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Diabetes on the Rise in California

Authors
Diamant, Allison L.
Babey, Susan H.
Brown, E. Richard
et al.

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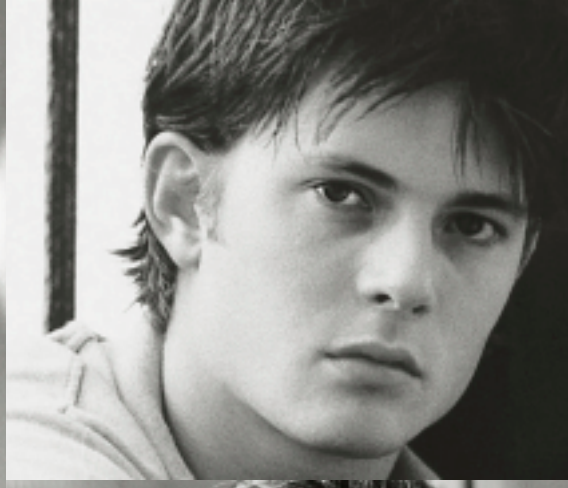

Diabetes in California:

Findings from the 2001 California Health Interview Survey

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April 2003

UCLA CENTER FOR HEALTH POLICY RESEARCH

THE CALIFORNIA ENDOWMENT

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UCLA Center for Health Policy Research
10911 Weyburn Avenue, Suite 300
Los Angeles, CA 90024
www.healthpolicy.ucla.edu

The California Endowment

21650 Oxnard Street, Suite 1200
Woodland Hills, California 91367
www.calendow.org

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Diabetes is a serious and growing health problem currently affecting an estimated 17 million adults and children in the United States with approximately 800,000 new cases diagnosed each year.[1] Diabetes poses a significant public health challenge because approximately one-third of individuals with the condition, or 5.9 million people, are believed to have diabetes but remain undiagnosed. These individuals are at risk for not receiving appropriate and necessary medical care. Among those who are diagnosed with diabetes, clinical research has demonstrated the importance of managing blood glucose levels in reducing diabetic complications such as end-stage renal disease, blindness, and amputation. Diabetes and obesity, in conjunction with high blood pressure, high cholesterol, and cigarette smoking increase considerably the risks of cardiovascular disease, stroke, and death.

This report examines diabetes in California based on data from the 2001 California Health Interview Survey (CHIS). CHIS is a collaborative project of the UCLA Center for Health Policy Research, the California Department of Health Services, and the Public Health Institute, and is the largest statewide health survey conducted in the United States. CHIS 2001 was a telephone survey of over 55,000 households across California covering a broad range of public health topics. The sample was designed to provide statewide estimates for California's overall population, its major racial and ethnic groups, and a number of smaller ethnic groups. All statements in this report that compare rates for one group with another group reflect statistically significant differences ($p < 0.05$) unless otherwise noted. A more detailed description of the data source and variables can be found in the Appendix.

PREVALENCE OF DIABETES

More than 1.4 million California adults have been diagnosed with diabetes—5.9% of Californians ages 18 and over. The prevalence of diabetes among adults in California varied with several important population characteristics.

- Among California adults, racial and ethnic variation in diabetes prevalence was most marked among adults ages 50-64 and 65 and over. Among adults ages 50-64, diabetes prevalence was significantly higher in African Americans (20.5%), Latinos (17.9%), and American Indians and Alaska Natives (AIAN) (19.6%) than in Asians and Native Hawaiians and other Pacific Islanders (NHOPI) (10.9%) and whites (8.3%).[2]
- Latinos of Mexican heritage had higher rates of diabetes than other Latino groups. Asian adults whose ancestry was Filipino, Japanese, or Southeast Asian (Vietnamese, Cambodian, or other Southeast Asian) were also disproportionately affected by diabetes compared with other Asian groups.
- The prevalence of diabetes was twice as high among adults who never attended high school (9.9%) as it was among college graduates (4.3%). Adults living at or below 100% of the Federal Poverty Level (FPL) suffered from diabetes at a higher rate than those with incomes above 300% FPL (7.8% and 4.5%, respectively).

1 Centers for Disease Control and Prevention. National diabetes fact sheet: general information and national estimates on diabetes in the United States, 2000. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2002.

2 The number of Native Hawaiians and other Pacific Islanders (NHOPI) in the CHIS 2001 sample was relatively small. Estimates for this group were reported separately whenever possible. When the sample of NHOPI was too small, it was included in the Asian category. As a result, we combined NHOPIs with Asians for all analyses conducted in this report except for those included in the "Identifying 'At Risk' Populations" section.

There was also considerable variation in the prevalence of diabetes by area of residence.

- The age-adjusted prevalence of diabetes varied among California's counties, ranging from less than 4% in Marin County, El Dorado County, and Sonoma County to 8.7% in Imperial County, 8.8% in Kings County, and 10.2% in Tulare County.[3] The results of statistical modeling indicated that this variation among counties in California could be accounted for by differences among the counties in the prevalence of other factors such as obesity, access to health care, and distribution of population characteristics such as age, gender, race and ethnicity, income, and education.

ACCESS TO MEDICAL CARE

Access to the health care system is critically important for persons with diabetes because these individuals require effective and ongoing medical care to manage and treat their chronic condition. Health insurance coverage is one important indicator of access to health care. In California, adults with diabetes were more likely than those without diabetes to have insurance coverage. However, 182,000 adults with diabetes (12.9%) were uninsured for all or part of the year.

- Nonelderly adults with diabetes were more likely to be covered by Medi-Cal than nonelderly adults not diagnosed with diabetes (22.0% and 9.7%, respectively).
- Elderly adults with diabetes were more likely to be covered by Medicare plus Medi-Cal than those without diabetes (27.6% and 17.1%, respectively) and were less likely to have Medicare with a private supplement (60.3% and 71.6%, respectively).
- Nearly 114,000 (9.0%) adults with diabetes reported that they had no insurance coverage for prescription drugs.

Having a usual source of care—a regular connection to a health care provider—is very important for assuring continuity of care and effective medical management of diabetes. Adults with diabetes were more likely to have a usual source of care than adults without diabetes. However, over 82,000 (5.8%) adults with diabetes reported they had no usual source of care.

- Lack of health insurance was an important reason why many adults with diabetes had no usual source of care. One-fourth (25.8%) of nonelderly adults with diabetes who were uninsured for at least some period during the year had no usual source of care compared with only 3.8% of those who were insured for the whole year.
- The health care safety net provided by public and community clinics was very important for adults with diabetes who were uninsured and those who were covered by Medi-Cal. Among nonelderly adults with diabetes, 19.8% of those with Medi-Cal and 27.2% of the uninsured reported that they typically went to a public or community clinic for their health care compared with only 2.7% of those who had employment-based insurance.

DIABETES CARE AND MANAGEMENT

Appropriate care for diabetes requires careful monitoring on the part of medical professionals as well as on the part of the person with diabetes. Appropriate management of this condition includes the following: taking diabetes medications; home glucose monitoring; encouraging more healthful behaviors, including weight loss, physical activity, and smoking cessation; regular visits to a physician; and annual foot exams. (Appropriate care for diabetes also includes nutrition counseling, annual dilated eye exams, diagnosis and treatment of high lipids, and assessment for diabetic nephropathy and neuropathy, but CHIS 2001 did not ask respondents about these).

3 The age-adjusted prevalence estimates what the prevalence would be for each county or county group if each county's population had the same age distribution. It is important to account for variation due to age because the prevalence of diabetes is strongly correlated with age. In addition, the age distribution of California residents varies significantly by county.

Diabetes Medications

In California, nearly 340,000 adults with diabetes (24.0%) were not taking any medications for the condition. Although not everyone with diabetes needs medication, California had a high proportion of people with diabetes who did not take medications (24.0% compared with 13.4% nationally).

- Nearly one-third of Latino adults with diabetes (32.4%) are not currently taking any medications for the condition compared with approximately 20% of AIANs, Asians and NHOPIs, whites, or African Americans.
- Adults with diabetes who had no usual source of health care were more than twice as likely as those with a usual source of care to report not taking any diabetes medications (53.9% and 22.2%, respectively). Uninsured adults with diabetes were nearly twice as likely as those with insurance not to be taking any diabetes medications (40.6% and 22.3%, respectively). Among the uninsured, those with incomes below 200% FPL were particularly vulnerable.

Home Glucose Monitoring

In California, 48.0% of adults with diabetes reported that they measured their blood glucose levels at least once a day—well below the Healthy People 2010 goal of 60%.

- Adults with diabetes who have a usual source of care (49.8%) were more than twice as likely as those with no usual source of care (19.5%) to measure their blood glucose levels at least once a day.
- More than 54% of whites, African Americans, and AIANs with diabetes checked their blood glucose at least once a day compared with less than 40% of Latinos and Asians and NHOPIs.
- Despite the vital importance of blood glucose monitoring among insulin users, only 79% of adults with diabetes using insulin checked their glucose levels at least once a day.

Behavior-Related Health Risks

Obesity or lack of physical activity make control of diabetes more difficult, and these factors as well as smoking increase the risk of diabetic complications such as end-stage renal disease, blindness, amputation, heart attack and stroke. In California, over 570,000 (40.8%) adults with diabetes were obese, over 390,000 (27.8%) reported they were sedentary, and over 200,000 (14.7%) were current smokers.

- AIANs had the highest rates of obesity (64.7%) and smoking (36.3%) among adults with diabetes. African-American adults with diabetes had the highest rates of physical inactivity (29.3%) as well as high rates of obesity (50.6%).

Doctor Visits

Regular consultation with a health care professional is crucial for people with diabetes. In California, 94% of adults with diabetes reported that they had seen a doctor at least once in the past year. However, over 65,000 adults with diabetes (4.7%) had not seen a doctor at all in the past year.

- Among adults with diabetes, those with no usual source of care were more likely than those with a usual source of care not to have seen a doctor in the past year, regardless of insurance status.

Foot Exams

People with diabetes are at particular risk for developing ulcers and other infections on their feet that, if left untreated, can result in amputation. Therefore, it is very important that people with diabetes undergo regular comprehensive foot exams by a clinician. In California, 447,000 adults with diabetes (31.8%) had not had their feet examined even once in the past year.

- In California, nearly half of Asian and NHOPI adults with diabetes (48.1%) had not had a foot exam in the past year compared with less than 30% of whites, AIANs, and African Americans.

- Having health insurance coverage and a usual source of care were extremely important factors in timely receipt of a foot exam. Adults with diabetes who had no usual source of care were much more likely than those with a usual source of care not to have had a foot exam in the past year (57.6% and 30.2%, respectively). Uninsured adults were also more likely than those with insurance not to have had a foot exam in the past year (49.6% and 30.0%, respectively).

Delays in Care

Delaying or not getting needed medical care may result in an increase in complications and worse outcomes for people with diabetes. In California, 368,000 adults with diabetes (26.2%) reported that they delayed getting or did not receive needed medical care such as a prescription, a test, or a treatment, including 163,000 (11.6%) who reported the care was specifically for their diabetes.

- Among adults with diabetes who delayed or did not receive needed care for their diabetes, 40% reported that it was because the care cost too much, that it was not covered by their insurance, or that they did not have insurance.
- Uninsured adults with diabetes were more likely than those with insurance to have delayed or not received needed medical care for diabetes (18.7% and 10.9%, respectively).

IDENTIFYING "AT RISK" POPULATIONS

Among adults and adolescents, obesity is a major risk factor for Type 2 diabetes. In addition, adolescents who are overweight or at risk for overweight are more likely to be obese or overweight as adults. In California, 3.8 million (17.0%) adults not diagnosed with diabetes were obese. An additional 316,000 (10.8%) adolescents not diagnosed with diabetes were overweight.

- Among adults not diagnosed with diabetes, nearly one-third of NHOPIs (31.0%) and over one- fourth of African Americans (26.4%) and AIANs (25.5%) were obese. Among adolescents not diagnosed with diabetes, 17% of African Americans and 12% of Latinos were overweight.
- Adults not diagnosed with diabetes who live in rural areas (23.0%) were more likely than those who live in suburban areas (15.4%) to be obese. This same pattern was found among adolescents; 13.6% of those living in rural areas were overweight compared with 8.9% in suburban areas.
- Among adults not diagnosed with diabetes, those with an 8th grade education or less (23.2%) were twice as likely to be obese as those with a college degree (11.6%).

Despite the importance of regular physical activity, nearly 3.5 million California adults not diagnosed with diabetes (15.4%) did not participate in any physical activity, and only 27.4% participated in regular physical activity. Among adolescents not diagnosed with diabetes, 73% reported participating in regular physical activity. However, 152,000 (5.2%) did not participate in any physical activity.

- Among adults not diagnosed with diabetes, nearly one-fifth of African Americans, Asians, and Latinos reported being sedentary.
- Adults who were sedentary were more likely to be obese than those who participated in regular physical activity (20.7% and 13.1%, respectively).

- Adolescents who were not enrolled in school were less likely than those who were enrolled to participate in regular physical activity (72.8% and 65.2%, respectively).[4]
- Adolescents living in urban areas (70.2%) were less likely to participate in regular physical activity than adolescents who lived in suburban areas (77.5%).

In California, 1.8 million adults not diagnosed with diabetes (8.2%) were at significant risk for developing diabetes because they were sedentary in conjunction with being overweight or obese. An additional 176,000 (6.0%) adolescents not diagnosed with diabetes were at risk for being obese as adults because they did not participate in regular physical activity and were overweight or at risk for being overweight.

- Among adults ages 18-64 not diagnosed with diabetes—after controlling for age, gender, education, income, and measures of access to care—Latinos, NHOPIs, AIANs, African Americans, those living in rural areas, and those who did not participate in regular physical activity were more likely to be obese. This greatly increases their risk for Type 2 diabetes.
- Among adolescents not diagnosed with diabetes—after controlling for age, education, income and physical activity—boys, African Americans, and those living in both urban and rural areas were more likely to be overweight and therefore were more likely to be at risk for developing Type 2 diabetes.

CONCLUSIONS AND POLICY IMPLICATIONS

The focus for all Californians, especially those at increased risk for diabetes, should be on minimizing the risk factors for and effects of diabetes. This can be done in two ways: prevention of diabetes and the effective management of diabetes among those who develop the condition.

Prevention of Diabetes

Primary prevention for diabetes cannot wait until adulthood, but should begin during childhood and continue through adolescence and adulthood. Type 2 diabetes is being diagnosed in increasing numbers among children and adolescents. This surge in the prevalence and incidence of diabetes is overwhelmingly due to the epidemic of obesity that is occurring in this country. Regular physical activity and nutritious eating can prevent the development of obesity and reduce the risk for Type 2 diabetes in children and adolescents as well as adults. Public policy and community action can help reduce these risks by facilitating and encouraging healthy choices.

Preventing Obesity: Healthful Eating

Lifestyle choices such as consuming a nutritious and balanced diet can prevent or delay the onset of Type 2 diabetes.

- Local governments should increase the availability of fresh fruits and vegetables in all neighborhoods.
- The state and local governments as well as private firms should increase the availability of *affordable* healthy food choices.
- Schools should provide healthier food choices for children and adolescents.
- Both state and local governments should more fully engage community-based organizations, schools, and health care professionals in the development of culturally appropriate interventions that promote healthier diets, and should expand funding for these efforts.

4 Although the contrast comparing regular physical activity between adolescents attending school and those not attending was not significant, adolescents not attending school were less likely to participate in regular physical activity than those attending school after controlling for other factors such as age, gender, and family income.

Physical Activity

Regular physical activity includes a wide variety of pursuits that do not require athletic skill. Rather, individuals should be encouraged to find aerobic activities they enjoy and that are convenient for them to pursue, such as vigorous walking.

- Promote physical activity programs in public schools
- Develop community policies and practices as well as legislation that promote safe environments for physical activity.
- Develop culturally appropriate and targeted interventions to promote regular physical activity among minority groups.

Access to Preventive Health Care

Careful monitoring and screening of groups at elevated risk for developing diabetes can also help in prevention. Particular racial and ethnic groups, those with family histories of diabetes, and people who are obese should be educated about their elevated risk for developing diabetes and about lifestyle changes they can make to prevent or delay the onset of diabetes.

- Assure access to trained health care providers who can counsel and screen at-risk patients.
- Expand public and private health insurance packages to provide adequate coverage for preventive care.

Effective Management of Diabetes

Effective management of diabetes focuses on reducing the risk for and impact of diabetic complications:

- Assure access to medical care for people with diabetes so that they can receive appropriate management of their condition.
- Assure adequate prescription drug coverage for people with diabetes.
- Develop and distribute culturally appropriate multilingual educational materials to people with diabetes on how to manage their condition.
- Provide adequate health care counseling on managing diabetes as well as on nutrition and physical activity for people with diabetes.
- Continue surveillance at the state and local levels.

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ABOUT THE AUTHORS

Allison L. Diamant, MD, MSHS, is an assistant professor in the Division of General Internal Medicine and Health Services Research at the UCLA School of Medicine. Susan H. Babey, PhD, is a research scientist at the UCLA Center for Health Policy Research. E. Richard Brown, PhD, is the director of the UCLA Center for Health Policy Research and a professor in the UCLA School of Public Health. Neetu Chawla, MPH, is a graduate student researcher at the UCLA Center for Health Policy Research.

1. DIABETES IN CALIFORNIA: INTRODUCTION

Diabetes is a serious and growing health problem currently affecting an estimated 17 million adults and children in the United States with approximately 800,000 new cases diagnosed each year.[5] The prevalence of diabetes among persons age 18 years or over increased by 50% between 1990 and 2000.[6] According to the Centers for Disease Control and Prevention (CDC), by 2050, the number of people diagnosed with diabetes is expected to rise from almost 11 million to 30 million. As one of the most common chronic conditions, diabetes poses a significant public health challenge.

Diabetes is an even greater public health challenge because approximately one-third of individuals with diabetes, or 5.9 million people, remain undiagnosed.[5] According to the American Diabetes Association, an additional 16 million people may have "pre-diabetes," putting them at increased risk for developing diabetes.[7] These individuals as well as those who have diabetes but remain undiagnosed are at increased risk for not receiving appropriate and necessary medical care.

The increase in the prevalence of diabetes in recent years is problematic because of the complications and costs associated with diabetes. Diabetes remains the seventh leading cause of death in the U.S., and it is the major cause of nontraumatic amputations, blindness, and end-stage kidney disease. In addition, diabetes is a significant risk factor for coronary heart disease and stroke. Furthermore, diabetes is expensive. The total attributable costs of diabetes are estimated to be $100 billion annually.[8, 9]

Diabetes is an abnormal elevation of the body's blood glucose, a condition known as hyperglycemia. Diabetes is classified into two main types. Type 1 diabetes develops primarily in childhood and is characterized by the body's inability to produce enough insulin to metabolize sugars. Type 2 diabetes is much more prevalent and affects predominantly older adults. In Type 2 diabetes, the body is not able to use the insulin that is available due to insulin resistance and relative pancreatic beta-cell dysfunction. The exact cause of diabetes is unclear, but obesity as well as an inherited predisposition is associated with its onset.

