CHAPTER 5
PATTERNS AND TRENDS IN PHYSICAL ACTIVITY

Contents

Introduction 175
Physical Activity among Adults in the United States 177
- Recent Patterns of Leisure-Time Physical Activity 177
  - Physical Inactivity during Leisure Time 177
  - Regular, Sustained Physical Activity during Leisure Time 177
  - Regular, Vigorous Physical Activity during Leisure Time 181
  - Participation in Specific Physical Activities 184
- Leisure-Time Physical Activity among Adults with Disabilities 186
- Trends in Leisure-Time Physical Activity 186

Physical Activity among Adolescents and Young Adults in the United States 186
- Physical Inactivity 188
- Vigorous Physical Activity 189
- Other Physical Activity 192
- Physical Education in High School 198
- Sports Team Participation 200

Conclusions 200
- Research Needs 201

Appendix A: Sources of National Survey Data 201

Appendix B: Measures of Physical Activity in Population Surveys 203

References 206

CHAPTER 5
PATTERNS AND TRENDS IN PHYSICAL ACTIVITY

Introduction

This chapter documents patterns and trends of reported leisure-time physical activity of adults and adolescents in the United States and compares the findings to the goals set by *Healthy People 2000* (U.S. Department of Health and Human Services [USDHHS] 1990; see Chapter 2, Appendix A, for the 1995 revised *Healthy People 2000* objectives for physical activity and fitness). The information presented here is based on cross-sectional data from national- and state-based surveillance systems, sponsored by the Centers for Disease Control and Prevention (CDC), that track health behaviors including leisure-time physical activity. Although self-reported survey information about physical activity is likely to contain errors of overreporting, there is no other feasible way to estimate physical activity patterns of a population. Moreover, there is no widely accepted "gold standard" methodology for measuring physical activity (see Chapter 2).

Occupational and most domestic physical activities are not presented because such information is not available. Most national goals address leisure-time rather than occupational physical activity because people have more personal control over how they spend their leisure time and because most people do not have jobs that require regular physical exertion. Nonetheless, measuring only leisure-time physical activity leads to an underestimate of total physical activity, especially for those people with physically demanding jobs.

Five surveys provided data on physical activity for this review: 1) the National Health Interview Survey (NHIS), which included questions on physical activity among adults in 1985, 1990, and 1991; 2) the Behavioral Risk Factor Surveillance System (BRFSS), a state-based survey of adults that was conducted monthly by state health departments, in collaboration with the CDC, and included questions on physical activity from 1986 through 1992 and in 1994; 3) the Third National Health and Nutrition Examination Survey (NHANES III) of U.S. adults from 1988 through 1994 (data from Phase I, 1988–1991, were available for presentation in this report); 4) the 1992 household-based NHIS Youth Risk Behavior Survey (NHIS-YRBS) of 12- through 21-year-olds; and 5) the national school-based Youth Risk Behavior Survey (YRBS), which was conducted in 1991, 1993, and 1995 among students in grades 9–12. The methodologies of these surveys are summarized in Table 5-1 and are described in detail in Appendices A and B of this chapter.

When adult data from the NHIS, BRFSS, and NHANES III are presented for comparison, they are shown from the most nearly contemporaneous survey years. Otherwise, the most recent data are presented. For determining trends, BRFSS data are restricted to those states that collected physical activity information each year.

Responses to questions included in the surveys were compiled (see Appendix B) into categories approximately corresponding to the *Healthy People 2000* physical activity objectives. These objectives are based on the health-related physical activity dimensions of caloric expenditure, aerobic intensity, flexibility, and muscle strength (Caspersen 1994). Thus the "regular, sustained physical activity" category used here pertains to total caloric expenditure and includes a summation of activities of any intensity, whereas the "regular, vigorous" category pertains to aerobic intensity and therefore includes only activities of vigorous intensity. Because some activities (e.g., vigorous activity of 30 minutes duration) fall into both of these categories, the categories are not mutually exclusive. Adding together the proportion of people in each category thus yields an

Table 5-1. Sources of national and state-based data on physical activity*

Survey title	Abbreviated title	Sponsor	Mode of survey administration	Years	Population, age	Response rate	Sample size	Physical activity measure†
Adults								
National Health Interview Survey	NHIS	National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention (CDC)	Household interview	1985, 1990, 1991	US, 18+ years	83–88%	36,399 in 1985, 41,104 in 1990, 43,732 in 1991	F/I/T/D over past 2 weeks
Behavioral Risk Factor Surveillance System	BRFSS	National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP), CDC	Telephone interview	1986–1991	25 states‡ and D.C., 18+ years	62–71%	Approx. 35,000–50,000	F/I/T/D over past month
				1992	48 states and D.C. 18+ years	71%	96,343	
				1994	49 states and D.C. 18+ years	70%	106,030	
Third National Health and Nutrition Examination Survey	NHANES III	NCHS, CDC	Household interview	1988–91 (Phase I)	US, 18+ years	82%	9,901	F/T over past month
Youths								
Youth Risk Behavior Survey	YRBS	NCCDPHP, CDC	Self-administered in school	1991, 1993, 1995	US, 9th–12th grades (approximately 15–18 years)	70–78% of selected schools; 86–90% of students	12,272 in 1991, 16,296 in 1993, 10,904 in 1995	F/I/T/D over past week
National Health Interview Survey-Youth Risk Behavior Survey	NHIS-YRBS	NCHS, CDC	Household administration via audiotape and self-completed answer sheets	1992	US, 12–21 years	74%	10,645	F/I/T over past week

*Available at the time this report was compiled.

†F = frequency; I = intensity; T = type; D = duration.

‡Alabama, Arizona, California, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Kentucky, Massachusetts, Minnesota, Missouri, Montana, New Mexico, New York, North Carolina, North Dakota, Ohio, Rhode Island, South Carolina, Tennessee, Utah, West Virginia, and Wisconsin.

overestimate of the proportion of people who are regularly physically active. More clear-cut is the category of inactivity, which is considered to be the most detrimental to health and is thus important to monitor as an indicator of need for intervention. Measures of stretching and strength training are also derived, when possible, from the survey responses.

The various surveys differ in the means by which they are conducted, in the wording of questions, in the time of year, in population sampling frames, in response rates, and in definitions of physical activity—all of which may cause differences in the resulting physical activity estimates. However, even with these differences, the data from the several data collection systems reveal a number of consistencies in patterns and trends in self-reported leisure-time physical activity.

Physical Activity among Adults in the United States

Recent Patterns of Leisure-Time Physical Activity

Physical Inactivity during Leisure Time

Physical inactivity during leisure time is one of the easiest measures to define in population surveys. Inactivity was conceptualized in the NHIS, BRFSS, and NHANES III as no reported leisure-time physical activity in the previous 2 to 4 weeks. *Healthy People 2000* objective 1.5 states that the proportion of leisure-time physical inactivity among people aged 6 years and older should be no more than 15 percent by the year 2000 (USDHHS 1990).

The proportion of U.S. adults aged 18 years and older who were classified as physically inactive during leisure time varied somewhat among the three recent surveys (Table 5-2). In the 1991 NHIS, 24.3 percent reported no activity in the previous 2 weeks. In the 1992 BRFSS, 28.7 percent of adults reported no activity during the previous month. In the 1988–1991 NHANES III, in which for operational reasons participants tended to be surveyed in the North in the summer and the South in the winter, the prevalence of inactivity during the previous month was somewhat lower—21.7 percent.

Thus, despite minor differences, the surveys are consistent in finding that about one-fourth of U.S. adults do not engage in any leisure-time physical activity, a proportion far from the 15 percent target of *Healthy People 2000* objective 1.5. Also evident across the surveys is that more women than men are physically inactive (Figure 5-1). The ratio of physical inactivity prevalence for women relative to that for men ranged from 1.2 to 1.7 across the three surveys. Findings for racial and ethnic groups, unadjusted for socioeconomic differences, were generally in accord across the surveys (Table 5-2): whites had a lower prevalence of leisure-time inactivity than blacks, Hispanics, and persons categorized as "other."

Among the sex-specific racial and ethnic groups, white men were the least likely to be inactive (< 26 percent). White women had a prevalence of inactivity (23.1–29.0 percent) similar to that among black men and lower than that among Hispanic men. At least one-third of black women and Hispanic women reported no physical activity in their leisure time.

In all three surveys, the prevalence of physical inactivity was higher in older groups (Figure 5-1). Fewer than one in four adults aged 18–29 years engaged in no physical activity, whereas about one in three men and one in two women over 74 years of age were inactive (Table 5-2). For the most part, the prevalence of physical inactivity was greater among persons with lower levels of education and income. For example, there was twofold to threefold more inactivity from lowest to highest income categories: only 10.9 to 17.8 percent of participants with an annual family income of $50,000 or more reported no leisure-time physical activities, whereas 30.3 to 41.5 percent of those with an income less than $10,000 reported this.

The prevalence of inactivity among adults tended to be lower in the north central and western states than in the northeastern and southern states (Table 5-2). Participants surveyed in the winter months reported being physically inactive substantially more often than did those surveyed during the summer months (Figure 5-2). In the 1994 BRFSS, state-specific prevalences of physical inactivity from 49 states and the District of Columbia ranged from 17.2 to 48.6 (Table 5-3).

Regular, Sustained Physical Activity during Leisure Time

Healthy People 2000 objective 1.3 proposes that at least 30 percent of people aged 6 years and older should engage regularly, preferably daily, in light to

Table 5-2. Percentage of adults aged 18+ years reporting no participation in leisure-time physical activity, by various demographic characteristics, National Health Interview Survey (NHIS), Third National Health and Nutrition Examination Survey (NHANES III), and Behavioral Risk Factor Surveillance System (BRFSS), United States

Demographic group	1991 NHIS*	1988–1991 NHANES III*	1992 BRFSS*†
Overall	**24.3** (23.2, 25.3)‡	**21.7** (19.0, 24.5)	**28.7** (28.3, 29.1)
Sex			
Males	**21.4** (20.2, 22.6)	**15.8** (12.4, 19.2)	**26.5** (25.9, 27.1)
Females	**26.9** (25.8, 28.0)	**27.1** (23.0, 31.3)	**30.7** (30.1, 31.3)
Race/Ethnicity			
White, non-Hispanic	**22.5** (21.4, 23.7)	**18.2** (15.6, 20.8)	**26.8** (26.4, 27.2)
Males	**20.3** (19.0, 21.6)	**12.9** (9.6, 16.1)	**25.3** (24.7, 25.9)
Females	**24.6** (23.4, 25.8)	**23.1** (19.0, 27.1)	**28.2** (27.6, 28.8)
Black, non-Hispanic	**28.4** (26.4, 30.4)	**30.4** (25.6, 35.3)	**38.5** (36.9, 40.1)
Males	**22.5** (20.0, 25.0)	**20.6** (14.5, 26.8)	**33.1** (30.9, 35.3)
Females	**33.2** (30.8, 35.6)	**38.1** (30.9, 45.2)	**42.7** (40.7, 44.7)
Hispanic§	**33.6** (31.0, 36.3)	**36.0** (32.5, 39.5)	**34.8** (32.8, 36.8)
Males	**29.6** (26.0, 33.2)	**29.1** (24.3, 33.9)	**30.2** (27.3, 33.1)
Females	**37.4** (34.1, 40.8)	**43.8** (38.5, 49.1)	**39.0** (36.5, 41.5)
Other	**26.7** (23.4, 30.0)		**31.4** (28.9, 33.9)
Males	**22.8** (18.2, 27.3)	‖	**27.6** (24.1, 31.1)
Females	**30.8** (27.0, 34.7)		**35.8** (32.3, 39.3)
Age (years)			
Males			
18–29	**17.6** (15.8, 19.4)	**12.5** (9.0, 16.0)	**18.9** (17.7, 20.1)
30–44	**21.1** (19.8, 22.5)	**14.5** (10.9, 18.1)	**25.0** (24.0, 26.0)
45–64	**23.9** (22.1, 25.7)	**16.9** (13.0, 20.8)	**32.0** (30.8, 33.2)
65–74	**23.0** (20.4, 25.6)	**17.5** (12.2, 22.8)	**33.2** (31.2, 35.2)
75+	**27.1** (23.8, 30.4)	**34.5** (28.0, 41.1)	**38.2** (35.3, 41.1)
Females			
18–29	**25.0** (23.4, 26.6)	**17.4** (13.4, 21.4)	**25.4** (24.2, 26.6)
30–44	**25.2** (23.8, 26.6)	**24.9** (20.6, 29.3)	**26.9** (25.9, 27.9)
45–64	**27.4** (25.9, 28.9)	**29.4** (24.6, 34.2)	**32.1** (30.9, 33.3)
65–74	**27.8** (25.7, 29.9)	**32.5** (25.9, 39.2)	**36.6** (34.8, 38.4)
75+	**37.9** (35.3, 40.6)	**54.3** (47.9, 60.6)	**50.5** (48.5, 52.5)
Education			
< 12 yrs	**37.1** (35.3, 38.9)	**34.5** (31.2, 37.8)	**46.5** (45.3, 47.7)
12 yrs	**25.9** (24.7, 27.1)	**20.8** (17.4, 24.3)	**32.8** (32.1, 33.6)
Some college (13–15 yrs)	**19.0** (17.8, 20.2)	**15.7** (11.4, 19.9)	**22.6** (21.9, 23.4)
College (16+ yrs)	**14.2** (13.1, 15.3)	**11.1** (6.9, 15.4)	**17.8** (17.0, 18.5)
Income¶			
< $10,000	**30.3** (28.4, 32.2)	**34.5** (30.3, 38.7)	**41.5** (40.1, 42.9)
$10,000–19,999	**30.2** (28.5, 32.0)	**28.5** (24.5, 32.6)	**34.6** (33.6, 35.6)
$20,000–34,999	**24.3** (22.9, 25.7)	**18.7** (14.8, 22.6)	**26.9** (26.1, 27.7)
$35,000–49,999	**19.5** (18.1, 20.9)	**15.9** (10.9, 20.9)	**23.0** (22.0, 24.0)
$50,000+	**14.4** (13.2, 15.6)	**10.9** (6.7, 15.1)	**17.7** (16.9, 18.5)
Geographic region			
Northeast	**25.9** (24.5, 27.3)	**21.6** (8.5, 34.6)	**29.5** (28.5, 30.5)
North Central	**20.8** (18.7, 22.9)	**16.7** (7.6, 25.8)	**28.6** (27.8, 29.4)
South	**27.0** (25.2, 28.8)	**24.8** (18.4, 31.1)	**32.4** (31.6, 33.2)
West	**22.5** (19.5, 25.5)	**22.6** (14.8, 30.5)	**22.0** (21.0, 23.0)

Sources: Centers for Disease Control and Prevention, National Center for Health Statistics, NHIS, public use data tapes, 1991; Centers for Disease Control and Prevention, National Center for Health Statistics, NHANES, public use data tapes, 1988–1991; Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, BRFSS, 1992.

*NHIS asked about the prior 2 weeks; BRFSS asked about the prior month. †Based on data from 48 states and the District of Columbia.
‡95% confidence intervals. §Hispanic reflects Mexican-Americans in NHANES III. ‖Estimates unreliable.
¶Annual income per family (NHIS) or household (BRFSS).

