

Acceptance of Pneumococcal Vaccine under Standing Orders by Race and Ethnicity

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The findings and conclusions in this report are those of the author(s) and do not necessarily represent the views of the funding agency.

Purpose: To assess whether and how pneumococcal vaccine acceptance occurs after nurse recommendation varies by race/ethnicity.

Methods: We prospectively evaluated nurses' standing orders to assess and vaccinate high-risk patients in a general medicine practice.

Results: Of 370 adult patients surveyed (60% nonwhite), 78 (21%) declined vaccination following nurse recommendation, and 43 (12%) persisted in declining after physician consultation. Three-hundred-twenty-seven (88%) patients accepted vaccination: 292 (79%) accepted following nurse recommendation and 35 (9%) following physician consultation. African Americans (19%) were significantly more likely to decline compared with whites (8%) and Asians (5%) ($P=0.01$). Reasons for refusal included believing vaccination was unnecessary (32%), fearing shots in general (21%), fearing vaccine-induced illness (26%) and wanting more information regarding the vaccine (9%).

Conclusion: Standing orders, physicians' firm recommendations and addressing patients' vaccine-related concerns may reduce racial/ethnic disparities in vaccination.

Key words: Pneumococcus ■ vaccination

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INTRODUCTION

Pneumococcal vaccination reduces morbidity and mortality and reduces healthcare costs.¹⁻⁵ Standing orders, which allow nurses and nonphysician staff to assess and vaccinate high-risk patients without direct involvement by physicians, have been shown to improve adult vaccination rates.⁶⁻¹⁰ National data from the National Health Interview Survey (NHIS) show that racial and ethnic minorities aged ≥ 65 years are much less likely to receive pneumococcal vaccination; levels of vaccination coverage among African Americans and Latinos were 33% and 32%, respectively, compared with 57% for whites.¹¹ These racial and ethnic disparities in vaccination rates are not fully explained by insurance status, access to care or health services utilization.¹¹ Other possible explanations include patient preference, healthcare system factors or differences in clinical practice, and time pressures or biases of physicians.

There are also a limited number of studies by race and ethnicity on why people refuse pneumococcal vaccinations. Some reported reasons include lack of knowledge and understanding of the importance of adult vaccinations, reliance on the recommendation of physicians, and fears that vaccines may cause illness.¹¹⁻¹⁶ The objectives of this study were to evaluate patients' acceptance and refusal of adult pneumococcal vaccination after nurse recommendation and to assess whether responses vary by race and ethnicity when a vaccine is offered in a standardized manner in the context of usual care in a general internal medicine practice.

METHODS

We obtained approval for this study from the institutional review boards of the University of California-San Francisco (UCSF) and the U.S. Centers for Disease Control and Prevention. In a university-based general internal medicine clinic from June through December 2004, we evaluated standing orders for nurses to assess patients for clinical indications and administer pneumococcal vaccine if indicated. The nurse in our study deter-

mined patient eligibility using a computerized medical record system [Summary Time-Oriented Records (STOR)] at UCSF.^{17,18} Clinician-entered patient diagnoses, medications and health maintenance information are available in STOR; and a computerized reminder system of health maintenance information, including pneumococcal vaccination status, is generated at each patient's visit. Prior to the patient's visit with their physician, the nurse reviewed STOR-generated vaccination reminders, medical comorbidities and prior vaccination history to determine which patients should be offered pneumococcal vaccination. Baseline pneumococcal vaccination rates previously reported for our primary care clinics were nearly 60%.¹⁹ For non-English-speak-

ing patients, professional interpreter services were made available.

Pneumococcal vaccination is recommended to all persons ≥65 years of age and to persons age <65 years who have ≥1 chronic medical condition such as diabetes or chronic heart, lung, liver or kidney disease.²⁰ Patients eligible to participate were given details of the study design. After signing the consent form, participants gave demographic information and a baseline history. Basic demographic information was collected on eligible persons who refused to participate and was compared with information from study participants. Race, ethnicity and primary language were based on patients' self-identifications. We defined race and ethnicity in six categories: African-

Table 1. Demographics and clinical characteristics of the 370 participants by race and ethnicity