This report examines diabetes in California based on data from the 2001 California Health Interview Survey (CHIS).[10] First, we report on the prevalence of diabetes in California with particular attention paid to disparities between different population groups and groups of people living in different areas of the state. Second, we discuss key factors affecting access to care for people with diabetes. Next, we consider the care and management of diabetes for people who live with the condition. In this section, we cover factors that pose significant health risks for adults with diabetes. We also examine the medical care received by people with diabetes. Finally, we examine the population groups at greatest risk for developing diabetes in two age groups: adults (ages 18 and over) and adolescents (ages 12-17). All comparative statements in this report reflect statistically significant differences ($p < 0.05$) unless otherwise noted.

5 Centers for Disease Control and Prevention. National diabetes fact sheet: general information and national estimates on diabetes in the United States, 2000. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2002.

6 Mokkdad AH, Bowman BA, Ford ES, Vinicor F, Marks JS, Koplan JP. The contintuing epidemics of obesity and diabetes in the United States. JAMA 2001; 286 (10): 1195-1200.

7 *Pre-diabetes* is a condition in which a person's blood glucose levels are higher than normal but not high enough for a diagnosis of Type 2 diabetes.

8 American Diabetes Association. Economic consequences of diabetes mellitus in the U.S. in 1997. Diabetes Care 1998; 21: 296-306.

9 Hodgson T, Cohen A. Medical care expenditures for diabetes, its chronic complications and its comorbidities. Preventive Medicine 1999; 29: 173-186.

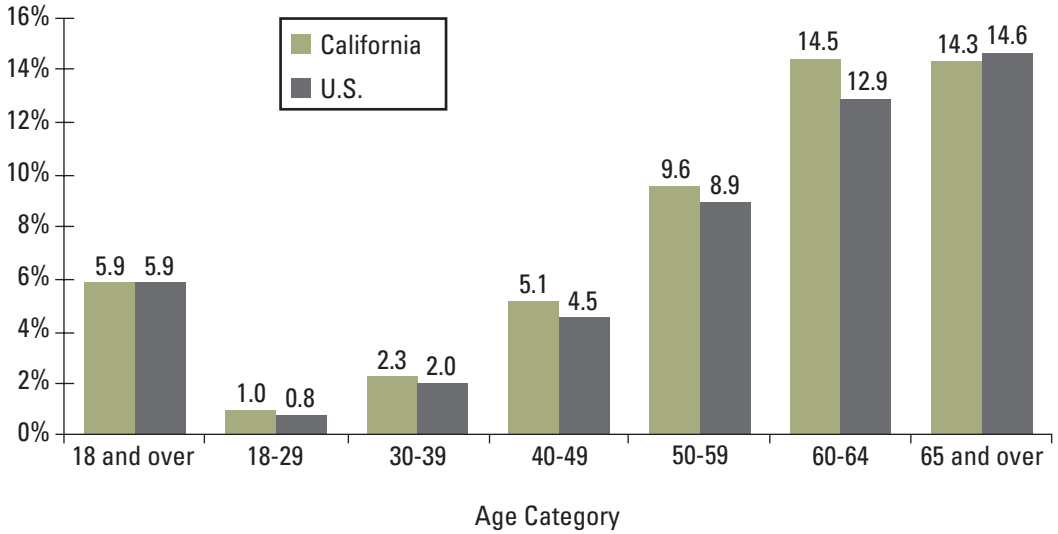
10 The 2001 California Health Interview Survey is discussed in more detail in the Appendix.

2. PREVALENCE OF DIABETES

More than 1.4 million (5.9%) adults in California have been diagnosed with diabetes. In addition, over 12,000 (0.4%) adolescents ages 12-17 have been diagnosed with diabetes.[11] Although the majority of adolescents with diabetes have Type 1, the number and proportion with Type 2 have increased. (The sample size of adolescents in California diagnosed with diabetes was too small to permit further analyses). The prevalence of diabetes among adults did not differ significantly between males and females, although there was significant variation by age. The prevalence of diabetes increased with age, rising significantly across age groups up to ages 60-64, where the rate leveled off (Exhibit 1). Although diabetes was more prevalent among older adults, it affected people of all ages. Over half (53.5%) of California adults with diabetes were younger than 60, and we estimate that over 195,000 adolescents and adults between the ages of 12 and 40 have been diagnosed with diabetes.

Nationally, the prevalence of diabetes was similar to the overall rate found in California. However, there were differences between the prevalence of diabetes in California and the U.S. among a number of population groups. Although the overall prevalence of diabetes in California and the U.S. was the same, rates in California appear to be slightly higher than national rates among age groups under the age of 65 (Exhibit 1).

EXHIBIT 1. DIABETES PREVALENCE BY AGE IN CALIFORNIA AND NATIONALLY, ADULTS AGES 18 AND OVER



Source: 2001 California Health Interview Survey and 2000 National Health Interview Survey

11 According to estimates from the 2000 National Health Interview Survey (NHIS), the prevalence of any type of diabetes among children under age 18 throughout the United States was 0.3%. According to data from CHIS 2001, the prevalence of diabetes among adolescents ages 12-17 in California was 0.4%.

The prevalence of diabetes in California varied across several important sociodemographic characteristics, including race and ethnicity, income, and education. Diabetes disproportionately affected African Americans, American Indians and Alaska Natives (AIANs), Latinos, adults with low incomes, and those with less education. Overall, African Americans and AIANs suffered from diabetes at a higher rate than whites, Latinos, or Asians and Native Hawaiians and other Pacific Islanders (NHOPI) (Exhibit 2).[12]

EXHIBIT 2. DIABETES PREVALENCE BY RACE/ETHNICITY, ADULTS AGES 18 AND OVER, CALIFORNIA, 2001

RACE/ETHNICITY	%
WHITE	5.6
LATINO	6.0
ASIAN AND NHOPI	4.7
AFRICAN AMERICAN	10.3
AMERICAN INDIAN AND ALASKA NATIVE	9.3

Note: Native Hawaiian and other Pacific Islander is abbreviated NHOPI. For an explanation of "Asian and NHOPI" and the exclusion of "other" race/ethnicity, see the Appendix.

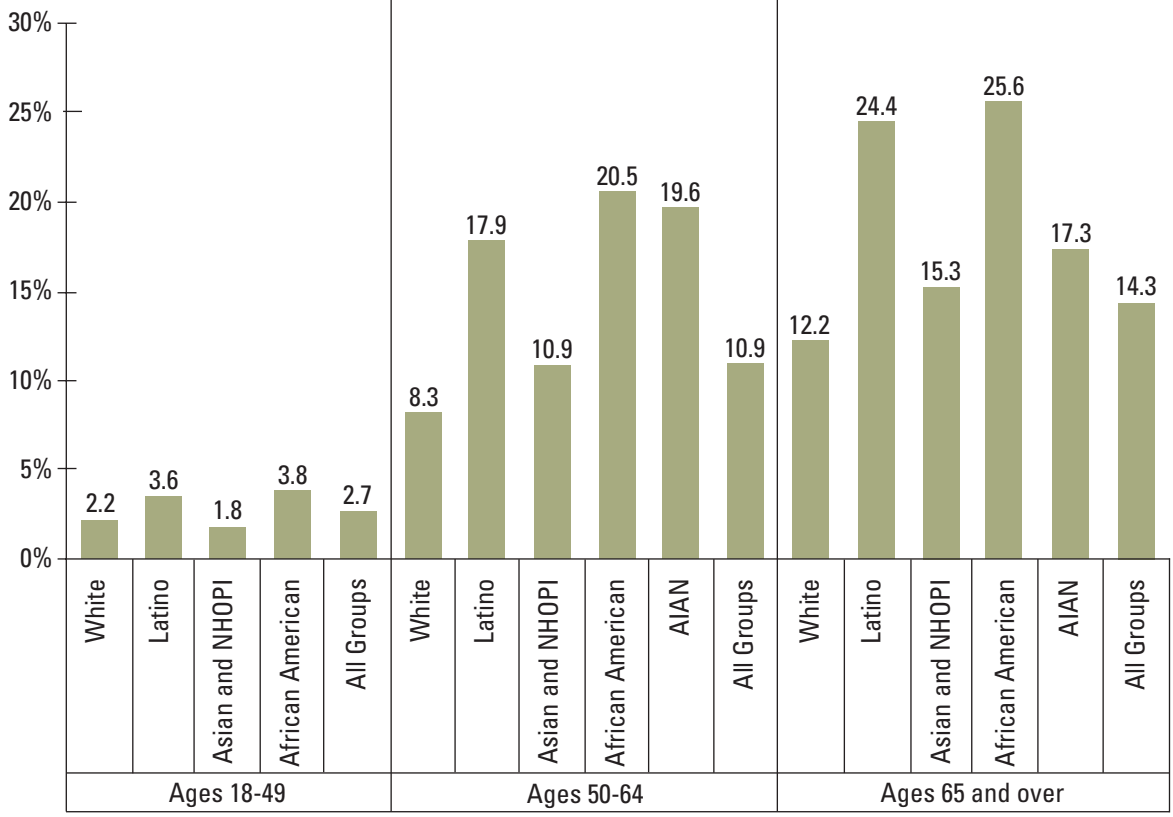
Source: 2001 California Health Interview Survey

However, because of the differences in the age distributions across racial and ethnic groups in California, it was important to look at the prevalence of diabetes as a function of both race and ethnicity and age. Within the 50-64 and 65 and over age groups, African Americans, Latinos, and AIANs had the highest prevalence, with the lowest rates occurring among whites and Asian and NHOPIs (Exhibit 3). Among younger adults (ages 18-49) diabetes prevalence was relatively low across racial and ethnic groups. Among adults ages 50-64, the prevalence of diabetes among African Americans (20.5%), AIANs (19.6%), and Latinos (17.9%) was approximately twice as high as the prevalence among whites (8.3%) or Asian and NHOPIs (10.9%). Among adults 65 and over, rates among African Americans (25.6%) and Latinos (24.4%) were more than twice as high as the rate for whites (12.2%).

In addition, the prevalence of diabetes varied within racial and ethnic groups. One of the unique features of CHIS 2001 is the ability to examine variation within Latino and Asian ethnic groups. Among respondents who identified themselves as Latino or Hispanic, those who reported their Latino/Hispanic ancestry as Mexican or two or more Latino/Hispanic groups had the highest rates of diabetes, while individuals from Central America had the lowest rate (Exhibit 4a). (The estimates for prevalence of diabetes among Puerto Ricans in CHIS 2001 exceed our standards for statistical reliability. However, the high rate among Puerto Ricans is consistent with other research so the estimates are presented here). Among Latino adults ages 50 and over, one in four Puerto Ricans (25.0%) and one in five Mexicans (21.2%) had been diagnosed with diabetes (Exhibit 4b).

12 The number of Native Hawaiians and other Pacific Islanders (NHOPI) in the CHIS 2001 sample was relatively small. Estimates for this group were reported separately whenever possible. When the sample of NHOPI was too small, it was included in the Asian category. As a result, we combined NHOPIs with Asians for all analyses conducted in this report except for those included in the "Identifying 'At Risk' Populations" section.

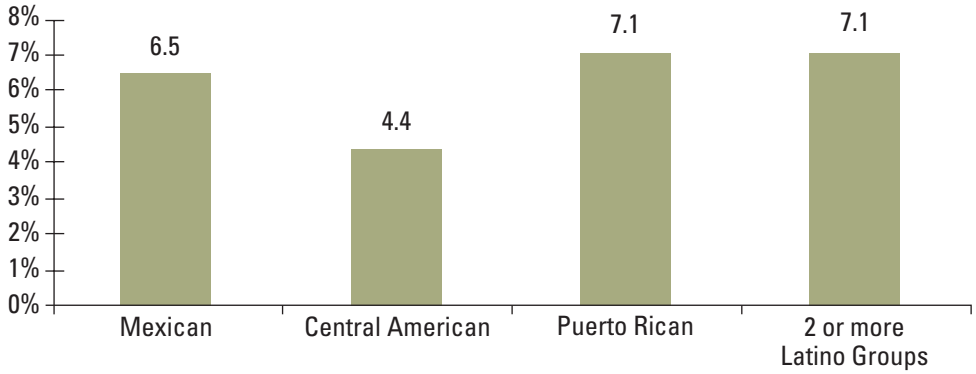
EXHIBIT 3. DIABETES PREVALENCE BY AGE AND RACE/ETHNICITY, ADULTS AGES 18 AND OVER, CALIFORNIA, 2001



Note: Rates of diabetes among American Indians and Alaska Natives were not reported for ages 18-49 because the estimate was not statistically reliable. Native Hawaiian and other Pacific Islander is abbreviated NHOPI and American Indian and Alaska Native is abbreviated AIAN. For an explanation of "Asian and NHOPI" and the exclusion of "other" race/ethnicity, see the Appendix.

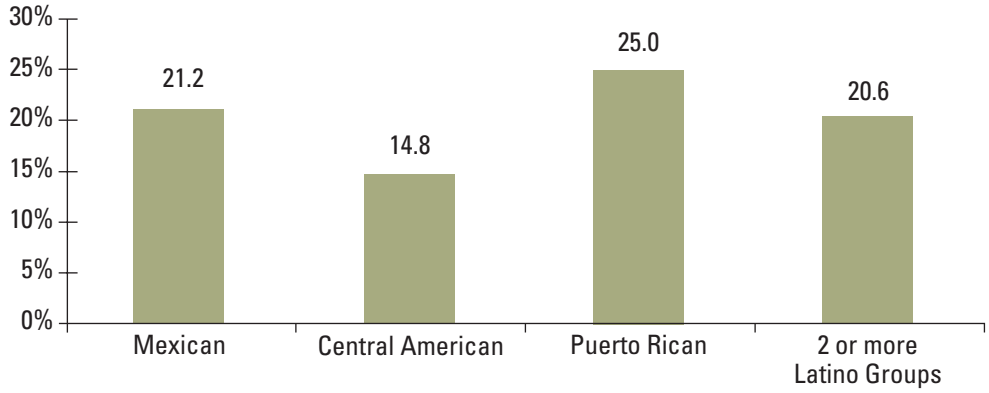
Source: 2001 California Health Interview Survey

EXHIBIT 4A. DIABETES PREVALENCE IN LATINO/HISPANIC ETHNIC GROUPS, ADULTS AGES 18 AND OVER, CALIFORNIA, 2001



Source: 2001 California Health Interview Survey

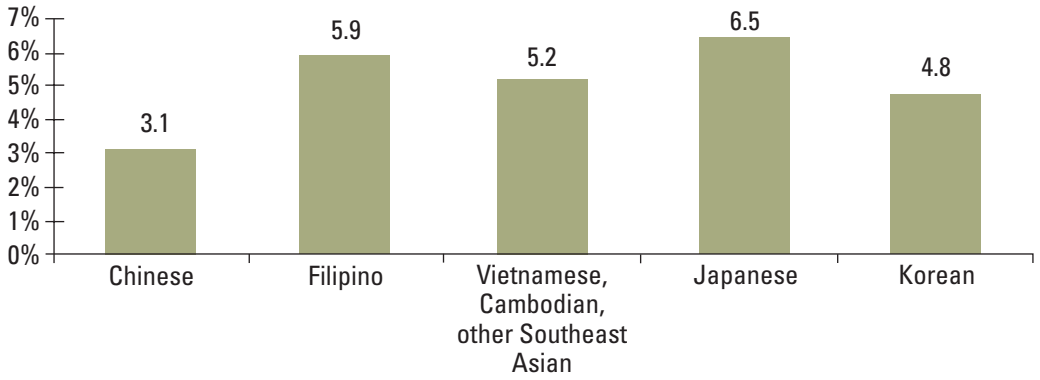
EXHIBIT 4B. DIABETES PREVALENCE IN LATINO/HISPANIC ETHNIC GROUPS, ADULTS AGES 50 AND OVER, CALIFORNIA, 2001



Source: 2001 California Health Interview Survey

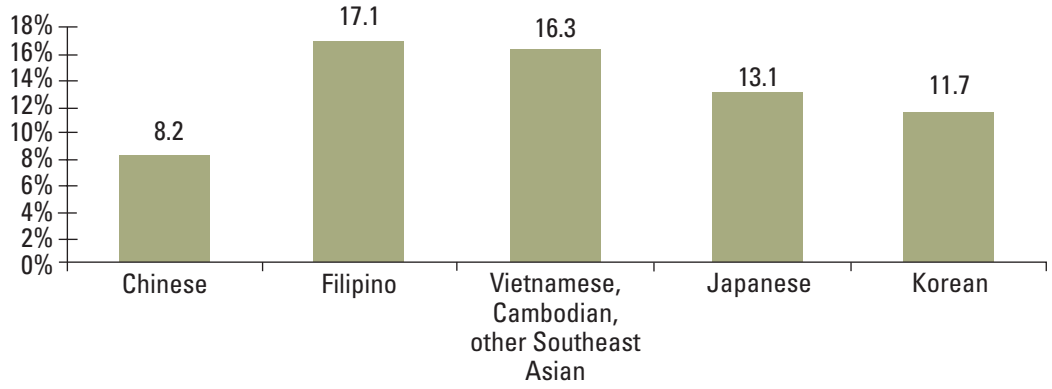
Among Asian ethnic groups, Japanese (6.5%) and Filipinos (5.9%) had the highest rates of diabetes, while Chinese (3.1%) had the lowest (Exhibit 5a). Although Asian adults of Japanese ancestry had the highest prevalence of diabetes overall, among Asian adults ages 50 and over, prevalence was highest among Filipinos (17.1%) and Southeast Asian adults (including Vietnamese and Cambodian, 16.3%) – significantly higher than among Chinese (8.2%) (Exhibit 5b).

EXHIBIT 5A. DIABETES PREVALENCE IN ASIAN ETHNIC GROUPS, ADULTS AGES 18 AND OVER, CALIFORNIA, 2001



Source: 2001 California Health Interview Survey

EXHIBIT 5B. DIABETES PREVALENCE IN ASIAN ETHNIC GROUPS, ADULTS AGES 50 AND OVER, CALIFORNIA, 2001



Source: 2001 California Health Interview Survey

The independent effects of education and income, as well as their interaction, on health status have been well documented.[13, 14] They are important factors especially with respect to risk for chronic conditions such as diabetes. Their impact includes but is not limited to an elevated risk for developing diabetes, barriers to care that may result in an increased risk for complications associated with diabetes, and health-risk behaviors that increase risk for diabetes and diabetic complications.

13 Lynch J, Kaplan G. Socioeconomic Position. In Social Epidemiology, Berkman LF and Kawachi I (Eds.), 13-35. New York: Oxford University Press, 2000.

14 Adler NE, Marmot M, McEwen BS, Stewart J. (Eds.) Socioeconomic status and health in industrial nations; social, psychological, and biological pathways. Annals of the New York Academy of Sciences 1999, vol. 896.

EXHIBIT 6. DIABETES PREVALENCE BY EDUCATION, ADULTS AGES 18 AND OVER, CALIFORNIA, 2001	
EDUCATIONAL ATTAINMENT	**%**
EIGHTH GRADE OR LESS	9.9
SOME HIGH SCHOOL	7.5
HIGH SCHOOL DIPLOMA	5.9
SOME COLLEGE	6.2
COLLEGE GRADUATE OR HIGHER	4.3

Source: 2001 California Health Interview Survey

EXHIBIT 7. DIABETES PREVALENCE BY FEDERAL POVERTY LEVEL, ADULTS AGES 18 AND OVER, CALIFORNIA, 2001	
FEDERAL POVERTY LEVEL (FPL)	**%**
0-99% FPL	7.8
100-199% FPL	7.6
200-299% FPL	6.8
300% + FPL	4.5

Source: 2001 California Health Interview Survey

Diabetes disproportionately affected less well-educated adults and adults with low incomes. Adults who had never attended high school had the highest prevalence of diabetes, significantly higher than adults who completed high school or adults who went to college (Exhibit 6). Furthermore, adults with incomes below 100% of the Federal Poverty Level (FPL) had the highest prevalence of diabetes, significantly higher than adults with incomes between 200% and 300% FPL or adults with incomes at or above 300% FPL (Exhibit 7).

