Influenza Vaccination Trends Among Adults 65 Years or Older in the United States, 1989-2002

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Background: Influenza vaccination of elderly individuals (65 years or older) has been recommended in the United States since 1961, and consistent surveillance of vaccine use has been conducted since 1989. We examined national trends in influenza vaccination coverage in the United States from 1989 to 2002 among noninstitutionalized elderly individuals and identified factors associated with receipt of influenza vaccine.

Methods: We analyzed data from the 1989-2002 National Health Interview Surveys, weighted to reflect the civilian, noninstitutionalized US population to determine self-reported levels of influenza vaccination. We conducted multivariable logistic regression modeling of 2002 data to identify factors independently associated with self-reported influenza vaccination.

Results: Among the elderly, influenza vaccination coverage increased from 30.5% in 1989 to 65.6% in 2002, with only a 2.4% increase from 1997 to 2002. In 2002, coverage remained lower for the non-Hispanic black (49.6%) and Hispanic (48.5%) populations compared with non-Hispanic whites (68.6%). Characteristics associated with a lower likelihood of influenza vaccination included fewer than 4 physician contacts in the past year and whether a person (1) was divorced or separated, (2) was non-Hispanic black or Hispanic, (3) had no regular physician, and (4) had less than a high school education. Individuals with chronic medical conditions and those 75 years or older were more likely to be vaccinated.

Conclusions: By 1997, influenza vaccination coverage exceeded the Healthy People 2000 objective of 60% for the elderly overall, but even by 2002, this objective was still not achieved in the elderly black and Hispanic populations. Vaccination coverage seems to be leveling off, and innovative initiatives are needed to reach the Healthy People 2010 target of 90%, especially among racial and ethnic minorities.

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Influenza causes significant morbidity and mortality in adults. Illnesses caused by influenza occur in an average of 5% to 20% of the US population annually. About 50% of those who become ill seek medical care, 1% of those who seek medical care are hospitalized, and 8% of those who are hospitalized die as a consequence of influenza. Overall, on average, each year approximately 226,000 patients are hospitalized for influenza-related respiratory or circulatory illnesses, and approximately 36,000 individuals die of influenza-associated causes, more than 90% of whom are elderly (65 years or older).

Vaccination significantly reduces influenza-related morbidity and mortality in adults. In the elderly population, the influenza vaccine is 50% to 60% effective in preventing hospitalization and 80% effective in preventing death resulting from pneumonia and influenza. The US Public Health Service has recommended influenza vaccination of elderly and chronically ill individuals since 1961, and Medicare coverage for influenza vaccination began in 1993. However, despite the presence of a safe and effective vaccine, long-standing recommendations to vaccinate all elderly individuals, and federal financial support for vaccination of the elderly population, vaccination levels are not optimal.

Healthy People 2000 objectives included increasing vaccination levels to at least 60% in the noninstitutionalized elderly population. Healthy People 2010 objectives call for raising influenza vaccination coverage in that group to 90%.

This article describes national trends in influenza vaccination coverage in the United States from 1989 to 2002 in the noninstitutionalized elderly population, assesses progress toward Healthy People 2010 health objectives, and identifies factors associated with receipt of influenza vaccine.
The National Health Interview Survey (NHIS)18 is a multi-stage cluster survey that has been conducted annually in the United States by the National Center for Health Statistics since 1957. The NHIS provides estimates on health indicators, health care utilization and access, and health-related behaviors for the US-resident civilian noninstitutionalized population (ie, individuals in nursing homes or prisons are not included in the survey). The results are weighted to reflect the US-resident civilian noninstitutionalized population and trends in these characteristics. The NHIS questionnaire consists of 2 main parts: (1) a set of basic health and demographic items and (2) 1 or more sets of questions about current health topics. The basic items constitute approximately 50% of the questionnaire and are repeated each year. Questions on current health topics facilitate a response to changing needs for data and cover a wide variety of issues.19,20

The 1989 immunization supplement, the 1991 health promotion and disease prevention supplement, the 1993 and 1995 surveys on Healthy People 2000 objectives, and the 1997-2002 sample adult core surveys included questions about adult immunizations.18 The questions regarding influenza and pneumococcal vaccination were as follows: “During the past 12 months, have you had a flu shot?” and “Have you ever had a pneumonia shot?” respectively. We used data from the 1989, 1991, 1993, 1995, and 1997-2002 NHIS for the trend analysis. We limited the study population for this analysis to elderly respondents. Unweighted sample sizes of 14,245, 8123, 4047, 3442, 6745, 6257, 6002, 6091, 6046, and 5757 elderly respondents were analyzed for the 1989, 1991, 1993, 1995, 1997, 1998, 1999, 2000, 2001, and 2002 surveys, respectively. We excluded respondents who did not know their influenza vaccination status (0.8%) from the analysis.