Characteristics	Total N=370	Whites n=145	Latinos n=23	African Americans n=88	Russian Immigrants n=27	Asians n=60	Others n=27
	Number (%)						
Age (Years)							
≤49	91 (25)	38 (26)	3 (13)	31 (35)	3 (11)	6 (10)	10 (37)
50–64	141 (38)	66 (46)	7 (30)	38 (43)	4 (15)	20 (33)	6 (22)
≥65	138 (37)	41 (28)	13 (57)	19 (22)	20 (74)	34 (57)	11 (41)
Female Sex	199 (54)	61 (42)	16 (70)	62 (70)	14 (52)	32 (53)	14 (52)
Insurance Type							
Medicare	34 (9)	10 (7)	0	18 (20)	2 (7)	3 (5)	1 (4)
Medicare/private	17 (5)	8 (5)	0	6 (7)	0	3 (5)	0
MediCal/Medicare	82 (22)	23 (16)	8 (35)	12 (14)	19 (71)	14 (23)	6 (22)
MediCal	110 (30)	33 (23)	10 (44)	34 (39)	4 (15)	18 (30)	11 (41)
Fee-for-service	2 (0.5)	0	1 (4)	1 (1)	0	0	0
Private/managed care	125 (34)	71 (49)	4 (17)	17 (19)	2 (7)	22 (37)	9 (33)
Chronic Illness*							
Diabetes	75 (20)	24 (17)	6 (26)	22 (25)	4 (15)	13 (22)	6 (22)
Heart disease	25 (7)	9 (6)	1 (4)	9 (10)	2 (7)	3 (5)	1 (4)
Lung disease	69 (19)	34 (23)	2 (9)	18 (20)	3 (11)	9 (15)	3 (11)
Liver disease	44 (12)	23 (16)	0	15 (17)	1 (4)	4 (7)	1 (4)
Renal disease	5 (1.4)	3 (2)	0	1 (1)	0	1 (2)	0
Cancer	6 (1.6)	2 (1)	0	3 (3)	0	1 (2)	0
Immunocompromised	6 (1.6)	5 (3)	0	0	0	0	1 (4)
Other	38 (10)	20 (14)	2 (9)	10 (11)	1 (4)	2 (3)	3 (11)
No chronic illness	120 (32)	37 (26)	12 (52)	15 (17)	17 (63)	30 (50)	9 (15)
Birthplace in United States	248 (67)	143 (99)	7 (30)	87 (99)	0	9 (15)	2 (7)
English Is Primary Language	254 (69)	145 (100)	3 (13)	87 (99)	0	11 (18)	8 (30)
Education ≥12 Years	307 (83)	131 (90)	12 (52)	69 (78)	26 (96)	46 (77)	23 (85)
Physician Visits, Past Year							
<1	5 (1.4)	1 (1)	0	1 (1)	0	1 (2)	2 (8)
1	20 (5)	11 (8)	1 (4)	4 (5)	0	4 (7)	0
2	37 (10)	19 (13)	1 (4)	5 (6)	3 (11)	6 (10)	3 (11)
3	22 (6)	8 (5)	3 (13)	3 (3)	1 (4)	4 (7)	3 (11)
>4	286 (77)	106 (73)	18 (79)	75 (85)	23 (85)	45 (75)	19 (70)
N=249	n=93	n=17	n=55	n=16	n=48	n=20	
Aware of Pneumococcal Vaccine**							
Yes	69 (28)	27 (29)	5 (29)	17 (31)	4 (25)	10 (21)	6 (30)
No	178 (71)	66 (71)	11 (65)	38 (69)	12 (75)	37 (77)	14 (70)
Unknown	2 (1)	0	1 (6)	0	0	1 (2)	0

* Patients may have more than one chronic illness; 68% of all patients had at least one chronic illness; ** Only subset of patients were asked question regarding awareness of pneumococcal vaccine; Percentages may not add precisely to 100% due to rounding.

American, Asian, Latino, white, Russian immigrant and other (including respondents self-identifying with multiple races or ethnic groups, or as Arab). Russian immigrants were considered to be a separate category because of their considerable numbers in our study clinic and their reluctance to accept preventive healthcare recommendations, as reported in other studies.^{19,21}

The opportunity for pneumococcal vaccination was offered before patients' appointments with their physicians. If a patient agreed to be immunized, the nurse administered the vaccine; patients who declined were surveyed to assess their reasons for refusal and, according to the study protocol, would subsequently receive a firm recommendation from their physician during the visit. Patients who accepted their physician's recommendation were vaccinated during or after their appointment.