Figure 5-1. Percentage of adults aged 18+ years reporting no participation in leisure-time physical activity by sex and age

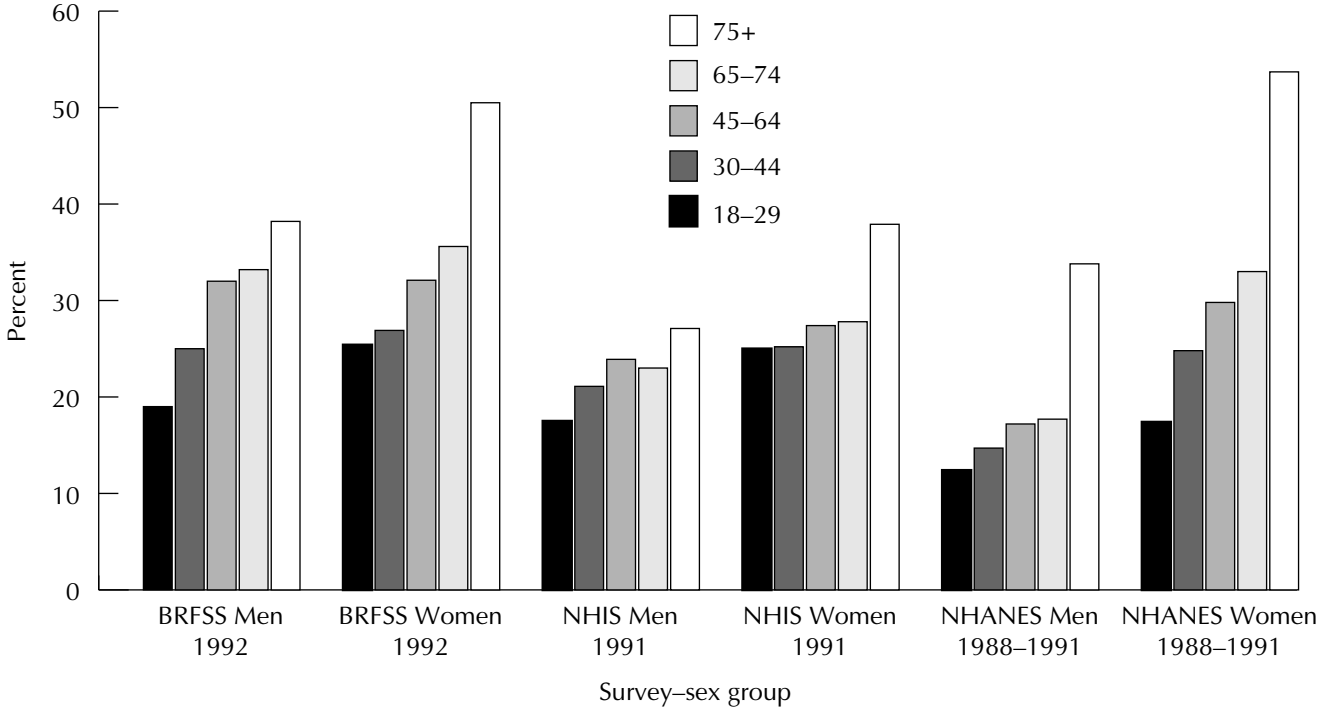


Figure 5-2. Percentage of adults aged 18+ years reporting no participation in leisure-time physical activity by month

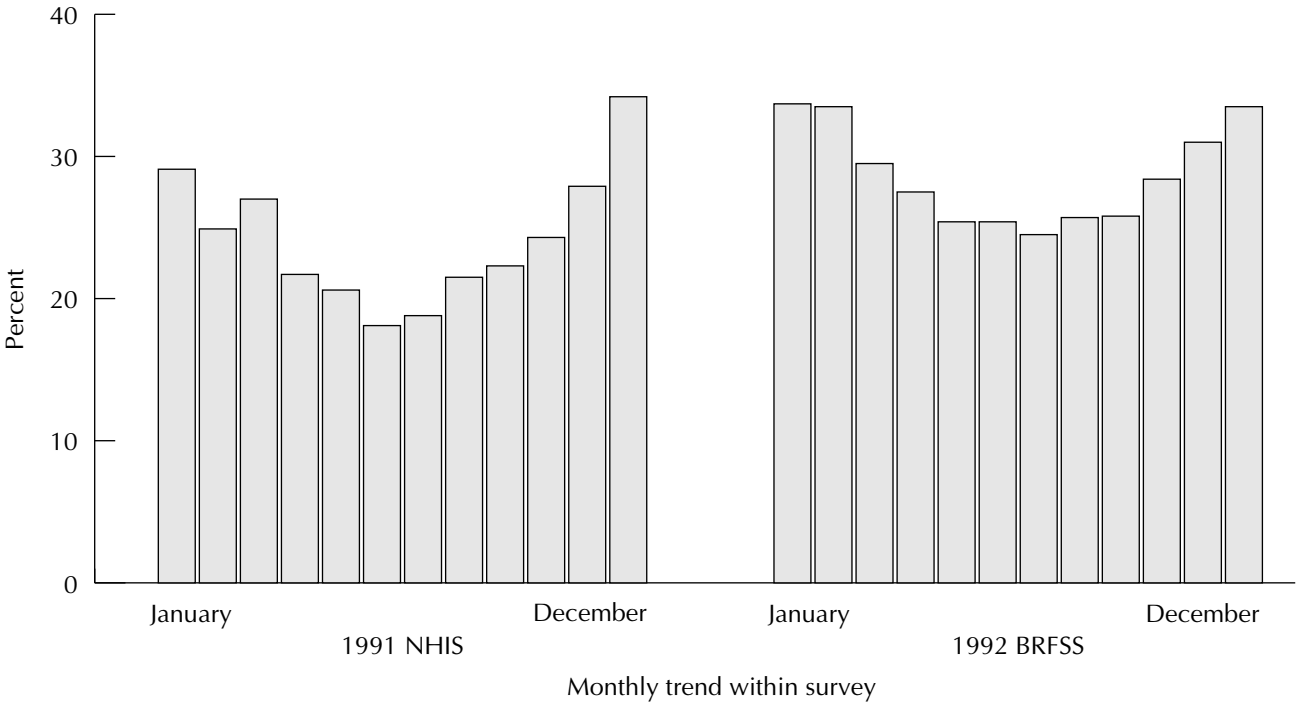


Table 5-3. Percentage of adults aged 18+ years reporting participation in no activity; regular, sustained activity; and regular, vigorous activity, by state,* Behavioral Risk Factor Surveillance System (BRFSS), 1994, United States

	No activity	Regular, sustained activity	Regular, vigorous activity
Overall	**29.4** (29.0, 29.8)†	**19.7** (19.3, 20.1)	**14.0** (13.6, 14.4)
Alabama	**45.9** (43.2, 48.6)	**17.1** (14.9, 19.3)	**11.2** (9.4, 13.0)
Alaska	**22.8** (19.9, 25.7)	**28.3** (24.8, 31.8)	**15.1** (12.4, 17.8)
Arizona	**23.7** (21.2, 26.2)	**17.8** (15.4, 20.2)	**17.9** (15.4, 20.4)
Arkansas	**35.1** (32.6, 37.6)	**17.2** (15.0, 19.4)	**10.7** (9.1, 12.3)
California	**21.8** (20.2, 23.4)	**21.9** (20.3, 23.5)	**15.7** (14.5, 16.9)
Colorado	**17.2** (15.0, 19.4)	**26.5** (24.1, 28.9)	**15.9** (14.1, 17.7)
Connecticut	**22.1** (19.9, 24.3)	**26.9** (24.5, 29.3)	**16.9** (14.9, 18.9)
Delaware	**36.4** (34.0, 38.8)	**17.7** (15.7, 19.7)	**14.1** (12.5, 15.7)
D.C.	**48.6** (45.3, 51.9)	**11.6** (9.4, 13.8)	**8.7** (6.9, 10.5)
Florida	**28.0** (26.2, 29.8)	**23.8** (22.2, 25.4)	**20.0** (18.6, 21.4)
Georgia	**33.0** (30.6, 35.4)	**18.0** (16.0, 20.0)	**13.5** (11.9, 15.1)
Hawaii	**20.8** (18.6, 23.0)	**25.5** (23.3, 27.7)	**18.3** (16.3, 20.3)
Idaho	**21.9** (19.7, 24.1)	**26.3** (23.8, 28.8)	**15.7** (13.7, 17.7)
Illinois	**33.5** (31.1, 35.9)	**15.7** (13.9, 17.5)	**14.6** (12.8, 16.4)
Indiana	**29.7** (27.7, 31.7)	**18.8** (17.0, 20.6)	**13.0** (11.4, 14.6)
Iowa	**33.2** (31.2, 35.2)	**15.9** (14.3, 17.5)	**13.3** (11.9, 14.7)
Kansas	**34.5** (31.8, 37.2)	**16.8** (14.6, 19.0)	**13.9** (11.9, 15.9)
Kentucky	**45.9** (43.5, 48.3)	**13.2** (11.6, 14.8)	**11.3** (9.9, 12.7)
Louisiana	**33.5** (30.8, 36.2)	**16.8** (14.8, 18.8)	**11.3** (9.5, 13.1)
Maine	**40.7** (37.8, 43.6)	**13.0** (11.0, 15.0)	**11.3** (9.5, 13.1)
Maryland	**30.5** (28.9, 32.1)	**17.6** (16.2, 19.0)	**14.5** (13.3, 15.7)
Massachusetts	**24.0** (21.6, 26.4)	**23.2** (21.0, 25.4)	**17.4** (15.4, 19.4)
Michigan	**23.1** (21.1, 25.1)	**21.8** (19.8, 23.8)	**14.5** (12.9, 16.1)
Minnesota	**21.8** (20.4, 23.2)	**20.1** (18.7, 21.5)	**15.4** (14.2, 16.6)
Mississippi	**38.5** (35.6, 41.4)	**14.0** (12.0, 16.0)	**9.8** (8.2, 11.4)

moderate physical activity requiring sustained, rhythmic muscular movements for at least 30 minutes per day (USDHHS 1990). Regular, sustained activity derived from the NHIS and the BRFSS was defined as any type or intensity of activity that occurs 5 times or more per week and 30 minutes or more per occasion (see Appendix B). This definition approximates the activity goal of the *Healthy People 2000* objective but includes vigorous activity of at least 30 minutes duration as well. Comparable information was unavailable in the NHANES III. The percentage of U.S. adults meeting this definition of regular, sustained activity during leisure time was about 22 percent in the two surveys (23.5 in the NHIS and 20.1 in the BRFSS; see Table 5-4)—8 percentage points lower than the *Healthy People 2000* target.

The prevalence of regular, sustained activity was somewhat higher among men than women; male:female ratios were 1.1:1.3. The two surveys found no consistent association between racial/ethnic groups and participation in regular, sustained activity. The prevalence of regular, sustained activity tended to be higher among 18- through 29-year-olds than among other age groups, and it was lowest (≤ 15 percent) among women aged 75 years and older. Education and income levels were associated positively with regular, sustained activity. For example, adults with a college education had an approximately 50 percent higher prevalence of regular, sustained activity than those with fewer than 12 years of

Table 5-3. *Continued*

	No activity	Regular, sustained activity	Regular, vigorous activity
Missouri	**32.0** (29.3, 34.7)	**18.0** (15.8, 20.2)	**10.8** (9.0, 12.6)
Montana	**21.0** (18.6, 23.4)	**21.8** (19.3, 24.3)	**15.0** (12.6, 17.4)
Nebraska	**24.3** (22.1, 26.5)	**16.7** (14.7, 18.7)	**14.7** (12.9, 16.5)
Nevada	**21.7** (19.5, 23.9)	**25.3** (22.9, 27.7)	**14.1** (12.3, 15.9)
New Hampshire	**25.8** (23.3, 28.3)	**21.2** (19.0, 23.4)	**17.0** (14.8, 19.2)
New Jersey	**30.9** (28.2, 33.6)	**20.7** (18.3, 23.1)	**11.6** (9.8, 13.4)
New Mexico	**19.8** (17.3, 22.3)	**25.5** (22.6, 28.4)	**18.4** (16.0, 20.8)
New York	**37.1** (34.7, 39.5)	**14.8** (13.2, 16.4)	**10.6** (9.2, 12.0)
North Carolina	**42.8** (40.3, 45.3)	**12.7** (11.1, 14.3)	**9.3** (7.9, 10.7)
North Dakota	**32.0** (29.6, 34.4)	**20.2** (18.0, 22.4)	**13.9** (12.1, 15.7)
Ohio	**38.0** (35.1, 40.9)	**15.9** (13.7, 18.1)	**12.4** (10.4, 14.4)
Oklahoma	**30.4** (28.0, 32.8)	**23.0** (20.8, 25.2)	**11.1** (9.5, 12.7)
Oregon	**20.8** (19.2, 22.4)	**27.3** (25.3, 29.3)	**18.7** (17.1, 20.3)
Pennsylvania	**26.5** (24.9, 28.1)	**21.2** (19.6, 22.8)	**14.5** (13.3, 15.7)
South Carolina	**31.4** (29.2, 33.6)	**15.1** (13.3, 16.9)	**11.9** (10.3, 13.5)
South Dakota	**30.8** (28.4, 33.2)	**19.4** (17.4, 21.4)	**11.9** (10.3, 13.5)
Tennessee	**39.7** (37.7, 41.7)	**15.0** (13.6, 16.4)	**12.7** (11.3, 14.1)
Texas	**27.8** (25.1, 30.5)	**20.7** (18.2, 23.2)	**13.0** (11.0, 15.0)
Utah	**21.0** (18.8, 23.2)	**21.6** (19.4, 23.8)	**14.3** (12.5, 16.1)
Vermont	**23.3** (21.5, 25.1)	**25.7** (23.7, 27.7)	**18.4** (16.6, 20.2)
Virginia	**23.0** (20.6, 25.4)	**24.6** (22.2, 27.0)	**14.6** (12.8, 16.4)
Washington	**18.2** (16.8, 19.6)	**25.7** (24.1, 27.3)	**16.8** (15.4, 18.2)
West Virginia	**45.3** (43.1, 47.5)	**14.3** (12.7, 15.9)	**9.8** (8.4, 11.2)
Wisconsin	**25.9** (23.2, 28.6)	**22.7** (20.2, 25.2)	**12.7** (10.7, 14.7)
Wyoming	**20.9** (18.4, 23.4)	**27.9** (24.8, 31.0)	**16.3** (13.9, 18.7)

Source: Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, BRFSS, 1994.

*Includes 49 states and the District of Columbia. Data for Rhode Island were unavailable.
†95% confidence intervals.

education. Among the regions of the United States, the West tended to have the highest prevalence of adults participating in regular, sustained activity (Table 5-4). Regular, sustained activity, which comprises many outdoor activities, was most prevalent in the summer. In the 1994 BRFSS, state-specific prevalences of regular, sustained activity ranged from 11.6 to 28.3 (Table 5-3).

Regular, Vigorous Physical Activity during Leisure Time

People who exercise both regularly and vigorously would be expected to improve cardiovascular fitness the most. The NHIS and the BRFSS defined regular, vigorous physical activity as rhythmic contraction of large muscle groups, performed at 50 percent or more of estimated age- and sex-specific maximum cardiorespiratory capacity, 3 times per week or more for at least 20 minutes per occasion (see Appendix B). The prevalence of regular, vigorous leisure-time activity reported by U.S. adults was about 15 percent (16.4 percent in the 1991 NHIS and 14.2 percent in the 1992 BRFSS; see Table 5-5). This prevalence is lower than the goal stated in *Healthy People 2000* objective 1.4, which is to have at least 20 percent of people aged 18 years and older engage in vigorous physical activity at 50 percent or more of individual cardiorespiratory capacity 3 days or more per week for 20 minutes or more per occasion (USDHHS 1990).

