

# Unmet Health Needs of Uninsured Adults in the United States

John Z. Ayanian, MD, MPP

Joel S. Weissman, PhD

Eric C. Schneider, MD, MSc

Jack A. Ginsburg, MPE

Alan M. Zaslavsky, PhD

**I**N 1998, APPROXIMATELY 44 MILLION Americans younger than 65 years—nearly one fifth of the nonelderly population—lacked health insurance, including 33 million adults aged 18 to 64 years.<sup>1</sup> Prior studies have documented that lacking health insurance is associated with important clinical consequences.<sup>2-4</sup> Uninsured adults generally encounter greater barriers to preventive services and treatment of chronic illnesses than to acute care.<sup>5</sup> They are more likely than insured adults to report poor health status,<sup>6-8</sup> delay seeking medical care,<sup>9</sup> and forgo necessary care for potentially serious symptoms.<sup>10</sup> Uninsured adults receive fewer screening services for cancer and cardiovascular risk factors,<sup>11-14</sup> present with later-stage diagnoses of cancer,<sup>15,16</sup> and experience more avoidable hospitalizations.<sup>17</sup> They also face an increased risk of death,<sup>18</sup> particularly when hospitalized<sup>19</sup> or diagnosed as having breast cancer.<sup>15</sup>

Although these studies provide compelling evidence of the adverse clinical consequences of being uninsured, most of them examined patterns of care and outcomes prior to 1990, before the rapid growth of managed care. Increasing competitive pressures in the US health care system over the past decade may be eroding access to care for the uninsured by reducing charity care provided by physicians<sup>20</sup> and undermining traditional safety-net providers such as community health centers

**Context** In 1998, 33 million US adults aged 18 to 64 years lacked health insurance. Determining the unmet health needs of this population may aid efforts to improve access to care.

**Objective** To compare nationally representative estimates of the unmet health needs of uninsured and insured adults, particularly among persons with major health risks.

**Design and Setting** Random household telephone survey conducted in all 50 states and the District of Columbia through the Behavioral Risk Factor Surveillance System.

**Participants** A total of 105764 adults aged 18 to 64 years in 1997 and 117364 in 1998, classified as long-term ( $\geq 1$  year) uninsured (9.7%), short-term ( $< 1$  year) uninsured (4.3%), or insured (86.0%).

**Main Outcome Measures** Adjusted proportions of participants who could not see a physician when needed due to cost in the past year, had not had a routine checkup within 2 years, and had not received clinically indicated preventive services, compared by insurance status.

**Results** Long-term- and short-term-uninsured adults were more likely than insured adults to report that they could not see a physician when needed due to cost (26.8%, 21.7%, and 8.2%, respectively), especially among those in poor health (69.1%, 51.9%, and 21.8%) or fair health (48.8%, 42.4%, and 15.7%) ( $P < .001$ ). Long-term-uninsured adults in general were much more likely than short-term-uninsured and insured adults not to have had a routine checkup in the last 2 years (42.8%, 22.3%, and 17.8%, respectively) and among smokers, obese individuals, binge drinkers, and people with hypertension, elevated cholesterol, diabetes, or human immunodeficiency virus risk factors ( $P < .001$ ). Deficits in cancer screening, cardiovascular risk reduction, and diabetes care were most pronounced among long-term-uninsured adults.

**Conclusions** In our study, long-term-uninsured adults reported much greater unmet health needs than insured adults. Providing insurance to improve access to care for long-term-uninsured adults, particularly those with major health risks, could have substantial clinical benefits.

JAMA. 2000;284:2061-2069

www.jama.com

and public hospitals.<sup>21-24</sup> Several studies have looked at the duration of periods without health insurance<sup>25,26</sup> or the effect of losing health insurance,<sup>29,31</sup> but these studies have not distinguished the clinical impact of short-term and long-term periods without insurance. In addition, few studies have

assessed the unmet needs of uninsured adults with specific chronic conditions, such as diabetes<sup>32,33</sup> or hypertension.<sup>34</sup>

Failing to monitor or effectively treat chronic illnesses such as hypertension in uninsured adults can result in substantial morbidity<sup>35,36</sup> and may increase the

**Author Affiliations:** Division of General Medicine and Primary Care, Department of Medicine, Brigham and Women's Hospital (Drs Ayanian and Schneider), Department of Health Care Policy, Harvard Medical School (Drs Ayanian, Weissman, and Zaslavsky), Institute for Health Policy, Massachusetts General Hospital (Dr Weissman), and Department of Health Policy and Management, Harvard School of Public

Health (Dr Schneider), Boston, Mass; and the American College of Physicians-American Society of Internal Medicine (Mr Ginsburg), Washington, DC.  
**Corresponding Author and Reprints:** John Z. Ayanian, MD, MPP, Department of Health Care Policy, Harvard Medical School, 180 Longwood Ave, Boston, MA 02115 (e-mail: ayanian@hcp.med.harvard.edu).

nation's health care costs. These costs are absorbed by clinicians and facilities as free care, passed on to private insurers through cost shifting and higher fees, or paid by taxpayers through higher taxes to finance public hospitals and public insurance programs. The more intensive medical care necessary to treat preventable complications of chronic illnesses may also be costly for the Medicare program when uninsured adults become eligible for this program at age 65 years. Despite such effects, many Americans have perceived being uninsured as a transient phenomenon without significant consequences.<sup>37,38</sup> Understanding the unmet health needs of uninsured adults could help to overcome such views and bolster federal and state efforts to improve access to care.

We used nationally representative survey data from the Behavioral Risk Factor Surveillance System (BRFSS) for more than 100 000 adults in 1997 and 1998 to compare uninsured and insured adults' access to physicians, especially among adults at increased risk for adverse health outcomes. We also examined rates of clinically indicated preventive services, including cancer screening, cardiovascular risk reduction, and diabetes management. To assess the effect of longer and shorter periods without health insurance, we differentiated adults uninsured 1 year or longer from those uninsured less than 1 year.

## METHODS

### Data Source

The BRFSS is a federally funded survey designed by the Centers for Disease Control and Prevention (CDC) in collaboration with state health departments to monitor health-related behaviors and risk factors in the US population.<sup>39</sup> Beginning with 15 states in 1984, the BRFSS has collected data annually through telephone interviews of adults aged 18 years or older residing in households. Since 1994, all 50 states and the District of Columbia have administered the BRFSS survey and submitted survey data to the CDC.