Data were analyzed using SAS version 9.1 (SAS Institute Inc., Cary, NC). First, we conducted descriptive analyses to profile the sample, including means, proportions and measures of variability. Statistics were calculated for each of the demographic variables by "vaccinated" or "not vaccinated" categories. Initial analyses were based on Chi-squared tests for categorical data and Student's *t* tests for continuous data to assess any univariate associations between demographic variables and refusal of pneumococcal vaccination. A multivariate logistic regression model was used to examine the associations of patients vaccinated versus those not vaccinated. The model was adjusted for demographic variables, including race/ethnicity, sex, primary language (English versus non-English), education (<12 years or ≥12 years), and age was computed based on five-year increments. Because the potential predictors available were of interest, we included all of the variables in the multivariate model. We computed odds ratios and 95%

confidence intervals. A significance level of 0.05 was used for all statistical tests.

RESULTS

Of 9,069 patients screened for eligibility for pneumococcal vaccination at the general medicine practice from June 1, 2004 through December 31, 2004, 370 patients [mean age 55 years (age range 22–93 years), 54% women, 60% nonwhite] who had a clinical indication for pneumococcal vaccination but who had not previously been vaccinated or who had been previously vaccinated at age <65 years were approached to assess their acceptance of the vaccine (Table 1). Sixty-eight percent of patients had ≥1 chronic medical illness, the most common of which were diabetes (20%), chronic lung disease (19%) and liver disease (12%). Sixty-three percent of patients who participated in the study and who accepted vaccination were <65 years of age. Acceptance rates for persons aged <65 years (89%) and for persons aged >65 years (88%) were similar, and age cohorts within each race/ethnicity did not differ. Thirty-three percent of patients were foreign born, and 31% did not use English as their primary spoken language.

A subset of 249 patients were surveyed, and 180 (72%) were not aware of the pneumococcal vaccine at the start of the study. There were no significant differences in term of pneumococcal awareness by race and ethnicity ($P>0.05$). Patients aged ≥65 years were more likely to be aware of the pneumococcal vaccine than were patients aged <65 years (35% vs. 23%; $P=0.04$). Three-hundred-twenty-seven patients (88%) accepted pneumococcal vaccination, and 292 (89%) accepted following the nurse's recommendation. Seventy-eight of 370 patients (21%) initially declined vaccination following nurse recommendation (Table 2), and 43 (12%)

Table 2. Acceptance of pneumococcal vaccine, by race and ethnicity, in the 370 study participants

Characteristics	Total	Whites	Latinos	African Americans	Russian Immigrants	Asians	Others
	N=370	n=145	n=23	n=88	n=27	n=60	n=27
	Number (%)						
Accepted Vaccine	327 (88)	133 (92)	19 (83)	71 (81)	23 (85)	57 (95)	24 (89)
Accept nurse rec.	292 (89)	116 (87)	18 (95)	64 (90)	19 (83)	52 (91)	23 (96)
Accept physician rec.	35 (11)	17 (13)	1 (5)	7 (10)	4 (17)	5 (9)	1 (4)
Accepted vaccine (F)	175 (54)	55 (41)	14 (74)	48 (68)	14 (61)	30 (53)	14 (58)
Accepted vaccine (M)	152 (46)	78 (59)	5 (26)	23 (32)	9 (39)	27 (47)	10 (42)
Declined Vaccine	43 (12)	12 (8)	4 (17)	17 (19)	4 (15)	3 (5)	3 (11)
Females	24 (56)	6 (50)	2 (50)	14 (82)	0	2 (67)	0
Males	19 (44)	6 (50)	2 (50)	3 (18)	4 (100)	1 (33)	3 (100)
Reason for Declining							
Fear of shots	9 (21)	2 (17)	0	4 (24)	1 (25)	1 (33)	1 (33)
Need more information	4 (9)	3 (25)	1 (25)	0	0	0	0
Fear of vaccine-related illness	11 (26)	1 (8)	2 (50)	6 (35)	1 (25)	1 (33)	0
Do not believe it is necessary	14 (32)	4 (33)	1 (25)	6 (35)	1 (25)	0	2 (67)
Other reasons	5 (12)	2 (17)	0	1 (6)	1 (25)	1 (33)	0