To further assess ongoing vaccination efforts, we stratified influenza vaccination levels for all years by age group (65-74, 75-84, and 85 years or older), race and ethnicity, marital status, level of education, NHIS poverty index, employment status, number of physician contacts in the previous year, interval in years since the last visit to a physician, whether a person had been hospitalized in the past year, whether a person has a regular physician, and whether the individual had health insurance. The NHIS poverty index is based on family size, number of children younger than 18 years, and family income using the poverty levels from the year prior to the survey derived from the US Census Bureau.21

We used SAS (SAS Inc, Cary, NC) and SUDAAN (Research Triangle Institute, Research Triangle Park, NC) statistical software to calculate point estimates and 95% confidence intervals for each year.22 We weighted all analyses to reflect the age, sex, and race and ethnicity of the US-resident civilian noninstitutionalized population. To determine predictors for influenza vaccination in the elderly population, we analyzed the 2002 NHIS data. Multivariable logistic regression models were performed using backward elimination and forward selection of variables. Variables were initially included in the full model if added least to the component model, and we reestimated a new model until only variables significantly associated with the outcome (P<.05) remained. We calculated standardized odds ratio estimates from the logistic regression model. The odds ratio may overestimate the relative risk as a result of common outcomes. The order of independent variables given in Table 2 is based on the significance of Wald χ² statistical tests. To evaluate missed opportunities for influenza vaccination in the elderly population, we calculated the percentage of individuals with selected health care characteristics from among those who did not report receipt of influenza vaccine in the past 12 months.

### RESULTS

In the elderly population, influenza vaccination coverage increased from 30.5% (95% confidence interval [CI], 29.4%-31.6%) in 1989 to 65.6% (95% CI, 64.1%-67.1%) in 2002, with a 2.7% average annual increase (Table 2). In all years, adults 75 years or older were significantly more likely to report vaccination than those aged 65 to 74 years (Table 2 and Figure 1). Vaccination rates in the non-Hispanic white population have been significantly higher than in other racial and ethnic groups.

### METHODS

The National Health Interview Survey (NHIS)18 is a multi-stage cluster survey that has been conducted annually in the United States by the National Center for Health Statistics since 1957. The NHIS provides estimates on health indicators, health care utilization and access, and health-related behaviors for the US-resident civilian noninstitutionalized population (ie, individuals in nursing homes or prisons are not included in the survey population). The results are weighted to reflect the US-resident civilian noninstitutionalized population. Interviews are conducted weekly throughout the year with a probability sample of households during face-to-face interviews. Data collected over the period of a year form the basis for annual estimates of the health characteristics of the US population and trends in these characteristics. The NHIS questionnaire consists of 2 main parts: (1) a set of basic health and demographic items and (2) 1 or more sets of questions about current health topics. The basic items constitute approximately 50% of the questionnaire and are repeated each year. Questions on current health topics facilitate a response to changing needs for data and cover a wide variety of issues.
Elderly individuals who had seen a physician in the past and those who did not have one in 2002 (67.0% vs 27.9%). There was almost a 37 percentage point difference in vaccination levels between those who had not visited a physician and those who had had 10 or more physician contacts in the past year (Table 3).

Coverage levels during 2002 were higher among persons at or above the poverty level compared with those living below the poverty level (66.9% vs 51.0%). Each year, there was a significant upward trend in reported vaccination levels with increasing educational level (Table 2).

Marital status also was associated with receipt of influenza vaccination. In all years from 1989 to 2002, elderly individuals who were currently married had significantly higher vaccination rates than those not married or alone. Those in the elderly population who were divorced or separated had the lowest vaccine coverage. In 2002, the influenza vaccination coverage for the elderly who were married was 69.1% (95% CI, 67.0%-71.2%) compared with 47.9% (95% CI, 44.0%-51.8%) for the elderly who were divorced or separated (Table 2).

There was a 40% difference in influenza vaccination coverage between those who had a regular place of care and those who did not have one in 2002 (67.0% vs 27.9%). Elderly individuals who had seen a physician in the past year were also more likely to report having received the influenza vaccine (68.2%; 95% CI, 66.7%-69.7%) than those who had not (31.8%; 95% CI, 26.5%-37.1%) (Table 3).