The BRFSS survey instrument has 2 standardized components. First, a core

**Table 1.** Unadjusted Insurance Status of 18- to 64-Year-Old Adults in the United States Stratified by Demographic and Clinical Characteristics\*

| Characteristic                     | Estimated Population, in Thousands | Uninsured, % |      | Insured, % |
|------------------------------------|------------------------------------|--------------|------|------------|
|                                    |                                    | ≥1 y         | <1 y |            |
| All adults aged 18-64 y            | 163 538                            | 9.7          | 4.3  | 86.0       |
| Age, y                             |                                    |              |      |            |
| 18-24                              | 24 232                             | 13.5         | 8.8  | 77.7       |
| 25-34                              | 39 217                             | 11.7         | 5.8  | 82.5       |
| 35-44                              | 42 873                             | 9.0          | 3.6  | 87.4       |
| 45-54                              | 33 887                             | 7.5          | 2.1  | 90.4       |
| 55-64                              | 23 329                             | 6.9          | 1.6  | 91.5       |
| Sex                                |                                    |              |      |            |
| Female                             | 82 332                             | 9.0          | 4.5  | 86.5       |
| Male                               | 81 207                             | 10.4         | 4.1  | 85.5       |
| Race/ethnicity                     |                                    |              |      |            |
| White                              | 119 559                            | 7.4          | 3.5  | 89.2       |
| Black                              | 16 868                             | 11.5         | 6.3  | 82.2       |
| Hispanic                           | 18 838                             | 22.6         | 7.7  | 69.7       |
| Asian or Pacific Islander          | 4 748                              | 8.5          | 4.6  | 86.9       |
| American Indian or Alaskan Native  | 1 647                              | 12.4         | 4.8  | 82.9       |
| Other                              | 1 243                              | 16.4         | 5.0  | 78.7       |
| Census region                      |                                    |              |      |            |
| Northeast                          | 31 604                             | 7.4          | 4.0  | 88.6       |
| South                              | 57 694                             | 11.9         | 5.0  | 83.1       |
| Midwest                            | 37 609                             | 6.4          | 3.4  | 90.2       |
| West                               | 36 631                             | 11.6         | 4.4  | 84.0       |
| Employment                         |                                    |              |      |            |
| Employed                           | 108 457                            | 7.1          | 3.4  | 89.5       |
| Self-employed                      | 14 375                             | 19.9         | 4.9  | 75.2       |
| Unemployed                         | 7 545                              | 22.3         | 16.7 | 61.0       |
| Not in labor force†                | 32 847                             | 10.7         | 4.4  | 84.9       |
| Education                          |                                    |              |      |            |
| Less than high school graduate     | 18 339                             | 26.0         | 6.7  | 67.3       |
| High school graduate               | 52 491                             | 11.3         | 5.5  | 83.2       |
| 1-3 y of college                   | 46 262                             | 7.4          | 4.1  | 88.5       |
| ≥4 y of college                    | 46 164                             | 3.5          | 2.1  | 94.3       |
| Annual household income            |                                    |              |      |            |
| <\$15 000                          | 14 748                             | 27.4         | 8.6  | 64.0       |
| \$15 000-24 999                    | 25 554                             | 19.0         | 8.5  | 72.5       |
| \$25 000-34 999                    | 24 044                             | 9.7          | 4.7  | 85.6       |
| \$35 000-49 999                    | 29 793                             | 3.9          | 2.6  | 93.5       |
| \$50 000-74 999                    | 25 612                             | 2.1          | 1.6  | 96.3       |
| ≥\$75 000                          | 22 875                             | 1.3          | 1.1  | 97.6       |
| Do not know                        | 9 187                              | 20.2         | 7.6  | 72.2       |
| Refused                            | 11 725                             | 6.5          | 2.9  | 90.6       |
| Self-reported health status        |                                    |              |      |            |
| Excellent                          | 42 306                             | 6.7          | 3.5  | 89.8       |
| Very good                          | 57 294                             | 7.5          | 3.9  | 88.6       |
| Good                               | 44 843                             | 12.3         | 5.1  | 82.6       |
| Fair                               | 14 381                             | 17.9         | 5.5  | 76.6       |
| Poor                               | 4 485                              | 12.4         | 5.0  | 82.6       |
| Current smoker                     |                                    |              |      |            |
| Yes                                | 41 849                             | 13.7         | 6.4  | 79.9       |
| No                                 | 121 353                            | 8.3          | 3.6  | 88.1       |
| Body mass index, kg/m <sup>2</sup> |                                    |              |      |            |
| ≥30                                | 29 593                             | 10.9         | 4.4  | 84.8       |
| <30                                | 127 968                            | 9.2          | 4.3  | 86.6       |

**Table 1.** Unadjusted Insurance Status of 18- to 64-Year-Old Adults in the United States Stratified by Demographic and Clinical Characteristics\* (cont)

| Characteristic                      | Estimated Population, in Thousands | Uninsured, % |      | Insured, % |
|-------------------------------------|------------------------------------|--------------|------|------------|
|                                     |                                    | ≥1 y         | <1 y |            |
| Hypertension†                       |                                    |              |      |            |
| Yes                                 | 20 949                             | 8.8          | 2.8  | 88.4       |
| No                                  | 140 412                            | 9.9          | 4.5  | 85.5       |
| Elevated cholesterol‡               |                                    |              |      |            |
| Yes                                 | 27 232                             | 5.7          | 2.2  | 92.0       |
| No                                  | 134 130                            | 10.6         | 4.7  | 84.7       |
| Diabetes mellitus‡                  |                                    |              |      |            |
| Yes                                 | 6608                               | 8.0          | 3.0  | 89.0       |
| No                                  | 156 766                            | 9.8          | 4.3  | 85.9       |
| Binge drinking‡                     |                                    |              |      |            |
| Yes                                 | 24 727                             | 11.5         | 5.9  | 82.6       |
| No                                  | 131 550                            | 9.5          | 4.0  | 86.5       |
| Human immunodeficiency virus risk‡§ |                                    |              |      |            |
| Medium or high                      | 8619                               | 15.4         | 6.6  | 78.0       |
| Not medium or high                  | 97 704                             | 10.6         | 5.5  | 83.9       |

\*All data are based on the 1998 Behavioral Risk Factor Surveillance System survey except for data on hypertension, elevated cholesterol, and binge drinking, which are from the 1997 survey.

†Includes students, homemakers, retirees, and those not able to work.

‡See "Methods" section for definition.

§Self-perceived risk among adults aged 18 to 44 years only.

set of questions is asked in all states annually (including health status, health insurance, presence of diabetes, smoking, breast and cervical cancer screening, and human immunodeficiency virus [HIV] risks) or biennially (eg, screening for hypertension, elevated cholesterol, and colorectal cancer, and influenza and pneumococcal vaccinations in 1997; weight control in 1998). Second, individual states may choose each year to include optional modules on topics such as diabetes management or preventive health counseling.