Table 5-4. Percentage of adults aged 18+ years reporting participation in regular, sustained physical activity (5+ times per week for 30+ minutes per occasion), by various demographic characteristics, National Health Interview Survey (NHIS) and Behavioral Risk Factor Surveillance System (BRFSS), United States

Demographic group	1991 NHIS*	1992 BRFSS*†
Overall	**23.5** (22.9, 24.1)‡	**20.1** (19.7, 20.5)
Sex		
Males	**26.6** (25.7, 27.5)	**21.5** (20.9, 22.1)
Females	**20.7** (19.9, 21.5)	**18.9** (18.4, 19.3)
Race/Ethnicity		
White, non-Hispanic	**24.0** (23.2, 24.7)	**20.8** (20.4, 21.2)
Males	**26.7** (25.7, 27.6)	**21.9** (21.3, 22.5)
Females	**21.5** (20.6, 22.4)	**19.8** (19.2, 20.4)
Black, non-Hispanic	**22.9** (21.4, 24.4)	**15.2** (14.0, 16.4)
Males	**28.9** (26.6, 31.3)	**18.5** (16.5, 20.5)
Females	**18.0** (16.2, 19.8)	**12.6** (11.4, 13.8)
Hispanic	**20.0** (18.1, 21.9)	**20.1** (18.5, 21.7)
Males	**23.7** (20.6, 26.7)	**21.4** (18.9, 23.9)
Females	**16.5** (14.3, 18.7)	**18.9** (16.7, 21.1)
Other	**23.4** (20.5, 26.2)	**17.3** (15.1, 19.5)
Males	**25.5** (21.0, 30.0)	**19.7** (16.6, 22.8)
Females	**21.1** (17.7, 24.6)	**14.5** (12.0, 17.0)
Age (years)		
Males		
18–29	**32.0** (30.2, 33.7)	**26.8** (25.4, 28.2)
30–44	**24.1** (22.8, 25.3)	**17.4** (16.6, 18.2)
45–64	**24.2** (22.8, 25.6)	**18.9** (17.7, 20.1)
65–74	**29.2** (27.0, 31.4)	**26.8** (24.8, 28.8)
75+	**24.6** (21.8, 27.4)	**23.2** (20.5, 25.9)
Females		
18–29	**23.2** (21.6, 24.8)	**19.9** (18.7, 21.1)
30–44	**20.4** (19.4, 21.4)	**18.5** (17.7, 19.3)
45–64	**20.6** (19.4, 21.8)	**19.4** (18.4, 20.4)
65–74	**21.3** (19.5, 23.0)	**19.0** (17.6, 20.4)
75+	**13.8** (12.2, 15.4)	**15.0** (13.4, 16.6)
Education		
< 12 yrs	**18.1** (17.0, 19.2)	**15.6** (14.6, 16.6)
12 yrs	**21.9** (21.0, 22.7)	**17.8** (17.2, 18.4)
Some college (13–15 yrs)	**26.8** (25.7, 28.0)	**22.7** (21.9, 23.5)
College (16+ yrs)	**28.5** (27.3, 29.6)	**23.5** (22.7, 24.3)
Income§		
< $10,000	**23.6** (21.8, 25.5)	**17.6** (16.6, 18.6)
$10,000–19,999	**20.4** (19.3, 21.4)	**18.7** (17.9, 19.5)
$20,000–34,999	**23.2** (22.2, 24.2)	**20.3** (19.5, 21.1)
$35,000–49,999	**23.9** (22.7, 25.1)	**20.9** (19.9, 21.9)
$50,000+	**28.0** (26.8, 29.2)	**23.5** (22.5, 24.5)
Geographic region		
Northeast	**23.9** (22.8, 25.0)	**20.2** (19.2, 21.2)
North Central	**24.2** (22.7, 25.6)	**18.2** (17.4, 19.0)
South	**21.1** (19.9, 22.2)	**19.0** (18.4, 19.6)
West	**26.1** (24.6, 27.5)	**24.0** (23.0, 25.0)

Sources: Centers for Disease Control and Prevention, National Center for Health Statistics, NHIS, public use data tapes, 1991; Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, BRFSS, 1992.

*Based on data from 48 states and the District of Columbia.

†NHIS asked about the prior 2 weeks; BRFSS asked about the prior month.

‡95% confidence intervals.

§Annual income per family (NHIS) or household (BRFSS).

Table 5-5. Percentage of adults aged 18+ years participating in regular, vigorous physical activity (3+ times per week for 20+ minutes per occasion at 50+ percent of estimated age- and sex-specific maximum cardiorespiratory capacity), by various demographic characteristics, National Health Interview Survey (NHIS) and Behavioral Risk Factor Surveillance System (BRFSS), United States

Demographic group	1991 NHIS*	1992 BRFSS*†
Overall	**16.4** (15.9, 16.9)‡	**14.4** (14.0, 14.8)
Sex		
Males	**18.1** (17.4, 18.8)	**12.9** (12.5, 13.3)
Females	**14.9** (14.3, 15.5)	**15.8** (15.4, 16.2)
Race/Ethnicity		
White, non-Hispanic	**17.2** (16.6, 17.7)	**15.3** (14.9, 15.7)
Males	**18.6** (17.9, 19.3)	**13.3** (12.7, 13.9)
Females	**15.9** (15.2, 16.6)	**17.1** (16.5, 17.7)
Black, non-Hispanic	**12.9** (11.7, 14.0)	**9.4** (8.6, 10.2)
Males	**16.0** (13.9, 18.0)	**9.5** (8.1, 10.9)
Females	**10.4** (9.0, 11.7)	**9.4** (8.4, 10.4)
Hispanic	**13.6** (11.9, 15.2)	**11.9** (10.5, 13.3)
Males	**15.6** (12.9, 18.3)	**12.4** (10.2, 14.6)
Females	**11.7** (9.9, 13.4)	**11.4** (9.8, 13.0)
Other	**16.8** (14.5, 19.1)	**11.8** (10.0, 13.6)
Males	**18.8** (15.2, 22.3)	**11.5** (9.0, 14.0)
Females	**14.8** (11.9, 17.8)	**12.2** (10.0, 14.4)
Age (years)		
Males		
18–29	**19.7** (18.3, 21.1)	**8.0** (7.2, 8.8)
30–44	**13.7** (12.8, 14.6)	**11.1** (10.3, 11.9)
45–64	**14.9** (13.7, 16.1)	**16.3** (15.3, 17.3)
65–74	**27.3** (25.2, 29.5)	**20.6** (18.8, 22.4)
75+	**38.3** (35.2, 41.5)	**20.6** (18.1, 23.1)
Females		
18–29	**16.0** (14.7, 17.3)	**11.4** (10.6, 12.2)
30–44	**13.3** (12.4, 14.1)	**18.0** (17.2, 18.8)
45–64	**12.1** (11.1, 13.0)	**17.7** (16.7, 18.7)
65–74	**18.5** (16.9, 20.1)	**16.5** (15.1, 17.9)
75+	**22.6** (20.5, 24.7)	**12.8** (11.4, 14.2)
Education		
< 12 yrs	**11.9** (11.1, 12.8)	**8.2** (7.4, 9.0)
12 yrs	**13.6** (13.0, 14.3)	**11.5** (10.9, 12.1)
Some college (13–15 yrs)	**18.9** (17.9, 19.9)	**14.9** (14.3, 15.5)
College (16+ yrs)	**23.5** (22.4, 24.6)	**21.9** (21.1, 22.7)
Income§		
< $10,000	**15.5** (14.1, 17.0)	**9.0** (8.2 , 9.8)
$10,000–19,999	**14.4** (13.5, 15.4)	**10.8** (10.2, 11.4)
$20,000–34,999	**15.5** (14.6, 16.4)	**14.2** (13.6, 14.8)
$35,000–49,999	**16.0** (14.9, 17.0)	**16.3** (15.5, 17.1)
$50,000+	**21.5** (20.4, 22.6)	**20.5** (19.5, 21.5)
Geographic region		
Northeast	**16.1** (15.2, 16.9)	**13.8** (13.0, 14.6)
North Central	**16.5** (15.5, 17.5)	**13.7** (13.1, 14.3)
South	**14.7** (13.9, 15.5)	**13.8** (13.2, 14.4)
West	**19.2** (17.9, 20.5)	**16.8** (16.0, 17.6)

Sources: Centers for Disease Control and Prevention, National Center for Health Statistics, NHIS, 1991; Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, BRFSS, 1992.

*NHIS asked about the prior 2 weeks; BRFSS asked about the prior month.

†Based on data from 48 states and the District of Columbia.

‡95% confidence intervals.

§Annual income per family (NHIS) or household (BRFSS).

The proportion performing regular, vigorous activity was 3 percentage points higher among men than women in the NHIS, but it was 3 percentage points higher among women than men in the BRFSS. This difference between sexes in the surveys may be related to the BRFSS's use of a correction procedure (based on speeds of activities like walking, jogging, and swimming) to create intensity coding (Appendix B; Caspersen and Powell [unpublished technical monograph] 1986; Caspersen and Merritt 1995). Regular, vigorous activity tended to be more prevalent among whites than among blacks and Hispanics (Table 5-5). These racial and ethnic patterns were somewhat more striking among women than among men.

The relationship between regular, vigorous physical activity and age varied somewhat between the two surveys. In the NHIS, the prevalence of regular, vigorous activity was higher for men and women aged 18–29 years than for those aged 30–64 years, but it was highest among men and women aged 65 years and older. Among men participating in the BRFSS, regular, vigorous activity increased with age from those 18–29 years old to those ≥ 65 years old. Among women participating in the BRFSS, the prevalence of regular, vigorous activity was higher for those aged 30–74 years than for those aged 18–29 years and ≥ 75 years.

The finding of generally lower prevalences of regular, vigorous activity among younger than older adults (Table 5-5) may seem unexpected. It is explained partly by both the greater leisure time of older adults and the use of an age-related relative intensity classification (Caspersen, Pollard, Pratt 1987; Stephens and Caspersen 1994; Caspersen and Merritt 1995). Because cardiorespiratory capacity declines with age, activities that would be moderately intense for young adults, such as walking, become more vigorous for older people. If the two surveys had instead used an absolute intensity classification, the estimated prevalence of people engaging in regular, vigorous physical activity would have fallen dramatically with age. (This age-related drop in activities of high absolute intensity is shown in Table 5-6 and described in the next section.) Likewise, the male:female ratio of vigorous activity prevalence in Table 5-5 would rise if an absolute intensity classification were used, because women have a lower average cardiorespiratory capacity than men.

In both surveys, the proportion of adults reporting regular, vigorous activity was higher in each successive educational category (Table 5-5). Adults who had college degrees reported regular, vigorous activity approximately two to three times more often than those who had not completed high school. In the NHIS, a similar positive association was seen between income and regular, vigorous physical activity. In the BRFSS, the prevalence of regular, vigorous physical activity was highest at the highest income level. The prevalence of regular, vigorous physical activity was not consistently related to employment status or marital status in the two surveys. It was higher in the West than in other regions of the United States and in warmer than in colder months. In the 1994 BRFSS, state-specific prevalences of regular, vigorous activity ranged from 6.7 to 16.9 (Table 5-3).

Participation in Specific Physical Activities

NHIS participants reported specific activities in the previous 2 weeks (Table 5-6). By far, walking was the most commonly reported leisure-time physical activity, followed by gardening or yard work, stretching exercises, bicycling, strengthening exercises, stair climbing, jogging or running, aerobics or aerobic dancing, and swimming. Because these percentages are based on all participants in the year-round NHIS, they underestimate the overall prevalence of participation in seasonal activities, such as skiing.

Substantial differences exist between the sexes for many activities. Gardening or yard work, strengthening exercises, jogging or running, and vigorous or contact sports were more commonly reported by men than women. Women reported walking and aerobics or aerobic dancing more often than men and reported participation in stretching exercises, bicycling, stair climbing, and swimming about as often as men. Participation in most activities, especially weight lifting and vigorous or contact sports, declined substantially with age (Table 5-6). The prevalence of walking, gardening or yard work, and golf tended to remain stable or increase with age. Among adults aged 65 years and older, walking (> 40 percent prevalence) and gardening or yard work (> 20 percent prevalence) were by far the most popular activities.

Table 5-6. Percentage of adults aged 18+ years reporting participation in selected common physical activities in the prior 2 weeks, by sex and age, National Health Interview Survey (NHIS), United States, 1991

	Males						Females						All ages and sexes
Activity category	18–29	30–44	45–64	65–74	75+	All	18–29	30–44	45–64	65–74	75+	All	
Walking for exercise	32.8	37.6	43.3	50.1	47.1	39.4	47.4	49.1	49.4	50.1	40.5	48.3	44.1
Gardening or yard work	22.2	36.0	39.8	42.6	38.4	34.2	15.4	28.6	29.6	28.2	21.5	25.1	29.4
Stretching exercises	32.1	27.2	20.0	15.5	15.7	25.0	32.5	27.7	21.4	21.9	17.9	26.0	25.5
Weight lifting or other exercise to increase muscle strength	33.6	21.2	12.2	6.4	4.7	20.0	14.5	10.6	5.1	2.8	1.1	8.8	14.1
Jogging or running	22.6	14.1	7.7	1.4	0.5	12.8	11.6	6.5	2.5	0.8	0.4	5.7	9.1
Aerobics or aerobic dance	3.4	3.3	2.1	1.6	1.0	2.8	19.3	12.3	6.6	4.2	1.6	11.1	7.1
Riding a bicycle or exercise bike	18.7	18.5	14.0	10.8	8.4	16.2	17.4	16.9	12.6	11.4	6.0	14.6	15.4
Stair climbing	10.5	11.4	9.6	6.0	4.0	9.9	14.6	12.8	10.3	7.3	5.6	11.6	10.8
Swimming for exercise	10.1	7.6	5.3	3.1	1.4	6.9	8.0	7.5	4.6	4.2	1.5	6.2	6.5
Tennis	5.7	3.3	2.9	1.1	0.4	3.5	3.1	2.4	1.3	0.6	0.1	2.0	2.7
Bowling	7.0	5.2	3.0	2.8	1.6	4.7	4.8	4.2	2.8	2.5	1.1	3.6	4.1
Golf	7.9	8.6	7.9	9.7	4.9	8.2	1.4	1.7	2.2	3.3	0.7	1.8	4.9
Baseball or softball	11.0	6.9	1.8	0.4	—	5.8	3.2	1.7	0.3	0.2	—	1.4	3.5
Handball, racquetball, or squash	5.2	2.8	1.5	0.3	—	2.7	1.0	0.4	0.4	0.1	—	0.5	1.6
Skiing	1.5	1.0	0.4	0.1	—	0.9	0.9	0.6	0.3	0.0	—	0.5	0.7
Cross country skiing	0.1	0.5	0.5	0.2	0.4	0.4	0.3	0.4	0.6	0.2	0.2	0.4	0.4
Water skiing	1.5	0.7	0.3	—	—	0.7	0.7	0.5	0.1	0.0	—	0.4	0.5
Basketball	24.2	10.5	2.4	0.1	0.1	10.5	3.1	1.7	0.4	—	0.2	1.5	5.8
Volleyball	6.8	3.0	1.1	0.2	0.2	3.1	4.4	1.9	0.5	0.0	0.1	1.8	2.5
Soccer	3.3	1.4	0.3	0.1	—	1.4	0.9	0.4	0.1	—	—	0.4	0.9
Football	7.6	1.8	0.4	0.2	—	2.7	0.7	0.4	0.0	—	—	0.3	1.5
Other sports	8.6	7.9	6.0	6.2	5.2	7.3	4.5	4.5	3.6	4.3	2.8	4.1	5.7

Note: 0.0 = quantity less than 0.05 but greater than zero; — = quantity is equal to zero.
Source: Centers for Disease Control and Prevention, National Center for Health Statistics, NHIS, 1991.

Healthy People 2000 objective 1.6 recommends that at least 40 percent of people aged 6 years and older should regularly perform physical activities that enhance and maintain muscular strength, muscular endurance, and flexibility (USDHHS 1990). National surveys have not quantified all these activities but have inquired about specific sentinel activities, such as weight lifting and stretching. In the 1991 NHIS, 14.1 percent of adults reported "weight lifting and other exercises to increase muscle strength" in the previous 2 weeks (Table 5-7). Participation in strengthening activities was more than twice as prevalent among men than women. Black men tended to have the highest participation (26.2 percent) and black women the lowest (6.9 percent). Participation was much higher among younger than older adults, among the more affluent than the less affluent, and in the West than in other regions of the United States.

Of special concern, given the promising evidence that strengthening exercises provide substantial benefit to the elderly (see Chapter 4), is the low prevalence of strengthening activities among those aged 65 or older (≤ 6.4 percent in men and ≤ 2.8 percent in women; see Table 5-7).

Adult participation in stretching activity over the previous 2 weeks was 25.5 percent in the NHIS (Table 5-7). Stretching participation declined with age and tended to be associated positively with levels of education and income and to be lower in the South than in other regions of the United States.

Leisure-Time Physical Activity among Adults with Disabilities

Although little information is available on physical activity patterns among people with disabilities, one recent analysis was based on the special NHIS Health Promotion and Disease Prevention Supplement from 1991. Heath and colleagues (1995) compared physical activity patterns among people with disabilities (i.e., activity limitations due to a chronic health problem or impairment) to those among people without disabilities. People with disabilities were less likely to report engaging in regular moderate physical activity (27.2 percent) than were people without disabilities (37.4 percent). People with disabilities were also less likely to report engaging in regular vigorous physical activity (9.6 percent vs. 14.2 percent). Correspondingly, people with disabilities were more likely to report being inactive (32 percent vs. 27 percent).