In all years, those in the elderly population who had been hospitalized in the past year were significantly more likely to report receipt of influenza vaccine than those who were not hospitalized in the past year. In addition, in each year, the rate of influenza vaccination increased as the number of physician contacts increased. In 2002, there was almost a 37 percentage point difference in vaccination levels between those who had not visited a physician and those who had had 10 or more physician contacts in the past year (Table 3).

We conducted multivariate logistic regression analysis of the 2002 NHIS data to identify independent factors for influenza vaccination in the elderly population. Influenza vaccination was independently associated with the number of visits to physicians in the past year, marital status, age, race and ethnicity, chronic medical conditions, having a regular place for care, and educational level (Table 1). Among those who reported not obtaining an influenza vaccine in the preceding year, 97.6% had health insurance, 92.3% had a regular place for care, 84.1% had had 1 or more physician contacts, 15.1% had 10 or more physician contacts, 15.1% had 10 or more physician contacts, and 15.1% had 10 or more physician contacts.
The NHIS data from 1989-2002 showed that influenza vaccine coverage in the US elderly population had steadily increased from 1989 to 1997 but leveled off after 1997. The Healthy People 2000 goal of 60% coverage for non-institutionalized elderly individuals was met in 1997 over-all. However, although whites met the goal in 1995, the 2002 vaccination rates for other racial and ethnic groups remained below the 2000 goal. Attainment of the Healthy People 2010 goal of 90% for all racial and ethnic groups poses a formidable challenge. The marked slowing in the influenza vaccination coverage increase that began after 1997 is a matter of substantial concern and suggests that new approaches are needed if increases in influenza vaccination are to occur.

Several factors have influenced influenza vaccination uptake over time. First, vaccination recommendations have changed over time. Beginning in 1961, the US Public Health Service specifically recommended annual influenza vaccination for all individuals 65 years or older or at least 6 months old with certain chronic medical conditions, but between 1962 and 1987, elderly persons with chronic medical conditions were intermittently given higher priority for vaccination than those without a recognized high-risk condition. Between 1973 and 1985, US influenza vaccination rates in the elderly, based on the US Immunization Survey, ranged from 22% to 30% except during the 1976-1977 swine flu vaccine campaign, when 38% of the elderly population were vaccinated. Since 1988, elderly individuals with or without chronic conditions have been given equal priority for influenza vaccination, and since 1989 the NHIS has included a question on influenza vaccination. From 1989 to 1997, a steady increase in vaccination coverage was noted with the change to an age-based recommendation.
Second, since 1993 Medicare has paid for influenza vaccine, removing financial barriers to vaccination for Medicare beneficiaries. Although vaccination rates did not increase markedly in the first year after implementation of Medicare coverage, they continued to gradually increase.

Third, the supply and timing of the availability of influenza vaccine have been unpredictable in recent years. In 2000, a substantial delay in influenza vaccine availability and distribution followed by a less severe delay in 2001 likely contributed to the recent lack of progress in improving vaccination coverage, although slowing of the increase in coverage began before 2000. However, the relative contribution of all of these factors to vaccination coverage is unclear.

Regardless, ensuring a reliable supply of influenza vaccine is essential if vaccination coverage is to increase. The limited supply of inactivated influenza vaccine during the severe shortage in 2004-2005 was largely successfully prioritized to the high-risk population, including the elderly, and preliminary estimates suggest that coverage in this group was comparable to that of recent years. Comparison with the 2005 NHIS data (available in 2006) will be needed to further assess the overall impact of this shortage on vaccine coverage in high-risk groups. However, progress toward the 2010 Healthy People goal of 90% coverage will not be attainable if there continues to be an unreliable supply of influenza vaccine.