Rec.: recommendation; F: female; M: male; Percentages may not add to 100% precisely due to rounding.

persisted in declining after physician consultation. There were no sex differences in acceptance of pneumococcal vaccine. Overall, acceptance was 95% of Asian, 92% of white, 85% of Russian immigrant, 83% of Latino and 81% of African-American participants. In bivariate analysis, African Americans were significantly more likely to refuse pneumococcal vaccination compared with whites and Asians (P=0.01). Reasons for refusal reported to the nurse included not believing vaccination was necessary (32%), being afraid of shots in general (21%), being afraid the vaccine might make them sick (26%) and wanting more information regarding the vaccine (9%). Of the white patients who refused pneumococcal vaccination, three of 12 (25%) patients reported “fear” of either shots or vaccine-related illness compared with 15 of 31 (48%) nonwhite patients. Among patients who refused vaccination and were asked what, if anything, would change their minds, 15 of 19 (79%) patients reported that “nothing” would change their strongly held refusal.

In multivariate analysis, African-American race was the only significant predictor of pneumococcal vaccine refusal (P=0.01) (Table 3). Other variables in the logistic regression model, including other ethnicities, sex, age, education and primary language were not significantly associated with refusal of pneumococcal vaccination.

DISCUSSION

This prospective study demonstrates that acceptance of pneumococcal vaccine in a general internal medicine clinic varies by race/ethnicity and that standing orders may help reduce national racial and ethnic disparities in vaccination rates by providing a consistent method for assessing all eligible patients. Further reductions may

be possible if patients’ vaccine-related concerns are addressed and if physicians offer strong recommendations for vaccination during office visits.

The racial and ethnic disparities in our study were smaller than those reported nationally, suggesting that the interventions used may be successful in reducing disparities in pneumococcal vaccination rates. In addition, the majority of these patients accepted pneumococcal vaccination offered systematically by a nurse under standing orders and, in patients who initially refused vaccination after the nurse’s recommendation, a strong follow-up recommendation by their physician was important in persuading them to be vaccinated.

Physicians’ attitudes and practices are also important in adult vaccination. Providers may miss opportunities to vaccinate older adults in outpatient clinics.²² In a recent survey, physicians reported barriers for use of pneumococcal vaccination, including attending to the urgent concerns (unrelated to vaccine) of patients during office visits, lack of patient immunization history, patients’ concerns about vaccine safety, and inadequate reimbursement, although many physicians indicated a willingness to try methods to improve vaccination rates (including tracking systems, chart reminders, patient reminders and standing orders).²³

In our study, more racial and ethnic minorities than whites refused pneumococcal vaccination, particularly African Americans, because of negative attitudes and misconceptions about vaccination and because of fear of shots or vaccine-related illness. In addition, although all of the patients in our study had clinical indications for vaccination, >70%, especially patients <65 years of age with chronic illness, were not aware of the pneumococcal vaccine for adults. The Medicare Current Benefi-

Table 3. Factors associated with vaccine acceptance among 370 participants

Factors	Unadjusted Odds Ratio (95%CI)*	Adjusted Odds Ratio (95%CI)*	P Value
Race/Ethnicity			0.08
White	Reference	Reference	
Latino	0.43 (0.12, 1.46)	0.18 (0.03, 1.03)	
African-American	0.38 (0.17, 0.84)	0.34 (0.15, 0.78)	
Russian immigrant	0.52 (0.15, 1.75)	0.26 (0.04, 1.73)	
Asian	1.29 (0.40, 4.16)	0.71 (0.15, 3.25)	
Other	1.04 (0.22, 4.94)	0.67 (0.11, 4.04)	
Gender			
Male	Reference	Reference	
Female	0.91 (0.48, 1.73)	1.16 (0.58, 2.29)	0.67
Age, Years (Five-Year Increments)		1.03 (0.91, 1.17)	0.66
Education			
<12 years	Reference	Reference	
≥12 years	0.61 (0.23, 1.62)	0.51 (0.18, 1.45)	0.21
Primary Language			
Not English	Reference	Reference	
English	0.73 (0.35, 1.50)	0.52 (0.12, 2.28)	0.39