Trends in Leisure-Time Physical Activity

Until the 20th century, people performed most physical activity as part of their occupations or in subsistence activities. In Western populations, occupation-related physical demands have declined, and the availability of leisure time has grown. It is generally believed that over the past 30 years, as both the popularity of sports and public awareness of the role of physical activity in maintaining health have increased, physical activity performed during leisure time has increased (Stephens 1987; Jacobs et al. 1991). Stephens concluded that the increase was greater among women than men and among older than younger adults and that the rate of increase probably was more pronounced in the 1970s than between 1980 and 1985 (Stephens 1987). However, no systematic data were collected on physical activity among U.S. adults until the 1980s.

Even now, few national data are available on consistently measured trends in physical activity. The NHIS has data from 1985, 1990, and 1991, and the BRFSS has consistent data from the same 25 states and the District of Columbia for each year between 1986 and 1992 and for 1994. According to the NHIS, participation in leisure-time physical activity among adults changed very little between the mid-1980s and the early 1990s (Table 5-8 and Figure 5-3). Similarly, in the BRFSS (Table 5-8 and Figure 5-4), little improvement was evident from 1986 through 1994.

Physical Activity among Adolescents and Young Adults in the United States

The most recent U.S. data on the prevalence of physical activity among young people are from the 1992 household-based NHIS-YRBS, which sampled all young people aged 12–21 years, and the 1995 school-based YRBS, which included students in grades 9–12. Variations in estimates between the NHIS-YRBS and the YRBS may be due not only to the distinct populations represented in each survey but also to the time of year each survey was conducted, the mode of administration, the specific wording of

Table 5-7. Percentage of adults aged 18+ years reporting participation in any strengthening activities* or stretching exercises in the prior 2 weeks, by various demographic characteristics, National Health Interview Survey (NHIS), United States, 1991

Demographic group	Strengthening activities	Stretching exercises
Overall	**14.1** (13.6, 14.6)†	**25.5** (24.7, 26.4)
Sex		
Males	**20.0** (19.2, 20.7)	**25.0** (24.0, 26.1)
Females	**8.8** (8.3, 9.2)	**26.0** (25.1, 27.0)
Race/Ethnicity		
White, non-Hispanic	**13.7** (13.2, 14.2)	**25.9** (24.9, 26.8)
Males	**18.8** (18.0, 19.6)	**24.9** (23.8, 26.0)
Females	**9.0** (8.5, 9.6)	**26.7** (25.7, 27.8)
Black, non-Hispanic	**15.5** (14.2, 16.9)	**24.2** (22.5, 26.0)
Males	**26.2** (23.7, 28.7)	**24.7** (22.1, 27.3)
Females	**6.9** (5.8, 8.0)	**23.9** (21.7, 26.0)
Hispanic	**15.8** (13.9, 17.6)	**22.4** (19.9, 24.9)
Males	**23.4** (20.3, 26.5)	**23.6** (20.4, 26.7)
Females	**8.6** (7.0, 10.3)	**21.3** (18.3, 24.3)
Other	**14.9** (12.3, 17.5)	**30.0** (26.2, 33.8)
Males	**20.3** (16.0, 24.7)	**31.4** (26.0, 36.8)
Females	**9.2** (6.6, 11.7)	**28.5** (24.3, 32.7)
Age (years)		
Males		
18–29	**33.6** (31.7, 35.5)	**32.1** (30.1, 34.2)
30–44	**21.2** (20.1, 22.3)	**27.2** (25.8, 28.6)
45–64	**12.2** (11.1, 13.4)	**20.0** (18.6, 21.5)
65–74	**6.4** (5.1, 7.7)	**15.5** (13.4, 17.6)
75+	**4.7** (3.1, 6.3)	**15.7** (13.2, 18.3)
Females		
18–29	**14.5** (13.3, 15.6)	**32.5** (30.7, 34.2)
30–44	**10.6** (9.9, 11.4)	**27.7** (26.3, 29.0)
45–64	**5.1** (4.5, 5.8)	**21.4** (20.1, 22.8)
65–74	**2.8** (2.0, 3.7)	**21.9** (20.0, 23.8)
75+	**1.1** (0.7, 1.6)	**17.9** (16.0, 19.9)
Education		
< 12 yrs	**7.4** (6.6, 8.1)	**14.7** (13.5, 15.8)
12 yrs	**12.3** (11.7, 13.0)	**22.6** (21.7, 23.6)
Some college (13–15 yrs)	**18.3** (17.3, 19.2)	**31.3** (29.9, 32.7)
College (16+ yrs)	**19.6** (18.6, 20.6)	**35.4** (34.0, 36.9)
Income‡		
< $10,000	**12.9** (11.4, 14.4)	**23.4** (21.7, 25.1)
$10,000–$19,999	**10.7** (9.8, 11.6)	**21.0** (19.7, 22.3)
$20,000–$34,999	**14.3** (13.4, 15.1)	**25.6** (24.4, 26.9)
$35,000–$49,999	**15.3** (14.3, 16.3)	**28.9** (27.4, 30.4)
$50,000+	**19.1** (18.1, 20.2)	**33.5** (32.1, 34.9)
Geographic region		
Northeast	**13.8** (12.9, 14.8)	**24.9** (23.6, 26.2)
North Central	**14.5** (13.6, 15.3)	**28.5** (26.5, 30.6)
South	**12.4** (11.6, 13.3)	**20.8** (19.2, 22.4)
West	**16.5** (15.4, 17.7)	**29.9** (28.1, 31.7)

Source: Centers for Disease Control and Prevention, National Center for Health Statistics, NHIS, 1991.

*Strengthening activities include weight lifting and other exercises to increase muscle strength.

†95% confidence intervals.

‡Annual income per family.

Table 5-8. Trends in the percentage of adults aged 18+ years reporting participation in no activity; regular, sustained activity; and regular, vigorous activity, by sex, National Health Interview Survey (NHIS) and Behavioral Risk Factor Surveillance System (BRFSS), United States, from 1985–1994

	1985, 1990, 1991 NHIS			1986–1994 BRFSS*		
	Males	Females	Total	Males	Females	Total
No activity						
1985	**19.9** (18.8, 20.9)†	**26.3** (25.3, 27.3)	**23.2** (22.3, 24.1)			
1986				**31.2** (30.0, 32.4)	**34.3** (33.3, 35.3)	**32.8** (32.0, 33.6)
1987				**29.6** (28.4, 30.8)	**33.9** (32.9, 34.9)	**31.8** (31.0, 32.6)
1988				**27.5** (26.5, 28.5)	**31.5** (30.5, 32.5)	**29.6** (28.8, 30.4)
1989				**28.8** (27.8, 29.8)	**33.6** (32.6, 34.6)	**31.3** (30.5, 32.1)
1990	**24.9** (23.9, 25.9)	**32.4** (31.4, 33.4)	**28.3** (28.0, 29.7)	**28.6** (27.6, 29.6)	**32.3** (31.3, 33.3)	**30.5** (29.7, 31.3)
1991	**21.4** (20.2, 22.6)	**26.9** (25.8, 28.0)	**24.3** (23.2, 25.3)	**29.0** (28.0, 30.0)	**32.8** (32.0, 33.6)	**31.0** (30.4, 31.6)
1992				**26.7** (25.9, 27.5)	**31.4** (30.6, 32.2)	**29.2** (28.6, 29.8)
1993						
1994				**28.7** (27.9, 29.5)	**33.0** (32.2, 33.8)	30.9 (30.3, 31.5)
Regular, sustained activity						
1985	**27.5** (26.6, 28.4)	**22.5** (21.7, 23.3)	**24.9** (24.2, 25.5)			
1986				**19.5** (18.5, 20.5)	**18.1** (17.3, 18.9)	**18.8** (18.2, 19.4)
1987				**20.0** (18.8, 21.2)	**17.6** (16.8, 18.4)	**18.8** (18.2, 19.4)
1988				**20.5** (19.5, 21.5)	**19.6** (18.8, 20.4)	**20.0** (19.4, 20.6)
1989				**20.0** (19.0, 21.0)	**18.0** (17.2, 18.8)	**19.0** (18.4, 19.6)
1990	**29.0** (28.1, 29.9)	**22.7** (22.0, 23.4)	**25.7** (25.1, 26.3)	**20.5** (19.5, 21.5)	**18.5** (17.7, 19.3)	**19.4** (18.8, 20.0)
1991	**26.6** (25.7, 27.5)	**20.7** (19.9, 21.5)	**23.5** (22.9, 24.1)	**19.5** (18.7, 20.3)	**18.3** (17.5, 19.1)	**18.9** (18.3, 19.5)
1992				**21.0** (20.2, 21.8)	**18.4** (17.8, 19.0)	**19.7** (19.1, 20.3)
1993						
1994				**19.3** (18.5, 20.1)	**18.1** (17.5, 18.7)	**18.7** (18.1, 19.3)
Regular, vigorous activity						
1985	**17. 2** (16 .1, 18.3)	**15.1** (14.3, 15.8)	**16.1** (15.3, 16.8)			
1986				**11.2** (10.4, 12.0)	**10.3** (9.7, 10.9)	**10.7** (10.1, 11.3)
1987				**10.7** (9.9, 11.5)	**10.6** (10.0, 11.2)	**10.7** (10.1, 11.3)
1988				**11.1** (10.3, 11.9)	**12.3** (11.5, 13.1)	**11.7** (11.1, 12.3)
1989				**11.3** (10.5, 12.1)	**11.9** (11.3, 12.5)	**11.6** (11.2, 12.0)
1990	**18.9** (18.1, 19.7)	**15.9** (15.3, 16.4)	**17.3** (16.8, 17.8)	**11.0** (10.2, 11.8)	**12.9** (12.3, 13.5)	**12.0** (11.6, 12.4)
1991	**18.1** (17.4, 18.8)	**14.9** (14.3, 15.5)	**16.4** (15.9, 16.9)	**11.2** (10.6, 11.8)	**12.6** (12.0, 13.2)	**11.9** (11.5, 12.3)
1992				**11.8** (11.2, 12.4)	**12.2** (11.6, 12.8)	**12.0** (11.6, 12.4)
1993						
1994				**11.4** (10.8, 12.0)	**11.4** (10.8, 12.0)	**11.4** (11.0, 11.8)

Sources: Centers for Disease Control and Prevention, National Center for Health Statistics, NHIS, 1985, 1990, 1991; Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, BRFSS, 1986–1992 and 1994.

*25 states and the District of Columbia

†95% confidence intervals.

questions, and the age of respondents. Trends over time can be monitored only with the YRBS, which was conducted in 1991 and 1993 as well as in 1995. An assessment of the test-retest reliability of the YRBS indicated that the four physical activity items included in the study had a kappa value (an indicator of reliability) in the "substantial" (i.e., 61–80) or "almost perfect" (i.e., 81–100) range (Brener et al. 1995).

Physical Inactivity

Healthy People 2000 objective 1.5 calls for reducing to no more than 15 percent the proportion of people aged 6 years and older who are inactive (USDHHS 1990). For this report, inactivity was defined as performing no vigorous activity (exercise or sports participation that made the respondent "sweat or breathe hard" for at least 20 minutes) and performing

Figure 5-3. Trends in leisure-time physical activity of adults aged 18+ years, NHIS

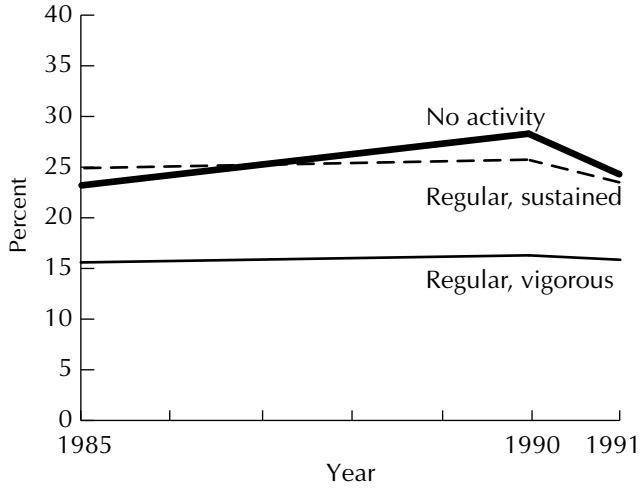
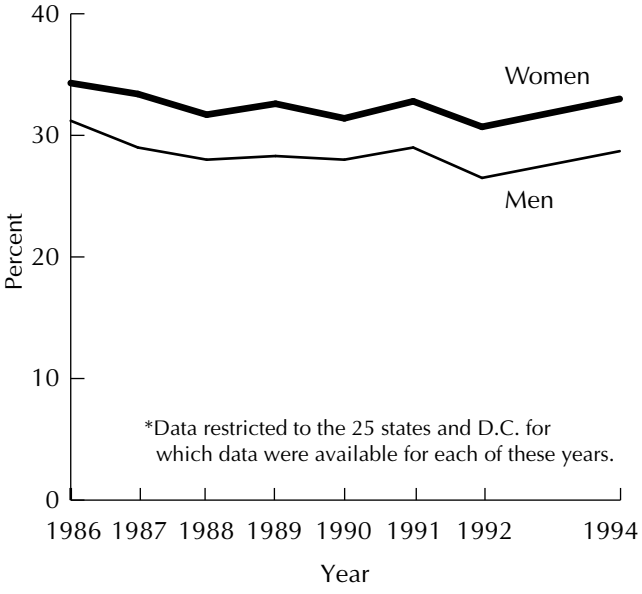


Figure 5-4. Trends in the percentage of adults aged 18+ years participating in no leisure-time activity, BRFSS*



no light to moderate activity (walking or bicycling for at least 30 minutes) during any of the 7 days preceding the survey. Among 12- through 21-year-olds surveyed in the 1992 NHIS-YRBS, the prevalence of inactivity in the previous week was 13.7 percent and was higher among females than males (15.3 percent vs. 12.1 percent) (Table 5-9). Overall, there was no difference among racial and ethnic groups, but black females had a higher prevalence than white females (20.2 percent vs. 13.7 percent). For both males and females, inactivity increased with age.

Similarly, in the 1995 school-based YRBS, the prevalence of inactivity in the previous week was 10.4 percent (Table 5-9) and was higher among females than males (13.8 percent vs. 7.3 percent). The prevalence was higher among black students than white students (15.3 percent vs. 9.3 percent) and among black females than white females (21.4 percent vs. 11.6 percent). Among female high school students, a substantial increase in inactivity was reported in the upper grades.

Thus the *Healthy People 2000* goal for inactivity has been met for adolescents overall but not for black females or for young adults.

Vigorous Physical Activity

Healthy People 2000 objective 1.4 (USDHHS 1990) proposes to increase to at least 75 percent the proportion of children and adolescents aged 6–17 years who engage in vigorous physical activity that promotes cardiorespiratory fitness 3 days or more per week for 20 minutes or more per occasion. In the 1992 NHIS-YRBS, 53.7 percent of 12- through 21-year-olds reported having exercised or taken part in sports that made them "sweat and breathe hard" during 3 or more of the 7 days preceding the survey (Table 5-10). However, one-fourth reported no vigorous activity during the same time period. Prevalences of vigorous activity were higher among males than females (60.2 percent vs. 47.2 percent) and among white youths than Hispanic youths (54.6 percent vs. 49.5 percent) (Table 5-10). Vigorous physical activity declined with age. Among males, the prevalence of vigorous activity was at least 60 percent for those aged 12–17 years but was lower at older ages (e.g., 42.2 percent among 21-year-olds). Among females aged 12–14 years, the prevalence was at least 60 percent but was lower at older ages (e.g., 30.2 percent among 21-year-olds). The prevalence of vigorous activity was associated positively with income and was higher during the spring than during other seasons.