The survey instruments and procedures are designed to produce representative samples and ensure consistency of data across states and years. Many questions are derived from other national surveys, including the National Health and Nutrition Examination Survey and the National Health Interview Survey. English and Spanish versions of the 2 standardized components were provided by the CDC to each state. Additional information about BRFSS survey instruments and procedures is available from the CDC.<sup>40</sup>

### Study Population

The BRFSS used random-digit dialing within blocks of telephone numbers to

identify a probability sample of all households with telephones in each state. In eligible households, 1 adult aged 18 years or older was randomly selected and interviewed about his/her health and medical care. Adults residing in hospitals, nursing homes, military bases, college dormitories, or prisons were not eligible. In 1997, the number of completed interviews per state ranged from 1505 to 4923 with a median estimated response rate of 62.5%. In 1998, completed interviews ranged from 1452 to 6005, with a median response rate of 59.2%.<sup>40</sup>

Our cohort included adults aged 18 to 64 years from all 50 states and the District of Columbia who completed the 1997 or 1998 BRFSS survey, including 105 764 respondents in 1997 and 117 364 in 1998. We defined uninsured adults as those who reported having no health insurance coverage at the time they were surveyed. We divided this group into the long-term uninsured (those who had been uninsured for ≥1 year) and the short-term uninsured (those who had been uninsured for <1 year), consistent with other research using BRFSS data.<sup>28</sup> Respondents who reported having health insurance from any private or public source (including Medi-

care, Medicaid, and military or veterans' coverage) were classified as insured. We excluded adults older than age 64 years because almost all are eligible for Medicare insurance. We also excluded people who did not report their age (<0.5% in each year) or insurance coverage (<0.3%).

### Study Variables

We categorized the sample by numerous demographic variables, including age, sex, race/ethnicity, income, education, employment, and self-reported health status (TABLE 1). To focus on adults at increased risk for future health problems and early mortality,<sup>41,42</sup> we identified respondents who reported current smoking, obesity (body mass index [BMI] ≥30 kg/m<sup>2</sup>), hypertension (diagnosed by a health professional on at least 2 occasions), diabetes mellitus (diagnosed by a health professional, not including gestational diabetes), elevated cholesterol (diagnosed by a health professional), binge drinking (≥5 alcoholic drinks on at least 1 occasion in the past month), or self-perceived risk (medium or high) for HIV infection. Smoking, obesity, diabetes mellitus, and HIV risk were determined from the 1998 BRFSS survey. Hypertension, elevated cholesterol, and binge drinking were assessed in 1997 but not 1998. In California, HIV risk was assessed only for people younger than age 45 years, so we limited analyses of this variable to people aged 18 to 44 years.

We studied 2 types of unmet health needs. The first type, inadequate access to physicians' care, was defined as reporting "a time during the last 12 months when you needed to see a doctor, but could not because of the cost" and not having "visited a doctor for a routine checkup" during the prior 2 years. For the latter measure, we focused on people with clinical risk factors or chronic conditions who would most likely benefit from regular checkups. The second type of unmet health need was failing to receive clinically indicated preventive services, defined as adequate, rather than optimal, care based on the recommended age range

and frequency in published national guidelines or evidence-based studies.

These preventive services included self-reported rates of cancer screening with mammography and clinical breast examinations within 2 years for women aged 50 to 64 years,<sup>43</sup> Papanicolaou tests within 3 years for women aged 18 to 64 years with an intact uterus,<sup>43</sup> fecal occult blood testing with a home kit within 2 years for people aged 50 to 64 years,<sup>44-46</sup> and sigmoidoscopy within 5 years for people aged 50 to 64 years.<sup>47-49</sup> Cardiovascular preventive services included hypertension screening within 2 years for all people aged 25 to 64 years,<sup>50</sup> cholesterol screening within 5 years for all people aged 45 to 64 years,<sup>43,50-52</sup> advice about weight loss by a health professional within 1 year for obese individuals aged 18 to 64 years,<sup>43</sup> and advice about smoking cessation by a health professional within 1 year for current smokers aged 18 to 64 years.<sup>43,53</sup> Indicators of appropriate preventive services for persons with diabetes aged 18 to 64 years included receiving a glycosylated hemoglobin measurement, foot examination by a health professional, cholesterol measurement, and influenza vaccine within 1 year; dilated eye examination within 2 years; and pneumococcal vaccine at any time in the past.<sup>54-56</sup> Screening for HIV at any time was evaluated for people aged 18 to 44 years who reported a medium or high risk of HIV infection.<sup>43</sup>

Information on preventive services was based on 1997 or 1998 data from all 50 states and the District of Columbia except for 4 services. Questions about glycosylated hemoglobin measurements and diabetic eye and foot examinations were asked during 1998 in 37 states, representing about 70% of the US adult population. Questions about smoking cessation counseling were asked during 1997 in 12 states, comprising about 25% of the US adult population.

#### Data Analysis

Our analysis had 3 main objectives. First, in demographic and clinical strata we compared the proportions of respondents who were uninsured 1 year or longer, uninsured less than 1 year, and

insured. Second, we compared the proportions of these 3 groups that lacked access to care by a physician. Third, we calculated the proportion of each insurance group that had not received clinically indicated preventive services.

To assess the independent effect of lacking health insurance on access to physicians and preventive services, we used multiple logistic regression to control for age, sex, race/ethnicity, census region, employment, education, and income. For all of these variables except income, data were missing for less than 0.5% of respondents, so we excluded these individuals from adjusted analyses. However, income data were missing for 11.7% of the weighted sample in 1997 and 12.8% in 1998. To avoid potential biases due to mishandling of incomplete income data (eg, deleting cases or using indicator variables for missing data) and to make full use of the observed data,<sup>57-59</sup> we used NORM statistical software to obtain multiple imputed income values for respondents with missing data.<sup>60</sup>

These imputed data sets were analyzed using conventional complete data techniques. We obtained adjusted rates of access measures for each category of insurance status (long-term uninsured, short-term uninsured, and insured) by direct standardization to the demographic characteristics of the full study cohort using the logistic regression model.<sup>61,62</sup> The BRFSS sampling and post-stratification weights were used in fitting the models and calculating adjusted proportions. To derive accurate SEs and tests of statistical significance from these weighted data, we used SUDAAN statistical software<sup>63,64</sup> and report 2-tailed tests of significance using standard procedures to calculate valid tests with multiply imputed data.<sup>65</sup>

## RESULTS

### Characteristics Related to Insurance Status

The study population was representative of more than 163 million US adults aged 18 to 64 years residing in households during 1998 and approximately 161 million comparable adults in 1997.

In 1998, 9.7% of this population had been uninsured for at least 1 year, including 1.8% for 1 to 2 years, 2.1% for 2 to 5 years, 3.4% for more than 5 years, 2.1% who were never insured, and 0.3% who could not recall when they were last insured. An additional 4.3% of the population was uninsured for less than 1 year, including 2.5% for less than 6 months and 1.8% for 6 to 12 months. In 1997, 9.8% of the cohort had been uninsured for at least 1 year and 4.2% for less than 1 year.

The unadjusted proportion of adults in 1998 who were uninsured for 1 year or longer, uninsured less than a year, or insured are portrayed in Table 1, stratified by demographic and clinical characteristics. Compared with other adults in the cohort, the proportions of uninsured individuals were higher among younger adults, men, blacks, Hispanics, residents of the South and West, those with less education and lower incomes, and those who were self-employed, unemployed, or not in the labor force. Adults whose self-reported health status was good, fair, or poor were 2 to 3 times more likely to have been uninsured for 1 year or longer than those who reported excellent or very good health. Smokers, obese individuals, and binge drinkers were more often uninsured than adults without these risk factors. In contrast, people with self-reported hypertension, diabetes mellitus, and elevated cholesterol were less likely to be uninsured than adults without these conditions.