* CI: confidence interval

ciary Survey found that not knowing that vaccination was recommended was the most commonly reported reason (57%) for not receiving pneumococcal vaccination.¹² Educational tools and other educational strategies have been used to enhance pneumococcal vaccination rates and have been effective in increasing vaccination use in, for example, patients with low literacy rates.^{24,25}

Fortunately, with the introduction and increased use of the new conjugate pneumococcal vaccine in children, there has been a decrease of pneumococcal-related diseases in adults because of herd immunity.^{26,27} Furthermore, racial differences in the incidence rates of invasive pneumococcal disease have been reduced, particularly in young children.^{28,29} Nonetheless, African-American adults are at twice the risk for invasive pneumococcal diseases compared with whites, although African Americans have not been specifically targeted by current recommendations.^{29,30}

Our study has several limitations. First, the study setting was a single general internal medicine clinic, and results may not be generalizable to other settings. Second, some patients with a clinical indication for pneumococcal vaccination may have been missed by the computer records system because new clinical diagnoses, especially diagnoses made outside of our medical center, may not have been recorded prior to the clinical visit. Third, it is likely that the number of Latinos and Russian immigrants in our study were not sufficient to reveal significant differences when compared with whites or Asians. Fourth, protocol was for providers to recommend vaccination strongly to patients during their appointment, but the compliance rate is unknown. Finally, population-level differences in pneumococcal vaccination may reflect differences in recommendations and immunization practices between medical practices where more white patients are seen and those in which more racial/ethnic minorities are seen. However, additional research is needed to compare data on pneumococcal vaccine acceptance with data on vaccination surveillance.

Because of the current emphasis on adult immunizations and due to our results, we suggest increasing awareness and providing education to patients on the benefits of pneumococcal vaccine, using standing orders for nurses in primary care clinics to assess and offer vaccination to patients, and encouraging physicians to give strong recommendations to their patients. Medical clinics and public health campaigns should promote pneumococcal vaccination in high-risk adults. Our finding that 4% of patients reported that nothing could induce them to accept vaccination suggests that universal vaccination is unlikely; however, these measures should increase pneumococcal vaccination rates and achieve the goal of the U.S. Department of Health and Human Services, in its Healthy People 2010 program, of reducing racial and ethnic disparities in pneumococcal vaccination.³¹

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REFERENCES

1. Sisk JE, Moskowitz AJ, Whang W, et al. Cost-effectiveness of vaccination against pneumococcal bacteremia among elderly people. *JAMA*. 1997; 278:1333-1339.
2. Fine MJ, Smith MA, Carson CA, et al. Efficacy of pneumococcal vaccination in adults. A meta-analysis of randomized controlled trials. *Arch Intern Med*. 1994;154:2666-2677.
3. Wagner C, Popp W, Posch M, et al. Impact of pneumococcal vaccination on morbidity and mortality of geriatric patients: a case-controlled study. *Gerontology*. 2003;49:246-250.
4. Watson L, Wilson BJ, Waugh N. Pneumococcal polysaccharide vaccine: a systematic review of clinical effectiveness in adults. *Vaccine*. 2002; 20:2166-2173.
5. Sisk JE, Whang W, Butler JC, et al. Cost-effectiveness of vaccination against invasive pneumococcal disease among people 50 through 64 years of age: role of comorbid conditions and race. *Ann Intern Med*. 2003;138:960-968.
6. Slobodkin D, Kitlas JL, Zielske PG. A test of the feasibility of pneumococcal vaccination in the emergency department. *Acad Emerg Med*. 1999;6: 724-727.
7. Klein RS, Adachi N. An effective hospital-based pneumococcal immunization program. *Arch Intern Med*. 1986;146:327-329.
8. Rhew DC, Glassman PA, Goetz MB. Improving pneumococcal vaccine rates. Nurse protocols versus clinical reminders. *J Gen Intern Med*. 1999;14: 351-356.
9. Dexter PR, Perkins SM, Maharry KS, et al. Inpatient computer-based standing orders vs. physician reminders to increase influenza and pneumococcal vaccination rates: a randomized trial. *JAMA*. 2004;292:2366-2371.
10. Nowalk MP, Middleton DB, Zimmerman RK, et al. Increasing pneumococcal vaccination rates among hospitalized patients. *Infect Control Hosp Epidemiol*. 2003;24:526-531.
11. Centers for Disease Control and Prevention (CDC). Racial/ethnic disparities in influenza and pneumococcal vaccination levels among persons aged ≥65 years—United States, 1989–2001. *Morb Mortal Wkly Rep*. 2003;52: 958-962.
12. Reasons reported by Medicare beneficiaries for not receiving influenza and pneumococcal vaccinations—United States, 1996. *Morb Mortal Wkly Rep*. 1999;48:886-890.
13. Santibanez TA, Nowalk MP, Zimmerman RK, et al. Knowledge and beliefs about influenza, pneumococcal disease, and immunizations among older people. *J Am Geriatr Soc*. 2002;50:1711-1716.
14. Daniels NA, Juarbe T, Rangel-Lugo M, et al. Focus group interviews on racial and ethnic attitudes regarding adult vaccinations. *J Natl Med Assoc*. 2004;96:1455-1461.
15. Centers for Disease Control and Prevention (CDC). Influenza and pneumococcal vaccination levels among persons aged ≥65 years—United States, 2001. *Morb Mortal Wkly Rep*. 2002;51:1019-1024.