In the 1995 YRBS, 63.7 percent of students in grades 9–12 reported having exercised or taken part in sports that made them "sweat and breathe hard" for at least 20 minutes during 3 or more of the 7 days

Table 5-9. Percentage of young people reporting no participation in vigorous or moderate physical activity during any of the 7 days preceding the survey, by demographic group, 1992 National Health Interview Survey-Youth Risk Behavior Survey (NHIS-YRBS) and 1995 Youth Risk Behavior Survey (YRBS), United States

Demographic group	1992 NHIS-YRBS*		1995 YRBS†	
Overall	**13.7**	(12.9, 14.5)‡	**10.4**	(9.0, 11.9)
Sex				
Males	**12.1**	(11.0, 13.2)	**7.3**	(6.5, 8.1)
Females	**15.3**	(14.1, 16.5)	**13.8**	(11.2, 16.3)
Race/Ethnicity				
White, non-Hispanic	**13.4**	(12.4, 14.5)	**9.3**	(7.9, 10.7)
Males	**13.1**	(11.7, 14.6)	**7.3**	(6.4, 8.1)
Females	**13.7**	(12.4, 15.1)	**11.6**	(8.7, 14.4)
Black, non-Hispanic	**14.7**	(12.7, 16.6)	**15.3**	(12.4, 18.2)
Males	**9.2**	(6.9, 11.5)	**8.1**	(5.4, 10.7)
Females	**20.2**	(17.0, 23.5)	**21.4**	(16.9, 25.8)
Hispanic	**14.3**	(12.4, 16.3)	**11.3**	(8.6, 14.1)
Males	**11.1**	(8.4, 13.8)	**7.5**	(5.1, 9.9)
Females	**17.8**	(14.9, 20.7)	**15.0**	(10.6, 19.5)
Age (years)			**Grade in school**	
Males			**Males**	
12	**7.7**	(5.1, 10.2)		
13	**6.0**	(3.6, 8.3)		
14	**3.6**	(2.1, 5.1)		
15	**6.3**	(3.7, 8.9)	9	**6.0** (3.4, 8.7)
16	**9.6**	(6.8, 12.4)	10	**5.2** (3.0, 7.4)
17	**10.5**	(7.2, 13.9)	11	**7.9** (4.3, 11.4)
18	**18.8**	(14.4, 23.3)	12	**10.0** (7.4, 12.5)
19	**18.6**	(14.7, 22.5)		
20	**22.3**	(17.9, 26.8)		
21	**18.1**	(14.3, 21.9)		
Females			**Females**	
12	**8.4**	(5.2, 11.5)		
13	**6.8**	(4.4, 9.2)		
14	**8.3**	(5.1, 11.5)		
15	**9.8**	(7.0, 12.6)	9	**8.7** (6.1, 11.3)
16	**14.4**	(10.9, 17.9)	10	**9.2** (7.3, 11.0)
17	**16.8**	(13.2, 20.3)	11	**17.8** (13.6, 22.0)
18	**18.7**	(14.5, 22.8)	12	**18.5** (13.3, 23.7)
19	**22.3**	(18.1, 26.5)		
20	**25.0**	(21.0, 28.9)		
21	**19.6**	(16.4, 22.9)		
Annual family income				
< $10,000	**14.9**	(12.6, 17.3)		
$10,000–19,999	**16.0**	(14.1, 17.9)		
$20,000–34,999	**12.2**	(10.6, 13.8)		
$35,000–49,999	**13.8**	(11.6, 15.9)		
$50,000+	**11.2**	(9.8, 12.7)		

Sources: Centers for Disease Control and Prevention, National Center for Health Statistics, NHIS-YRBS, 1992 machine readable data file and documentation, 1993; Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, YRBS 1995 data tape (in press).

*A national household-based survey of youths aged 12–21 years.

†A national school-based survey of students in grades 9–12.

‡95% confidence intervals.

Table 5-10. Percentage of young people reporting participation in vigorous physical activity during 3 or more of the 7 days preceding the survey, by demographic group, 1992 National Health Interview Survey-Youth Risk Behavior Survey (NHIS-YRBS) and 1995 Youth Risk Behavior Survey (YRBS), United States

Demographic group	1992 NHIS-YRBS*		1995 YRBS†
Overall	**53.7** (52.5, 54.9)‡		**63.7** (60.4, 66.9)
Sex			
Males	**60.2** (58.6, 61.8)		**74.4** (72.1, 76.6)
Females	**47.2** (45.6, 48.8)		**52.1** (47.5, 56.8)
Race/Ethnicity			
White, non-Hispanic	**54.6** (53.2, 56.0)		**67.0** (62.6, 71.4)
Males	**60.2** (58.4, 62.0)		**76.0** (73.0, 78.9)
Females	**49.0** (46.8, 51.2)		**56.7** (50.0, 63.4)
Black, non-Hispanic	**52.6** (49.9, 55.3)		**53.2** (49.6, 56.8)
Males	**62.7** (58.8, 66.6)		**68.1** (62.8, 73.4)
Females	**42.3** (38.6, 46.0)		**41.3** (35.5, 42.1)
Hispanic	**49.5** (46.6, 52.4)		**57.3** (53.7, 60.9)
Males	**56.7** (52.6, 60.8)		**69.7** (64.9, 74.5)
Females	**41.7** (38.2, 45.2)		**45.2** (39.9, 50.6)
Age (years)		**Grade in school**	
Males		**Males**	
12	**70.8** (66.7, 74.9)		
13	**73.7** (69.4, 78.0)		
14	**76.1** (72.2, 80.0)		
15	**72.6** (68.1, 71.1)	9	**80.8** (75.9, 85.6)
16	**65.6** (60.3, 70.9)	10	**75.9** (72.5, 79.3)
17	**60.2** (54.7, 65.7)	11	**70.2** (67.5, 72.9)
18	**48.4** (43.1, 53.7)	12	**66.9** (63.0, 70.7)
19	**44.1** (38.4, 49.8)		
20	**43.4** (38.5, 48.3)		
21	**42.2** (37.1, 47.3)		
Females		**Females**	
12	**66.2** (62.1, 70.3)		
13	**63.1** (58.0, 68.2)		
14	**63.1** (58.4, 67.8)		
15	**56.6** (51.9, 61.3)	9	**60.9** (54.8, 67.0)
16	**50.9** (45.6, 56.2)	10	**54.4** (47.6, 61.3)
17	**43.6** (38.1, 49.1)	11	**44.7** (40.6, 48.9)
18	**37.5** (32.2, 42.8)	12	**41.0** (34.6, 47.5)
19	**32.6** (27.3, 37.9)		
20	**28.2** (23.9, 32.5)		
21	**30.2** (25.5, 34.9)		
Annual family income			
< $10,000	**46.7** (43.2, 50.2)		
$10,000–19,999	**48.5** (46.0, 51.1)		
$20,000–34,999	**55.0** (52.5, 57.6)		
$35,000–49,999	**58.4** (55.5, 61.3)		
$50,000+	**60.2** (57.9, 62.6)		

Sources: Centers for Disease Control and Prevention, National Center for Health Statistics, NHIS-YRBS, 1992 machine readable data file and documentation, 1993; Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, YRBS 1995 data tape (in press).

*A national household-based survey of youths aged 12–21 years.

†A national school-based survey of students in grades 9–12.

‡95% confidence intervals.

preceding the survey (Table 5-10). However, 16.0 percent reported no vigorous physical activity during the same time period. Subgroup patterns were similar to those reported for the NHIS-YRBS. Vigorous physical activity was more common among male than female students (74.4 percent vs. 52.1 percent) and among white than black or Hispanic students (67 percent vs. 53.2 percent and 57.3 percent, respectively). Among both male and female students, vigorous activity was less common in the upper grades. From 1991 through 1995, the overall prevalence did not change significantly among students in grades 9–12 (data not shown).

NHIS-YRBS and YRBS data clearly show that the prevalence of vigorous physical activity among young people falls short of the *Healthy People 2000* goal of 75 percent.

Other Physical Activity

Healthy People 2000 objective 1.6 (USDHHS 1990) aims for at least 40 percent of people aged 6 and older to regularly perform physical activities that enhance and maintain muscular strength, muscular endurance, and flexibility. The 1992 NHIS-YRBS indicated that 45.6 percent of 12- through 21-year-olds had participated in strengthening or toning activities (e.g., push-ups, sit-ups, or weight lifting) during at least 3 of the 7 days preceding the survey (Table 5-11). These activities were more common among males than females (54.6 percent vs. 36.4 percent) and among white and Hispanic youths than black youths (46.4 percent and 45.4 percent, respectively, vs. 39.8 percent). Among both males and females, the prevalence of strengthening or toning activities decreased as age increased and was greater among young people living in households with higher incomes.

Similar to the NHIS-YRBS, the 1995 YRBS indicated that 50.3 percent of students in grades 9–12 had participated in strengthening or toning activities during at least 3 of the 7 days preceding the survey (Table 5-11). Subgroup patterns were similar to those reported for the 1992 NHIS-YRBS. Male students were more likely than female students to participate in strengthening or toning activities (59.1 percent vs. 41.0 percent), and white students were more likely than black students to do so (52.8 percent vs. 41.4 percent). Among female students, participation was greater among those in lower grades, but this practice did not vary by grade among male students. Between 1991 and 1995, the overall prevalence of strengthening or toning activities among students in grades 9–12 did not change (data not shown).

In the 1992 NHIS-YRBS, 48.0 percent of 12- through 21-year-olds reported having participated in stretching activities (e.g., toe touching, knee bending, or leg stretching) during at least 3 of the 7 days preceding the survey. White and Hispanic youths were more likely than black youths to report this (49.2 percent and 48.5 percent, respectively, vs. 40.7 percent). Overall, the prevalence of stretching activities did not differ by sex, although these activities were more common among black males than among black females (44.9 percent vs. 36.5 percent). Among both males and females, the prevalence was higher in the younger age categories. Participation was also higher with higher family income.

In the 1995 YRBS, 53.0 percent of students in grades 9–12 reported having participated in stretching activities during at least 3 of the 7 days preceding the survey (Table 5-12). Subgroup patterns were generally similar to those reported for the NHIS-YRBS. Similar proportions of male and female students participated in stretching activities (55.5 percent and 50.4 percent, respectively), and white students were more likely than black students to do so (55.1 percent vs. 45.4 percent). Participation in stretching activities declined across grades for both male and female students. Between 1991 and 1995, the overall prevalence among students in grades 9–12 did not change significantly (data not shown).

Thus the *Healthy People 2000* objective for strengthening and stretching activities has been met overall among adolescents and young adults but not among all subgroups.

Healthy People 2000 objective 1.3 (USDHHS 1990) proposes to increase to at least 30 percent the proportion of people aged 6 and older who engage regularly, preferably daily, in light to moderate physical activity for at least 30 minutes per day. Walking and bicycling can be used to measure light to moderate physical activity among young people. In the 1992 NHIS-YRBS, 26.4 percent of 12- through 21-year-olds reported having walked or bicycled for 30 minutes or more on at least 5 of the 7 days preceding the survey (Table 5-13). These activities were more common among males than females (29.1 percent vs. 23.7 percent) and among Hispanic youths than

Table 5-11. Percentage of young people reporting participation in strengthening or toning activities during 3 or more of the 7 days preceding the survey, by demographic group, 1992 National Health Interview Survey-Youth Risk Behavior Survey (NHIS-YRBS) and 1995 Youth Risk Behavior Survey (YRBS), United States

Demographic group	1992 NHIS-YRBS*		1995 YRBS†	
Overall	**45.6** (44.4, 46.8)‡		**50.3** (46.6, 54.0)	
Sex				
Males	**54.6** (53.0, 56.2)		**59.1** (56.1, 62.1)	
Females	**36.4** (34.8, 38.0)		**41.0** (36.0, 46.0)	
Race/Ethnicity				
White, non-Hispanic	**46.4** (45.0, 47.8)		**52.8** (47.2, 58.4)	
Males	**54.4** (52.6, 56.2)		**60.3** (56.4, 64.2)	
Females	**38.4** (36.4, 40.4)		**44.4** (36.4, 2.4)	
Black, non-Hispanic	**39.8** (37.5, 42.2)		**41.4** (37.9, 45.0)	
Males	**53.2** (49.3, 57.1)		**54.2** (49.7, 58.6)	
Females	**26.2** (23.1, 29.3)		**31.3** (26.7, 35.9)	
Hispanic	**45.4** (42.5, 48.3)		**47.4** (41.8, 53.1)	
Males	**53.3** (49.4, 57.2)		**57.8** (51.9, 63.8)	
Females	**36.9** (33.2, 40.6)		**37.4** (29.6, 45.2)	
Age (years)		**Grade in school**		
Males		**Males**		
12	**59.4** (54.7, 64.1)			
13	**66.3** (62.2, 70.4)			
14	**61.1** (56.0, 66.2)			
15	**66.6** (61.9, 71.3)	9	**65.3** (58.0, 72.5)	
16	**61.3** (56.0, 66.6)	10	**60.0** (55.8, 64.2)	
17	**53.9** (48.6, 59.2)	11	**55.9** (52.5, 59.2)	
18	**46.0** (41.3, 50.7)	12	**54.7** (49.7, 59.7)	
19	**45.2** (39.7, 50.7)			
20	**42.0** (37.5, 46.5)			
21	**40.5** (35.8, 45.2)			
Females		**Females**		
12	**43.9** (39.6, 48.2)			
13	**46.9** (41.6, 52.2)			
14	**47.6** (42.7, 52.5)			
15	**44.0** (39.1, 48.9)	9	**51.3** (42.9, 59.8)	
16	**38.1** (33.6, 42.6)	10	**45.6** (38.3, 53.0)	
17	**37.1** (32.0, 42.2)	11	**31.0** (27.6, 34.3)	
18	**31.1** (25.6, 36.6)	12	**30.0** (25.1, 34.9)	
19	**26.4** (22.1, 30.7)			
20	**26.3** (22.0, 30.6)			
21	**23.2** (19.3, 27.1)			
Annual family income				
<$10,000	**36.4** (33.7, 39.1)			
$10,000–$19,999	**44.6** (41.9, 47.3)			
$20,000–$34,999	**46.5** (44.0, 49.1)			
$35,000–$49,999	**49.6** (46.7, 52.5)			
$50,000+	**51.4** (49.1, 53.8)			

Sources: Centers for Disease Control and Prevention, National Center for Health Statistics, NHIS-YRBS,1992 machine readable data file and documentation, 1993; Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, YRBS 1995 data tape (in press).

*A national household-based survey of youths aged 12–21 years.

†A national school-based survey of students in grades 9–12.

‡95% confidence intervals.

Table 5-12. Percentage of young people reporting participation in stretching activities during 3 or more of the 7 days preceding the survey, by demographic group, 1992 National Health Interview Survey-Youth Risk Behavior Survey (NHIS-YRBS) and 1995 Youth Risk Behavior Survey (YRBS), United States

Demographic group	1992 NHIS-YRBS*		1995 YRBS†	
Overall	**48.0**	(46.8, 49.2)‡	**53.0**	(49.9, 56.2)
Sex				
Males	**48.2**	(46.6, 49.8)	**55.5**	(52.3, 58.7)
Females	**47.9**	(46.3, 49.5)	**50.4**	(46.6, 54.3)
Race/Ethnicity				
White, non-Hispanic	**49.2**	(47.8, 50.6)	**55.1**	(50.8, 59.3)
Males	**48.0**	(46.0, 50.0)	**56.1**	(52.1, 60.1)
Females	**50.4**	(48.4, 52.4)	**53.9**	(48.2, 59.5)
Black, non-Hispanic	**40.7**	(38.0, 43.4)	**45.4**	(41.7, 49.0)
Males	**44.9**	(41.0, 48.8)	**50.5**	(45.0, 55.9)
Females	**36.5**	(32.8, 40.2)	**41.5**	(36.6, 46.3
Hispanic	**48.5**	(45.8, 51.2)	**49.1**	(45.0, 53.2)
Males	**49.9**	(46.0, 53.8)	**54.8**	(50.1, 59.6)
Females	**47.0**	(43.3, 50.7)	**43.5**	(37.6, 49.5)
Age (years)			**Grade in school**	
Males			**Males**	
12	**55.4**	(50.5, 60.3)		
13	**62.0**	(57.3, 66.7)		
14	**57.9**	(53.2, 62.6)		
15	**56.1**	(51.0, 61.2)	9	**65.7** (58.9, 72.6)
16	**54.0**	(48.7, 59.3)	10	**51.1** (47.8, 54.4)
17	**48.2**	(42.9, 53.5)	11	**52.9** (48.1, 57.6)
18	**36.2**	(31.1, 41.3)	12	**49.8** (42.0, 57.7)
19	**36.7**	(32.0, 41.4)		
20	**32.9**	(28.4, 37.4)		
21	**38.5**	(33.4, 43.6)		
Females			**Females**	
12	**62.5**	(58.0, 67.0)		
13	**62.5**	(57.2, 67.8)		
14	**61.6**	(56.7, 66.5)		
15	**57.9**	(53.0, 62.8)	9	**59.9** (52.8, 67.0)
16	**52.0**	(47.1, 56.9)	10	**55.8** (49.6, 61.9)
17	**42.0**	(37.1, 46.9)	11	**39.5** (33.7, 45.3)
18	**38.5**	(33.0, 44.0)	12	**38.4** (32.7, 44.1)
19	**33.1**	(28.0, 38.2)		
20	**33.9**	(29.6, 38.2)		
21	**35.0**	(30.9, 39.1)		
Annual family income				
< $10,000	**40.8**	(37.7, 43.9)		
$10,000–$19,999	**44.5**	(41.8, 47.2)		
$20,000–$34,999	**48.2**	(45.9, 50.6)		
$35,000–$49,999	**51.9**	(49.2, 54.6)		
$50,000+	**54.2**	(51.7, 56.8)		

Sources: Centers for Disease Control and Prevention, National Center for Health Statistics, NHIS-YRBS, 1992 machine readable data file and documentation, 1993; Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, YRBS 1995 data tape (in press).