Diabetes prevalence also varied by place of residence. Adults who live in rural areas had higher rates of diabetes than adults who live in suburban areas (Exhibit 8). In addition, the prevalence of diabetes varied among California counties. Exhibit 9 shows the prevalence and age-adjusted prevalence of diabetes for each county or county group. The age-adjusted prevalence estimates what the prevalence would be for each county or county group if each county's population had the same age distribution. It was important to account for variation due to age because diabetes

EXHIBIT 8. DIABETES PREVALENCE BY AREA OF RESIDENCE, ADULTS AGES 18 AND OVER, CALIFORNIA, 2001	
AREA OF RESIDENCE	**%**
URBAN	6.0
2ND CITY	6.2
SUBURBAN	5.4
SMALL TOWN	6.2
RURAL	6.7

Note: Classification of area of residence is based on the population density of the zip code in which the respondent lives. For example, *second city* refers to a zip code with a population density between 1,000 and 4,150 persons per square mile. *Rural* refers to a zip code with a population density equal to or less than 210 persons per square mile.

Source: 2001 California Health Interview Survey

prevalence is strongly correlated with age. In addition, the age distribution of California residents varies significantly by county. Without age adjustment, rates were highest in Tulare (9.9%) and Imperial (9.0%) counties and lowest in Marin (3.7%), El Dorado (3.7%), and Santa Cruz (3.9%) counties. After adjusting for age, prevalence was highest in Tulare (10.2%), Kings (8.8%), and Imperial (8.7%) counties, and lowest in Sonoma (3.9 %), El Dorado (3.2%), and Marin (3.0%) counties. However, adjusting only for differences in the age of populations residing in different counties did not fully explain the variation in diabetes prevalence between counties. To examine possible reasons for the variation in prevalence of diabetes at the county level a statistical model was developed. The results indicated that the variation in diabetes prevalence between counties could be accounted for by differences in the prevalence of other factors such as obesity, access to health care, and the prevalence of sociodemographic characteristics such as age, gender, race and ethnicity, income, and education.

EXHIBIT 9. DIABETES PREVALENCE AND AGE-ADJUSTED PREVALENCE IN CALIFORNIA COUNTIES OR COUNTY GROUPS, ADULTS AGES 18 AND OVER, 2001

	DIABETES PREVALENCE (ADULTS AGES 18+)		AGE-ADJUSTED DIABETES PREVALENCE** (ADULTS AGES 18+)	
NORTHERN AND SIERRA COUNTIES	**%**	**(90% CI*)**	**%**	**(90% CI*)**
BUTTE	**6.1**	(4.5-7.7)	**5.3**	(4.0-6.6)
SHASTA	**6.7**	(5.1-8.2)	**6.0**	(4.4-7.6)
HUMBOLDT, DEL NORTE	**7.4**	(5.7-9.1)	**6.8**	(5.3-8.4)
SISKIYOU, LASSEN, TRINITY, MODOC	**7.2**	(5.7-8.8)	**5.7**	(4.4-7.1)
MENDOCINO, LAKE	**7.1**	(5.5-8.7)	**5.5**	(4.3-6.8)
TEHAMA, GLENN, COLUSA	**7.0**	(5.4-8.6)	**6.2**	(4.8-7.6)
SUTTER, YUBA	**8.0**	(6.4-9.7)	**7.6**	(6.1-9.1)
NEVADA, PLUMAS, SIERRA	**5.2**	(3.8-6.7)	**4.0**	(2.8-5.1)
TUOLOMNE, CALAVERAS, AMADOR, INYO, MARIPOSA, MONO, ALPINE	**6.3**	(4.8-7.8)	**5.0**	(3.7-6.2)
GREATER BAY AREA				
SANTA CLARA	**5.1**	(4.1-6.2)	**5.3**	(4.3-6.3)
ALAMEDA	**5.7**	(4.5-6.9)	**5.8**	(4.6-7.0)
CONTRA COSTA	**5.6**	(4.4-6.8)	**5.2**	(4.1-6.2)
SAN FRANCISCO	**4.0**	(3.2-4.9)	**4.1**	(3.3-4.8)
SAN MATEO	**5.2**	(3.9-6.5)	**4.9**	(3.7-6.2)
SONOMA	**6.1**	(4.6-7.6)	**3.9**	(2.9-4.9)
SOLANO	**6.6**	(5.4-7.7)	**6.6**	(5.5-7.6)
MARIN	**3.7**	(2.4-5.0)	**3.0**	(1.9-4.0)
NAPA	**6.9**	(5.2-8.5)	**6.0**	(4.5-7.5)
SACRAMENTO AREA				
SACRAMENTO	**6.2**	(5.0-7.4)	**6.1**	(4.9-7.3)
PLACER	**5.2**	(3.7-6.6)	**4.4**	(3.2-5.6)
YOLO	**4.2**	(3.0-5.4)	**4.6**	(3.4-5.8)
EL DORADO	**3.7**	(2.6-4.8)	**3.2**	(2.2-4.2)

(continued on next page)

* The 90% Confidence Interval (CI) provides a more reliable prevalence estimate for persons in the population group than does the "point estimate." Estimates with narrower ranges are more precise or reliable than those with wider ranges.

** The age-adjusted prevalence provides an estimate of the prevalence for a county as if that county had the same age distribution as the state of California.

Source: 2001 California Health Interview Survey

EXHIBIT 9. DIABETES PREVALENCE AND AGE-ADJUSTED PREVALENCE IN CALIFORNIA COUNTIES OR COUNTY GROUPS, ADULTS AGES 18 AND OVER, 2001 (CONTINUED)

	DIABETES PREVALENCE (ADULTS AGES 18+)		AGE-ADJUSTED DIABETES PREVALENCE** (ADULTS AGES 18+)	
SAN JOAQUIN VALLEY	**%**	**(90% CI*)**	**%**	**(90% CI*)**
FRESNO	**7.3**	(5.9-8.8)	**7.5**	(6.1-8.9)
KERN	**6.7**	(5.3-8.0)	**6.8**	(5.5-8.1)
SAN JOAQUIN	**7.6**	(6.2-9.1)	**7.5**	(6.1-8.8)
STANISLAUS	**6.1**	(4.6-7.6)	**6.1**	(4.6-7.5)
TULARE	**9.9**	(8.0-11.9)	**10.2**	(8.3-12.1)
MERCED	**7.7**	(6.1-9.4)	**7.8**	(6.2-9.4)
KINGS	**8.0**	(6.3-9.7)	**8.8**	(7.0-10.6)
MADERA	**6.7**	(5.2-8.2)	**6.3**	(4.9-7.7)
CENTRAL COAST				
VENTURA	**4.9**	(3.8-6.0)	**4.7**	(3.7-5.8)
SANTA BARBARA	**5.6**	(4.3-6.8)	**5.4**	(4.3-6.6)
SANTA CRUZ	**3.9**	(2.8-5.0)	**4.0**	(2.9-5.1)
SAN LUIS OBISPO	**5.5**	(4.2-6.9)	**4.9**	(3.7-6.2)
MONTEREY, SAN BENITO	**4.9**	(3.6-6.2)	**5.0**	(3.7-6.3)
LOS ANGELES				
LOS ANGELES	**6.3**	(5.9-6.7)	**6.6**	(6.2-7.0)
OTHER SOUTHERN CALIFORNIA				
ORANGE	**4.3**	(3.6-5.0)	**4.4**	(3.7-5.2)
SAN DIEGO	**5.2**	(4.4-5.9)	**5.2**	(4.5-6.0)
SAN BERNARDINO	**7.0**	(5.8-8.2)	**7.5**	(6.3-8.7)
RIVERSIDE	**7.5**	(6.2-8.9)	**7.1**	(5.8-8.3)
IMPERIAL	**9.0**	(7.0-11.0)	**8.7**	(6.9-10.6)
STATEWIDE	**5.9**	**(5.7-6.1)**	**5.9**	**(5.7-6.1)**

* The 90% Confidence Interval (CI) provides a more reliable prevalence estimate for persons in the population group than does the "point estimate." Estimates with narrower ranges are more precise or reliable than those with wider ranges.

** The age-adjusted prevalence provides an estimate of the prevalence for a county as if that county had the same age distribution as the state of California.

Source: 2001 California Health Interview Survey

3. ACCESS TO MEDICAL CARE

Persons with diabetes require careful and effective medical care to manage their chronic conditions. Although it is desirable for persons with diabetes to take as much control as feasible in day-to-day monitoring of glucose levels, insulin, other medication, and diet, regular professional medical care is essential to assure optimal control of the condition and to prevent disabling and potentially fatal complications of diabetes. Health professionals should regularly monitor blood pressure and cholesterol levels, examine eyes and feet, assess the effectiveness of home monitoring of glucose levels, and provide counseling regarding aspirin use, nutritious eating, regular physical activity, and smoking cessation. These elements of medical management are associated with decreased development and increased identification of end-organ damage associated with diabetes.

Having health insurance coverage and a place one usually goes when in need of health care (i.e., a usual source of care) are key factors affecting access to medical care. People with diabetes cannot receive appropriate and necessary care for diabetes if they do not have access to the health care system. CHIS asked all respondents an extensive series of questions about their health insurance coverage and the place that they usually went when they needed health care or advice. In this section, we examine the health insurance coverage of California adults with diabetes compared with those not diagnosed with diabetes. Next, we describe the types of places to which adults with diabetes typically went for their health care in California and the relationship between this usual source of care and health insurance coverage. In subsequent sections the importance of these factors with respect to receipt of needed medical care is discussed.

Health Insurance Coverage

Health insurance is important for all persons because it provides at least a minimum level of financial access to health care services. It is critically important for persons with diabetes and other chronic conditions to have health insurance because of the ongoing need for care and medical management of their condition. Without health insurance, people with diabetes have no financial protection against medical expenses and thus are at greatly increased risk for not obtaining the medical care they need to manage this serious chronic condition.

Nearly one in five (18.8%) of the 915,000 California residents under age 65 who had diabetes was uninsured for health care for some period during the year. Among nonelderly adults with diabetes, 13.9% had no public coverage or private health insurance when they were interviewed for CHIS in 2001, and another 4.9% were insured when they were interviewed but experienced some period without coverage during the preceding 12 months. Thus, a total of approximately 172,000 (18.8%) nonelderly adults with diabetes were uninsured for all or part of the year, greatly increasing their risk of not receiving the medical care they needed to help them manage their condition.

Nonelderly adults with diabetes were less likely than those without diabetes to receive employment-based health insurance (57.7% vs. 63.8%, respectively) and less likely to be covered by privately purchased insurance (3.9% compared with 6.7% of those without diabetes; Exhibit 10). In addition, nonelderly adults with diabetes were less likely than other adults to be employed (58.4% vs. 74.7%, respectively), reducing their opportunities to obtain job-based insurance. Their lower rates of labor force participation suggest that they were more likely to be disabled, one of the main factors in explaining why one-fifth of nonelderly adults with diabetes depend on Medi-Cal for their coverage—more than twice the proportion of those without diabetes (22.0% and 9.7%, respectively).

Among adults...with diabetes who had some form of health insurance, nearly one in 10 (9.0%) reported having no coverage for prescription drugs...[but] insulin and other diabetes medications are a substantial, ongoing expense.

EXHIBIT 10. HEALTH INSURANCE COVERAGE OF NONELDERLY ADULTS BY DIABETES DIAGNOSIS, AGES 18-64, CALIFORNIA, 2001

	ADULTS DIAGNOSED WITH DIABETES (N=915,000) %	ADULTS NOT DIAGNOSED WITH DIABETES (N=19,488,000) %
EMPLOYMENT-BASED	57.7	63.8
MEDI-CAL	22.0	9.7
PRIVATELY PURCHASED	3.9	6.7
OTHER PUBLIC	2.6	1.3
UNINSURED	13.9	18.4
TOTAL	100	100

Note: Totals may not add to 100% due to rounding.
Source: 2001 California Health Interview Survey

Among adults 65 years of age and over, those with diabetes were more likely than those without diabetes to have a combination of Medicare and Medi-Cal and less likely to have Medicare with private supplemental coverage (Exhibit 11). However, over 32,000 (6.6%) elderly people with diabetes were either covered by Medicare only or were completely uninsured, leaving them vulnerable to the high costs of medications as well as other medical bills.

Among adults of all ages with diabetes who had some form of health insurance, nearly one in 10 (9.0%) reported having no coverage for prescription drugs. These 114,000 (9.0%) Californians face significant financial barriers to managing their diabetes effectively because insulin and other diabetes medications are a substantial, ongoing expense.

EXHIBIT 11. HEALTH INSURANCE COVERAGE OF ELDERLY ADULTS BY DIABETES DIAGNOSIS, AGES 65 AND OVER, CALIFORNIA, 2001

	ADULTS DIAGNOSED WITH DIABETES (N=491,000) %	ADULTS NOT DIAGNOSED WITH DIABETES (N=2,927,000) %
MEDICARE AND MEDI-CAL	27.6	17.1
MEDICARE AND OTHER (HMO, PVT. SUPPLEMENT, ETC.)	60.3	71.6
MEDICARE ONLY	5.8	6.6
OTHER ONLY	5.6	4.2
UNINSURED	*	0.5
TOTAL	100	100

Note: Totals may not add to 100% due to rounding.
* The estimate was not statistically reliable.
Source: 2001 California Health Interview Survey

Nonelderly adults with diabetes who were uninsured or covered by Medi-Cal...relied heavily on the health care safety net.

EXHIBIT 12. PERCENT WITH EACH TYPE OF USUAL SOURCE OF CARE BY TYPE OF INSURANCE, NONELDERLY ADULTS WITH DIABETES, AGES 18-64, CALIFORNIA, 2001

USUAL SOURCE OF CARE	EMPLOYMENT-BASED	MEDI-CAL	PRIVATELY PURCHASED/ OTHER PUBLIC	UNINSURED
DOCTOR'S OFFICE/KAISER/HMO	91.1	61.6	60.7	31.8
GOVERNMENT/COMMUNITY CLINIC	2.7	19.8	17.9	27.2
OTHER CLINIC/HOSPITAL CLINIC	2.9	10.6	13.2	10.2
NONE OR EMERGENCY DEPARTMENT	3.1	7.7	*	30.3

Note: People who reported some other type of usual source of care are not included in the table because of their small sample size.

* The estimate was not statistically reliable.

Source: 2001 California Health Interview Survey

Usual Source of Care

Lack of health insurance coverage reduces the probability that persons with diabetes will have a medical home, a place they regularly go for care. Having a "usual source of care" has been shown to greatly enhance the likelihood that individuals will receive care for their chronic conditions as well as preventive screening services.[15] A usual source of care is especially important for people with diabetes because they require ongoing care and surveillance to adequately control their condition and to prevent complications.

Among adults of all ages, those with diabetes were more likely than those who had not been diagnosed with diabetes to have a usual source of care other than an emergency department (94.2% and 83.9%, respectively). Among nonelderly adults with diabetes, one in four (25.8%) who were uninsured for at least some period during the year had no usual source of care – in sharp contrast to those who were insured throughout the year, only 3.8% of whom did not have a usual source of health care. Some of those who were uninsured and had no usual source of care said they simply went to a hospital emergency room, an expensive option that does not allow for continuity of care.

Nonelderly adults with diabetes who were uninsured or covered by Medi-Cal and who had a regular source of care relied heavily on the health care safety net. More than one-fourth (27.2%) who were uninsured and one-fifth who were covered by Medi-Cal (19.8%) identified a public or community clinic as their usual source of care, compared with 2.7% of those with job-based coverage. In contrast, 91.1% of those with job-based coverage relied on private or HMO doctors, nearly three times as many as the uninsured (31.8%) and considerably higher than those covered by Medi-Cal (61.6%) (Exhibit 12).

15 Corbie-Smith G, Flagg EW, Doyle JP, O'Brien MA.. Influence of usual source of care on differences by race/ethnicity in receipt of preventive services. Journal of General Internal Medicine 2002 Jun; 17 (6): 458-64.

EXHIBIT 13. PERCENT WITH EACH TYPE OF USUAL SOURCE OF CARE BY TYPE OF INSURANCE, ELDERLY ADULTS WITH DIABETES, AGES 65 AND OVER, CALIFORNIA, 2001				
USUAL SOURCE OF CARE	**MEDICARE AND MEDI-CAL**	**MEDICARE AND OTHER**	**MEDICARE ONLY**	**OTHER ONLY**
DOCTOR'S OFFICE/KAISER/HMO	80.7	94.8	76.7	80.4
GOVERNMENT/COMMUNITY CLINIC	6.6	1.4	*	*
OTHER CLINIC/HOSPITAL CLINIC	8.9	3.0	*	*

Note: The number of uninsured elderly adults was too small to present estimates for type of usual source of care. The number of elderly adults with no usual source of care or who used the emergency room as a usual source of care was too small to present estimates. Elderly adults who reported some other type of usual source of care were not included in the table because of their small sample size.

* The estimate was not statistically reliable.

Source: 2001 California Health Interview Survey

Virtually all (98.0%) elderly Californians with diabetes had a usual source of care regardless of their particular type and combination of health insurance coverage. However, those covered by a combination of Medicare and Medi-Cal were more likely to rely on public or community clinics for their care than were those with Medicare plus some type of private supplemental insurance or HMO coverage (6.6% compared to 1.4%) (Exhibit 13).

4. DIABETES CARE AND MANAGEMENT

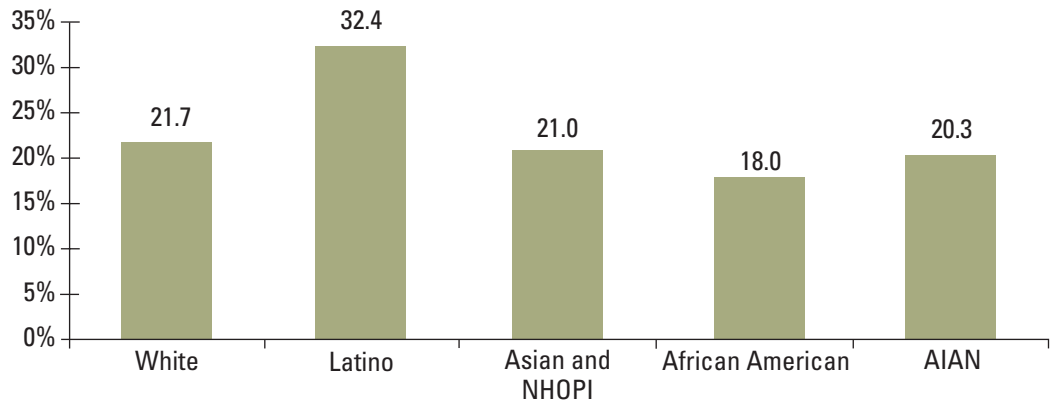
Medical care for diabetes focuses on the management of blood glucose levels, blood pressure, and blood lipids through the use of medication as well as the reduction of behavior-related health risks through appropriate nutrition, weight loss, and physical activity. At the time of a patient's initial diagnosis with Type 2 diabetes, medical management may rely primarily on behavioral interventions that focus on weight loss, a balanced diet, and increased physical activity. If this form of medical management fails to control a patient's blood glucose, the treatment plan is expanded to include oral medications. If satisfactory glycemic control is not achieved using multiple oral-diabetic medications, treatment with insulin is instituted either alone or in conjunction with oral medications.