### Access to Physicians

TABLE 2 presents the unadjusted proportion of adults in each insurance category who could not see a physician when needed in the past year due to cost, stratified by demographic factors. Nearly two fifths of long-term-uninsured adults and one third of the short-term-uninsured adults reported this problem, compared with only about 1 in 14 insured adults. Among long-term-uninsured adults, cost barriers to seeing a physician were greatest for women, blacks, the unemployed, and those with low incomes.

Adjusted proportions of uninsured and insured adults in clinical risk groups who could not see a physician when needed in the past year due to cost are shown in TABLE 3. In each of these risk groups, long-term- and short-term-uninsured adults were significantly more likely than insured adults to have experienced cost barriers to needed care in the past year, reflecting the impact of even short-term periods without health insurance. As depicted in the FIGURE, 69.1% of long-term-uninsured adults in poor health and 48.8% of those in fair health reported they could not see a physician when needed in the past year due to cost, compared with 51.9% and 42.4% of short-term-uninsured adults and 21.8% and 15.7% of insured adults, respectively.

TABLE 4 presents the adjusted proportions of uninsured and insured adults who did not have a routine checkup by a physician during the prior 2 years. In all clinical risk groups, long-term-uninsured adults were significantly more likely than insured adults to have lacked a routine checkup. For short-term-uninsured adults, the differences relative to insured adults were smaller and significant only among smokers, obese individuals, and binge drinkers, but not among those with hypertension, diabetes, elevated cholesterol, or HIV risk.

#### Access to Clinically Indicated Preventive Services

TABLE 5 shows the adjusted proportions of adults who did not receive appropriate preventive services. Long-term-uninsured adults were significantly more likely than insured adults to have unmet needs for each of these services, except for glycosylated hemoglobin measurements and pneumococcal vaccinations among adults with diabetes and HIV screening among those with self-perceived risk. For clinical services such as breast cancer or hypertension screening, long-term-uninsured adults were 3 to 4 times more likely not to have received these services. Short-term-uninsured adults had intermediate rates of unmet needs for preventive services that were statistically higher than the

rates of insured adults for mammography, Papanicolaou tests, and hypertension and cholesterol screening.

#### COMMENT

Our study provides recent, nationally representative estimates of unmet health needs experienced by uninsured adults—two thirds of whom had been uninsured for 1 year or longer. Nearly

half of uninsured adults with annual incomes below \$15 000 reported they could not see a physician when needed in the past year due to the cost of care. Uninsured adults with clinically important chronic conditions and health risks were much more likely than insured adults to report this problem, even after adjusting for income and other potential confounders. Alarm-

**Table 2.** Unadjusted Proportion of Uninsured and Insured Adults in the United States Who Could Not See a Physician When Needed in the Past Year Due to Cost\*

| Characteristic                    | Uninsured, % |      | Insured, % |
|-----------------------------------|--------------|------|------------|
|                                   | ≥1 y         | <1 y |            |
| All adults aged 18-64 y           | 38.6         | 30.4 | 7.4        |
| Age, y                            |              |      |            |
| 18-24                             | 35.5         | 24.3 | 8.9        |
| 25-34                             | 36.0         | 29.9 | 9.0        |
| 35-44                             | 41.8         | 34.5 | 7.4        |
| 45-54                             | 42.6         | 37.5 | 6.5        |
| 55-64                             | 38.7         | 37.5 | 5.1        |
| Sex                               |              |      |            |
| Female                            | 47.7         | 37.9 | 8.9        |
| Male                              | 30.7         | 22.0 | 5.9        |
| Race/ethnicity                    |              |      |            |
| White                             | 39.4         | 29.2 | 6.7        |
| Black                             | 43.6         | 38.1 | 8.8        |
| Hispanic                          | 36.0         | 31.1 | 11.9       |
| Asian or Pacific Islander         | 28.8         | 10.5 | 5.6        |
| American Indian or Alaskan Native | 33.5         | 30.0 | 10.0       |
| Other                             | 39.2         | 41.5 | 12.2       |
| Census region                     |              |      |            |
| Northeast                         | 41.8         | 26.6 | 6.0        |
| South                             | 39.7         | 33.1 | 8.4        |
| Midwest                           | 38.4         | 26.8 | 6.0        |
| West                              | 35.4         | 31.3 | 8.7        |
| Employment status                 |              |      |            |
| Employed                          | 38.1         | 28.9 | 6.7        |
| Self-employed                     | 31.8         | 25.1 | 7.4        |
| Unemployed                        | 47.8         | 34.2 | 15.1       |
| Not in labor force                | 41.5         | 33.4 | 8.7        |
| Education                         |              |      |            |
| Less than high school graduate    | 38.8         | 34.8 | 13.2       |
| High school graduate              | 38.7         | 30.6 | 8.5        |
| 1-3 y of college                  | 40.2         | 32.5 | 7.5        |
| ≥4 y of college                   | 35.6         | 20.4 | 4.6        |
| Annual household income           |              |      |            |
| <\$15 000                         | 47.7         | 46.2 | 19.8       |
| \$15 000-24 999                   | 41.5         | 31.2 | 14.6       |
| \$25 000-\$34 999                 | 31.8         | 25.8 | 9.6        |
| \$35 000-49 999                   | 30.3         | 22.9 | 5.5        |
| \$50 000-74 999                   | 23.5         | 19.4 | 3.0        |
| ≥\$75 000                         | 21.4         | 16.8 | 2.0        |
| Do not know                       | 35.0         | 26.8 | 8.6        |
| Refused                           | 32.4         | 28.5 | 5.8        |

\* $P < .001$  for all 3-way comparisons in each stratum.

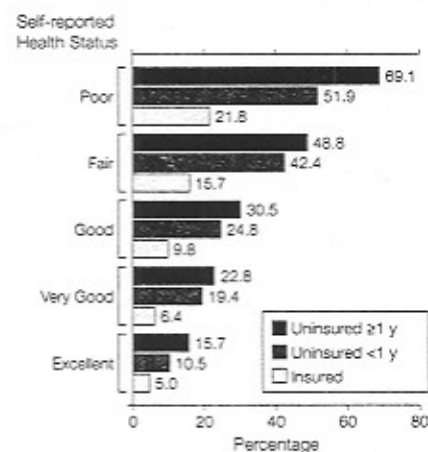
**Table 3.** Adjusted Proportion of Uninsured and Insured Adults in Clinical Risk Groups Who Could Not See a Physician When Needed in the Past Year Because of Cost\*

| Clinical Group                                    | Uninsured, % |       | Insured, % |
|---|--------------|-------|------------|
|   | ≥1 y†        | <1 y† |            |
| All adults aged 18-64 y                           | 26.8         | 21.7  | 8.2        |
| Clinical risk group                               |              |       |            |
| Current smoking                                   | 37.0         | 27.1  | 12.3       |
| Body mass index ≥30 kg/m <sup>2</sup>             | 34.8         | 29.9  | 10.4       |
| Hypertension                                      | 40.3         | 35.1  | 11.7       |
| Diabetes mellitus                                 | 45.9         | 33.8  | 12.7       |
| Elevated cholesterol                              | 36.9         | 28.3  | 10.1       |
| Binge drinking                                    | 29.1         | 27.6  | 8.7        |
| Medium or high human immunodeficiency virus risk‡ | 33.7         | 23.0  | 11.5       |

\*Adjusted by direct standardization to the demographic characteristics of the full study cohort, using logistic regression to control for age, sex, race/ethnicity, region, employment status, education, and income. Behavioral Risk Factor Surveillance System data from 1996 were used for all adults and for current smokers and those who reported body mass index of 30 kg/m<sup>2</sup> or higher, diabetes mellitus, or human immunodeficiency virus risk; 1997 data were used for those who reported hypertension, elevated cholesterol, or binge drinking.