*A national household-based survey of youths aged 12–21 years.

†A national school-based survey of students in grades 9–12.

‡95% confidence intervals.

Table 5-13. Percentage of young people reporting participation in walking or bicycling for 30 minutes or more during 5 or more of the 7 days preceding the survey, by demographic group, 1992 National Health Interview Survey-Youth Risk Behavior Survey (NHIS-YRBS) and 1995 Youth Risk Behavior Survey (YRBS), United States

Demographic group	1992 NHIS-YRBS*		1995 YRBS†
Overall	**26.4** (25.4, 27.4)‡		**21.1** (18.7, 23.5)
Sex			
Males	**29.1** (27.5, 30.7)		**21.6** (18.4, 24.8)
Females	**23.7** (22.3, 25.1)		**20.5** (17.8, 23.2)
Race/Ethnicity			
White, non-Hispanic	**25.1** (23.9, 26.3)		**18.3** (15.0, 21.6)
Males	**27.5** (25.7, 29.3)		**19.7** (15.5, 23.8)
Females	**22.7** (21.1, 24.3)		**16.8** (13.9, 19.8)
Black, non-Hispanic	**26.9** (24.6, 29.2)		**27.0** (23.2, 30.9)
Males	**29.8** (26.7, 32.9)		**27.2** (23.2, 31.2)
Females	**23.9** (20.2, 27.6)		**26.4** (20.8, 32.0)
Hispanic	**32.3** (29.8, 34.9)		**26.8** (22.6, 31.0)
Males	**35.5** (31.6, 39.4)		**26.0** (19.9, 32.1)
Females	**28.8** (25.5, 32.1)		**27.6** (23.8, 31.5)
Age (years)		**Grade in school**	
Males		**Males**	
12	**38.9** (34.6, 43.2)		
13	**37.3** (32.4, 42.2)		
14	**35.3** (31.2, 39.4)		
15	**33.9** (29.0, 38.8)	9	**27.9** (22.1, 33.7)
16	**29.9** (25.6, 34.2)	10	**21.7** (17.8, 25.6)
17	**22.2** (17.7, 26.7)	11	**19.2** (16.2, 22.1)
18	**23.3** (18.6, 28.0)	12	**17.7** (13.1, 22.3)
19	**21.3** (17.2, 25.4)		
20	**22.0** (17.9, 26.1)		
21	**23.3** (19.0, 27.6)		
Females		**Females**	
12	**32.2** (28.1, 36.3)		
13	**28.5** (24.0, 33.0)		
14	**28.7** (23.8, 33.6)		
15	**22.9** (18.8, 27.0)	9	**22.5** (18.5, 26.5)
16	**22.9** (18.8, 27.0)	10	**22.8** (18.5, 27.2)
17	**19.4** (15.5, 23.3)	11	**16.8** (13.3, 20.3)
18	**20.1** (16.0, 24.2)	12	**16.1** (11.6, 20.6)
19	**18.8** (14.5, 23.1)		
20	**20.8** (16.7, 24.9)		
21	**22.1** (18.4, 25.8)		
Annual family income			
< $10,000	**27.8** (25.1, 30.5)		
$10,000–$19,999	**29.5** (26.8, 32.2)		
$20,000–$34,999	**27.6** (25.2, 30.0)		
$35,000–$49,999	**25.5** (23.2, 27.9)		
$50,000+	**23.5** (21.5, 25.5)		

Sources: Centers for Disease Control and Prevention, National Center for Health Statistics, NHIS-YRBS, 1992 machine readable data file and documentation, 1993; Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, YRBS 1995 data tape (in press).

*A national household-based survey of youths aged 12–21 years.

†A national school-based survey of students in grades 9–12.

‡95% confidence intervals.

Table 5-14. Percentage of young people reporting participation in selected physical activities during 1 or more of the 7 days preceding the survey, by demographic group, 1992 National Health Interview Survey-Youth Risk Behavior Survey (NHIS-YRBS),* United States

Demographic group	Aerobics or dancing	Baseball, softball, or Frisbee®	Basketball, football, or soccer
Overall	**38.2** (37.1, 39.2)†	**22.4** (21.4, 23.4)	**45.8** (44.6, 47.1)
Sex			
Males	**22.6** (21.3, 24.0)	**27.2** (25.7, 28.8)	**61.7** (60.1, 63.3)
Females	**53.9** (52.4, 55.5)	**17.5** (16.4, 18.7)	**29.7** (28.2, 31.3)
Race/Ethnicity			
White, non-Hispanic	**35.0** (33.7, 36.2)	**23.6** (22.3, 24.9)	**44.7** (43.1, 46.2)
Black, non-Hispanic	**49.4** (46.6, 52.1)	**16.6** (14.3, 18.9)	**49.5** (46.7, 52.3)
Hispanic	**42.0** (39.0, 45.0)	**23.4** (21.1, 25.7)	**47.1** (44.4, 49.8)
Age (years)			
Males			
12	**26.9** (22.5, 31.2)	**46.4** (41.6, 51.3)	**81.2** (77.4, 85.0)
13	**23.4** (19.6, 27.3)	**40.6** (35.8, 45.3)	**84.3** (80.8, 87.9)
14	**22.0** (18.4, 25.7)	**40.9** (36.6, 45.2)	**78.5** (74.3, 82.6)
15	**21.9** (17.7, 26.1)	**25.6** (21.0, 30.3)	**76.7** (72.5, 81.0)
16	**24.5** (20.2, 28.9)	**27.4** (22.9, 31.9)	**69.6** (64.5, 74.6)
17	**20.8** (16.8, 24.6)	**22.5** (18.1, 26.9)	**59.3** (54.2, 64.3)
18	**19.0** (14.9, 23.1)	**20.8** (16.3, 25.2)	**54.6** (49.1, 60.0)
19	**24.0** (19.6, 28.4)	**17.5** (13.8, 21.2)	**43.8** (38.5, 49.0)
20	**21.2** (17.2, 25.2)	**17.0** (13.3, 20.8)	**38.5** (33.9, 43.2)
21	**21.4** (17.2, 25.7)	**15.6** (12.1, 19.1)	**32.4** (27.6, 37.1)
Females			
12	**63.1** (58.7, 67.5)	**37.9** (33.4, 42.5)	**62.6** (57.6, 67.6)
13	**63.7** (59.5, 67.9)	**30.3** (26.2, 34.3)	**61.6** (56.9, 66.3)
14	**63.7** (59.0, 68.3)	**29.1** (24.7, 33.5)	**51.9** (46.8, 57.1)
15	**62.0** (57.5, 66.4)	**22.6** (18.3, 26.9)	**41.6** (37.2, 46.1)
16	**55.7** (50.5, 60.9)	**16.0** (12.3, 19.6)	**28.0** (23.3, 32.6)
17	**54.0** (48.8, 59.2)	**10.2** (7.4, 13.1)	**23.4** (19.0, 27.7)
18	**50.3** (45.2, 55.5)	**11.4** (7.3, 15.4)	**13.8** (10.2, 17.4)
19	**44.8** (39.1, 50.4)	**6.9** (4.4, 9.3)	**8.5** (6.0, 11.0)
20	**40.7** (36.2, 45.2)	**7.6** (4.8, 10.4)	**6.9** (4.7, 9.1)
21	**45.6** (41.0, 50.2)	**8.4** (5.9, 10.9)	**7.5** (5.2, 9.8)

white or black youths (32.3 percent vs. 25.1 percent and 26.9 percent, respectively). Walking or bicycling decreased as age increased and was more prevalent in the fall than in other seasons.

In the 1995 YRBS, 21.1 percent of students in grades 9–12 reported having walked or bicycled for 30 minutes or more on at least 5 of the 7 days preceding the survey (Table 5-13). Male and female students reported similar prevalences of these activities. Black and Hispanic students were more likely than white students to have walked or bicycled (27.0 percent and 26.8 percent, respectively, vs. 18.3 percent). Between 1993 and 1995, the overall prevalence among students in grades 9–12 did not change significantly (data not shown).

It thus appears that the *Healthy People 2000* objective for light to moderate physical activity has not been attained by adolescents and young adults.

The 1992 NHIS-YRBS provided information on participation in seven additional types of physical

Table 5-14. *Continued*

House cleaning or yard work for ≥ 30 minutes	Running, jogging, or swimming	Skating, skiing, or skateboarding	Tennis, raquetball, or squash
82.8 (81.7, 83.8)	**55.3** (54.1, 56.6)	**13.3** (12.5, 14.0)	**10.5** (9.8, 11.2)
78.1 (76.6, 79.5)	**57.6** (55.9, 59.3)	**15.9** (14.8, 17.0)	**11.7** (10.7, 12.8)
87.5 (86.3, 88.7)	**53.0** (51.4, 54.7)	**10.6** (9.6, 11.5)	**9.3** (8.4, 10.2)
83.1 (81.9, 84.3)	**55.8** (54.3, 57.3)	**15.2** (14.2, 16.2)	**11.4** (10.6, 12.3)
84.2 (81.9, 86.5)	**52.4** (49.5, 55.3)	**9.0** (7.3, 10.8)	**5.4** (4.2, 6.6)
80.1 (77.9, 82.4)	**53.6** (50.9, 56.4)	**9.8** (8.2, 11.5)	**8.0** (6.7, 9.4)
76.9 (72.9, 81.0)	**72.8** (68.3, 77.3)	**32.5** (27.8, 37.3)	**14.4** (10.8, 18.0)
83.3 (80.1, 86.5)	**74.3** (70.1, 78.4)	**26.2** (22.1, 30.3)	**13.3** (10.3, 16.4)
79.4 (75.5, 83.4)	**71.2** (66.8, 75.6)	**20.7** (16.9, 24.5)	**14.5** (11.3, 17.8)
82.9 (79.3, 86.5)	**70.8** (66.5, 75.1)	**19.9** (15.9, 23.9)	**15.3** (11.7, 18.9)
79.6 (75.7, 83.6)	**63.4** (58.8, 68.1)	**13.4** (10.0, 16.8)	**10.4** (7.4, 13.3)
78.7 (74.5, 82.9)	**55.3** (49.9, 60.7)	**12.2** (8.6, 15.7)	**11.3** (8.0, 14.6)
70.9 (65.9, 75.9)	**47.4** (42.2, 52.5)	**9.4** (6.3, 12.4)	**11.6** (8.3, 14.9)
75.0 (69.6, 80.4)	**46.3** (41.3, 51.2)	**10.8** (7.7, 14.0)	**9.9** (6.9, 12.8)
74.4 (70.3, 78.5)	**34.4** (29.9, 38.9)	**8.6** (6.1, 11.2)	**8.2** (5.5, 10.8)
77.6 (73.7, 81.5)	**39.8** (34.1, 45.5)	**5.9** (3.8, 7.9)	**9.5** (6.5, 12.5)
88.0 (84.8, 91.2)	**80.5** (76.4, 84.5)	**24.9** (20.5, 29.3)	**13.9** (10.5, 17.3)
88.1 (85.1, 91.1)	**76.2** (72.1, 80.3)	**19.7** (16.1, 23.4)	**12.4** (9.2, 15.6)
87.2 (83.9, 90.4)	**72.9** (68.6, 77.2)	**14.8** (11.6, 18.0)	**13.0** (10.0, 15.9)
88.5 (85.3, 91.7)	**65.4** (60.7, 70.1)	**10.0** (7.0, 12.9)	**16.1** (12.6, 19.6)
89.1 (85.7, 92.5)	**59.7** (54.8, 64.6)	**8.9** (6.2, 11.7)	**11.1** (8.0, 14.2)
86.0 (82.6, 89.4)	**49.0** (43.5, 54.4)	**4.8** (2.7, 6.8)	**8.0** (5.4, 10.5)
87.0 (83.4, 90.5)	**41.5** (35.8, 47.3)	**8.1** (5.5, 10.7)	**6.9** (4.4, 9.5)
82.6 (78.1, 87.1)	**32.9** (27.8, 38.0)	**6.6** (4.1, 9.1)	**3.8** (2.1, 5.4)
87.1 (83.0, 91.2)	**30.8** (25.8, 35.7)	**5.8** (3.5, 8.0)	**5.8** (3.6, 8.0)
89.8 (86.2, 93.4)	**30.3** (26.0, 34.6)	**4.8** (3.1, 6.6)	**4.1** (2.2, 5.9)

Source: Centers for Disease Control and Prevention, National Center for Health Statistics, NHIS-YRBS, 1992 machine readable data file and documentation, 1993.

*A national household-based survey of youths aged 12–21 years.

†95% confidence intervals.

activity during 1 or more of the 7 days preceding the survey: aerobics or dancing; baseball, softball, or Frisbee®[1]; basketball, football, or soccer; house cleaning or yard work for at least 30 minutes; running, jogging, or swimming for exercise; skating, skiing, or skateboarding; and tennis, racquetball, or squash (Table 5-14). Among 12- through 21-year-olds, males were more likely than females to participate in baseball, softball, or Frisbee®; in basketball, football, or soccer; in running, jogging, or swimming for exercise; in skating, skiing, or skateboarding; and in tennis, racquetball, or squash.

[1]Use of trade names is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

Table 5-15. Percentage of students in grades 9–12 reporting enrollment in physical education class, daily attendance in physical education class, and participation in exercise or sports for at least 20 minutes during an average physical education class, by demographic group, 1995 Youth Risk Behavior Survey (YRBS),* United States

Demographic group	Enrolled in physical education	Attended physical education daily	Exercised or played sports ≥ 20 minutes per class†
Overall	**59.6** (48.6, 70.5)‡	**25.4** (15.8, 34.9)	**69.7** (66.4, 72.9)
Sex			
Males	**62.2** (52.5, 71.8)	**27.0** (16.8, 37.2)	**74.8** (71.8, 77.8)
Females	**56.8** (44.1, 69.6)	**23.5** (14.5, 32.4)	**63.7** (59.3, 68.1)
Race/Ethnicity			
White, non-Hispanic	**62.9** (49.8, 76.1)	**21.7** (9.9, 33.5)	**71.3** (67.0, 75.6)
Males	**64.2** (52.6, 75.8)	**23.3** (11.2, 35.3)	**74.8** (71.1, 78.5)
Females	**61.7** (46.4, 77.0)	**19.9** (8.0, 31.8)	**67.1** (60.5, 73.8)
Black, non-Hispanic	**50.2** (45.1, 55.3)	**33.8** (29.9, 37.8)	**59.0** (54.6, 63.3)
Males	**56.8** (50.6, 62.9)	**37.7** (32.3, 43.0)	**71.8** (65.9, 77.8)
Females	**44.4** (37.3, 51.5)	**30.1** (25.8, 34.5)	**46.6** (39.3, 53.8)
Hispanic	**51.0** (40.9, 61.2)	**33.1** (24.5, 41.8)	**68.5** (62.8, 74.1)
Males	**57.6** (48.6, 66.6)	**36.2** (28.8, 43.6)	**76.0** (67.0, 85.0)
Females	**44.6** (31.2, 58.0)	**30.1** (18.7, 41.5)	**59.0** (52.5, 65.6)
Grade in school			
Males			
9	**80.5** (75.1, 85.9)	**42.1** (23.3, 60.8)	**76.5** (72.2, 80.9)
10	**72.6** (62.3, 82.8)	**34.8** (18.9, 50.8)	**73.1** (67.9, 78.3)
11	**51.5** (32.8, 70.1)	**17.4** (9.3, 25.6)	**75.8** (70.3, 81.2)
12	**45.4** (29.0, 61.9)	**14.8** (9.2, 20.4)	**73.7** (68.1, 79.3)
Females			
9	**80.8** (73.8, 87.8)	**39.7** (21.5, 58.0)	**65.6** (57.2, 74.1)
10	**71.4** (59.3, 83.5)	**33.8** (17.4, 50.3)	**63.9** (58.8, 68.9)
11	**41.2** (22.8, 59.6)	**12.3** (7.6, 17.1)	**57.2** (48.4, 66.0)
12	**39.1** (20.9, 57.2)	**11.1** (6.5, 15.7)	**66.0** (59.7, 72.4)

Source: Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, YRBS 1995 data tape (in press).