Reasons for the leveling-off of coverage rates since 1997 are not well understood. Most of the elderly who are vaccinated receive their influenza vaccination in a clinical setting (physician’s office, 58%; health clinic, 12%). One reason for the leveling-off of coverage rates in recent years may be that the number of elderly who are able or willing to make the effort to seek vaccination in clinical settings has reached its limit given the current low level of interventions in place to promote immunization. Effective approaches for increasing vaccination have been well documented, and among the most effective interventions are systems changes that are designed to make the identification and delivery of preventive services routine, such as standing-order programs or special immunization clinics. Promoting the implementation of interventions to increase vaccination rates is not straightforward because that implementation requires additional effort and incentives for health care providers. In addition, it has been shown that providing influenza vaccinations can result in financial loss to health care providers, in smaller clinical settings in particular, potentially constituting a business-based disincentive to provide immunizations. This remains true even after Medicare’s 2003 doubling of the physician administration fee. However, in January 2005, the Medicare reimbursement rate for vaccine administration was substantially boosted from approximately $8 to approximately $18, an increase that may encourage physicians’ interest in providing vaccinations. The unreliable supply of influenza vaccine in recent years may also discourage physicians from offering influenza vaccine in their clinics in the future, and this trend needs to be monitored. An increase in providing vaccination in alternative settings (community immunization programs, health depart-
in marked contrast to those who had not been vaccinated because of lack of awareness or lack of a strong enough recommendation. If the 90% goal is to be reached, substantial efforts are needed to educate the public about the true risk of adverse effects of the vaccine, the risk of severe illness from influenza even for healthy elderly individuals, and the benefits of vaccination. Studies in other industrialized countries have found similar concerns among unvaccinated individuals and vaccination rates that are generally below 80% among the elderly, including 78% in Australia in 2001,38 37% in Portugal in 2003,39 70% in Alberta, Canada, in 2000,40 and 58% in Switzerland in 2000.41

Racial and ethnic disparities reported in other surveys42-44 were confirmed in our analysis. Our analysis and others42-44 show that these disparities persist after taking into account sociodemographic factors and access to care. Among Medicare beneficiaries, a 20-percentagepoint gap exists between black and white beneficiaries, whether they are enrolled in Medicare-managed care or in a fee-for-service plan. These differences are not well understood and may result from a combination of factors, including differences in the quality of care accessed by other racial and ethnic groups compared with the white population,45-47 differences in attitudes toward vaccination and toward preventive care in general, and differences in physician-patient interactions. Findings from the Medicare Current Beneficiary Survey35 show no marked differences in reasons for nonvaccination by race and ethnicity. Concerns about vaccination may be more prevalent among blacks and Hispanics given that the unvaccinated account for a greater proportion of these groups.

Education levels were independently associated with self-reported receipt of influenza vaccine. Elderly individuals with an education beyond high school were more likely to receive the vaccine than those with less education. Our findings are consistent with previous surveys. The elderly who did not complete high school may experience more barriers to receiving care because they lack knowledge about preventive services.48-50 Our study also found that married elderly individuals were more likely to be vaccinated than those divorced or alone. Based on other studies, married couples are more frequent users of preventive services because of the improved social support, easier transportation, and greater likelihood of having previously established a regular source of health care. Systems to improve the ease of access to vaccination services of those without social support networks are needed and may help improve coverage levels.

Physician contact and recommendation for vaccination services can be a strong determinant of a patient’s decision to be vaccinated,41,42 but such contacts with the medical system do not guarantee vaccination. Our multivariable logistic model shows that physicians contacts within the preceding year and having chronic medical conditions were independently associated with influenza vaccine coverage. However, a substantial proportion of the elderly who had visited their physician at least 10 times or had been hospitalized still did not get vaccinated. Furthermore, 15% of unvaccinated individuals had been hospitalized within the past year, a group likely

### Table 3. Percentage of Individuals 65 Years or Older in the United States Who Reported Receiving Influenza Vaccine in the Past 12 Months, by Health Care Access Characteristics, 1989-2002† (Cont)