In this section we discuss two ways in which adults with diabetes participate in the management of their condition: taking medications for diabetes and home glucose monitoring. Next, we discuss some important behavioral factors that affect a person's ability to manage their diabetes. We also discuss heart disease and hypertension, comorbidities closely associated with diabetes and diabetic complications. Then we discuss two indicators of medical management of diabetes: reported visits to a physician and receipt of foot exams among adults with diabetes. Finally, we discuss unmet needs for health care among people with diabetes.

Diabetes Medications

In California, over 75% of adults with diabetes were taking some form of medication for diabetes (compared with 86.3% nationally).[16] However, nearly 340,000 (24.0%) adults with diabetes in California were not taking any medications to control the condition—compared with 13.4% in a national sample of adults with diabetes. Although some of these adults may have been controlling their diabetes with diet and exercise, nearly 40% of those not taking any medications had been living with diabetes for more than five years, making it more likely that they needed medication to help control blood glucose levels. Furthermore, certain racial and ethnic groups, people with no insurance, and those with no usual source of care, were more likely not to be taking medications. Latinos were more likely not to be taking medications for diabetes than AIANs, Asian and NHOPIs,

EXHIBIT 14. PERCENT NOT TAKING ANY DIABETES MEDICATIONS BY RACE/ETHNICITY, ADULTS WITH DIABETES, AGES 18 AND OVER, CALIFORNIA, 2001



Note: Native Hawaiian and other Pacific Islander is abbreviated NHOPI and American Indian and Alaska Native is abbreviated AIAN. For an explanation of "Asian and NHOPI" and the exclusion of "other" race/ethnicity, see the Appendix.

Source: 2001 California Health Interview Survey

16 Based on data from the 2000 National Health Interview Survey (NHIS).

EXHIBIT 15. PERCENT NOT TAKING ANY DIABETES MEDICATIONS BY INSURANCE STATUS AND FEDERAL POVERTY LEVEL (FPL), ADULTS WITH DIABETES, AGES 18 AND OVER, CALIFORNIA, 2001		
	UNINSURED	INSURED
0-199% FPL	44.4	21.8
≥ 200% FPL	30.8	22.7
ALL ADULTS WITH DIABETES	40.6	22.3

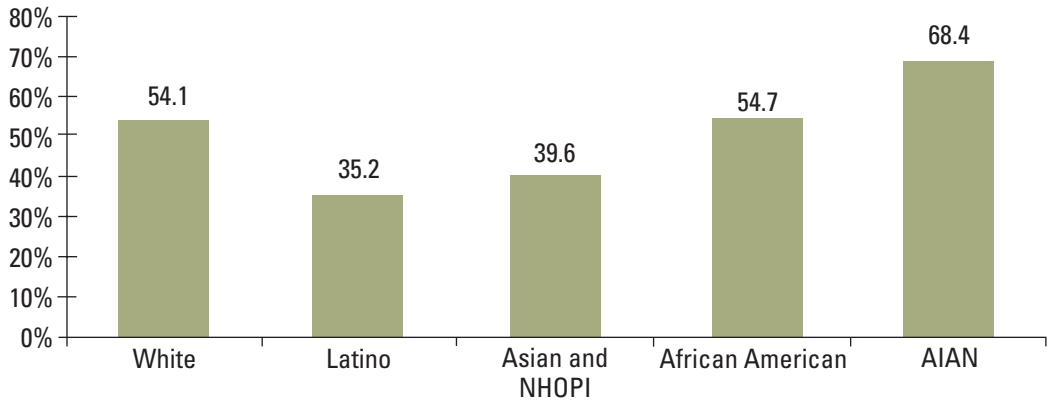
Source: 2001 California Health Interview Survey

African Americans, or whites (Exhibit 14). This finding was disturbing considering the high rates of diabetes among Latinos ages 50 and over. In addition, women had higher rates of not taking any medications than men (27.4% and 20.7%, respectively).

For some people with diabetes, the fact that they were not taking medications is undoubtedly due to limited access to care. For instance, more than half of all adults with diabetes who did not have a usual source of care were not taking any diabetes medications compared with less than one-quarter of those with a usual source of care (53.9% and 22.2%, respectively). Health insurance status was also related to whether someone with diabetes takes medications. Uninsured adults with diabetes were nearly twice as likely as adults with insurance not to be taking any medications for diabetes (40.6% and 22.3%, respectively). In addition, among respondents 18-64 years of age with diabetes, the uninsured had the highest rate of not using diabetes medication (41.8%) compared with those with Medi-Cal or employment-based insurance (24.4% and 24.3%, respectively). This finding suggests that the safety net provided by Medi-Cal was working for those adults with diabetes who qualified for it. However, many of those adults with diabetes who did not have insurance or did not have a usual source of care might not have been receiving the medications they needed to control their condition.

Furthermore, although there was no direct relationship between income and not taking medications, income affected the relationship between insurance and taking medications. Among adults with diabetes, the uninsured with incomes below 200% FPL had the highest rate for not using any diabetes medication compared to adults with higher incomes or those with health insurance (Exhibit 15). This finding suggests that although lack of insurance increases the likelihood that persons with diabetes will not be taking any diabetic medication, lack of insurance affects low-income persons more adversely than those with higher incomes.

EXHIBIT 16. PERCENT WHO MONITOR GLUCOSE AT LEAST ONCE PER DAY BY RACE/ETHNICITY, ADULTS WITH DIABETES, AGES 18 AND OVER, CALIFORNIA, 2001



Note: Native Hawaiian and other Pacific Islander is abbreviated NHOPI and American Indian and Alaska Native is abbreviated AIAN. For an explanation of "Asian and NHOPI" and the exclusion of "other" race/ethnicity, see the Appendix.

Source: 2001 California Health Interview Survey

Home Glucose Monitoring

Home monitoring of blood glucose levels is essential in the management of diabetes in order to prevent diabetic complications. One of the diabetes-focused objectives of Healthy People 2010 (HP2010) is to increase the proportion of adults with diabetes who perform self-blood-glucose monitoring at least once daily from 42% to 60%. Nationally, the median rate for home glucose monitoring was 46%, with a range from 30% to 66% between 1997 and 1999.[17] Although California's rate is not very different from the national median home glucose-monitoring rate, it is well below the HP2010 goal of 60%.

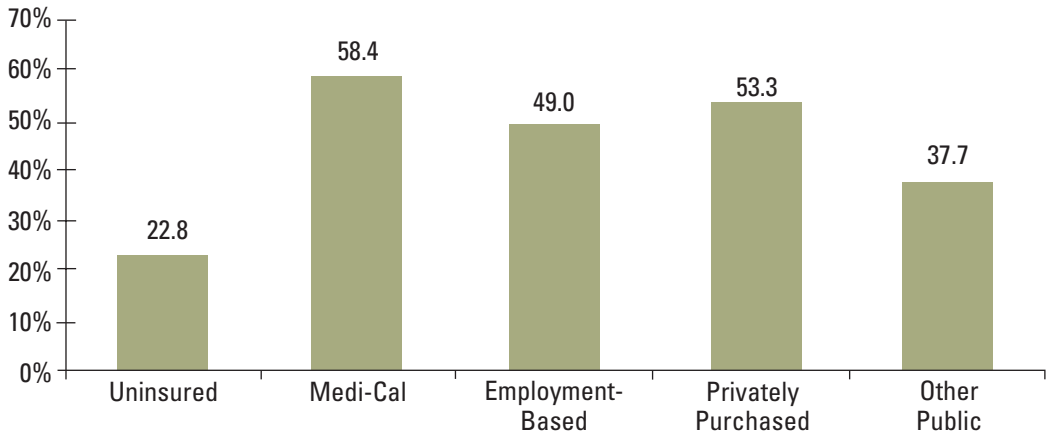
In California, 48.0% of adults with diabetes reported measuring their blood glucose levels at least once each day. However, 424,000 (30.2%) reported that they measured their blood glucose less frequently than once per week. Rates of measuring blood glucose levels at home varied with several important characteristics. Latinos and Asians and NHOPIs had the lowest rates of monitoring their glucose level at least once each day, rates significantly lower than those of African Americans, whites, and AIANs (Exhibit 16). AIANs had the highest reported rate of monitoring, higher than whites, Asian and NHOPIs, and Latinos. Among adults with diabetes, those with insurance were more than twice as likely

17 S Leatherman, D McCarthy. Quality of Health Care in the United States: A Chartbook. The Commonwealth Fund. New York, 2002.

as the uninsured to check their blood glucose levels at least once each day (50.6% and 22.8%, respectively). Rates for checking blood glucose levels daily also varied by insurance type. Adults ages 18-64 with Medi-Cal had the highest rate for checking their blood glucose at least once each day—significantly higher than adults with employment-based insurance, other public insurance, or no insurance (Exhibit 17). Having a usual source of care was also important in monitoring blood glucose levels at home. Adults with diabetes who had a usual source of care were more than twice as likely as those without a usual source of care to measure their blood glucose at least once each day (49.8% vs. 19.5%).

Although it is important for any person with diabetes to monitor his or her blood glucose level, it is vital for those using insulin. People using insulin to treat their diabetes should be measuring their blood glucose levels more than once each day; however, we found that in California only 79% of adults with diabetes using insulin reported doing so. Among adults with diabetes using insulin, over 65,000 (20.4%) measured their blood glucose levels less frequently than once per day.

EXHIBIT 17. PERCENT WHO MONITOR GLUCOSE AT LEAST ONCE PER DAY BY TYPE OF INSURANCE, NONELDERLY ADULTS WITH DIABETES, AGES 18-64, CALIFORNIA, 2001



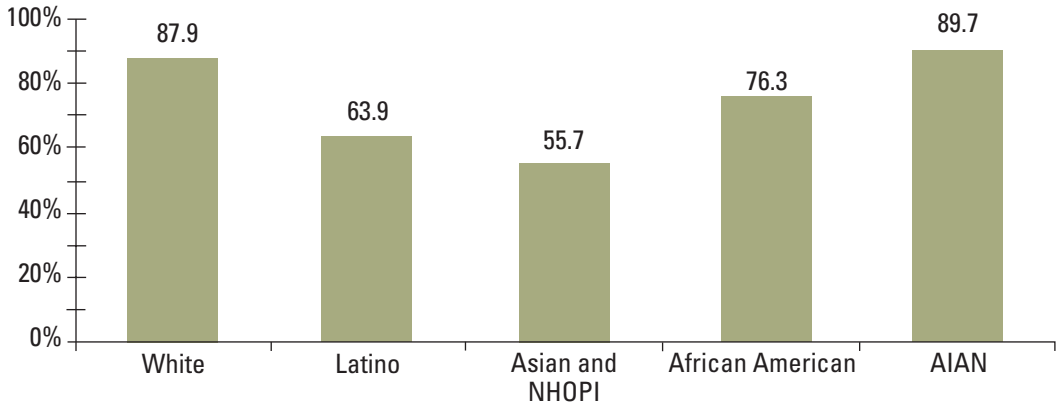
Source: 2001 California Health Interview Survey

The rates of monitoring blood glucose among insulin users varied by race and ethnicity. Only 55.7% of Asian and NHOPIs and 63.9% of Latinos checked their blood glucose levels at least once each day compared with more than 85% of AIANs and whites (Exhibit 18).

Behavior-Related Health Risks

As mentioned previously, control of blood glucose levels among individuals with diabetes is crucial for managing the condition and for reducing the risk of complications associated with this condition. Factors such as lack of physical activity, being overweight, or being obese can make the control and regulation of blood glucose more difficult or increase the risk for diabetes-related complications. In addition, diabetes itself is a significant risk factor for heart disease, and the presence of diabetes with high blood pressure (hypertension) significantly elevates risk for end-stage kidney disease and stroke. Among people with diabetes, smoking increases the risk for amputation and nonhealing ulcers.

EXHIBIT 18. PERCENT WHO MONITOR GLUCOSE AT LEAST ONCE PER DAY AMONG INSULIN USERS BY RACE/ETHNICITY, ADULTS WITH DIABETES, AGES 18 AND OVER, CALIFORNIA, 2001



Note: Native Hawaiian and other Pacific Islander is abbreviated NHOPI and American Indian and Alaska Native is abbreviated AIAN. For an explanation of "Asian and NHOPI" and the exclusion of "other" race/ethnicity, see the Appendix.

Source: 2001 California Health Interview Survey

EXHIBIT 19. PREVALENCE OF BODY MASS INDEX (BMI), PHYSICAL ACTIVITY, AND SMOKING, ADULTS WITH DIABETES, AGES 18 AND OVER, CALIFORNIA, 2001	
	%
BMI	
UNDERWEIGHT: BMI< 18.5 KG/M^2	0.6
NORMAL WEIGHT: BMI 18.5 - 24.9 KG/M^2	21.2
OVERWEIGHT: BMI 25.0 – 29.9 KG/M^2	34.4
OBESE: BMI ≥ 30.0 KG/M^2	40.8
PHYSICAL ACTIVITY	
REGULAR PHYSICAL ACTIVITY	19.8
SOME PHYSICAL ACTIVITY	52.3
NO PHYSICAL ACTIVITY (SEDENTARY)	27.8
SMOKING	
CURRENT SMOKER	14.7
CURRENTLY NONSMOKER	85.1

Source: 2001 California Health Interview Survey

In California, over 570,000 (40.8%) adults with diabetes were obese, and an additional 484,000 (34.4%) were overweight (Exhibit 19).[18] Over 1.1 million (80.1%) adults with diabetes reported that they did not participate in regular physical activity, and of these over 390,000 (27.8%) reported that they had not participated in any physical activity during the preceding thirty days.[19] Furthermore, although smoking is seriously contraindicated for individuals with diabetes because of the increased risk of vascular complications, over 200,000 California adults with diabetes (14.7%) were current smokers. In California, over 790,000 adults with diabetes (56.2%) also had high blood pressure, and nearly 300,000 (21.2%) also had heart disease.

Certain population groups among those with diabetes were at greater risk for complications because they had a higher prevalence of obesity, lower rates of regular physical activity and/or higher rates of being sedentary, or were more likely to smoke. Among adults with diabetes, females were more likely to be sedentary than males (32.0% and 23.7%, respectively) and were also more likely to be obese than males (43.3% and 38.3%, respectively).

18 Obesity and overweight are based on Body Mass Index (BMI), a standardized measure of weight and height that is used to classify adults as *underweight, normal weight, overweight,* or *obese*. BMI is an important predictor for future medical conditions such as diabetes and cardiovascular disease. Adults are classified as follows: *underweight* if BMI< 18.5 kg/m^2, *normal weight* if BMI is between 18.5 to 24.9 kg/m^2, *overweight* if BMI is between 25.0 and 29.9 kg/m^2, and *obese* if BMI is 30.0 kg/m^2 or greater.

19 Adults were asked if they had participated in any physical activity in their free time for at least 10 minutes in the past 30 days. Adults who said they had not and who also said that they did not walk or bike to work or to run errands were categorized as not participating in any physical activity (*sedentary*).

EXHIBIT 20. PREVALENCE OF OBESITY, NO PHYSICAL ACTIVITY, AND SMOKING BY AGE AND RACE/ETHNICITY, ADULTS WITH DIABETES, AGES 18 AND OVER, CALIFORNIA, 2001			
	OBESITY %	NO PHYSICAL ACTIVITY %	CURRENT SMOKING %
AGE			
AGES 18-39	40.2	13.4	18.8
AGES 40-64	48.3	22.7	18.6
AGES 65 AND OVER	29.9	40.8	7.4
RACE/ETHNICITY			
WHITE	41.9	28.6	16.0
LATINO	42.1	25.6	12.8
ASIAN AND NHOPI	15.6	24.2	10.4
AFRICAN AMERICAN	50.6	29.3	18.2
AIAN	64.7	25.2	36.3

Note: Native Hawaiian and other Pacific Islander is abbreviated NHOPI and American Indian and Alaska Native is abbreviated AIAN. For an explanation of "Asian and NHOPI" and the exclusion of "other" race/ethnicity, see the Appendix.

Source: 2001 California Health Interview Survey

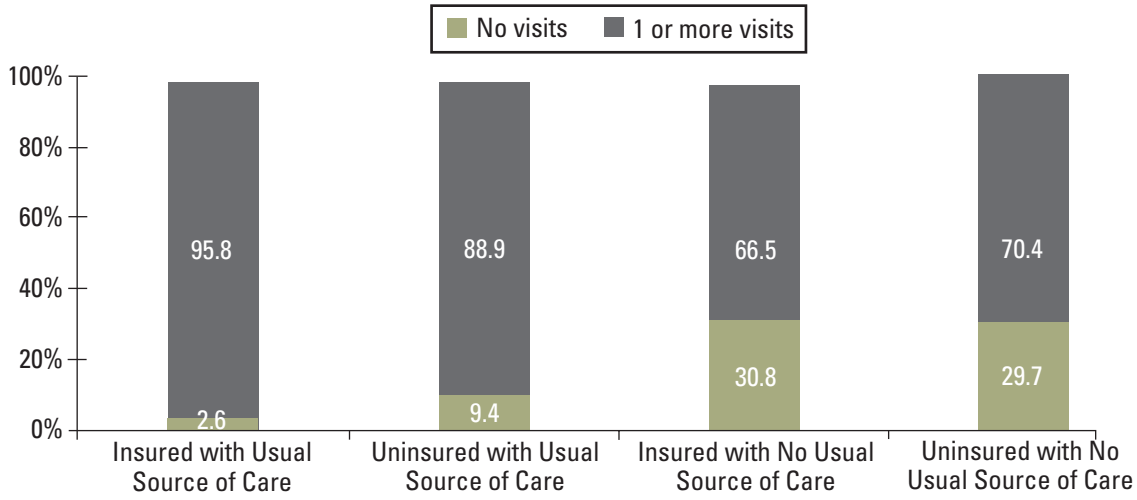
Older adults with diabetes were at greater risk for complications because they had high rates of obesity and were more likely to be sedentary compared to younger adults (Exhibit 20). Younger adults were more likely to be smokers than older adults. American Indians and Alaska Natives had the highest rates of obesity as well as the highest smoking rates. African Americans had the highest rates of physical inactivity as well as high rates of obesity and smoking. Among adults with diabetes, almost two-thirds of AIANs were obese; half of African Americans were obese; and over two-fifths of Latinos and whites were obese. Asian and NHOPIs had the lowest rates of obesity and smoking.

Doctor Visits

People with diabetes require careful medical monitoring to prevent dangerous complications. In California, 94% of adults with diabetes reported that they had seen a doctor at least once in the past year. However, over 65,000 (4.7%) adults with diabetes reported that they did not visit a doctor at all during the preceding year.[20] The degree to which people with diabetes received care or experienced barriers in the timely receipt of care was strongly related to health insurance coverage and having a usual source of care. Among nonelderly adults with diabetes who were uninsured at least some time during the year, 13.3% did not visit a doctor even once during the year, compared with 4.5% of

20 Approximately 1.6% of adults with diabetes reported that they did not know how many times they had seen a doctor in the past 12 months.