*A national school-based survey of students in grades 9–12.

†Among students enrolled in physical education.

‡95% confidence intervals.

Females were more likely than males to participate in aerobics or dancing and in house cleaning or yard work for at least 30 minutes. White youths were more likely than black or Hispanic youths to participate in skating, skiing, or skateboarding and in tennis, racquetball, or squash. For both males and females, increasing age was associated with decreasing participation in baseball, softball, or Frisbee®; in basketball, football, or soccer; in running, jogging, or swimming for exercise; and in skating, skiing, or skateboarding. For females, participation in aerobics or dancing and in tennis, racquetball, or squash also decreased by age.

Physical Education in High School

The YRBS provides data on enrollment and daily attendance in school physical education for students in grades 9–12. (See Chapter 6 for a discussion of the availability of physical education programs.) In 1995,

Table 5-16. Percentage of students in grades 9–12 reporting participation on at least one sports team run by a school or by other organizations during the year preceding the survey, by demographic group, 1995 Youth Risk Behavior Survey (YRBS),* United States

Demographic group	Participation on sports team run by a school	Participation on sports team run by other organization
Overall	**50.3** (46.6, 54.0)†	**36.9** (34.4, 39.4)
Sex		
Males	**57.8** (53.7, 62.0)	**46.4** (43.4, 49.3)
Females	**42.4** (38.6, 46.2)	**26.8** (24.2, 29.4)
Race/Ethnicity		
White, non-Hispanic	**53.9** (49.6, 58.2)	**39.1** (35.7, 42.5)
Males	**59.9** (54.8, 65.0)	**47.2** (43.0, 51.4)
Females	**47.1** (43.0, 51.2)	**29.9** (26.8, 32.9)
Black, non-Hispanic	**45.0** (39.9, 50.2)	**32.4** (29.0, 35.9)
Males	**57.9** (52.6, 63.2)	**46.8** (42.4, 51.1)
Females	**34.9** (28.2, 41.7)	**21.1** (16.5, 25.8)
Hispanic	**37.8** (33.6, 42.0)	**32.0** (28.5, 35.6)
Males	**48.6** (44.0, 53.2)	**43.2** (37.9, 48.4)
Females	**27.3** (21.9, 32.7)	**21.2** (16.5, 25.9)
Grade in school		
Males		
9	**61.7** (54.0, 69.4)	**52.8** (47.0, 58.7)
10	**55.6** (50.1, 61.1)	**46.9** (42.4, 51.4)
11	**56.0** (49.7, 62.4)	**43.1** (40.6, 45.7)
12	**58.3** (52.0, 64.6)	**42.8** (39.2, 46.3)
Females		
9	**43.7** (39.2, 48.2)	**32.0** (28.2, 35.9)
10	**47.9** (42.8, 53.0)	**32.4** (26.8, 38.0)
11	**39.4** (32.1, 46.7)	**23.8** (19.9, 27.6)
12	**38.8** (32.4, 45.1)	**19.8** (15.2, 24.3)

Source: Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, YRBS 1995 data tape (in press).

*A national school-based survey of students in grades 9–12.
†95% confidence intervals.

59.6 percent of students in grades 9–12 were enrolled in physical education (Table 5-15). Enrollment did not vary by sex or race/ethnicity, but it decreased by grade. Between 1991 and 1995, overall enrollment in physical education among students in grades 9–12 did not change significantly (data not shown).

Healthy People 2000 objective 1.8 (USDHHS 1990) recommends increasing to at least 50 percent the proportion of children and adolescents in grades 1–12 who participate in daily school physical education. The 1995 YRBS indicated that daily attendance in physical education among high school students was 25.4 percent and did not vary by sex or race/ethnicity (Table 5-15). Daily attendance decreased with increasing grade for both male and female students. Between 1991 and 1995, overall daily attendance in physical education classes in grades 9–12 decreased significantly, from 41.6 percent to 25.4 percent (data not shown). Current trend data thus indicate that the *Healthy People 2000* goal of 50 percent has not been attained and is also becoming more distant.

Healthy People 2000 objective 1.9 (USDHHS 1990) recommends that students be active for at

least 50 percent of the class time they spend in physical education. In 1995, 69.7 percent of students in grades 9–12 who were taking physical education reported being physically active for at least 20 minutes, which is about half of a typical class period (Table 5-15). This active participation was more common among male students than female students (74.8 percent vs. 63.7 percent) and among white students than black students (71.3 percent vs. 59.0 percent). Between 1991 and 1995, the overall percentage of students in grades 9–12 taking physical education who reported being physically active for at least 20 minutes decreased from 80.7 percent to 69.7 percent (data not shown). Decreases between 1991 or 1993 and 1995 occurred for students in all grades. Thus a decreasing proportion of the high school students who are enrolled in physical education classes are meeting the *Healthy People 2000* goal for time spent being physically active in class.

Only 18.6 percent of all high school students were physically active for at least 20 minutes on a daily basis in physical education classes (data not shown).

Sports Team Participation

The YRBS provides data on participation on sports teams during the 12 months preceding the survey for students in grades 9–12. In 1995, 50.3 percent of students participated on sports teams run by a school, and 36.9 percent participated on sports teams run by other organizations (Table 5-16). Participation on sports teams run by a school was more common among male students than female students (57.8 percent vs. 42.4 percent) and among white students than Hispanic students (53.9 percent vs. 37.8 percent). Between 1991 and 1995, participation on sports teams run by a school increased significantly among high school students overall, from 43.5 percent to 50.3 percent (data not shown). Specific increases were identified among female students, white and black students, and students in grades 11 and 12.

Participation on sports teams run by other organizations besides a school was more common among male students than female students (46.4 percent vs. 26.8 percent) and among white students than Hispanic students (39.1 percent vs. 32.0 percent). Between 1991 and 1995, overall participation among students in grades 9–12 on sports teams run by other organizations did not change significantly (data not shown).

Conclusions

Adults

1. Approximately 15 percent of U.S. adults engage regularly (3 times a week for at least 20 minutes) in vigorous physical activity during leisure time.
2. Approximately 22 percent of adults engage regularly (5 times a week for at least 30 minutes) in sustained physical activity of any intensity during leisure time.
3. About 25 percent of adults report no physical activity in their leisure time.
4. Physical inactivity is more prevalent among women than men, among blacks and Hispanics than whites, among older than younger adults, and among the less affluent than the more affluent.
5. The most popular leisure-time physical activities among adults are walking and gardening or yard work.

Adolescents and Young Adults

1. Only about one-half of U.S. young people (ages 12–21 years) regularly participate in vigorous physical activity. One-fourth report no vigorous physical activity.
2. Approximately one-fourth of young people walk or bicycle (i.e., engage in light to moderate activity) nearly every day.
3. About 14 percent of young people report no recent vigorous or light to moderate physical activity. This indicator of inactivity is higher among females than males and among black females than white females.
4. Males are more likely than females to participate in vigorous physical activity, strengthening activities, and walking or bicycling.
5. Participation in all types of physical activity declines strikingly as age or grade in school increases.

6. Among high school students, enrollment in physical education remained unchanged during the first half of the 1990s. However, daily attendance in physical education declined from approximately 42 percent to 25 percent.
7. The percentage of high school students who were enrolled in physical education and who reported being physically active for at least 20 minutes in physical education classes declined from approximately 81 percent to 70 percent during the first half of this decade.
8. Only 19 percent of all high school students report being physically active for 20 minutes or more in daily physical education classes.

Research Needs

1. Develop methods to monitor patterns of regular, moderate physical activity.
2. Improve the validity and comparability of self-reported physical activity in national surveys.
3. Improve methods for identifying and tracking physical activity patterns among people with disabilities.
4. Routinely monitor the prevalence of physical activity among children under age 12.
5. Routinely monitor school policy requirements and of students' participation in physical education classes in elementary, middle, and high schools.

Appendix A: Sources of National Survey Data

National Health Interview Survey (NHIS)

This analysis used data from the 1991 NHIS to determine current prevalences of physical activity, and from 1985, 1990, and 1991 to determine physical activity trends, among U.S. adults aged 18 years and older (National Center for Health Statistics [NCHS] 1988, 1993; NCHS unpublished data). Since 1957, NCHS has been collecting year-round health data from a probability sample of the civilian, noninstitutionalized adult population of the United States. The design included oversampling of blacks to provide more precise estimates. For the 1985, 1990, and 1991 special supplement on health promotion and disease prevention, one adult aged 18 years or older was randomly selected from each family for participation from the total NHIS sample. Interviews were conducted in the homes; self-response was required for this special supplement, and callbacks were made as necessary. The sample was poststratified by the age, sex, and racial distribution of the U.S. population for the survey year and weighted to provide national estimates. The overall response rate for the NHIS has been 83 to 88 percent.

Behavioral Risk Factor Surveillance System (BRFSS)

The Centers for Disease Control and Prevention (CDC) initiated the BRFSS in 1981 to help states obtain prevalence estimates of health behaviors, including physical activity, that were associated with chronic disease. The BRFSS conducts monthly, year-round, telephone interviews of adults aged 18 years of age and older sampled by random-digit dialing (Remington et al. 1988; Siegel et al. 1991; Frazier, Franks, Sanderson 1992). Physical activity questions have been consistent since 1986, except for a minor change from 1986 to 1987. In 1994, the most recent survey available, 49 states and the District of Columbia participated. Only 25 states and the District of Columbia have participated continuously since 1986. For 1986–1991, sample sizes ranged from approximately 35,000 to 50,000, and response rates from 62 to 71 percent; for 1992, the sample size was 96,343, and the response rate 71 percent; for 1994, the sample size was 106,030, and the response rate

70 percent. For examination of trends, analysis was restricted to the 25 states and the District of Columbia, that had consistently participated from 1986 through 1994. For 1992 cross-sectional analyses, data were included from all 48 states that had participated that year and from the District of Columbia. For 1994 cross-sectional analyses, data were included from the 49 participating states and from the District of Columbia.

Third National Health and Nutrition Examination Survey (NHANES III)

NHANES III is the seventh in a series of national health examination surveys that began in the 1960s. The sample for NHANES III (NCHS 1994a) was selected from 81 counties across the United States. The survey period covered 1988–1994 and consisted of two phases of equal length and sample size. Both Phase I (1988–1991) and Phase II (1992–1994) used probability samples of the U.S. civilian noninstitutionalized population. Black and Mexican American populations were oversampled to obtain statistically reliable estimates for these minority groups. Phase II data were not available at the time this report was prepared. In Phase I, the selected population was 12,138 adults 18 years of age or older, of which 82 percent (9,901) underwent a home interview that included questions on physical activity. Participants in NHANES III also underwent a detailed medical examination in a mobile examination center. NHANES III data were weighted to the 1990 U.S. civilian noninstitutionalized population to provide national estimates.

Youth Risk Behavior Survey (YRBS)

The CDC developed the YRBS (Kolbe 1990; Kolbe, Kann, Collins 1993) to measure six categories of priority health-risk behaviors among adolescents: 1) behaviors that contribute to intentional and unintentional injuries; 2) tobacco use; 3) alcohol and other drug use; 4) sexual behaviors that result in unintended pregnancy and sexually transmitted diseases, including HIV infection; 5) unhealthy dietary behaviors; and 6) physical inactivity. Data were collected through national, state, and local school-based surveys of high school students in grades 9–12 during the spring of odd-numbered years and through a 1992 national household-based survey of young people aged 12 –21 years. The 1991, 1993, and 1995 national school-based YRBS (Kann et al. 1993; CDC unpublished data) used three-stage cluster sample designs. The targeted population consisted of all public and private school students in grades 9–12 in the 50 states and the District of Columbia. Schools with substantial numbers of black and Hispanic students were sampled at relatively higher rates than all other schools.

Survey procedures were designed to protect student privacy and allow anonymous participation. The questionnaire was administered in the classroom by trained data collectors, and students recorded their responses on answer sheets designed for scanning by computer. The school response rates ranged from 70 to 78 percent, and the student response rate ranged from 86 to 90 percent. The total number of students who completed questionnaires was 12,272 in 1991, 16,296 in 1993, and 10,904 in 1995. The data were weighted to account for nonresponse and for oversampling of black and Hispanic students.

National Health Interview Survey-Youth Risk Behavior Survey (NHIS-YRBS)

To provide more information about risk behaviors among young people, including those who do not attend school, the CDC added a youth risk behavior survey to the 1992 National Health Interview Survey (CDC 1993; NCHS 1994b). The survey was conducted as a follow-back from April 1992 through March 1993 among 12- through 21-year-olds from a national probability sample of households. School-aged youths not attending school were oversampled. NHIS-YRBS interviews were completed for 10,645 young people, representing an overall response rate of 74 percent.

The questionnaire for this survey was administered through individual portable cassette players with earphones. After listening to questions, respondents marked their answers on standardized answer sheets. This methodology was designed to help young people with reading problems complete the survey and to enhance confidentiality during household administration. Data from this report were weighted to represent the U.S. population of 12- through 21-year-olds.

Appendix B: Measures of Physical Activity in Population Surveys

There is no uniformly accepted method of assessing physical activity. Various methods have been used (Stephens 1989); unfortunately, estimates of physical activity are highly dependent on the survey instrument. The specific problems associated with using national surveillance systems—such as those employed here—to monitor leisure-time physical activity have been reviewed previously (Caspersen, Merritt, Stephens 1994).

All of the population surveys cited have employed a short-term recall of the frequency, and in some cases the duration and intensity, of activities that either were listed for the participant to respond to or were probed for in an open-ended manner. The validity of these questions is not rigorously established. Estimates of prevalence of participation are influenced by sampling errors, seasons covered, and the number and wording of such questions; generally, the more activities offered, the more likely a participant will report some activity. Besides defining participation in any activity or in individual activities, many researchers have found it useful to define summary indices of regular participation in vigorous activity or moderate activity (Caspersen 1994; Caspersen, Merritt, Stephens 1994). These summary measures often require assumptions about the intensity of reported activities and the frequency and duration of physical activity required for health benefits.

National Health Interview Survey (NHIS)

Participants in the NHIS were asked in a standardized interview whether they did any of 22 exercises, sports, or physically active hobbies in the previous 2 weeks: walking for exercise, jogging or running, hiking, gardening or yard work, aerobics or aerobic dancing, other dancing, calisthenics or general exercise, golf, tennis, bowling, bicycling, swimming or water exercises, yoga, weight lifting or training, basketball, baseball or softball, football, soccer, volleyball, handball or racquetball or squash, skating, and skiing (National Center for Health Statistics [NCHS] 1992). They were also asked, in an open-ended fashion, for other unmentioned activities performed in the previous 2 weeks. For each activity, the interviewer asked the number of times, the average minutes duration, and the perceived degree to which heart rate or breathing increased (i.e., none or small, moderate, or large).

The physical activity patterns were scored by using data for frequency and duration derived directly from the NHIS. To estimate the regular, vigorous physical activity pattern, a previously proposed convention was followed (Caspersen, Pollard, Pratt 1987). One of two sex-specific regression equations was used to estimate the respondent's maximum cardiorespiratory capacity (expressed in metabolic equivalents [METs]) (Jones and Campbell 1982): [60–0.55 • age (years)]/3.5 for men, and [48–0.37 • age (years)]/3.5 for women. One MET is the value of resting oxygen uptake relative to total body mass and is generally ascribed the value of 3.5 milliliters of oxygen per kilogram of body mass per minute (for example, 3 METs equals 3 times the resting level; walking at 3 miles per hour on a level surface would be at about that intensity). Individual activity intensity was based on reported values (Taylor et al. 1978; Folsom et al. 1985; Stephens and Craig 1989).