†P<.001 for all comparisons with insured adults.

‡Self-perceived risk among adults aged 18 to 44 years only.

**Figure.** Adjusted Proportion of Uninsured and Insured Adults Who Could Not See a Physician When Needed in Past Year Due to Cost by Health Status

Adjusted by direct standardization to the demographic characteristics of the full study cohort in 1998, using logistic regression to control for age, sex, race/ethnicity, region, employment status, education, and income. P<.001 for all 2-way comparisons of long-term-uninsured adults and short-term-uninsured adults with insured adults, respectively, in each category of health status. The numbers of respondents in each risk group can be computed from data in Table 1.

ingly high proportions of long-term-uninsured adults in poor or fair health reported forgoing needed care, including about two thirds of those in poor health and half of those in fair health. Another national survey has provided examples of the troubling personal nar-

atives embodied in these statistics.<sup>66</sup> These findings challenge the views of a growing proportion of Americans—from 43% in 1993 to 57% in 1999—who believe that uninsured people are able to get the care they need from physicians and hospitals.<sup>37,38</sup>

Distinctive features of our study included a focus on the unmet health needs of long-term-uninsured adults, particularly those with impaired health or major chronic conditions such as diabetes mellitus, hypertension, and elevated cholesterol. Long-term-uninsured adults with these conditions and other clinical risk factors were much less likely than insured adults to have received routine checkups during which their health risks might have been addressed. In addition, long-term-uninsured adults were less likely to report that they received basic preventive services related to cancer screening and cardiovascular risk reduction, but not HIV screening. The magnitude of these differences was greatest for services such as mammography and cholesterol screening that are often ordered by primary care physicians during routine checkups. For routine checkups and most preventive services, individuals who had been uninsured less than 1 year did not differ substantially from people who were insured, possibly because the short-term uninsured continued to have regular sources of care

or had received checkups while they were insured. In contrast, the short-term uninsured were similar to the long-term uninsured in the likelihood they had not seen a physician when needed in the past year due to cost, suggesting that even short-term periods without insurance may cause sizeable numbers of people to forgo needed care.

Our study provides population-based rates of specific clinical services reported by uninsured and insured adults with diabetes mellitus, building on 2 other national studies that examined some of the same clinical services but did not distinguish the short-term and long-term uninsured.<sup>32,33</sup> Although uninsured adults with diabetes did not differ significantly from insured adults with diabetes in reported rates of glycosylated hemoglobin measurements or pneumococcal vaccinations, long-term-uninsured adults with diabetes were less likely than insured adults with diabetes to have received other basic services, such as eye and foot examinations, cholesterol screening, and influenza vaccinations. These results are particularly concerning because adults with diabetes mellitus face an increased risk of numerous complications, including serious infections, cardiovascular disease, renal failure, and retinopathy, that can be prevented or deferred with effective medical care.<sup>34</sup> Therefore, improving access to care for uninsured adults with diabetes may help prevent avoidable complications of this serious chronic disease.

Our results are generally consistent with earlier reports that assessed the impact of insurance status on a narrower range of preventive services. Rates of breast and cervical cancer screening have increased substantially among uninsured women over the past 2 decades,<sup>11,12</sup> perhaps in part because the National Breast and Cervical Cancer Early Detection Program has funded and promoted free screening services for uninsured, low-income women in all 50 states since 1991.<sup>67</sup> However, the absolute differences in screening rates between uninsured and insured women

have remained remarkably consistent when our findings are compared with earlier studies.<sup>11,12</sup> Furthermore, another report based on BRFSS data found that age-adjusted mammography rates increased by about 6% for both insured and uninsured women between 1991-1992 and 1996-1997, but the absolute difference between these groups remained approximately 25%.<sup>68</sup> Lower rates of cancer screening among uninsured adults may be the principal reason why they are diagnosed at later, less curable stages of breast and colorectal cancer than insured adults.<sup>15,16</sup>

Although patchwork programs can fill gaps in specific services such as cancer screening for uninsured adults, national health goals represented in the Healthy People 2010 objectives are unlikely to be met without more vigorous efforts to extend affordable health insurance to the uninsured for a wide range of basic medical services.<sup>69</sup> Fourteen states have taken steps to expand health insurance coverage for low-income adults.<sup>70</sup> Evidence from 3 states (Minnesota, Oregon, and Tennessee) suggests these programs have helped reduce both the prevalence and duration of periods without insurance for low-income adults.<sup>71</sup> Comparable efforts to improve access by other states and the federal government could target long-term-uninsured adults with low incomes or chronic health conditions and the approximately 2 million uninsured adults aged 55 to 64 years who are approaching eligibility for Medicare, as others have suggested.<sup>37,72-75</sup> Our findings suggest that the health benefits of extending insurance to these groups could be substantial, but the costs borne by uninsured people must be low enough to encourage broad participation, especially for those who are poor or near poor.<sup>76</sup>

Our study had some limitations. Although we focused on clinically important access measures that would be expected to yield better health outcomes and are supported by national guidelines, we did not analyze clinical outcomes or the effectiveness of specific treatments. Our study was a cross-

**Table 4.** Adjusted Proportion of Uninsured and Insured Adults in Clinical Risk Groups Who Did Not Have a Routine Checkup in the Past 2 Years\*

| Clinical Group                                    | Uninsured, % |       | Insured, % |
|---|--------------|-------|------------|
|   | ≥1 y         | <1 y  |            |
| All adults aged 18-64 y                           | 42.8†        | 22.3† | 17.8       |
| Clinical risk group                               |              |       |            |
| Current smoking                                   | 52.2†        | 27.6† | 21.6       |
| Body mass index ≥30 kg/m <sup>2</sup>             | 40.7†        | 20.0† | 14.8       |
| Hypertension                                      | 25.8†        | 13.9  | 10.3       |
| Diabetes mellitus                                 | 25.5†        | 7.2   | 5.0        |
| Elevated cholesterol                              | 28.6†        | 10.4  | 10.5       |
| Binge drinking                                    | 40.0†        | 22.2† | 16.1       |
| Medium or high human immunodeficiency virus risk§ | 44.0†        | 22.7  | 18.9       |

\*Adjusted by direct standardization to the demographic characteristics of the full study cohort, using logistic regression to control for age, sex, race/ethnicity, region, employment status, education, and income. Behavioral Risk Factor Surveillance System data from 1998 were used for all adults and for current smokers and those who reported a body mass index of 30 kg/m<sup>2</sup> or higher, diabetes mellitus, or human immunodeficiency virus risk; 1997 data were used for those who reported hypertension, elevated cholesterol, or binge drinking.