EXHIBIT 21. PHYSICIAN VISITS DURING THE PRECEDING YEAR BY USUAL SOURCE OF CARE AND INSURANCE STATUS, ADULTS WITH DIABETES, AGES 18 AND OVER, CALIFORNIA, 2001



Note: Totals do not add to 100% percent because some respondents did not recall how many times they saw a doctor in the past year.

Source: 2001 California Health Interview Survey

those with continuous coverage. In addition, among all adults with diabetes, those without an identifiable source of care, whether insured or uninsured (30.8% and 29.7%, respectively), were more than three times as likely not to have seen a physician during the preceding year as those who were uninsured but had a usual source of care (9.4%), and they were more than ten times as likely not to have seen a physician as those who had both insurance and a usual source of care (2.6%) (Exhibit 21). These findings underscore the importance of having a usual source of care for persons with diabetes. People with diabetes should have a connection to the health care system through which they can receive regular monitoring of and assistance in managing their condition.

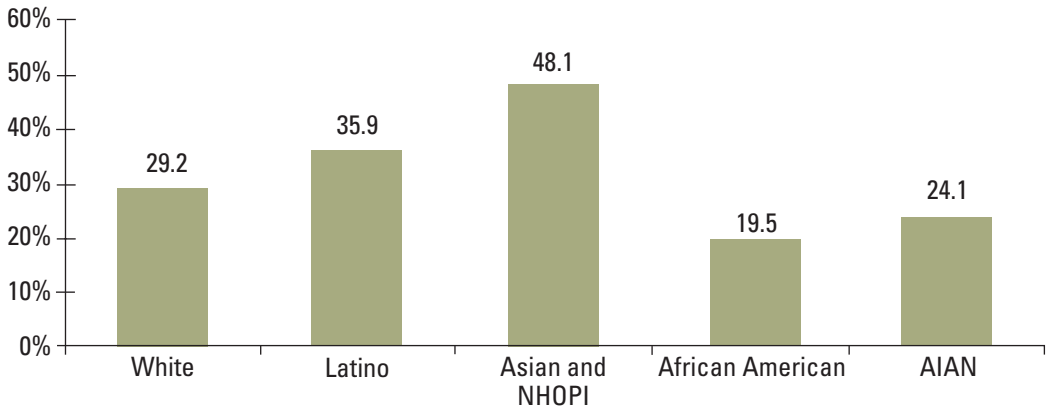
Foot Exams

People with diabetes are at particular risk for developing ulcers and other infections on their feet that require treatment and which, if present, may put them at increased risk for amputation of all or part of a lower extremity. Exams by both providers and patients are advocated by many organizations. One objective of Healthy People 2010 is to increase the proportion of adults with diabetes who have at least one annual foot exam from 55% to 75%. The median rate for foot exams in the U.S. between 1997 and 1999 was 58%.[21]

In California, over two-thirds (66.6%) of respondents with diabetes reported that a doctor examined their feet for sores at least once within the preceding year. Although this rate was higher than other samples, 447,000 (31.8%) adults with diabetes did not have their feet examined by a health care provider even once during the preceding year. In addition, there were certain population groups whose rates of foot exams were considerably lower.

21 S Leatherman, D McCarthy. Quality of Health Care in the United States: A Chartbook. The Commonwealth Fund. New York, 2002.

EXHIBIT 22. PERCENT WITH NO FOOT EXAM IN THE PAST YEAR BY RACE/ETHNICITY, ADULTS WITH DIABETES, AGES 18 AND OVER, CALIFORNIA, 2001



Note: Native Hawaiian and other Pacific Islander is abbreviated NHOPI and American Indian and Alaska Native is abbreviated AIAN. For an explanation of "Asian and NHOPI" and the exclusion of "other" race/ethnicity, see the Appendix.

Source: 2001 California Health Interview Survey

Certain racial and ethnic groups, the uninsured, and those with no usual source of care were much less likely to report having their feet examined in the past year. Asian and NHOPIs and Latinos had the highest rates for having no foot exam in the past year (48.1% and 35.9%, respectively), significantly higher than most other racial/ethnic groups (Exhibit 22). In addition, having insurance and having a usual source of care were important factors in receiving a foot exam. Adults with diabetes who had no usual source of care were nearly twice as likely as those with a usual source of care to have had no foot exam during the preceding year (Exhibit 23). Adults with diabetes who were uninsured were also more likely than those with insurance to have had no foot exam in the past year (49.6% and 30.0%, respectively).

EXHIBIT 23. PERCENT WITH NO FOOT EXAM IN THE PAST YEAR BY INSURANCE STATUS AND USUAL SOURCE OF CARE, ADULTS WITH DIABETES, AGES 18 AND OVER, CALIFORNIA, 2001

	NO FOOT EXAM BY PHYSICIAN IN THE PAST 12 MONTHS %
INSURED	30.0
UNINSURED	49.6
USUAL SOURCE OF CARE	30.2
NO USUAL SOURCE OF CARE OR EMERGENCY ROOM	57.6

Source: 2001 California Health Interview Survey

EXHIBIT 24. TYPES OF DELAYED CARE FOR DIABETES, ADULTS WITH DIABETES, AGES 18 AND OVER, CALIFORNIA, 2001		
	% OF ADULTS WITH DIABETES	ESTIMATED N
DELAYED PRESCRIPTION MEDICATION FOR DIABETES	5.4	76,000
DELAYED TEST OR TREATMENT FOR DIABETES	4.2	59,000
DELAYED OTHER MEDICAL CARE FOR DIABETES	5.0	70,000
DELAYED ANY CARE FOR DIABETES	11.6	163,000*

* The estimated N for adults with diabetes who delayed specific types of care does not add up to the number who delayed any care because some adults with diabetes delayed more than one type of care.

Source: 2001 California Health Interview Survey

EXHIBIT 25. DELAYS IN CARE BY CURRENT HEALTH INSURANCE STATUS, ADULTS WITH DIABETES, AGES 18 AND OVER, CALIFORNIA, 2001		
	UNINSURED %	INSURED %
DELAYED PRESCRIPTION MEDICATION FOR DIABETES	8.4	5.1
DELAYED ANY MEDICAL CARE FOR DIABETES	18.7	10.9

Source: 2001 California Health Interview Survey

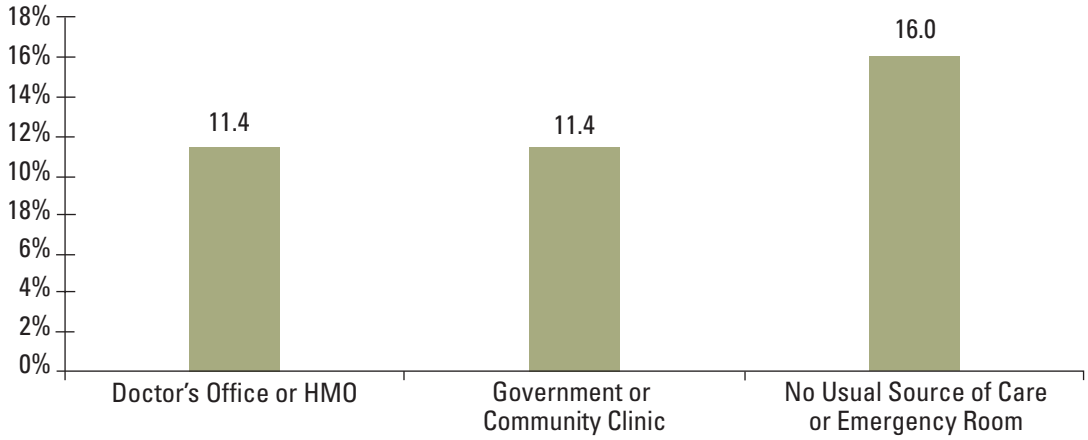
Delays in Care

Delaying or not getting needed health care may result in an increase in complications and worse outcomes for people with diabetes. Delays in receipt of medical care may include not receiving prescription medications, specific tests or treatment, and other types of medical care. Health insurance coverage and having a usual source for getting health care are important factors in the timely receipt of needed medical care.

In California, 368,000 (26.2%) adults with diabetes reported that they delayed or did not receive necessary medical care. This includes 163,000 (11.6%) who reported that the delayed care was specifically for their diabetes (Exhibit 24).

Among individuals with diabetes, 5.4% delayed or did not get their prescription diabetes medication. Over half (51.5%) of the adults with diabetes who delayed or did not get a prescription for their condition reported that the delay was because the medication cost too much or because they did not have insurance to cover the medication. Overall, one-tenth (11.6%) of respondents with diabetes reported having delayed or failed to obtain needed medical care directly related to diabetes. Among these individuals, 40% attributed their unmet need for care to financial or insurance related barriers.

EXHIBIT 26. PERCENT WHO REPORTED DELAYING OR NOT RECEIVING NEEDED MEDICAL CARE FOR DIABETES BY TYPE OF USUAL SOURCE OF CARE, ADULTS WITH DIABETES, AGES 18 AND OVER, CALIFORNIA, 2001



Source: 2001 California Health Interview Survey

In California, people with diabetes who were uninsured, had low incomes, or had no usual source of care were at increased risk for unmet health care needs. Among adults with diabetes, those who were uninsured were more likely to delay or not obtain needed care for diabetes (18.7% and 10.9%, respectively; Exhibit 25). In addition, adults with diabetes who experienced interruptions in their health care coverage during the preceding year were more likely than those with continuous coverage to have delayed or not received needed health care (19.5% and 10.4%, respectively). For persons with diabetes, delayed care increases the risk of poor outcomes.

Among adults with diabetes, nearly one in six (16.0%) without a usual source of care reported that they had delayed or not received care for diabetes such as prescription medicine, a test, or treatment. Among adults with a usual source of care, those who utilized the health care safety net provided by public or community clinics (11.4%) reported similar rates of delay to those who reported having a private doctor or HMO as their usual source of care (11.4%) (Exhibit 26).

5. IDENTIFYING "AT RISK" POPULATIONS

The prevalence of diabetes is expected to double in the next 25 years, with particular risk for Latinos, African Americans, and Pacific Islanders. Early diagnosis of diabetes is especially important because individuals may already have developed complications by the time of their diagnosis. Furthermore, it is currently estimated that one-third of people who have diabetes have not been diagnosed and are therefore not receiving appropriate and necessary medical care. The Centers for Disease Control and Prevention (CDC) estimate that 17 million people nationwide have diabetes, 5.9 million of whom have not yet been diagnosed.[22] According to the American Diabetes Association, an additional 16 million people may have "pre-diabetes," putting them at increased risk for developing diabetes.[23] The group of people we discuss as being at risk for Type 2 diabetes almost certainly includes a large proportion of individuals who currently have diabetes but who remain undiagnosed. These individuals with undiagnosed diabetes may not be receiving appropriate and necessary medical care.

As mentioned previously, the risk for Type 2 diabetes increases significantly with age. In addition, individuals with particular comorbidities and health behaviors are at elevated risk for developing diabetes. Specifically, individuals who are obese and sedentary are at greater risk for developing Type 2 diabetes. Furthermore, research has demonstrated that individuals in certain racial and ethnic groups, such as African Americans and Latinos, are at elevated risk for developing diabetes independent of obesity and level of physical activity. Research studies have found that lifestyle changes can prevent or delay the onset of Type 2 diabetes among adults at risk for developing diabetes. Lifestyle interventions include consuming nutritious food and engaging in moderate physical activity.

In this section, we discuss major risk factors for Type 2 diabetes. We focus on two population groups that have not been diagnosed with diabetes: adults ages 18 and over and adolescents ages 12-17. Among adults we examined rates of being overweight and obese, and among adolescents we report rates of being overweight and at risk for overweight. In addition, among each group we examined self-reported physical activity among various sociodemographic populations and report findings from multivariate statistical models predicting the largest risk factor for Type 2 diabetes – obesity.

Adult Obesity

Obesity is the major risk factor for Type 2 diabetes in this country, and it has reached epidemic proportions among both adults and children. Recent evidence strongly suggests that lifestyle and behavioral interventions that promote weight loss, increase physical activity, and improve diet can significantly decrease the incidence and prevalence of Type 2 diabetes.[24]

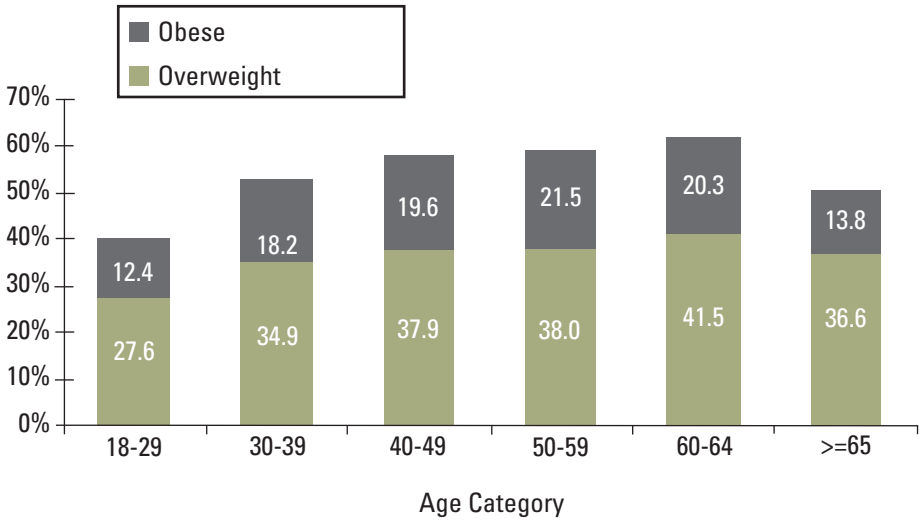
In California, over 7.7 million adults not diagnosed with diabetes were overweight (34.6%), and an additional 3.8 million were obese (17.0%). The prevalence of obesity varied by age. Approximately one in five adults between the ages of 40 and 64 was obese compared with one in eight between the ages of 18 and 29 (Exhibit 27).

22 Centers for Disease Control and Prevention. National diabetes fact sheet: general information and national estimates on diabetes in the United States, 2000. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2002.

23 *Pre-diabetes* is a condition in which a person's blood glucose levels are higher than normal but not high enough for a diagnosis of Type 2 diabetes.

24 Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA, Nathan DM. Reduction in the incidence of type diabetes with lifestyle intervention or metformin. New England Journal of Medicine 2002; 346 (6): 393-403.

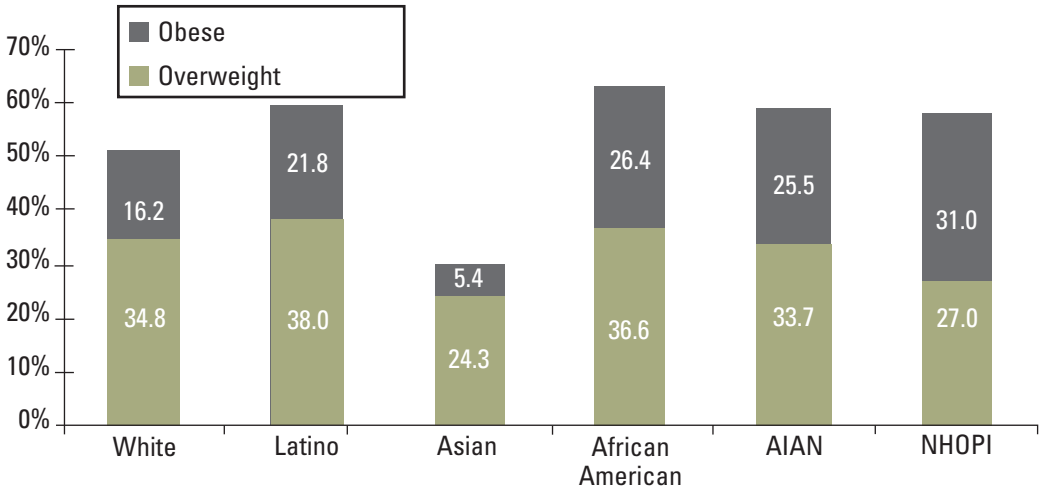
EXHIBIT 27. PREVALENCE OF OVERWEIGHT AND OBESITY BY AGE, ADULTS NOT DIAGNOSED WITH DIABETES, AGES 18 AND OVER, CALIFORNIA, 2001



Note: *Overweight* was defined as having a BMI between 25.0 and 29.9. *Obese* was defined as having a BMI of 30.0 or higher.

Source: 2001 California Health Interview Survey

EXHIBIT 28. PREVALENCE OF OVERWEIGHT AND OBESITY BY RACE/ETHNICITY, ADULTS NOT DIAGNOSED WITH DIABETES, AGES 18 AND OVER, CALIFORNIA, 2001



Note: *Overweight* was defined as having a BMI between 25.0 and 29.9. *Obese* was defined as having a BMI of 30.0 or higher. Native Hawaiian and other Pacific Islander is abbreviated NHOPI and American Indian and Alaska Native is abbreviated AIAN. For an explanation of the exclusion of "other" race/ethnicity, see the Appendix.

Source: 2001 California Health Interview Survey

Rates of obesity also varied by race and ethnicity. Among adults not diagnosed with diabetes, nearly one in three NHOPIs, one in four African Americans and AIANs, and one in five Latinos were obese compared to one in 20 Asians (Exhibit 28).[25] In addition, the racial and ethnic groups most at risk in terms of obesity also varied by *gender*. Among adult males, NHOPIs had much higher rates of obesity (35.9%) than most other racial and ethnic groups, while among adult females, African Americans had the highest rate of obesity (29.2%), with high rates also found among NHOPIs (26.5%), AIANs (25.9%), and Latinas (22.4%). Interestingly, although Asians had the lowest rates of obesity relative to other racial and ethnic groups for both males (6.9%) and females (3.8%), Asian males were twice as likely to be overweight or obese as Asian females.

Rates of obesity also varied by several other sociodemographic characteristics. Adults with lower incomes, less education, or living in rural areas were disproportionately affected by obesity. Among adults not diagnosed with diabetes, those with incomes at or above 300% FPL were less likely to be obese than adults with lower incomes (Exhibit 29). In addition, one in four adults who had not attended school beyond the eighth grade and one in five adults who started but did not complete high school were obese compared to about one in nine adults who had a college degree. Adults who lived in rural areas had higher rates of obesity than adults who lived in suburban areas.

To assess whether differences in obesity by race and ethnicity or urban-rural area of residence may be due to differences in the demographic profiles of these groups, we controlled for respondent characteristics (such as age, gender, education, and income), physical activity, and measures of access to health care among adults ages 18-64. Race and ethnicity and area of residence were both significantly associated with elevated risk for obesity even after controlling for these other characteristics. Latinos, NHOPIs, American Indians and Alaska Natives, and African Americans were all more likely than whites to be obese, while Asians were less likely. Additionally, respondents living in rural areas were more likely to be obese than people living in urban or suburban areas. These findings suggest that

EXHIBIT 29. PREVALENCE OF OBESITY BY FEDERAL POVERTY LEVEL, EDUCATION, AND AREA OF RESIDENCE, ADULTS NOT DIAGNOSED WITH DIABETES, AGES 18 AND OVER, CALIFORNIA, 2001

FEDERAL POVERTY LEVEL (FPL)	%
< 100%	20.0
100-199%	19.1
200-299%	19.0
300% +	15.3
EDUCATION	
EIGHTH GRADE OR LESS	23.2
SOME HIGH SCHOOL	20.9
HIGH SCHOOL DIPLOMA	18.4
SOME COLLEGE	18.9
COLLEGE DEGREE OR HIGHER	11.6
AREA OF RESIDENCE	
URBAN	16.7
2ND CITY	17.5
SUBURBAN	15.4
SMALL TOWN	19.1
RURAL	23.0
ALL ADULTS NOT DIAGNOSED WITH DIABETES	**17.0**

Note: Classification of area of residence is based on the population density of the zip code in which the respondent lives. For example, *second city* refers to a zip code with a population density between 1,000 and 4,150 persons per square mile. *Rural* refers to a zip code with a population density equal to or less than 210 persons per square mile.