The final activity intensity code for a specific activity was found by selecting one of three conditions corresponding to the perceived level of effort associated with usual participation. The perceived effort was associated with none or small, moderate, or large perceived increases in heart rate or breathing. For example, the activity intensity code for three levels of volleyball participation would be 5, 6, and 8 METs as the perceived effort progressed from none or small to large increases in heart rate or breathing. In some cases, a single intensity code was averaged for several types of activity participation that were not distinguished in the NHIS. This averaging was done for such activities as golf, calisthenics or general exercise, swimming or water exercises, skating, and skiing. To determine if an activity would qualify a person to meet the intensity criterion of vigorous physical activity, each intensity code had to meet or exceed 50 percent of the estimated age- and sex-specific maximum cardiorespiratory capacity.

For this report, three patterns of leisure-time activity were defined (Caspersen 1994):

- *No physical activity:* No reported activity during the previous 2 weeks.
- *Regular, sustained activity:* ≥ 5 times per week and ≥ 30 minutes per occasion of physical activity of any type and at any intensity.
- *Regular, vigorous activity:* ≥ 3 times per week and ≥ 20 minutes per occasion of physical activity involving rhythmic contractions of large muscle groups (e.g., jogging or running, racquet sports, competitive group sports) performed at ≥ 50 percent of estimated age- and sex-specific maximum cardiorespiratory capacity.

Behavioral Risk Factor Surveillance System (BRFSS)

The BRFSS questionnaire first asks, "During the past month, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?" If yes, participants were asked to identify their two most common physical activities and to indicate the frequency in the previous month and duration per occasion (Caspersen and Powell 1986; Caspersen and Merritt 1995). If running, jogging, walking, or swimming were mentioned, participants were also asked the usual distance covered.

The reported frequency and duration of activity were used for scoring. Intensity of physical activity was assigned by using the same intensity codes as the NHIS, and a correction procedure (explained later in this section) based on speeds of activities was used to create intensity codes for walking, running/jogging, and swimming (Caspersen and Powell 1986; Caspersen and Merritt 1995).

The estimate of speed was made by dividing the self-reported distance in miles by the duration in hours. The speed estimate was entered into specific regression equations to refine the intensity code for these four activities, because the application of a single intensity code is likely to underestimate or overestimate the intensity. Based on previously published formulae (American College of Sports Medicine 1988), five equations were constructed for predicting metabolic intensity of walking, jogging, and running at various calculated speeds:

Equation 1 METs = 1.80
(Speeds < 0.93 mph)

Equation 2 METs = 0.72 x mph + 1.13
(Speeds ≥ 0.93 but < 3.75 mph)

Equation 3 METs = 3.76 x mph - 10.20
(Speeds ≥ 3.75 but < 5.00 mph)

Equation 4 METs = 1.53 x mph + 1.03
(Speeds ≥ 5.00 but < 12.00 mph)

Equation 5 METs = 7.0 or 8.0
(Speeds ≥ 12.00 mph)

Below 0.93 mph, an intensity code of 1.8 METs (Equation 1) was used, to be consistent with Montoye's intensity code for residual activities like those associated with slow movements (Montoye 1975). Equation 2 is extrapolated to include speeds as slow as 0.93 mph—the point at which metabolic cost was set at 1.8 METs. Persons whose calculated speeds fell between 0.93 and 12.0 mph were assigned an intensity from equations 2, 3, or 4, regardless of whether they said they walked, jogged, or ran. Equation 3 was created by simply connecting with a straight line the last point of equation 2 and the first point of equation 4. This interpolation was seen as a reasonable way to determine intensity within the range of speed where walking or jogging might equally occur. This assignment method was considered to be more objective, specific, and generally conservative than assigning an intensity code based solely on the self-reported type of activity performed. Thus, as a correction procedure for self-reported speeds judged likely to be erroneously high, an intensity of 2.5 METs was assigned for walking speeds above 5.0 mph, 7.0 METs for jogging speeds above 12.0 mph, and 8.0 METs for running speeds above 12.0 mph.

Another set of regression equations predicted metabolic intensity from swimming velocity:

Equation 6 METs = 1.80
(Speeds < 0.26 mph)

Equation 7 METs = 4.19 x mph - 0.69
(Speeds ≥ 0.26 but < 2.11 mph)

Equation 8 METs = 8.81 x mph - 9.08
(Speeds ≥ 2.11 but < 3.12 mph)

Equation 9 METs = 5.50
(Speeds ≥ 3.12 mph)

These equations were set forth in a Canadian monograph of energy expenditure for recreational activities (Groupe d'étude de Kino-Quebec sur le système de quantification de la dépense énergétique 1984). However, swimming speeds up to 3.12 mph for the crawl and backstroke, in the derivation of equations 7 and 8, were obtained from published research (Holmer 1974a; Holmer 1974b; Passmore and Durnin 1955). Default intensity codes were assigned as follows: 1.8 METs for swimming speeds less than 0.26 mph, and 5.5 METs for velocities greater than 3.12 mph, because such speeds are improbable and likely reflected errors in self-report.

Definitions used for leisure-time physical activity were the same as those described for the NHIS earlier in this appendix.

Third National Health and Nutrition Examination Survey (NHANES III)

The NHANES III questions that addressed leisure-time physical activity (NCHS 1994a) were adapted from the NHIS. Participants first were asked how often they had walked a mile or more at one time in the previous month. They were then asked to specify their frequency of leisure-time physical activity during the previous month for the following eight activities: jogging or running, riding a bicycle or an exercise bicycle, swimming, aerobics or aerobic dancing, other dancing, calisthenics or exercises, gardening or yard work, and weight lifting. An open-ended question asked for information on up to four physical activities not previously listed. Information on duration of physical activity was not collected. Northern sites selected for NHANES III tended to be surveyed in warm rather than cold months, which might have led to a greater prevalence of reported physical activity than would otherwise be obtained from a year-round survey. No physical activity was defined as no reported leisure-time physical activity in the previous month. Regular, sustained activity and regular, vigorous activity were not defined for NHANES III because of the lack of information on activity duration.

Youth Risk Behavior Survey (YRBS)

In the YRBS questionnaire (Kann et al. 1993), students in grades 9–12 were asked eight questions about physical activity. The question on vigorous physical activity asked, "On how many of the past 7 days did you exercise or participate in sports activities for at least 20 minutes that made you sweat and breathe hard, such as basketball, jogging, fast dancing, swimming laps, tennis, fast bicycling, or similar aerobic activities?" The questionnaire asked separately about the frequency of three specific activities in the previous 7 days: 1) stretching exercises, such as toe touching, knee bending, or leg stretching; 2) exercises to strengthen or tone the muscles, such as push-ups, sit-ups, or weight lifting; and 3) walking or bicycling for at least 30 minutes at a time. Participants were asked about physical education, "In an average week when you are in school, on how many days do you go to physical education (PE) classes?" and "During an average physical education (PE) class, how many minutes do you spend actually exercising or playing sports?" Students were also asked, "During the past 12 months, on how many sports teams run by your school did you play? (Do not include PE classes.)" and "During the past 12 months, on how many sports teams run by organizations outside of your school did you play?"

National Health Interview Survey-Youth Risk Behavior Survey (NHIS-YRBS)

The NHIS-YRBS questionnaire (NCHS 1994b) ascertained the frequency of vigorous physical activity among U.S. young people aged 12–21 years by asking, "On how many of the past 7 days did you exercise or take part in sports that made you sweat and breathe hard, such as basketball, jogging, fast dancing, swimming laps, tennis, fast bicycling, or other aerobic activities?" Ten other questions asked about the previous 7 days' frequency of participating in the following specific activities: 1) stretching exercises, such as toe touching, knee bending, or leg stretching; 2) exercises to strengthen or tone muscles, such as push-ups, sit-ups, or weight lifting; 3) house cleaning or yard work for ≥ 30 minutes at a time; 4) walking or bicycling for ≥ 30 minutes at a time; 5) baseball, softball, or Frisbee®[1]; 6) basketball, football, or soccer; 7) roller skating, ice skating, skiing, or skateboarding; 8) running, jogging, or swimming for exercise; 9) tennis, racquetball, or squash; and 10) aerobics or dance. Questions about duration and intensity were not asked.

[1]Use of trade names is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

References

American College of Sports Medicine. *Guidelines for exercise testing and prescription*. 3rd ed. Philadelphia: Lea and Febiger, 1988:168–169.

Brener ND, Collins JL, Kann L, Warren CW, Williams BI. Reliability of the Youth Risk Behavior Survey questionnaire. *American Journal of Epidemiology* 1995;141:575–580.

Caspersen CJ. What are the lessons from the U.S. approach for setting targets. In: Killoran AJ, Fentem P, Caspersen C, editors. *Moving on: international perspectives on promoting physical activity*. London: Health Education Authority, 1994:35–55.

Caspersen CJ, Merritt RK. Physical activity trends among 26 states, 1986–1990. *Medicine and Science in Sports and Exercise* 1995;27:713–720.

Caspersen CJ, Merritt RK, Stephens T. International physical activity patterns: a methodological perspective. In: Dishman RK, editor. *Advances in exercise adherence*. Champaign, IL: Human Kinetics, 1994: 73–110.

Caspersen CJ, Pollard RA, Pratt SO. Scoring physical activity data with special consideration for elderly populations. In: Data for an aging population. *Proceedings of the 21st national meeting of the Public Health Conference on Records and Statistics*. Washington, DC: U.S. Government Printing Office, 1987:30–4. DHHS Publication No. (PHS)88–1214.

Centers for Disease Control. *1992 BRFSS Summary Prevalence Report*. Atlanta: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Center for Chronic Disease Prevention and Health Promotion, 1992.

Centers for Disease Control. Youth Risk Behavior Survey, 1991 data tape. Atlanta: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Center for Chronic Disease Prevention and Health Promotion, 1991. National Technical Information Service Order No. PB94–500121.

Centers for Disease Control and Prevention. *1994 BRFSS Summary Prevalence Report*. Atlanta: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, 1994.

Centers for Disease Control and Prevention. National Health Interview Survey—Youth Risk Behavior Survey, 1992 machine readable data file and documentation. Atlanta: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Health Statistics, 1993.

Centers for Disease Control and Prevention. Youth Risk Behavior Survey, 1993 data tape. Atlanta: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, 1993. National Technical Information Service Order No. PB95–503363.

Centers for Disease Control and Prevention. Youth Risk Behavior Survey, 1995 data tape. Atlanta: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion (in press).

Folsom AR, Caspersen CJ, Taylor HL, Jacobs DR Jr, Luepker RV, Gomez-Marin O, et al. Leisure-time physical activity and its relationship to coronary risk factors in a population-based sample: the Minnesota Heart Survey. *American Journal of Epidemiology* 1985;121:570–579.

Frazier EL, Franks AL, Sanderson LM. Behavioral risk factor data. In: *Using chronic disease data: a handbook for public health practitioners*. Atlanta: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Center for Chronic Disease Prevention and Health Promotion, 1992:4-1–4-17.

Groupe d'étude de Kino-Quebec sur le système de quantification de la dépense énergétique (GSQ). Rapport final. Québec: Government du Québec, 1984.

Heath GW, Chang MH, Barker ND. Physical activity among persons with limitations—United States, 1991. Paper presented at the annual meeting of the Society for Disability Studies, June 17–19, 1995, Oakland, California.

Holmer I. Energy cost of arm stroke, leg kick, and the whole stroke in competitive swimming styles. *European Journal of Applied Physiology* 1974a;33:105–118.

Holmer I. Propulsive efficiency of breaststroke and freestyle swimming. *European Journal of Applied Physiology* 1974b;33:95–103.

Jacobs DR Jr, Hahn LP, Folsom AR, Hannan PJ, Sprafka JM, Burke GL. Time trends in leisure-time physical activity in the upper Midwest, 1957–1987: University of Minnesota Studies. *Epidemiology* 1991;2:8–15.

Jones NL, Campbell EJM. *Clinical exercise testing*. 2nd ed. Philadelphia: W.B. Saunders, 1982:249.

Kann L, Warren W, Collins JL, Ross J, Collins B, Kolbe LJ. Results from the national school-based 1991 Youth Risk Behavior Survey and progress toward achieving related health objectives for the nation. *Public Health Reports* 1993;108(Suppl 1):47–67.

Kolbe LJ. An epidemiological surveillance system to monitor the prevalence of youth behaviors that most affect health. *Health Education* 1990;21:44–48.

Kolbe LJ, Kann L, Collins JL. Overview of the Youth Risk Behavior Surveillance System. *Public Health Reports* 1993;108(Suppl 1):2–10.

Montoye HJ. *Physical activity and health: an epidemiologic study of an entire community*. Englewood Cliffs, NJ: Prentice Hall, 1975.

National Center for Health Statistics. *Plan and operation of the Third National Health and Nutrition Examination Survey, 1988–94*. Vital and Health Statistics, Series 1, No. 32. Hyattsville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Health Statistics, 1994a. DHHS Publication No. (PHS)94–1308 .

National Center for Health Statistics, Adams PF, Benson V. *Current estimates from the National Health Interview Survey, 1990*. Vital and Health Statistics, Series 10, No. 181. Hyattsville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Center for Health Statistics, 1991. DHHS Publication No. (PHS)92–1509.

National Center for Health Statistics, Benson V, Marano MA. *Current estimates from the National Health Interview Survey, 1992*. Vital and Health Statistics, Series 10, No. 189. Hyattsville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Health Statistics, 1994b. DHHS Publication No. (PHS)94–1517.

National Center for Health Statistics, Piani AL, Schoenborn CA. *Health promotion and disease prevention: United States, 1990*. Vital and Health Statistics, Series 10, No. 185. Hyattsville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Health Statistics, 1993. DHHS Publication No. (PHS)93–1513.

National Center for Health Statistics, Schoenborn CA. *Health promotion and disease prevention: United States, 1985*. Vital and Health Statistics, Series 10, No. 163. Hyattsville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Center for Health Statistics, 1988. DHHS Publication No. (PHS)88–1591.

Passmore R, Durnin JVGA. Human energy expenditure. *Physiological Reviews* 1955;35:801–840.

Remington PL, Smith MY, Williamson DF, Anda RF, Gentry EM, Hogelin GC. Design, characteristics, and usefulness of state-based behavioral risk factor surveillance: 1981–87. *Public Health Reports* 1988;103: 366–375.

Siegel PZ, Brackbill RM, Frazier EL, Mariolis P, Sanderson LM, Waller MN. Behavior Risk Factor Surveillance, 1986–1990. *Morbidity and Mortality Weekly Report* 1991; 40(No. SS–4):1–23.

Stephens T. Design issues and alternatives in assessing physical activity in general population surveys. In: Drury TF, editor. *Assessing physical fitness and physical activity in population-based surveys*. Hyattsville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Center for Health Statistics, 1989:197–210. DHHS Publication No. (PHS)89–1253.

Stephens T. Secular trends in adult physical activity: exercise boom or bust? *Research Quarterly for Exercise and Sport* 1987;58:94–105.

Stephens T, Caspersen CJ. The demography of physical activity. In: Bouchard C, Shephard RJ, Stephens T, editors. *Physical activity, fitness, and health: international proceedings and consensus statement*. Champaign, IL: Human Kinetics, 1994:204–213.

Stephens T, Craig CL. Fitness and activity measurement in the 1981 Canada Fitness Survey. In: Drury TF, editor. *Assessing physical fitness and physical activity in population-based surveys*. Hyattsville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Center for Health Statistics, 1989:401–32. DHHS Publication No. (PHS)89–1253.

Taylor HL, Jacobs DR Jr, Schucker B, Knudsen J, Leon AS, DeBacker G. A questionnaire for the assessment of leisure-time physical activities. *Journal of Chronic Diseases* 1978;31:741–755.

U.S. Department of Health and Human Services. *Healthy People 2000: national health promotion and disease prevention objectives—full report, with commentary*. Washington, DC: U.S. Department of Health and Human Services, Public Health Service, 1991. DHHS Publication No. (PHS)91–50212.