†P<.001 for comparison with insured adults.

‡P<.01 for comparison with insured adults.

§Self-perceived risk among adults aged 18 to 44 years only.

**Table 5.** Adjusted Proportion of Uninsured and Insured Adults Who Did Not Receive Clinically Indicated Preventive Services\*

| Preventive Service                               | Reference Period, y | Survey Year | Age Range, y | Uninsured, % |        | Insured, % |
|--|---------------------|-------------|--------------|--------------|--------|------------|
|  |                     |             |              | ≥1 y         | <1 y   |            |
| Cancer screening                                 |                     |             |              |              |        |            |
| Mammography†                                     | 2                   | 1998        | 50-64        | 32.2±        | 21.3±  | 11.0       |
| Clinical breast examination†                     | 2                   | 1998        | 50-64        | 35.8±        | 17.5   | 10.7       |
| Papanicolaou test§                               | 3                   | 1998        | 18-64        | 19.5±        | 10.5±  | 6.3        |
| Fecal occult blood testing via home kit          | 2                   | 1997        | 50-64        | 90.4±        | 80.5   | 75.3       |
| Sigmoidoscopy                                    | 5                   | 1997        | 50-64        | 89.3±        | 75.2   | 73.6       |
| Cardiovascular risk reduction                    |                     |             |              |              |        |            |
| Hypertension screening                           | 2                   | 1997        | 25-64        | 19.5±        | 8.6±   | 5.8        |
| Cholesterol screening                            | 5                   | 1997        | 45-64        | 40.5±        | 24.0   | 18.1       |
| Weight loss advice by health professional¶       | 1                   | 1998        | 18-64        | 72.0±        | 67.2   | 64.1       |
| Smoking cessation advice by health professional# | 1                   | 1997        | 18-64        | 58.4±        | 49.6   | 40.3       |
| Diabetes management**                            |                     |             |              |              |        |            |
| Glycosylated hemoglobin measurement              | 1                   | 1998        | 18-64        | 83.2         | 73.0   | 75.0       |
| Foot examination by health professional          | 1                   | 1998        | 18-64        | 63.9±        | 41.8   | 40.4       |
| Dilated eye examination                          | 2                   | 1998        | 18-64        | 43.6±        | 18.4   | 26.7       |
| Cholesterol measurement                          | 1                   | 1997        | 18-64        | 30.2±        | 25.4†† | 13.3       |
| Influenza vaccine                                | 1                   | 1997        | 18-64        | 73.0         | 63.7   | 57.3       |
| Pneumococcal vaccine                             | Ever                | 1997        | 18-64        | 83.9         | 86.4   | 78.4       |
| Human immunodeficiency virus screening‡‡         | Ever                | 1998        | 18-44        | 51.5         | 46.6   | 44.7       |

\*Adjusted by direct standardization to the demographic characteristics of the full study cohort, using logistic regression to control for age, sex, race/ethnicity, region, employment status, education, and income.

†Among women.

‡P<.001 for comparison with insured adults.

§Among women with intact uterus.

¶P<.01 for comparison with insured adults.

||Among people with a body mass index of 30 kg/m<sup>2</sup> or higher.

#Among current smokers.

\*\*Among adults with diabetes.

††P<.05 for comparison with insured adults.

‡‡Among people with self-perceived medium or high human immunodeficiency virus risk.

sectional analysis, so we could not directly examine the effects on the uninsured of the growth of managed care or other temporal changes in the health care system. In addition, the cross-sectional nature of BRFSS data did not allow us to link the timing of preventive services to specific periods in which individuals were uninsured. Our measures were based on self-reported data that were not independently verified. The reliability of such self-reports is very good or excellent for most variables included in our study.<sup>77-80</sup> Studies of the validity of self-reported data indicate that telephone surveys closely approximate the prevalence of diabetes and smoking obtained from clinical testing, but may underestimate rates of obesity, hypertension, and elevated cholesterol,<sup>81</sup> and overestimate rates of mammography.<sup>82</sup>

We have no reason to expect substantial differences in the accuracy of health data reported by uninsured and insured adults, particularly after we controlled for numerous demographic confounders and used rigorous multiple-imputation methods to minimize potential bias related to missing income data. However, our study may underestimate the unmet health needs of uninsured adults if they are less likely to be aware of important health conditions due to inadequate screening. Even when uninsured adults with low incomes obtain care, they report that the quality and continuity of care is substantially worse than reported by insured low-income adults.<sup>31,74</sup> The study cohort also did not include adults living in households without telephones, who represent about 5% of the US population and are more likely to be poor, black, Hispanic, and residents of the South.<sup>39</sup> Because these groups are more often uninsured than other groups of adults, our estimates of uninsured adults with deficits in basic care probably would increase if people without telephones had been included.

The federal and state governments have begun to extend affordable health insurance to uninsured children in the

United States by expanding Medicaid and launching the Children's Health Insurance Program.<sup>3,83</sup> In contrast, the unmet health needs of 33 million uninsured adults continue to fester in the health care system without a cohesive political response by the federal government or most states. Concerted and collaborative action by policymakers and health care professionals will be required to address these persistent needs.

**Funding/Support:** This study was funded by the American College of Physicians-American Society of Internal Medicine.

**Acknowledgment:** We are grateful to Robert E. Wolf, MS, for statistical programming, Recai Yucel, PhD, for imputing missing data, Whitney W. Addington, MD, and Robert B. Doherty for help in initiating this study, and Melinda Schriver for helpful comments on an earlier draft of the manuscript.