Source: 2001 California Health Interview Survey

25 Although the number of Native Hawaiians and other Pacific Islanders (NHOPI) in the CHIS 2001 sample was relatively small, estimates for this group were reported separately whenever possible. Estimates for the NHOPI group were reported separately for analyses of adults and adolescents not diagnosed with diabetes. These analyses are reported in the section on "Identifying 'At Risk' Populations."

EXHIBIT 30. OBESITY PREVALENCE AND AGE-ADJUSTED PREVALENCE IN CALIFORNIA COUNTIES OR COUNTY GROUPS, ADULTS AGES 18 AND OVER, 2001

	OBESITY PREVALENCE (ADULTS AGES 18+)		AGE-ADJUSTED OBESITY PREVALENCE** (ADULTS AGES 18+)	
NORTHERN AND SIERRA COUNTIES	**%**	**(90% CI*)**	**%**	**(90% CI*)**
BUTTE	**19.1**	(16.4-21.8)	**19.6**	(16.8-22.3)
SHASTA	**21.0**	(18.3-23.8)	**21.0**	(17.9-24.0)
HUMBOLDT, DEL NORTE	**20.8**	(17.9-23.7)	**20.9**	(18.0-23.8)
SISKIYOU, LASSEN, TRINITY, MODOC	**23.2**	(20.3-26.1)	**22.8**	(19.7-26.0)
MENDOCINO, LAKE	**22.9**	(20.1-25.7)	**22.4**	(19.3-25.6)
TEHAMA, GLENN, COLUSA	**22.9**	(20.2-25.7)	**22.4**	(19.7-25.2)
SUTTER, YUBA	**24.7**	(21.7-27.6)	**24.8**	(21.8-27.8)
NEVADA, PLUMAS, SIERRA	**15.4**	(12.7-18.0)	**15.9**	(12.5-19.2)
TUOLOMNE, CALAVERAS, AMADOR, INYO, MARIPOSA, MONO, ALPINE	**16.8**	(14.3-19.3)	**15.8**	(13.2-18.4)
GREATER BAY AREA				
SANTA CLARA	**14.5**	(12.8-16.2)	**14.5**	(12.9-16.2)
ALAMEDA	**17.5**	(15.3-19.5)	**17.3**	(15.2-19.3)
CONTRA COSTA	**19.7**	(17.5-21.9)	**19.4**	(17.2-21.6)
SAN FRANCISCO	**11.2**	(9.7-12.6)	**11.4**	(9.9-12.8)
SAN MATEO	**16.9**	(14.4-19.5)	**16.7**	(14.1-19.3)
SONOMA	**13.5**	(11.3-15.7)	**12.8**	(10.6-15.0)
SOLANO	**22.4**	(20.4-24.4)	**22.2**	(20.1-24.2)
MARIN	**11.5**	(9.1-13.8)	**10.5**	(7.9-13.0)
NAPA	**16.2**	(13.7-18.7)	**15.3**	(12.8-17.8)
SACRAMENTO AREA				
SACRAMENTO	**21.1**	(19.0-23.3)	**21.1**	(18.9-23.2)
PLACER	**15.8**	(13.3-18.2)	**15.4**	(12.8-18.1)
YOLO	**17.5**	(14.8-20.2)	**18.8**	(16.0-21.5)
EL DORADO	**17.5**	(14.7-20.4)	**16.9**	(14.0-19.7)

Note: *Obesity* is defined as BMI ≥ 30.0.

(continued on next page)

* The 90% Confidence Interval (CI) provides a more reliable prevalence estimate for persons in the population group than does the "point estimate." Estimates with narrower ranges are more precise or reliable than those with wider ranges.

** The age-adjusted prevalence provides an estimate of the prevalence for a county as if that county had the same age distribution as the state of California.

Source: 2001 California Health Interview Survey

EXHIBIT 30. OBESITY PREVALENCE AND AGE-ADJUSTED PREVALENCE IN CALIFORNIA COUNTIES OR COUNTY GROUPS, ADULTS AGES 18 AND OVER, 2001 (CONTINUED)

	OBESITY PREVALENCE (ADULTS AGES 18+)		AGE-ADJUSTED OBESITY PREVALENCE** (ADULTS AGES 18+)	
SAN JOAQUIN VALLEY	**%**	**(90% CI*)**	**%**	**(90% CI*)**
FRESNO	**25.2**	(22.6-27.9)	**25.7**	(23.1-28.2)
KERN	**24.6**	(22.2-27.1)	**24.7**	(22.3-27.1)
SAN JOAQUIN	**25.5**	(22.9-28.2)	**25.5**	(22.9-28.2)
STANISLAUS	**24.1**	(21.1-27.0)	**24.0**	(21.1-27.0)
TULARE	**22.7**	(19.9-25.5)	**23.1**	(20.4-25.7)
MERCED	**28.5**	(25.3-31.7)	**28.8**	(25.7-31.9)
KINGS	**26.3**	(23.2-29.3)	**26.9**	(24.0-29.8)
MADERA	**23.8**	(20.8-26.8)	**23.8**	(20.8-26.8)
CENTRAL COAST				
VENTURA	**16.3**	(13.9-18.6)	**16.1**	(13.8-18.5)
SANTA BARBARA	**15.9**	(13.8-18.0)	**16.5**	(14.4-18.6)
SANTA CRUZ	**14.4**	(11.8-16.9)	**14.2**	(11.8-16.6)
SAN LUIS OBISPO	**15.2**	(12.7-17.6)	**15.4**	(12.8-17.9)
MONTEREY, SAN BENITO	**24.5**	(21.3-27.6)	**24.6**	(21.5-27.7)
LOS ANGELES				
LOS ANGELES	**18.8**	(18.1-19.5)	**18.9**	(18.2-19.6)
OTHER SOUTHERN CALIFORNIA				
ORANGE	**14.5**	(13.1-15.9)	**14.6**	(13.2-15.9)
SAN DIEGO	**15.3**	(14.1-16.6)	**15.6**	(14.3-16.8)
SAN BERNARDINO	**23.0**	(21.0-25.1)	**23.1**	(21.0-25.1)
RIVERSIDE	**19.4**	(17.4-21.5)	**19.5**	(17.5-21.6)
IMPERIAL	**27.0**	(23.8-30.2)	**27.2**	(24.1-30.4)
STATEWIDE	**18.4**	(18.0-18.7)	**18.4**	(18.0-18.7)

Note: *Obesity* is defined as BMI ≥ 30.0.

* The 90% Confidence Interval (CI) provides a more reliable prevalence estimate for persons in the population group than does the "point estimate." Estimates with narrower ranges are more precise or reliable than those with wider ranges.

** The age-adjusted prevalence provides an estimate of the prevalence for a county as if that county had the same age distribution as the state of California.

Source: 2001 California Health Interview Survey

Nearly 3.5 million adults (15.4%) of those not diagnosed with diabetes) reported that they did not participate in any physical activity.

these groups were at elevated risk for diabetes as well as other medical conditions because of the consequences of obesity. The identification of groups at risk for obesity may facilitate the development of specifically targeted, culturally appropriate interventions to increase community awareness and to combat rising rates of obesity in this country.

The prevalence of obesity also varied across California counties. Exhibit 30 shows the prevalence and age-adjusted prevalence of obesity for each county or county group. The age-adjusted prevalence estimates what the prevalence would be for each county or county group if each county population had the same age distribution. It was important to take variation due to age into account because rates of obesity are related to age and there were differences among California counties in the age distribution of their populations. Overall, the age-adjusted prevalence of obesity (including adults diagnosed and those not diagnosed with diabetes) was greatest among adults in Merced (28.8%), Imperial (27.2%), and Kings (26.9%) counties and lowest among adults in Sonoma (12.8%), San Francisco (11.4%), and Marin (10.5%) counties.

Adult Physical Activity

Physical activity is important for all adults and children for a variety of reasons, including cardiovascular and aerobic benefits, increase in lean muscle mass, optimization of bone mineral density, positive effects on metabolism, and stress reduction. Regular physical activity is important for maintaining lean muscle mass, controlling weight, and reducing the level of risk for a number of chronic medical conditions, including Type 2 diabetes. Adult respondents were asked a series of questions about the type and duration of their physical activity during the 30 days preceding their interviews.

EXHIBIT 31. LEVEL OF PHYSICAL ACTIVITY, ADULTS NOT DIAGNOSED WITH DIABETES, AGES 18 AND OVER, CALIFORNIA, 2001

PHYSICAL ACTIVITY	%
REGULAR PHYSICAL ACTIVITY	27.4
SOME PHYSICAL ACTIVITY	57.2
NO PHYSICAL ACTIVITY (SEDENTARY)	15.4

Source: 2001 California Health Interview Survey

In California, the vast majority of adults not diagnosed with diabetes, nearly 16.3 million (72.6%), did not meet the current standards for regular physical activity.[26] In fact, less than one-third of adults (27.4%) not diagnosed with diabetes reported participating in regular physical activity (Exhibit 31). Nearly 3.5 million adults (15.4% of those not diagnosed with diabetes) reported that they did not participate in any physical activity.[27] This lack of physical activity greatly increases the risk of obesity and, as a result, the risk of developing Type 2 diabetes.

Among adults not diagnosed with diabetes, rates of physical activity were related to obesity (Exhibit 32). One in five adults who were sedentary was obese compared to one in eight adults who participated in regular activity.

Among adults not diagnosed with diabetes, level of physical activity was related to age and gender. Older adults were twice as likely to be sedentary as younger adults (Exhibit 34), and females were more likely to be sedentary than males. There was also significant variation in level of physical activity by race and ethnicity. Almost one-fifth of African Americans, Latinos, and Asians were sedentary

26 *Regular physical activity* refers to participating in vigorous activity for at least 20 minutes three or more times a week or participating in moderate activity for at least 30 minutes five or more times per week. Adults were considered to participate in some physical activity if they said they participated in physical activity but they did not meet the levels for our definition of regular physical activity.

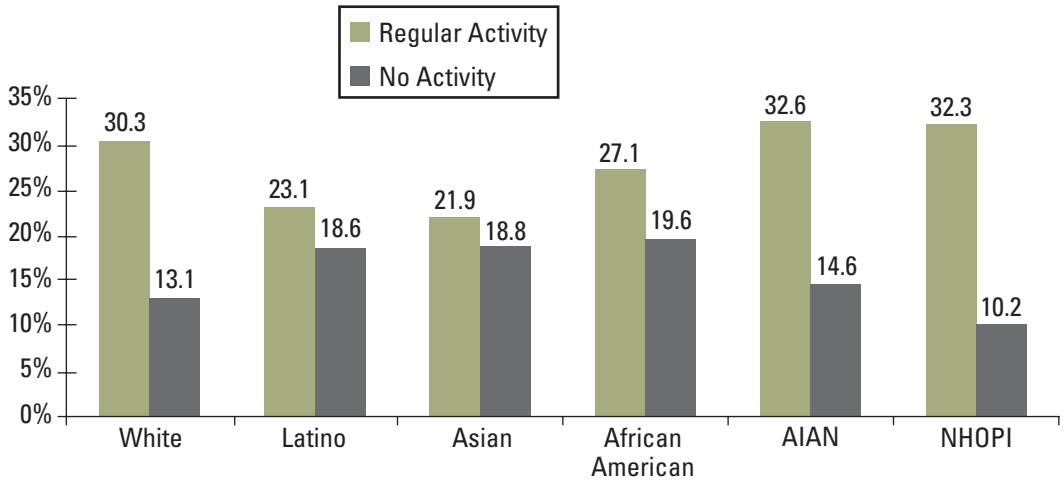
27 Adults were asked if they had participated in any physical activity in their free time for at least 10 minutes in the past 30 days. Adults who said they had not and who also said that they did not walk or bike to work or to run errands were categorized as participating in no physical activity (*sedentary*).

EXHIBIT 32. PREVALENCE OF OBESITY BY PHYSICAL ACTIVITY, ADULTS NOT DIAGNOSED WITH DIABETES, AGES 18 AND OVER, CALIFORNIA, 2001	
	OBESITY %
NO PHYSICAL ACTIVITY (SEDENTARY)	20.7
REGULAR PHYSICAL ACTIVITY	13.1

Note: *Obesity* was defined as BMI ≥ 30.0. *Regular physical activity* was defined as at least 3 days per week of vigorous physical activity for at least 20 minutes or at least 5 days per week of moderate physical activity for at least 30 minutes. The category of *no physical activity/sedentary* included the participants who responded "no" to any form of physical activity.

Source: 2001 California Health Interview Survey

EXHIBIT 33. PHYSICAL ACTIVITY BY RACE/ETHNICITY, ADULTS NOT DIAGNOSED WITH DIABETES, AGES 18 AND OVER, CALIFORNIA, 2001



Note: Native Hawaiian and other Pacific Islander is abbreviated NHOPI and American Indian and Alaska Native is abbreviated AIAN. For an explanation of the exclusion of "other" race/ethnicity, see the Appendix.

Source: 2001 California Health Interview Survey

compared with only 10.2% of NHOPI and 13.1% of whites (Exhibit 33). Although Asians had a low prevalence of obesity, their rates for being overweight were not very different from other racial/ethnic groups, particularly among males. Furthermore, Asians in California had the lowest reported rates of regular physical activity and one of the highest rates of physical inactivity. This may indicate the need to target preventive educational information to this population.

Level of participation in physical activity was also related to education and family income (Exhibit 34). Adults with less education were the most likely to be sedentary. In addition, adults living below 200% FPL were nearly twice as likely to be sedentary as adults with family incomes at or above 300% FPL.

Adolescents "At Risk" for Diabetes

In the past, Type 2 diabetes was most commonly found among adults who were overweight or obese *and* ages 40 or over. Now, as more children and adolescents in the United States become overweight and inactive, there is an increasingly high prevalence of Type 2 diabetes among young people. While the identification of diabetes is important among adults, adolescents, and children, so is prevention of diabetes. Diabetes prevention should begin among children and adolescents. Eating nutritious foods, engaging in regular physical activity, and reducing rates of obesity reduce the risk for future development of diabetes as well as other medical conditions such as high blood pressure and heart disease.

EXHIBIT 34. PHYSICAL ACTIVITY BY AGE, GENDER, EDUCATION, AND FEDERAL POVERTY LEVEL, ADULTS NOT DIAGNOSED WITH DIABETES, AGES 18 AND OVER, CALIFORNIA, 2001

	REGULAR PHYSICAL ACTIVITY %	NO PHYSICAL ACTIVITY %
AGE		
AGES 18-49	29.2	12.4
AGES 50-64	24.6	17.4
AGES 65 AND OVER	22.2	28.6
GENDER		
MALE	31.7	12.3
FEMALE	23.4	18.4
EDUCATION		
EIGHTH GRADE OR LESS	14.2	27.9
SOME HIGH SCHOOL	23.5	22.0
HIGH SCHOOL GRADUATE	25.4	18.5
SOME COLLEGE	29.2	13.7
COLLEGE GRADUATE	31.8	9.7
FEDERAL POVERTY LEVEL (FPL)		
0-99%	23.1	20.5
100-199%	22.7	21.0
200-299%	25.9	17.8
300%+	30.7	11.4

Source: 2001 California Health Interview Survey

In California, over 736,000 adolescents (ages 12-17) not diagnosed with diabetes were either overweight (10.8%) or were at risk for being overweight (14.3%).

An increasing proportion of younger individuals are being diagnosed with diabetes, and those groups at elevated risk should be targeted for disease prevention and screening. The CDC estimates that 151,000 people under the age of 20 have diabetes.[28] Furthermore, the CDC reports that Type 2 diabetes is becoming more common among American Indian, African-American, and Hispanic/Latino children and adolescents, suggesting that adolescents who have these racial/ethnic backgrounds are at particular risk. For children and teens at risk, health care providers can encourage, support, and educate the entire family to make lifestyle changes that may delay—or prevent—the onset of Type 2 diabetes. Such changes include maintaining a healthy weight and staying physically active. For adolescents, being overweight is a major risk factor for diabetes. In addition, overweight adolescents are more likely to become overweight or obese as adults.[29, 30]

Adolescent Overweight[31]

In California, over 736,000 adolescents (ages 12-17) not diagnosed with diabetes were either overweight (10.8%) or were at risk for being overweight (14.3%).[32] Among adolescents in California, certain groups appeared to be more likely to be overweight or at risk for overweight. Adolescent males were nearly twice as likely to be overweight as adolescent females (14.2% and 7.2%, respectively; Exhibit 35).

EXHIBIT 35. PREVALENCE OF "OVERWEIGHT" AND "AT RISK FOR OVERWEIGHT" BY AGE AND GENDER, ADOLESCENTS NOT DIAGNOSED WITH DIABETES, AGES 12-17, CALIFORNIA, 2001

	AT RISK FOR OVERWEIGHT[1] %	OVERWEIGHT[2] %
ALL ADOLESCENTS	14.3	10.8
AGE		
AGES 12-14	15.6	10.2
AGES 15-17	13.0	11.4
GENDER		
MALE	14.9	14.2
FEMALE	13.7	7.2

1 85th – 94th percentile for gender- and age-appropriate height and weight

2 ≥95th percentile for gender- and age-appropriate height and weight

Source: 2001 California Health Interview Survey

28 Centers for Disease Control and Prevention. National diabetes fact sheet: general information and national estimates on diabetes in the United States, 2000. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2002.

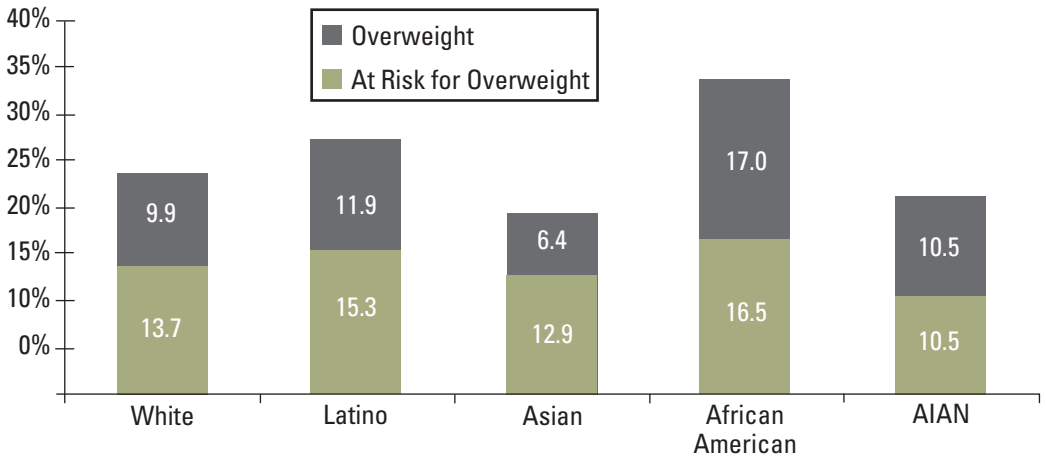
29 Whitaker RC, Pepe MS, Wright JA, Seidel KD, Dietz WH. Early adiposity rebound and the risk of adult obesity. Pediatrics, 1998; 101 (5). See *http://www.pediatrics.org/cgi/content/full/101-3/e5.*

30 Guo SS, et al. The predictive value of childhood BMI values for overweight at age 35 years. American Journal of Clinical Nutrition 1994; 59: 810-819.

