–2.34)	1.17 (1.00–1.36)
Middle income	1.60 (1.05–2.42)	1.17 (1.02–1.33)
High income	2.03 (1.32–3.14)	1.29 (1.11–1.49)
BMI (kg/m ²)		
Normal (18.5–24.9)	1.00 (Ref.)	1.00 (Ref.)
Overweight (25.0–29.9)	1.08 (0.77–1.53)	0.83 (0.76–0.90)
Obese, classes 1 and 2 (30.0–39.9)	0.79 (0.54–1.17)	0.62 (0.56–0.69)
Obese, class 3 (≥40)	0.39 (0.24–0.64)	0.45 (0.37–0.56)
Cardiovascular risk factors (Ref. = none)‡	0.88 (0.65–1.20)	1.04 (0.95–1.14)
Depression (Ref. = no)	0.66 (0.46–0.95)	0.77 (0.69–0.85)
Physical function limitations (Ref. = none)	0.47 (0.37–0.61)	0.57 (0.50–0.65)
Ever advised to exercise more (Ref. = no)	0.99 (0.73–1.34)	1.35 (1.25–1.47)

Data are odds ratio (95% CI). *All data are based on the Medical Expenditure Panel Survey, 2003. †Odds ratios were obtained from logistic regression models adjusting for sex, age, race/ethnicity, education and income levels, region, BMI, cardiovascular risk factors, depression, physical limitation status, and receiving advice to exercise more. ‡Cardiovascular risk factors were history of cardiovascular disease, diagnosis of hypertension, and/or diagnosis of hyperlipidemia. Ref., reference.

ceive discomfort when exercising (33), or have decreased exercise capacity (35). In this study, the likelihood of being active among individuals with diabetes was reduced by half when physical limitations were present. Depression is also a barrier. In this study, adults with diabetes were one-third less likely to be active if diagnosed with depression. The American Diabetes Association's standards of medical

care recognize the need to individualize a patient's activity plan to accommodate macro- and microvascular complications and to address psychosocial problems (2).

Physical activity was also correlated with sociodemographic characteristics. For example, inactivity is more common among women, people with lower incomes and less education, African Amer-

icans and Hispanics, and adults residing in northeastern and southern states (10). Results from this study were consistent with these established correlates among adults without diabetes; however, the association of sex and education status was not observed among adults with diabetes. In addition, the data also suggest that rates of physical activity were not lower among Hispanic compared with non-Hispanic adults with diabetes. It is not clear why correlates of physical activity would be different in those with diabetes, but these differences may be important in developing strategies to increase physical activity in this population.

In this study, the rate of physical activity among adults without diabetes, while disappointing, is consistent with other national surveys (15). The highest rates reported were among the youngest, most educated, and most economically advantaged adults, but even then over a third was inactive. Reinforcing the value of life-long physical activity for young, sedentary adults can help curb the rising obesity and diabetes epidemics as young adults gain, on average, an estimated 2 lb per year (36), with a long-term risk of becoming overweight exceeding 50% (37).

The results of this research are subject to limitations. All variables relied on self-reports, including disease status and the diagnosis of diabetes. While diabetes and risk factor estimates presented here are consistent with other U.S. survey-based national estimates (38–40), it may be that the self-reported rates of diabetes and diabetes risk factors in this study are underestimated, leading to a bias toward the null when assessing differences in physical activity by disease status. Self-reported health conditions can be underreported in general (41), and blacks, whites, and Hispanics differ in reporting of diseases and levels of illness and disability (42,43). Previous studies (44) have also shown that overweight respondents tend to underestimate their weight and overestimate their height so BMI scores are underestimated. However, excellent concordance between medical records and patient self-report has been observed for several medical diagnoses, including history of diabetes, obesity, and history of acute myocardial infarction (45).

MEPS also does not contain information on undiagnosed diabetes. Recent estimates suggest that one-third of individuals with diabetes are undiagnosed (27). Respondents in this study

with multiple risk factors for developing type 2 diabetes may have undiagnosed diabetes, which may explain why their rates of physical activity were similar to those patients with diabetes. Finally, several known environmental factors associated with physical activity were also unavailable for study using the MEPS data so that environmental barriers to physical activity could not be assessed.

Self-report was also used to ascertain physical activity in the MEPS due to the challenges of measuring cardiorespiratory fitness on a large national scale. Self-reported physical activity has moderate validity with individuals tending to over-report activity (26). On the other hand, while the MEPS definition of moderate and vigorous physical activity included domestic household and leisure-time activity, it did not specifically query other sources of physical exertion undertaken by adults, such as through employment (24), and therefore may underestimate total physical activity. For example, the International Physical Activity Questionnaire measures more contributors toward total physical activity and has been shown to lead to higher physical activity prevalence estimates compared with the Behavior Risk Factor Survey Surveillance (46). Also, the extent of sedentary behavior, such as longer television viewing, was not assessed in the MEPS. Recent epidemiological evidence (47) suggests that increased sedentary behavior is a predictor of diabetes risk independent of leisure-time physical activity. Nevertheless, physical activity estimates from national public health surveys, such as the MEPS, can provide valuable information to guide national policy and program decisions (48).

Caution should also be taken in directly comparing results from this study with other studies as part of the apparent differences in the prevalence of physical activity may be attributable to differences in how physical activity was defined (49) and changing public health recommendations (Table 1). In the MEPS, physical activity was defined as "moderate/vigorous activity, ≥ 30 min, three or more days per week." The American Diabetes Association's recommendations have become more specific as scientific understanding has evolved, i.e., from "regular physical activity" in 2003 (25) to "150 min per week of moderate-intensity (50–70% of maximum heart rate)" in 2006 (2). The Centers for Disease Control and Prevention similarly defines recommended

physical activity as "moderate-intensity activities in a usual week of 30 min per day for at least 5 days per week." (50) Therefore, values reported in the 2003 MEPS data may be an overestimation of the proportion of adults achieving "therapeutic levels" of exercise based on current public health guidelines.

It is difficult to be optimistic about addressing the twin epidemics of obesity and diabetes without success in increasing physical activity in the population. The results of this study provide very pessimistic data about achieving this goal. Physical activity is least likely to be present in those who already have diabetes and in those most at risk for developing diabetes. There is a great need for intensive efforts to target interventions to increase physical activity in these individuals.

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