#### REFERENCES

1. Fronstin P. *Sources of Health Insurance and Characteristics of the Uninsured: Analysis of the March 1999 Current Population Survey*. Washington, DC: Employee Benefit Research Institute; 2000:1-26.
2. Weissman JS, Epstein AM. *Falling Through the Safety Net: Insurance Status and Access to Health Care*. Baltimore, Md: Johns Hopkins University Press; 1994.
3. Rowland D, Feder J, Keenan PS. Uninsured in America: the causes and consequences. In: Altman SH, Reinhardt UE, Shields AE, eds. *The Future US Healthcare System: Who Will Care for the Poor and Uninsured?* Chicago, Ill: Health Administration Press; 1998:25-44.
4. American College of Physicians-American Society of Internal Medicine. *No Health Insurance? It's Enough to Make You Sick*. Philadelphia, Pa: American College of Physicians-American Society of Internal Medicine; 2000.
5. Hafner-Eaton C. Physician utilization disparities between the uninsured and insured: comparisons of the chronically ill, acutely ill, and well nonelderly population. *JAMA*. 1993;269:787-792.
6. Franks P, Clancy CM, Gold MR, Nutting PA. Health insurance and subjective health status: data from the 1987 National Medical Expenditure Survey. *Am J Public Health*. 1993;83:1295-1299.
7. Hahn B, Flood AB. No insurance, public insurance, and private insurance: do these options contribute to differences in general health? *J Health Care Poor Underserved*. 1995;6:41-59.
8. Centers for Disease Control and Prevention. Self-assessed health status and selected behavioral risk factors among persons with and without health-care coverage: United States, 1994-1995. *MMWR Morb Mortal Wkly Rep*. 1998;47:176-180.
9. Weissman JS, Stern R, Fielding SL, Epstein AM. Delayed access to health care: risk factors, reasons, and consequences. *Ann Intern Med*. 1991;114:325-331.
10. Baker DW, Shapiro MF, Schur CL. Health insurance and access to care for symptomatic conditions. *Arch Intern Med*. 2000;160:1269-1274.
11. Woolhandler S, Himmelstein DU. Reverse targeting of preventive care due to lack of health insurance. *JAMA*. 1988;259:2872-2874.
12. Centers for Disease Control and Prevention. Health insurance coverage and receipt of preventive health services: United States, 1993. *MMWR Morb Mortal Wkly Rep*. 1995;44:219-225.
13. Himmelstein DU, Woolhandler S. Care denied: US residents who are unable to obtain needed medical services. *Am J Public Health*. 1995;85:341-344.
14. Ford ES, Will JC, Ford MAD, Mokdad AH. Health insurance status and cardiovascular disease risk factors among 50-64-year-old women: findings from the Third National Health and Nutrition Examination Survey. *J Womens Health Gen Gen Med*. 1998;7:997-1006.
15. Ayanian JZ, Kohler BA, Abe T, Epstein AM. The relation between health insurance coverage and clinical outcomes among women with breast cancer. *N Engl J Med*. 1993;329:326-331.
16. Roetzheim RG, Pal N, Tennant C, et al. Effects of health insurance and race on early detection of cancer. *J Natl Cancer Inst*. 1999;91:1409-1415.
17. Weissman JS, Gatsonis C, Epstein AM. Rates of avoidable hospitalization by insurance status in Massachusetts and Maryland. *JAMA*. 1992;268:2388-2394.
18. Franks P, Clancy CM, Gold MR. Health insurance and mortality: evidence from a national cohort. *JAMA*. 1993;270:737-741.
19. Hadley J, Steinberg EP, Feder J. Comparison of uninsured and privately insured hospital patients: condition on admission, resource use, and outcome. *JAMA*. 1991;265:374-379.
20. Cunningham PJ, Grossman JM, St Peter RF, Lesser CS. Managed care and physicians' provision of charity care. *JAMA*. 1999;282:1087-1092.
21. Hawkins DR, Rosenbaum S. The challenges facing health centers in a changing healthcare system. In: Altman SH, Reinhardt UE, Shields AE, eds. *The Future US Healthcare System: Who Will Care for the Poor and Uninsured?* Chicago, Ill: Health Administration Press; 1998:99-122.
22. Gage LS. The future of safety-net hospitals. In: Altman SH, Reinhardt UE, Shields AE, eds. *The Future US Healthcare System: Who Will Care for the Poor and Uninsured?* Chicago, Ill: Health Administration Press; 1998:123-149.
23. Cunningham PJ. Pressures on safety net access: the level of managed care penetration and uninsurance rate in a community. *Health Serv Res*. 1999;34:255-270.
24. United States General Accounting Office. *Health Care Access: Programs for Underserved Populations Could Be Improved*. Washington, DC: US General Accounting Office; 2000.
25. Jensen GA. The dynamics of health insurance among the near elderly. *Med Care*. 1992;30:598-614.
26. Swartz K, Marcotte J, McBride TD. Personal characteristics and spells without health insurance. *Inquiry*. 1993;30:64-76.
27. McBride TD. Uninsured spells of the poor: prevalence and duration. *Health Care Finance Rev*. 1997;19:145-160.
28. State-specific prevalence of lapses in health-care-insurance coverage: United States, 1995. *MMWR Morb Mortal Wkly Rep*. 1998;47:73-77.
29. Lurie N, Ward NB, Shapiro MF, Gallego C, Vaghwalla R, Brook RH. Termination of Medi-Cal benefits: a follow-up study one year later. *N Engl J Med*. 1986;314:1266-1268.
30. Burstin HR, Swartz K, O'Neil AC, Orav EJ, Brennan TA. The effect of change of health insurance on access to care. *Inquiry*. 1998;35:389-397.
31. Schoen C, DesRoches C. Uninsured and unstably insured: the importance of continuous insurance coverage. *Health Serv Res*. 2000;35:187-206.
32. Brechner RJ, Cowie CC, Howie LJ, Herman WH, Will JC, Harris MI. Ophthalmic examination among adults with diagnosed diabetes mellitus. *JAMA*. 1993;270:1714-1718.
33. Beckles GLA, Engelgau MM, Venkat Narayan KM, Herman WH, Aubert RE, Williamson DF. Population-based assessment of the level of care among adults with diabetes in the US. *Diabetes Care*. 1998;21:1432-1438.
34. Moy E, Bartman BA, Weir MR. Access to hypertensive care: effects of income, insurance, and source of care. *Arch Intern Med*. 1995;155:1497-1502.