31 The *overweight* category among adolescents used to be referred to as *obese* and roughly corresponds to the obese BMI range among adults.

32 *At risk for overweight* is defined as at or above the gender- and age-specific 85th percentile of BMI and below the 95th percentile of BMI based on the revised CDC Growth Charts for the United States. *Overweight* is defined as at or above the gender- and age-specific 95th percentile of BMI based on the revised CDC Growth Charts for the United States.

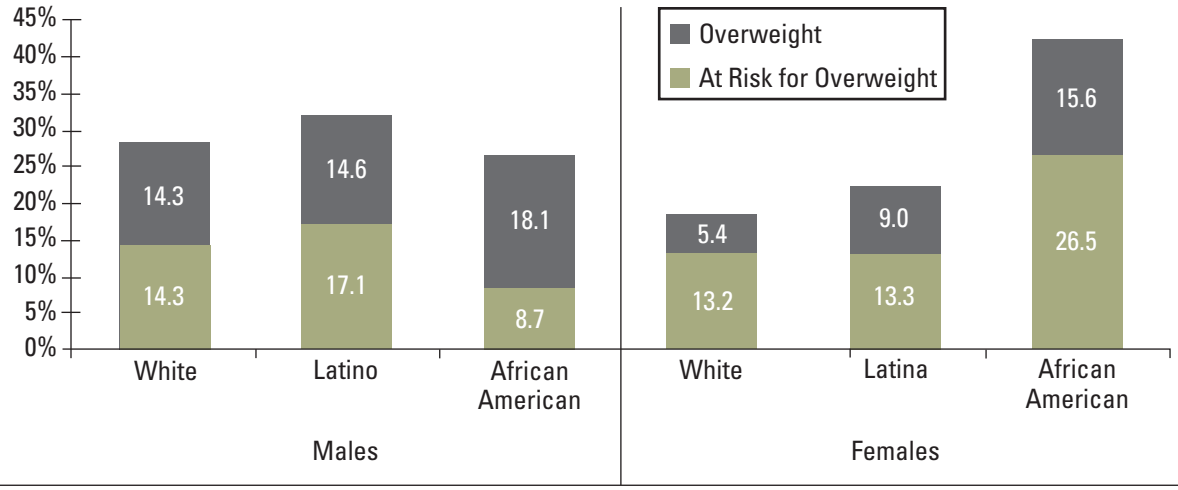
EXHIBIT 36A. PREVALENCE OF "OVERWEIGHT" AND "AT RISK FOR OVERWEIGHT" BY RACE/ETHNICITY, ADOLESCENTS NOT DIAGNOSED WITH DIABETES, AGES 12-17, CALIFORNIA, 2001



Note: The sample size of adolescent Native Hawaiians and other Pacific Islanders was too small to make a reliable estimate for rates of overweight and at risk for overweight. *At risk for overweight* was defined as 85th – 94th percentile for gender- and age-appropriate height and weight. *Overweight* was defined as 95th percentile or greater for gender- and age-appropriate height and weight. American Indian and Alaska Native is abbreviated AIAN. For an explanation of the exclusion of "other" race/ethnicity, see the Appendix.

Source: 2001 California Health Interview Survey

EXHIBIT 36B. PREVALENCE OF "OVERWEIGHT" AND "AT RISK FOR OVERWEIGHT" BY GENDER AND RACE/ETHNICITY, ADOLESCENTS NOT DIAGNOSED WITH DIABETES, AGES 12-17, CALIFORNIA, 2001



Note: The sample sizes for adolescent males and females were too small to present estimates for overweight or at risk for overweight for Native Hawaiians and other Pacific Islanders, American Indians and Alaska Natives, and Asians. For an explanation of the exclusion of "other" race/ethnicity, see the Appendix. *At risk for overweight* was defined as 85th – 94th percentile for gender- and age-appropriate height and weight. *Overweight* was defined as 95th percentile or greater for gender- and age-appropriate height and weight.

Source: 2001 California Health Interview Survey

EXHIBIT 37. PREVALENCE OF "OVERWEIGHT" AND "AT RISK FOR OVERWEIGHT" BY FEDERAL POVERTY LEVEL AND AREA OF RESIDENCE, ADOLESCENTS NOT DIAGNOSED WITH DIABETES, AGES 12-17, CALIFORNIA, 2001		
	AT RISK FOR OVERWEIGHT %	OVERWEIGHT %
FEDERAL POVERTY LEVEL (FPL)		
0 - 99% FPL	15.1	14.0
100-199% FPL	14.1	11.5
200-299% FPL	18.8	10.5
300% + FPL	12.5	8.9
AREA OF RESIDENCE		
URBAN	14.7	11.5
2ND CITY	14.6	11.2
SUBURBAN	13.7	8.9
SMALL TOWN	13.4	11.1
RURAL	15.2	13.6

Note: *At risk for overweight* refers to adolescents in the 85th to 94th percentile for age- and gender-appropriate height and weight. *Overweight* refers to adolescents at or above the 95th percentile for age and gender appropriate height and weight. Classification of area of residence is based on the population density of the zip code in which the respondent lives. For example, *second city* refers to a zip code with a population density between 1,000 and 4,150 persons per square mile. *Rural* refers to a zip code with a population density equal to or less than 210 persons per square mile.

Source: 2001 California Health Interview Survey

Rates of being overweight or at risk for overweight among adolescents also varied by race and ethnicity. African American and Latino adolescents had higher rates of being overweight than whites or Asians (Exhibit 36a), and these rates also varied by gender. Among Latinos and whites rates of overweight were higher among adolescent boys than adolescent girls. However, rates of being at risk for overweight were highest among African-American girls, far higher than among African-American boys (Exhibit 36b).

Rates of overweight among adolescents also varied with several other important characteristics. Adolescents in families with lower incomes and those living in rural areas were more likely to be overweight (Exhibit 37). One in seven (14.0%) adolescents with family incomes less than 100% FPL was overweight compared to one in eleven (8.9%) adolescents with family incomes at or above 300% FPL. In addition, adolescents living in rural areas were somewhat more likely to be overweight than adolescents living in suburban areas.

EXHIBIT 38. PHYSICAL ACTIVITY BY AGE, GENDER, AND RACE/ETHNICITY, ADOLESCENTS NOT DIAGNOSED WITH DIABETES, AGES 12-17, CALIFORNIA, 2001		
	REGULAR PHYSICAL ACTIVITY %	NO PHYSICAL ACTIVITY %
AGE		
AGES 12-14	72.3	5.6
AGES 15-17	73.1	4.8
GENDER		
MALE	77.3	5.3
FEMALE	67.8	5.1
RACE/ETHNICITY		
WHITE	76.5	3.0
LATINO	69.2	8.4
ASIAN	65.8	5.0
AFRICAN AMERICAN	74.6	5.4
AIAN	69.8	*
NHOPI	66.1	*

* The estimate was not statistically reliable.

Note: Native Hawaiian and other Pacific Islander is abbreviated NHOPI and American Indian and Alaska Native is abbreviated AIAN. For an explanation of the exclusion of "other" race/ethnicity, see the Appendix.

Source: 2001 California Health Interview Survey

Adolescent Physical Activity

Participation in regular physical activity is at least as important for adolescents as it is for adults. Adolescents interviewed by CHIS were asked several questions about their level of physical activity during the past seven days.

In California, 73% percent of adolescents not diagnosed with diabetes reported that they participated in regular physical exercise in the week preceding the interview.[33] However, over 800,000 (27.3%) adolescents in California not diagnosed with diabetes reported not participating in regular physical activity, including 152,000 (5.2%) who participated in no physical activity at all.

Reported rates of participation in physical activity among adolescents not diagnosed with diabetes varied according to some important population characteristics. Adolescent males were more likely to report participating in regular physical activity than females; however, there were no differences between males and females in rates of no physical activity (Exhibit 38). White and African-American adolescents reported the highest rates of regular physical activity (76.5% and 74.6%, respectively), and rates among whites were significantly higher than among Asian adolescents (65.8%). Latino adolescents reported high rates of no physical activity, significantly higher than whites.

33 For an explanation of the definitions of *regular physical activity* and *no physical activity*, please see the Appendix.

EXHIBIT 39. PHYSICAL ACTIVITY BY EDUCATION, FEDERAL POVERTY LEVEL, AND AREA OF RESIDENCE, ADOLESCENTS NOT DIAGNOSED WITH DIABETES, AGES 12-17, CALIFORNIA, 2001		
	REGULAR PHYSICAL ACTIVITY %	NO PHYSICAL ACTIVITY %
EDUCATION		
ATTENDING SCHOOL	72.8	5.1
NOT ATTENDING SCHOOL	65.2	*
FEDERAL POVERTY LEVEL (FPL)		
0-99% FPL	69.1	7.9
100-199% FPL	68.9	8.9
200-299% FPL	71.3	3.9
300% + FPL	76.8	2.5
AREA OF RESIDENCE		
URBAN	70.2	6.8
2ND CITY	74.4	4.2
SUBURBAN	73.0	4.0
SMALL TOWN	74.6	*
RURAL	77.5	3.9

* The estimate was not statistically reliable.
Source: 2001 California Health Interview Survey

Rates of physical activity among adolescents also varied according to socioeconomic factors (Exhibit 39). Adolescents with family incomes below 200% FPL were three times as likely to be sedentary as those with family incomes at or above 300% FPL. Adolescents attending school were more likely to report regular physical activity than those not attending school.[34] Finally, adolescents living in urban areas reported the lowest rates of regular physical activity, lower than those living in rural areas.

Latino adolescents, African-American adolescents, adolescents whose families had lower incomes, and adolescents not attending school appeared to be at greatest risk for developing diabetes because of their relatively high rates of being overweight and at risk for overweight, and high rates of being sedentary. In addition, adolescents living in rural areas were more likely to be overweight, but adolescents living in urban areas were more likely to be sedentary.

After adjustment for sociodemographic variables (age, education, and income), adolescent boys were more likely than adolescent girls to be overweight. African Americans were more likely than whites to be overweight, and Asians were less likely than whites to be overweight. In addition, adolescents in urban or rural areas were more likely than adolescents living in suburban areas to be overweight. Surprisingly, level of physical activity was not a significant determinant for being overweight among adolescents. However, the majority of adolescents (72.7%) reported engaging in regular physical activity.

34 Although the contrast comparing regular physical activity between adolescents attending school and those not attending was not significant, adolescents not attending school were less likely to participate in regular physical activity than those attending school after controlling for other factors such as age, gender, and family income.

6. CONCLUSIONS AND POLICY RECOMMENDATIONS

Nearly 1.5 million adults in California (5.9%) have been diagnosed with diabetes, and at least 1.8 million (8.2%) were at significant risk for diabetes. This latter group almost certainly includes a large number of individuals who currently have diabetes but who remain undiagnosed. In addition, over 12,000 (0.4%) adolescents ages 12-17 had been diagnosed with diabetes, with an increasing number at risk for developing diabetes as adolescents or adults.

In California the prevalence of diabetes is expected to double by the year 2020.[35] This increase will pose a great burden on the health of the state as well as on health care costs because diabetes is the number one risk factor for coronary heart disease as well as blindness and chronic renal failure. Therefore greater emphasis should be placed on the impact of factors such as obesity and lack of physical activity that put individuals at risk for diabetes and worsen diabetic complications.

The focus for all Californians, especially those at particular risk for diabetes, should be on minimizing the risks for and effects of diabetes. This can be done in two ways: prevention of diabetes and the effective management of diabetes among those who develop the condition. Primary prevention of diabetes focuses on a reduction in the factors that put individuals at risk and greater emphasis on health-promoting behaviors. Effective management involves the early diagnosis of diabetes, especially among groups already identified as being at increased risk, to ensure that people receive appropriate medical care. Furthermore, effective management emphasizes the need to provide coordinated care to individuals with diabetes to ensure their access to and receipt of adequate and appropriate health services to decrease the development of diabetes-related complications.

PREVENTION OF DIABETES

Primary prevention for diabetes cannot wait until adulthood, but should begin during childhood and continue through adolescence and adulthood. In the twenty-first century, Type 2 diabetes is being diagnosed increasingly among children and adolescents. This surge in the prevalence and incidence of diabetes is due overwhelmingly to the epidemic of obesity that has occurred among adults and children. Regular physical activity and nutritious eating can prevent the development of obesity and the increased risk for diabetes in children and adolescents as well as adults.

Preventing Obesity: Healthful Eating

In California, over 7.7 million (34.6%) adults not diagnosed with diabetes were overweight, and an additional 3.8 million (17.0%) were obese. Nearly one in three Native Hawaiian and other Pacific Islanders (NHOPI), one in four African Americans, and American Indians and Alaska Natives (AIAN), and one in five Latinos were obese compared with one in twenty Asians. Among adult males not diagnosed with diabetes, NHOPIs had much higher rates of obesity than other racial and ethnic groups. Among adult females not diagnosed with diabetes, the prevalence of obesity was high among African Americans, NHOPIs, AIANs and Latinas. The prevalence of obesity also varied by level of education and income—obesity was highest among adults with low income or less education. Age-adjusted obesity rates also varied considerably by county. Among adolescents in California not diagnosed with diabetes, 736,000 (25.1%) were either at risk for being overweight or were already overweight. Adolescent males were nearly twice as likely as adolescent females to be overweight or at risk for overweight, and African-American and Latino adolescents had higher rates of overweight than whites or Asians.

35 Diabetes Facts and Figures. California Diabetes Control Program, 2001. See *http://www.caldiabetes.org/html/rs-factsfigures.cfm.*

Public policy and community action can help reduce these risks by facilitating and encouraging healthy choices.

- **Local governments should increase the availability of fresh fruits and vegetables in all neighborhoods.** Many health care providers and policy makers assume that people have equal access to healthy food. This assumption unfortunately is not true and is further complicated by cost constraints faced by many people with diabetes. Access to markets that carry healthy food options, including fresh fruits and vegetables and low-salt and low-fat foods, is limited in many urban areas of the country. In addition, healthy food options are less accessible in traditionally minority and low-income areas. To obtain the five servings of fruits and vegetables that people are learning they should consume daily, individuals may choose to purchase less expensive canned fruits and vegetables that do not retain the benefits of fresh produce and contain higher levels of salt and sugar as well as preservatives.

  In many areas, the increase in the number of farmers' markets has improved access to fresh fruits and vegetables. However, disparities in access to healthy food options persist. Supermarket chains and farmers' markets should be encouraged to open in all neighborhoods, including low-income communities. One example of a program that promotes access to fresh fruits and vegetables is the WIC (Women, Infants, and Children) Farmers' Market Nutrition Program. Many WIC recipients are low-income mothers who may be struggling to find nutritious food choices for themselves and their children. This program provides these mothers access to a wider selection of fruits and vegetables than they might otherwise experience and represents a model program that should continue to be funded and expanded. Similar programs should also be developed for other low-income groups.

- **The state and local governments as well as private firms should increase the availability of *affordable* healthy food choices.** In the U.S., risk factors for unhealthful eating include the widespread availability and use of fast-food establishments that mainly provide low-cost high-calorie meals to adults and children. These outlets often promote consumption of super-size portions, thus increasing the fat intake and calories associated with many of these meals. The prevalence and promotion of fast-food restaurants coupled with the absence of alternative, healthier food choices is especially problematic in low-income neighborhoods. Additionally, the increased consumption of high-calorie diets has facilitated the epidemics of obesity and diabetes.

- **Schools should provide healthier food choices for children and adolescents.** Children should have access to healthier school lunches and other school-based meals. In addition, the sugary snacks and sodas available in vending machines on school campuses should be replaced with more nutritious snacks and healthier drinks such as water. For example, the Los Angeles Unified School District recently banned the sale of soda in schools. This was an important step towards improving food choices for schoolchildren. In addition, Senate Bill 1520 (SB 1520), considered in the legislature in 2002, would have limited and eventually prohibited the sale of carbonated beverages in California schools. This bill also set forth nutritional requirements for foods served and sold in schools including food in vending machines. Enacting this bill or one similar to it would greatly improve the availability of healthy food choices for schoolchildren.

- **The State and local governments should more fully engage community-based organizations, schools, and health care professionals in developing culturally appropriate interventions that promote healthier diets, and should expand funding for these efforts.** Minority groups including African Americans, Latinos, and AIANs are at particular risk for the development of diabetes. Targeted interventions that promote healthier diets with culturally appropriate healthy food choices are needed to reduce the risk of developing diabetes among minority groups. Programs and organizations such as the Children and Adolescent Nutrition and Fitness Program (CANFit) and the California Latino "5-a-Day" Campaign are examples of California programs focusing on improving nutrition and physical fitness among minority groups that should continue to receive support. Additional programs that increase knowledge about the importance and attainment of nutrition and fitness among minority groups should also be developed.

Physical Activity

In California, nearly 16.3 million (72.6%) adults not diagnosed with diabetes did not meet the current guidelines for regular physical activity, including 3.5 million (15.4%) who did not participate in any physical activity. Participation in regular physical activity varied by race and ethnicity as well as by education and income. Almost three-quarters of adolescents not diagnosed with diabetes reported engaging in regular physical activity. However, 800,000 (27.3%) adolescents did not participate in regular physical activity.

Regular physical activity includes a wide variety of pursuits and does not require athletic skill. Rather, individuals should be encouraged to find aerobic activities that they enjoy and that are convenient for them to pursue, such as vigorous walking. The U.S. Preventive Services Task Force recently changed its recommendation for optimal physical activity to 60 minutes of continuous physical activity at least 5 days per week. Up to that time the recommendations for regular physical activity were set at a lower standard. And yet, only two-fifths of California adults have been participating in regular physical activity although almost one-half are doing some type of leisure-time activity. These latter individuals have incorporated some level of physical activity into their lives and should be encouraged to increase the frequency and duration of activity to meet the new recommendations.

- **Promote physical activity programs in public schools.** Community and state boards of education can allocate funding or increase funding for physical activity programs offered before, during, and after school. Physical activity among children and adolescents is an important risk-reduction factor for obesity and diabetes, perhaps even more so than for adults. Regular exercise habits developed early and continued through one's lifetime may have long lasting and protective effects against diabetes and other chronic medical conditions. Unfortunately, schools have been reducing and even eliminating physical activity curricula. Nevertheless, we find that adolescents enrolled in school were more likely than those not enrolled to participate in regular physical activity.