<table>
<thead>
<tr>
<th>Characteristic*</th>
<th>1999</th>
<th>2002</th>
<th>Annual Average Change From 1999 to 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physician contacts within past year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>34.9 (30.3-39.5)</td>
<td>37.7 (32.6-42.8)</td>
<td>2.0 (1.6-2.4)</td>
</tr>
<tr>
<td>1</td>
<td>54.9 (50.3-59.5)</td>
<td>56.6 (52.0-61.2)</td>
<td>2.4 (2.0-2.8)</td>
</tr>
<tr>
<td>2-3</td>
<td>69.0 (66.1-71.9)</td>
<td>63.0 (59.7-66.3)</td>
<td>6.7 (6.3-7.2)</td>
</tr>
<tr>
<td>4-9</td>
<td>71.3 (68.9-73.7)</td>
<td>70.7 (68.5-72.9)</td>
<td>2.5 (2.3-2.7)</td>
</tr>
<tr>
<td>&gt;10</td>
<td>70.9 (69.3-72.5)</td>
<td>74.5 (71.8-77.2)</td>
<td>2.7 (2.4-3.0)</td>
</tr>
<tr>
<td>Pneumococcal vaccination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>84.6 (84.6-89.2)</td>
<td>58.8 (84.2-87.4)</td>
<td>0.8 (0.6-1.0)</td>
</tr>
<tr>
<td>No</td>
<td>43.2 (41.0-45.4)</td>
<td>39.9 (37.8-42.0)</td>
<td>1.3 (1.1-1.5)</td>
</tr>
<tr>
<td>Interval since last physician visit, y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>68.9 (65.7-70.3)</td>
<td>68.2 (66.7-69.7)</td>
<td>2.7 (2.5-2.9)</td>
</tr>
<tr>
<td>≥1</td>
<td>25.8 (21.4-30.2)</td>
<td>31.8 (26.5-37.1)</td>
<td>1.5 (1.1-1.9)</td>
</tr>
<tr>
<td>Hospitalization within past year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>68.6 (65.0-72.2)</td>
<td>73.8 (71.9-76.8)</td>
<td>2.8 (2.5-3.1)</td>
</tr>
<tr>
<td>No</td>
<td>65.1 (63.5-66.7)</td>
<td>63.6 (61.9-64.3)</td>
<td>2.7 (2.5-2.9)</td>
</tr>
<tr>
<td>Regular physician</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>67.3 (65.8-68.8)</td>
<td>67.0 (65.5-68.5)</td>
<td>NA</td>
</tr>
<tr>
<td>No</td>
<td>34.7 (28.9-40.5)</td>
<td>27.9 (20.8-35.0)</td>
<td>NA</td>
</tr>
<tr>
<td>Health insurance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>66.0 (64.5-67.5)</td>
<td>66.0 (64.5-67.5)</td>
<td>NA</td>
</tr>
<tr>
<td>No</td>
<td>†</td>
<td>29.0 (16.1-41.9)</td>
<td>NA</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; NA, data not available.
*All variables listed were statistically significant in bivariate models.
†Estimate does not meet standard of reliability (sample size <50 or ratio of SE/estimate >0.3).

ment clinics, pharmacies, etc) may be part of the solution; however, patients must be motivated to seek out vaccination, and a physician’s recommendation remains one of the most important determinants of vaccination.34

Concerns about the adverse effects of vaccination, lack of awareness of the need for vaccination, and perceived lack of effectiveness are cited as leading reasons for nonvaccination.35,36 In a survey conducted during January 2005 (Centers for Disease Control and Prevention, unpublished data, 2005) among unvaccinated individuals, the main reasons cited for nonvaccination included concerns about adverse effects (16%), the opinion that the vaccine is not needed (30%), lack of knowledge of a recommendation for influenza vaccine (4%), and lack of a recommendation by a physician (2%).

Although surveys34 show that individuals with concerns about the vaccine who receive a physician recommendation are more likely to be vaccinated than those who do not receive a physician recommendation, a prospective study35 among elderly African Americans has shown that most patients who had not been vaccinated because of concerns about the vaccine remained unvaccinated even after a strong physician recommendation,
to be at highest risk of influenza complications. Use of standing-order programs can help reduce the number of missed opportunities for vaccination of individuals who have already accessed the medical system and should be instituted in all health care settings, including inpatient and outpatient settings.

A limitation of our study is that information on influenza vaccination was determined only by self-report and was not verified by medical records. Memory bias may exist. However, previous studies have found that self-report of influenza vaccination by adults was sensitive and specific for influenza vaccination compared with review of medical records. In addition, high-risk medical conditions are also self-reported, and some conditions associated with increased risk of influenza complications are not included in the NHIS.

The number of individuals vaccinated against influenza in the United States each year is remarkable: approximately 70 to 75 million in 2002 for all age groups. Given the potential reductions in deaths and hospitalizations, the goal is to vaccinate at least 90% of the elderly. The elderly are particularly important given that the most severe outcomes occur at much higher rates in individuals 65 years or older. Therefore, the lack of continuing increases in vaccination rates should cause concern and indicates that new approaches are needed. Priorities include better understanding of how to add a routine offering of vaccinations, including ensuring vaccination for patients who access the medical system for other reasons; addressing concerns about the risk of influenza and the risks and benefits of vaccination; developing and implementing effective approaches to increasing vaccination among racial and ethnic groups with low coverage; and devising ways to provide immunizations in additional alternative, convenient settings for those unable or unwilling to seek out vaccination in more traditional settings. Finally, a wide disparity exists in health care coverage among states. A closer examination of the health care environment and synergies between different groups, including the Center for Medicare and Medicaid Services Quality Improvement Organizations, public health adult immunization programs, and community immunization programs in states with high coverage rates may yield clues to help improve vaccination coverage.

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REFERENCES