35. Shea S, Misra D, Ehrlich MH, Field L, Francis CK. Predisposing factors for severe, uncontrolled hypertension in an inner-city minority population. *N Engl J Med*. 1992;327:776-781.
36. Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. The sixth report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Arch Intern Med*. 1997;157:2413-2446.
37. Schroeder SA. The medically uninsured: will they always be with us? *N Engl J Med*. 1996;334:1130-1133.
38. Blendon RJ, Young JT, DesRoches CM. The uninsured, the working uninsured, and the public. *Health Aff (Millwood)*. 1999;18:203-211.
39. Powell-Griner E, Anderson JE, Murphy W. State- and sex-specific prevalence of selected characteristics: Behavioral Risk Factor Surveillance System, 1994 and 1995. *MMWR Morb Mortal Wkly Rep*. 1997;46 (SS-3):1-31.
40. Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System Web site. Available at: <http://www.cdc.gov/nccdphp/brfss>. Accessed September 22, 2000.
41. Hahn RA, Teutsch SM, Rothenberg RB, Marks JS. Excess deaths from nine chronic diseases in the United States, 1986. *JAMA*. 1990;264:2654-2659.
42. McGinnis JM, Foege WH. Actual causes of death in the United States. *JAMA*. 1993;270:2207-2212.
43. US Preventive Services Task Force. *Guide to Clinical Preventive Services*. Baltimore, Md: Williams & Wilkins; 1996.
44. Kronborg O, Fenger C, Olsen J, Jorgensen OD, Sondergaard O. Randomised study of screening for colorectal cancer with faecal-occult-blood test. *Lancet*. 1996;348:1467-1471.
45. Hardcastle JD, Chamberlain JO, Robinson MHE, et al. Randomised controlled trial of faecal-occult-blood screening for colorectal cancer. *Lancet*. 1996;348:1472-1477.
46. Mandel JS, Church TR, Ederer F, Bond JH. Colorectal cancer mortality: effectiveness of biennial screening for fecal occult blood. *J Natl Cancer Inst*. 1999;91:434-437.
47. Selby JV, Friedman GD, Quesenberry CP Jr, Weiss NS. A case-control study of screening sigmoidoscopy and mortality from colorectal cancer. *N Engl J Med*. 1992;326:653-657.
48. Byers T, Levin B, Rothenberger D, et al. American Cancer Society guidelines for screening and surveillance for early detection of colorectal polyps and cancer: update 1997. *CA Cancer J Clin*. 1997;47:154-160.
49. Winawer SJ, Fletcher RH, Miller L, et al. Colorectal cancer screening: clinical guidelines and rationale. *Gastroenterology*. 1997;112:594-642.
50. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. Summary of the second report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel II). *JAMA*. 1993;269:3015-3023.
51. American College of Physicians. Guidelines for using serum cholesterol, high-density lipoprotein cholesterol, and triglyceride levels as screening tests for preventing coronary heart disease in adults: part 1. *Ann Intern Med*. 1996;124:515-517.
52. Garber AM, Browner WS, Hulley SB. Cholesterol screening in asymptomatic adults, revisited: part 2. *Ann Intern Med*. 1996;124:518-531.
53. The Smoking Cessation Clinical Practice Panel and Staff. The Agency for Health Care Policy and Research Smoking Cessation Clinical Practice Guideline. *JAMA*. 1996;275:1270-1280.
54. American Diabetes Association. Standards of medical care for patients with diabetes mellitus. *Diabetes Care*. 1998;21(suppl 1):S23-S31.
55. American Diabetes Association. Immunization and the prevention of influenza and pneumococcal disease in people with diabetes. *Diabetes Care*. 2000;23:109-111.
56. Vijan S, Hofer TP, Hayward RA. Cost-utility analysis of screening intervals for diabetic retinopathy in patients with type 2 diabetes mellitus. *JAMA*. 2000;283:889-896.
57. Rubin DB, Schenker N. Multiple imputation in health-care databases: an overview and some applications. *Stat Med*. 1991;10:585-598.
58. Heitjan DF. What can be done about missing data? approaches to imputation. *Am J Public Health*. 1997;98:548-550.
59. Schafer JL. Multiple imputation: a primer. *Stat Methods Med Res*. 1999;8:3-15.
60. Schafer JL. *Analysis of Incomplete Multivariate Data*. New York, NY: Chapman & Hall; 1997.
61. Little RJA. Direct standardization: a tool for teaching linear models for unbalanced data. *Am Stat*. 1982;36:38-43.
62. Leape LL, Hilborne LH, Bell R, Kamberg C, Brook RH. Underuse of cardiac procedures: do women, ethnic minorities, and the uninsured fail to receive needed revascularization? *Ann Intern Med*. 1999;130:183-192.
63. Frane J. SUDAAN: Professional Software for Survey Data Analysis. Research Triangle Park, NC: Research Triangle Institute; 1989.
64. LaVange LM, Stearns SC, Lafata JE, Koch GG, Shah BV. Innovative strategies using SUDAAN for analysis of health surveys with complex samples. *Stat Methods Med Res*. 1996;5:311-329.
65. Rubin DB. *Multiple Imputation for Nonresponse in Surveys*. New York, NY: John Wiley & Sons; 1987.
66. Donelan K, Blendon RJ, Hill CA, et al. Whatever happened to the health insurance crisis in the United States? voices from a national survey. *JAMA*. 1996;276:1346-1350.
67. Marks JS, Lee NC, Lawson HW, Henson R, Bobo JK, Kaeser MK. Implementing recommendations for the early detection of breast and cervical cancer among low-income women. *MMWR Morb Mortal Wkly Rep*. 2000;49(RR02):35-55.
68. Centers for Disease Control and Prevention. Self-reported use of mammography and insurance status among women aged greater than or equal to 40 years: United States, 1991-1992 and 1996-1997. *MMWR Morb Mortal Wkly Rep*. 1998;47:825-830.
69. US Department of Health and Human Services. *Healthy People 2010* Web site. Available at: <http://www.health.gov/healthypeople>. Accessed September 22, 2000.
70. Krebs-Carter M, Holahan J. *State Strategies for Covering Uninsured Adults*. Washington, DC: The Urban Institute; 2000.
71. Schoen C, Lyons B, Rowland D, Davis K, Puleo E. Insurance matters for low-income adults: results from a five-state survey. *Health Aff (Millwood)*. 1997;16:163-171.
72. Davis K, Schoen C. Incremental health insurance coverage: building on the current system. In: Altman SH, Reinhardt UE, Shields AE, eds. *The Future US Healthcare System: Who Will Care for the Poor and Uninsured?* Chicago, Ill: Health Administration Press; 1998:247-263.
73. Short PF, Klerman JA. *Targeting Long- and Short-Term Gaps in Health Insurance*. New York, NY: Commonwealth Fund; 1998.
74. Schoen C, Puleo E. Low-income working families at risk: uninsured and underserved. *J Urban Health*. 1998;75:30-49.
75. Blumenthal D. Health care reform at the close of the 20th century. *N Engl J Med*. 1999;340:1916-1920.
76. Ku L, Coughlin TA. Sliding-scale premium health insurance programs: four state's experiences. *Inquiry*. 1999;36:471-480.
77. Shea S, Stein AD, Lantigua R, Basch CE. Reliability of the Behavioral Risk Factor Survey in a triethnic population. *Am J Epidemiol*. 1991;133:489-500.
78. Stein AD, Lederman RI, Shea S. The Behavioral Risk Factor Surveillance System questionnaire: its reliability in a statewide sample. *Am J Public Health*. 1993;83:1768-1772.
79. Stein AD, Courval JM, Lederman RI, Shea S. Reproducibility of responses to telephone interviews: demographic predictors of discordance to risk factor status. *Am J Epidemiol*. 1995;141:1097-1106.
80. Bowlin SJ, Morrill BD, Nafziger AN, Lewis C, Pearson TA. Reliability and changes in validity of self-reported cardiovascular disease risk factors using dual response: The Behavioral Risk Factor Survey. *J Clin Epidemiol*. 1996;49:511-517.
81. Bowlin SJ, Morrill BD, Nafziger AN, Jenkins PL, Lewis C, Pearson TA. Validity of cardiovascular disease risk factors assessed by telephone survey: the Behavioral Risk Factor Survey. *J Clin Epidemiol*. 1993;46:561-571.
82. Degnan D, Harris R, Ranney J, et al. Measuring the use of mammography: two methods compared. *Am J Public Health*. 1992;82:1386-1388.
83. Selden TM, Banthin JS, Cohen JW. Waiting in the wings: eligibility and enrollment in the State Children's Health Insurance Program. *Health Aff (Millwood)*. 1999;18:126-133.