  Legislation enacted in 2002 mandates an increase in time spent for physical activity in the schools. However, the implementation of this legislation may be hindered by budget limitations and availability of facilities for students in underserved areas. Local efforts have also been made to ensure the continuation of physical activity programs in schools. For example, the Los Angeles County Board of Supervisors approved recommendations to promote physical activity and healthy eating from the county Blue Ribbon Task Force on Childhood Fitness. In addition, a project spearheaded by California Project LEAN (Leaders in Encouraging Activity and Nutrition), called "Food on the Run," is a student-driven campaign that seeks to empower high school students to improve their own nutrition and fitness through peer counseling, dance classes, nutrition lessons, and low-fat menu offerings. Another project called "Operation FitKids" is a program that provides fitness equipment and facilities to low-income communities through the use of recycled commercial fitness equipment. "Operation FitKids" works with high schools, community organizations, and youth groups across the nation to create fitness centers that provide adolescents and teenagers greater access to comprehensive physical fitness programs. Other such innovative programs are needed to capture the interest of students and create viable options for underserved communities in working towards maintaining their health and fitness.

- **Develop community policies and practices as well as legislation that promote safe environments for physical activity.** State and local governments and community members can work together to increase the number of parks, build and maintain sidewalks, and have well-lit neighborhoods, particularly for urban and low-income populations. A variety of community programs have been developed and implemented to increase the level of physical activity among adults; however, many people still face limited access to appropriate facilities and lack security in their own neighborhoods. The California Department of Health Services in partnership with the University of California, San Francisco, Institute for Health and Aging developed the Physical Activity and Health Initiative (PAHI). PAHI was organized to provide leadership in the state for the promotion of physical activity to improve the public's health. One of the goals of PAHI is to increase the proportion of community and neighborhood policies and environments that encourage and support walking and biking. There have also been an increasing number of public and private businesses that are providing physical activity opportunities for employees. However, there is little information available on the long-term sustainability of these programs and on their continued impact on rates of regular physical activity among adults, and these programs are more likely to be available to more affluent workers.

- **Develop culturally appropriate and targeted interventions to promote regular physical activity among minority groups, including NHOPIs, African Americans, Latinos, and AIANs.** Many interventions regarding physical activity do not account for differences in culture and living conditions among different racial and ethnic groups. As a result, different groups may not feel that current interventions promote viable options for lifestyle improvement. In order to encourage health-promoting behaviors such as regular physical activity, more culturally sensitive, multilingual interventions addressing healthy lifestyle choices are needed.

Access to Preventive Health Care

Careful monitoring and screening of groups at elevated risk for developing diabetes can also help in prevention efforts. Particular racial and ethnic groups, those with family histories of diabetes, and people who are obese should be educated about their elevated risk for developing diabetes and about lifestyle changes they can make to prevent or delay the onset of diabetes. In addition, these groups should be screened regularly so that if diabetes develops they can begin receiving care as soon as possible.

In California, 3.6 million nonelderly adults not diagnosed with diabetes (18.4%) have no health insurance coverage. These adults are less likely to have access to the health care system. As a result, they are less likely to receive preventive health care such as cholesterol screening, monitoring for high blood pressure, and testing for high levels of blood glucose.

- **Assure access to trained health care providers who can counsel and screen at-risk patients.** Primary-care providers should be knowledgeable about their patients' risks for diabetes and vigilant in their screening for signs and symptoms of pre-diabetes and diabetes. Those individuals with specific risk factors such as family histories of diabetes, obesity, and limited physical activity should be monitored and counseled to reduce their risk factors (e.g., weight loss, nutritious eating, physical activity). Health care providers should consider using documentation systems that will allow them to monitor patients' risk factors for diabetes and to ensure regular screening. In addition, primary-care providers such as physicians, nurse practitioners, and physician assistants should be adequately trained to provide nutrition and physical activity counseling to their patients, or to refer them to appropriate health and community resources.
- **Expand public and private health insurance packages to provide adequate coverage for preventive care.** Preventive care should include health promotion, health and nutritional education, physical activity, and screening for diabetes—particularly among high-risk groups. Many health insurance packages provide limited coverage for health education and preventive care. Though emphasis on prevention is increasing, health insurance packages still need to expand coverage to include interventions that address nutrition education, physical-activity promotion, and screening.

EFFECTIVE MANAGEMENT OF DIABETES

To manage diabetes effectively the condition should be identified at its earliest stage so that diabetes care can be instituted as appropriate. Early diagnosis of diabetes is important to limit the extent of complications. However, early diagnosis is unlikely if individuals do not have access to appropriate medical care. Improving the rates of early diagnosis of diabetes is the joint responsibility of individuals and the community, health care providers, and the health care system. Individuals are less likely to be diagnosed with diabetes if they do not have health insurance and a usual source of health care, or if their health care-seeking behavior is episodic and does not include primary care and prevention.

Availability of Timely Data

In California, diabetes prevalence rises considerably with increasing age and varies by race and ethnicity. Overall, African Americans and AIANs had the highest rates of diabetes, with the lowest rates among Asians. Among older adults, Latinos, African Americans, and AIANs had the highest rates of diabetes. Due to the large sample size and the diversity of the population in California, we were able to measure the prevalence of diabetes within Latino and Asian ethnic groups. Having diabetes was also associated with lower levels of education and income. The findings from CHIS provide county-level data and indicate significant variation in the prevalence of diabetes throughout the state. In addition, adults with diabetes were disproportionately overweight (34%) or obese (41%), and more likely to be sedentary than to participate in regular physical activity although there was significant racial and ethnic variation.

- **Continue surveillance at the state and local levels.** Timely data on diabetes at the state and local levels are needed to support the design and implementation of effective public health and clinical interventions.

Improving Access to Medical Care and Diabetes Education

Effective management of diabetes focuses on reducing the risk for and impact of diabetic complications. Research demonstrates that it is common for people with diabetes to under-use general preventive services as well as preventive services specific to diabetes.[36] Appropriate care for individuals with diabetes includes optimization of glycemic control through diet, physical activity, medication, home glucose monitoring, and regular measurement of hemoglobin A1C by the health care provider. It also must involve careful monitoring for diabetes-related complications such as diabetic retinopathy with annual dilated retinal exams; diabetic nephropathy and end-stage renal disease by monitoring microalbuminuria and kidney function; diabetic foot ulcers through regular foot exams; hypertension with regular blood pressure checks; and hypercholesterolemia with checks of blood lipid levels.

People with diabetes are also at increased risk for developing comorbid conditions such as high blood pressure, high cholesterol, heart disease, and obesity. Appropriate diabetes care also includes the use of aspirin as prophylaxis for coronary artery disease and peripheral vascular disease including heart attack, stroke, and lower extremity disease. People with diabetes are also at increased risk for pneumonia and influenza and should receive appropriate immunizations. Diabetes care can be improved although this requires the efforts of health care providers and the healthcare system (i.e., public and private health plans and public health programs) in conjunction with patients.

36 Beckles et al. Population-based assessment of the level of care among adults with diabetes in the U.S. Diabetes Care 1998; 21: 1432-1438.

Although the majority of adults with diabetes had health insurance, approximately 172,000 (18.8%) adults under age 65 were uninsured for health care during all or a portion of the year preceding the survey. There was considerable variation in receipt of health care between adults with insurance and without insurance, and between those with and without a usual source of care. The adverse effects of being uninsured are seen across all income groups, but uninsured adults below 200% of the Federal Poverty Level (FPL) were far more likely than those with higher incomes not to get needed health care, including prescription medications for diabetes.

Many adults with diabetes in California did not receive appropriate medical care for their condition. Over 65,000 adults with diabetes (4.7%) had not visited a physician within the past year. Nearly 340,000 adults with diabetes in California (24%) were not taking any medications to control the condition (compared with 13.4% nationally). Furthermore, there was racial and ethnic variation in medication use. Latinos, for example, were the least likely to be taking medication for diabetes.

- **Increase access to medical care to promote early diagnosis of diabetes.** With increasing budget cuts in the health care system, particularly in Los Angeles County, the number of individuals with undiagnosed diabetes is likely to increase. In order to provide timely and appropriate treatment as well as reduce the risk of diabetes-related complications, Californians need appropriate access to medical care to diagnose the condition early.
- **Assure access to medical care for people with diabetes so that they can receive appropriate management of their condition.** In 2000, California enacted legislation that requires health insurance plans to cover diabetes education, supplies, and equipment. This law will help assure that those with diabetes who have insurance coverage will obtain the information and supplies they need to manage their condition. However, people with diabetes who do not have health insurance will continue to have limited access to medical care for their diabetes.
- **Assure adequate prescription drug coverage for people with diabetes.** Access to prescription medications is an integral component of diabetes management. Much of diabetes treatment involves either use of insulin or oral medications to maintain appropriate blood glucose levels. Assuring access to these treatments is a necessary step in improving both the management of diabetes and the prevention/reduction of associated comorbidities such as high blood pressure, high cholesterol, and heart disease. The diabetes insurance coverage enacted in 2000 specifies that medications for diabetes be covered—but only for insurance plans that already offer prescription drug coverage.

  Home glucose monitoring is important especially for people using insulin to treat diabetes, yet one-fifth measured their blood glucose level less frequently than once per day. Additionally, rates of home glucose monitoring among insulin users varied significantly by race and ethnicity, with only 56% of Asian and NHOPIs and 64% of Latinos checking their blood glucose at least once per day. Over two-thirds of adults with diabetes had undergone at least one foot exam by a health professional during the preceding year; however, 447,000 (31.8%) had not had any foot exam in the past year.

- **Conduct culturally appropriate multilingual education for people with diabetes on how to appropriately manage their condition.** People with diabetes should know how often to monitor their blood glucose levels and should have the supplies and knowledge to conduct this monitoring at home. They should also be aware of the potential complications of diabetes and the medical monitoring that they should obtain to prevent these complications, such as an annual foot exam, a dilated eye exam, regular monitoring of blood pressure and cholesterol levels, and regular hemoglobin A1C tests. The California Diabetes Control Program and the Diabetes Coalition of California have developed a health record card and an accompanying presentation called Take Charge. This presentation can be used by nonhealthcare professionals to teach those with diabetes about the necessary tests and exams for appropriate diabetes care. These tools are available in multiple languages.

- **Health care providers should provide adequate counseling on managing diabetes as well as on nutrition and physical activity for people with diabetes.** The California Diabetes Control Program (DCP) is helping to develop innovative models for diabetes management that can be used in managed-care health systems as well as by fee-for-service Medi-Cal providers. These models are based on findings from the Diabetes and Complications Control Trials (DCCT) and have been developed in conjunction with public and private entities (e.g., Harbor General/UCLA Hospital, UC San Diego, and the Santa Barbara Health Authority). In addition, the California DCP provides electronic access to important diabetes-specific information for health care providers in California and around the country.

- **State and local governments, as well as health care professionals and community health advocates, should focus on the ethnic and racial diversity of people with diabetes, the variety of languages spoken by those with diabetes, and the varied levels of educational attainment of those with diabetes.** People with diabetes have diverse racial and ethnic backgrounds and they speak a variety of languages. In addition, the prevalence of diabetes is much higher among those who never attended high school than it is among those with higher levels of educational attainment. Because of this diversity, it is crucial that all those in the health care system who interact with people with diabetes, as well as those in state and local governments who create policy that affects those with diabetes, be aware of cultural differences and work to communicate effectively.

CONCLUSION

In California, 1.4 million adults and 12,000 adolescents have been diagnosed with diabetes. An additional 1.8 million adults and 176,000 adolescents are at significant risk for developing Type 2 diabetes because of overweight and obesity in conjunction with limited physical activity. The focus for all Californians should be on minimizing the risks for and complications of diabetes. Strategies and policies that promote prevention of Type 2 diabetes and the effective management of diabetes need to be implemented. To achieve this, individuals, communities, health care providers, the health care system, and government programs need to work together to address the disparities in risk, prevalence, level of care, and outcomes for diabetes.

DATA SOURCE

The findings presented in this report are based on data from the 2001 California Health Interview Survey (CHIS 2001). CHIS 2001 interviewed 55,428 households drawn from every county in California for its random-digit dial (RDD) telephone survey, providing a sample that is representative of the state's noninstitutionalized population living in households. Data were weighted to the 2000 Census. CHIS interviewed one sample adult in each household. In households with children, CHIS interviewed one adolescent ages 12-17 (a total of 5,801), and obtained information for one child under age 12 by interviewing the adult who was most knowledgeable about the child (a total of 12,592). Westat, a private survey research organization, conducted the RDD portion of the CHIS interviews between November 2000 and September 2001. In addition to the RDD sample, CHIS conducted an oversample of American Indians and Alaska Natives residing in both urban and rural areas and oversamples of Japanese, Vietnamese, South Asians, Koreans, and Cambodians; this report does not include data from these oversamples.

Expert teams reviewed all CHIS questionnaires to ensure that question wording was culturally appropriate for a variety of population groups. Questionnaires were also translated, and interviews were conducted in six languages: English, Spanish, Chinese (Mandarin and Cantonese dialects), Vietnamese, Korean, and Khmer (Cambodian). Community-outreach campaigns were conducted in communities of color to encourage the participation of populations that often have low participation rates in surveys. These campaigns used media and materials that were both culturally and linguistically appropriate to particular communities.

CHIS covered a broad range of public health concerns, including health insurance coverage, eligibility for and participation in public health care programs, access to and use of health care services, health and mental health status, chronic conditions (asthma, cancer, cardiovascular disease, arthritis, and diabetes), health behavior (including diet and physical activity, alcohol and tobacco use, and cancer screening and prevention), dental health, women's health, and demographic characteristics (including employment; income; race; Latino, Asian, and Pacific Islander ethnicity; nativity of the respondent and his or her parents; citizenship; immigration status; and English proficiency).

CHIS is a collaboration of the UCLA Center for Health Policy Research, the California Department of Health Services, and the Public Health Institute. Funding for CHIS 2001 has been provided by the California Department of Health Services, the National Cancer Institute, The California Endowment, the California Children and Families Commission, the Centers for Disease Control and Prevention (CDC), and the Indian Health Service. For more information on CHIS, please visit *www.chis.ucla.edu.*

BRIEF DESCRIPTION OF VARIABLES USED

CHIS 2001 includes a wide range of demographic and health information obtained from respondents, including extensive information on race and ethnicity as well as information on the prevalence of diabetes, medical care for diabetes, height and weight, and physical activity.

Race and Ethnicity

Respondents were first asked if they are of Latino or Hispanic origin. They were then asked which one or more of the following racial groups they would use to describe themselves: Native Hawaiian and other Pacific Islander, American Indian and Alaska Native, Asian, African American, or white. Respondents who selected more than one racial group or who said they were Latino and selected a racial group were asked which group they most identified with. Responses to this question were used to categorize respondents who identified more than one race or ethnicity into the following racial and ethnic categories: Latino, white, African American, Asian, Native Hawaiian and other Pacific Islander (NHOPI), American Indian and Alaska Native (AIAN), and Other. Respondents who did not select a single race or ethnicity with which they most identified were assigned to the "other" race category. Finally, any respondent who selected AIAN and reported that he or she was enrolled as a member of a tribe was assigned to be AIAN.

The number of NHOPI in the CHIS 2001 sample is relatively small (n = 219 adults using the classification described in the previous paragraph). Estimates for this group were reported separately whenever possible. When the sample of NHOPI was too small, it was included in the Asian category. As a result, we combined NHOPIs with Asians for all analyses conducted in this report *except* for those included in the "Identifying 'At Risk' Populations" section. In addition, we did not report any estimates for the "other" race and ethnicity category in this report.

Diabetes-specific Variables

The prevalence of diabetes was calculated from adult and adolescent respondent answers to the question "Has a doctor ever told you that you have diabetes or sugar diabetes?" Women were asked a variation of this question: "Other than during pregnancy, has a doctor ever told you that you have diabetes or sugar diabetes?" Adult respondents who said "yes" were asked additional items, including age at first diagnosis; use of insulin or oral medication; frequency of home glucose-monitoring; and number of foot exams by a physician during the preceding year. Please note that the estimates of diabetes prevalence presented in this report are based on respondents reporting that they received a diagnosis of diabetes from a doctor, which may underestimate the prevalence due to limitations of respondent recall or limited access to medical care.

In addition, persons who reported having diabetes were asked about the number of times a doctor checked for hemoglobin "A one C" in the past year. It is unclear whether respondents were able to accurately answer this item. Hemoglobin A1C (glycosylated hemoglobin) is a type of blood test that measures blood sugar control over an extended period in individuals with diabetes. It requires that a specific test be done at the laboratory. Although respondents are likely to know if they had blood drawn in the past year, they may not know which specific blood tests were performed unless they specifically asked their doctor or were told the test had been conducted. Experts agree that the best way to determine the true rate at which Hemoglobin A_1C is measured among people with diabetes is to conduct a chart review. However, there is a major educational initiative by the California Diabetes Control Program in partnership with the National Diabetes Education Program to increase patients' knowledge, understanding, and awareness of this important measure for evaluating glycemic control.

Body Mass Index

Body Mass Index (BMI) was calculated based on respondent reports of weight in pounds or kilograms and height in feet/inches or meters/centimeters. Wherever necessary, responses were converted to metric values, and BMI was calculated in kg/m^2. The values for adolescents were compared to age- and gender-appropriate growth charts for the United States. Adolescents in the 85th to 94th percentiles are considered at risk for being overweight, and adolescents in the 95th percentile and higher are categorized as overweight. These percentiles roughly correspond to the "overweight" and "obese" BMI ranges for adults. There is evidence that respondents may underestimate their weight and overestimate their height when self-reporting this information. Although self-reported height and weight are highly correlated with measured height and weight, BMI derived from self-reported height and weight may underestimate the true prevalence of overweight and obesity.[37]

Physical Activity

Physical activity for adults was based on the frequency and duration of participation in moderate and vigorous leisure-time activities and other nonleisure activities during the month preceding the interview. The individual measures were used to construct a 3-level physical activity variable in which regular physical activity was defined as at least 3 days per week of vigorous physical activity for at least 20 minutes or at least 5 days per week of moderate physical activity for at least 30 minutes. The category of "some physical activity" includes those individuals who responded "yes" to participating in either vigorous or moderate physical activity but did not meet the standards for regular physical activity. The category of "no physical activity/sedentary" includes the participants who responded "no" to any form of physical activity. Adolescents were asked about their participation in physical activities during the preceding 7 days. Their responses are categorized similarly to those of adults: participating in regular physical activity, some physical activity, or no physical activity using the same criteria.

STATISTICAL ANALYSES AND REPORTING OF FINDINGS

All estimates presented in this study have a "coefficient of variation" (CV) less than or equal to 0.30 unless otherwise noted. The CV provides information about the precision of estimates from survey data. It was determined that estimates with a CV greater than 0.30 should not be presented because the "true" estimate might be very different from the one that was calculated. In addition, all comparative statements reflect statistically significant differences ($p < 0.05$) unless otherwise noted.

37 Kuczmarski MF, Kuczmarski RJ, Najjar M. Effects of age on validity of self-reported height, weight, and body mass index: findings from the Third National Health and Nutrition Examination Survey, 1988-1994. J Am Diet Assoc, 2001; 101 (1): 28-34

UCLA CENTER FOR HEALTH POLICY RESEARCH

10911 WEYBURN AVENUE, SUITE 300

LOS ANGELES, CALIFORNIA 90024

PHONE: (310) 794-0909

FAX: (310) 794-2686

chpr@ucla.edu

www.healthpolicy.ucla.edu

THE CALIFORNIA ENDOWMENT

21650 OXNARD STREET, SUITE 1200

WOODLAND HILLS, CALIFORNIA 91367

PHONE: (818) 703-3311

FAX: (818) 703-4193

www.calendow.org

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