16. Centers for Disease Control and Prevention (CDC). Public health and aging: influenza vaccination coverage among adults aged ≥50 years and pneumococcal vaccination coverage among adults aged ≥65 years—United States, 2002. *Morb Mortal Wkly Rep*. 2003;52:987-992.
17. Whiting-O'Keefe QE, Simborg DW, Epstein WV, et al. A computerized summary medical record system can provide more information than the standard medical record. *JAMA*. 1985;254:1185-1192.
18. Whiting-O'Keefe QE, Simborg DW, Epstein WV. A controlled experiment to evaluate the use of a time-oriented summary medical record. *Med Care*. 1980;18:842-852.
19. Daniels NA, Nguyen TT, Gildengorin G, et al. Adult immunization in university-based primary care and specialty practices. *J Am Geriatr Soc*. 2004;52:1007-1012.
20. Centers for Disease Control and Prevention (CDC). Prevention of pneumococcal disease: recommendations of the Advisory Committee on Immunization Practices (ACIP). *Morb Mortal Wkly Rep*. 1997;46 (No. RR-8).
21. Benisovich SV, King AC. Meaning and knowledge of health among older adult immigrants from Russia: a phenomenological study. *Health Educ Res*. 2003;18:135-144.
22. Nowalk MP, Zimmerman RK, Cleary SM, et al. Missed opportunities to vaccinate older adults in primary care. *J Am Board Fam Pract* 2005;18:20-27.
23. Szilagyi PG, Shone LP, Barth R, et al. Physician practices and attitudes regarding adult immunizations. *Prev Med*. 2005;40:152-161.
24. Jacobson TA, Thomas DM, Morton FJ, et al. Use of a low-literacy patient education tool to enhance pneumococcal vaccination rates. A randomized controlled trial. *JAMA*. 1999;282:646-650.
25. Thomas DM, Ray SM, Morton FJ, et al. Patient education strategies to improve pneumococcal vaccination rates: randomized trial. *J Investig Med*. 2003;51:141-148.
26. Fry AM, Zell ER, Schuchat A, et al. Comparing potential benefits of new pneumococcal vaccines with the current polysaccharide vaccine in the elderly. *Vaccine*. 2002;21:303-311.
27. McIntosh ED, Conway P, Willingham J, et al. Pneumococcal pneumonia in the UK—how herd immunity affects the cost-effectiveness of 7-valent pneumococcal conjugate vaccine (PCV). *Vaccine*. 2005;23:1739-1745.
28. Talbot TR, Poehling KA, Hartert TV, et al. Elimination of racial differences in invasive pneumococcal disease in young children after introduction of the conjugate pneumococcal vaccine. *Pediatr Infect Dis J*. 2004;23:726-731.
29. Flannery B, Schrag S, Bennett NM, et al. Active Bacterial Core Surveillance/Emerging Infections Program Network. Impact of childhood vaccination on racial disparities in invasive *Streptococcus pneumoniae* infections. *JAMA*. 2004 12;291:2197-2203.
30. Whitney CG, Schaffner W, Butler JC. Rethinking recommendations for use of pneumococcal vaccines in adults. *Clin Infect Dis*. 2001;33:662-675
31. U.S. Department of Health and Human Services. Healthy People 2010. www.healthypeople.gov/default.htm. Accessed 05/29/05. ■



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