

Wisconsin Trends in Pneumonia and Influenza Mortality, 1980-2003

Casey L. Schumann, BS; Neil J. Hoxie, MS; James M. Vergeront, MD

ABSTRACT

Introduction: Mortality due to pneumonia and influenza continues to be a serious public health threat, especially among those aged ≥ 65 . Continued monitoring of these high-risk populations is necessary for evaluating the impact of public health prevention activities, determining vaccine distribution policies, and ensuring that existing guidelines reflect the populations at risk.

Objectives: We characterized pneumonia and influenza mortality in Wisconsin from 1980 to 2003, including trend analysis, identification of high risk populations, and assessment of Wisconsin's progress toward state and national goals for vaccination.

Methods: We examined mortality trends for pneumonia and influenza as underlying causes of death among all Wisconsin residents who died in the state from 1980 to 2003.

Results: The pneumonia and influenza (P&I) mortality rate increased from 27/100,000 to 38/100,000 during 1980 through 1988, and then decreased to 26/100,000 through 2003. The decline in the mortality rate after 1988 was temporally associated with improving pneumococcal and influenza vaccination among those ≥ 65 . By 2003, all age groups except those aged ≥ 85 had lower P&I mortality than in 1980.

Conclusions: In Wisconsin, the increase in pneumonia and influenza mortality demonstrated during the 1980s was reversed. However, there was relatively little change in mortality among those aged 65-84 and rates among those ≥ 85 years have increased. Novel improvements in public health interventions are needed to improve

the focus on the elderly, including efforts to increase vaccination, prevent pneumococcal disease, and explore other evidence-based strategies to reduce pneumonia and influenza mortality.

INTRODUCTION

Each year, seasonal influenza epidemics are characterized by excess morbidity and mortality. Influenza and influenza-related deaths are the seventh leading cause of death overall, and the fifth leading cause of death among the elderly (≥ 65 years) in the United States.¹ These diseases have a substantial public health impact, including 36,000 deaths² and 114,000 hospitalizations³ in the United States each year. Epidemiologic studies show that children tend to have the highest rates of influenza, but the elderly and anyone at high risk for secondary complications are at greatest risk of dying from influenza and influenza-related disease.^{3,4} It is these trends that drive policy decisions regarding vaccination, vaccination guidelines, and prevention strategies.

Continued monitoring of influenza and influenza-related deaths (eg pneumonia) in the population is necessary for evaluating the impact of public health prevention activities, determining vaccine distribution policies, and detecting unexpected outbreaks. Both the national health plan, *Healthy People 2010*, and *Healthiest Wisconsin 2010* set goals for the percentage of adults aged ≥ 65 that should be vaccinated for pneumococcal diseases and influenza.^{5,6} The long-term success of prevention programs that facilitate progress toward these goals can be measured not only by assessing vaccination rates, but also by measuring changes in pneumonia and influenza (P&I) mortality over time. Since vaccination recommendations are based on the burden of disease, it is important to continuously identify high-risk populations to ensure that existing guidelines reflect the populations at risk. This is especially important during periods of vaccine shortage, as was the case during the 2004-2005 influenza season.⁷ Knowing who was at highest risk for

Ms Schumann is a graduate student in the University of Wisconsin-Madison Medical School, Department of Population Health Sciences. Mr Hoxie and Doctor Vergeront are with the Wisconsin AIDS/HIV Program, Bureau of Communicable Diseases and Preparedness, Wisconsin Division of Public Health. Mr Hoxie is an epidemiologist and Doctor Vergeront is director. Please address correspondence to: Casey L. Schumann, 753 WARF Building, 610 Walnut St, Madison, WI 53726; phone 608.263.0352; fax 608.262.6404; e-mail cschumann@wisc.edu.

Table 1. Pneumonia and Influenza Mortality Rates by Age* and Race,† Wisconsin 1980-2003

Year	No. of Deaths	Age-Specific Mortality Rates (Deaths/100,000)				Age-Adjusted Mortality Rates (Deaths/100,000)	
		65-74	75-79	80-84	85+	White	AA
1980	1101	—	—	—	—	—	—
1981	1225	88	141	310	776	—	—
1982	1020	93	138	303	815	27	20
1983	1281	92	134	291	807	28	22
1984	1235	101	137	317	921	29	26
1985	1466	105	151	331	992	31	25
1986	1645	110	152	327	1072	33	29
1987	1532	121	159	346	1137	34	28
1988	1835	115	156	345	1171	35	30
1989	1666	113	165	369	1240	35	30
1990	1754	103	163	364	1230	35	31
1991	1779	99	158	364	1191	34	30
1992	1641	99	156	353	1172	33	34
1993	1820	97	154	347	1137	33	30
1994	1790	100	156	341	1131	32	28
1995	1727	100	157	338	1082	32	28
1996	1780	101	157	324	1068	32	30
1997	1794	102	156	330	1088	32	31
1998	1943	98	151	347	1135	32	33
1999	1448	98	146	332	1119	31	33
2000	1245	96	134	311	1082	31	33
2001	1258	93	132	286	1021	30	34
2002	1319	84	129	279	986	—	—
2003	1186	—	—	—	—	—	—

AA=African Americans

*Rates are presented as 3-year moving averages.

† Rates are presented as 5-year moving averages; all rate ratios had $P>0.05$.

the disease allowed the Centers for Disease Control and Prevention (CDC) to issue interim influenza vaccination recommendations, which specified high risk subpopulations to be given first priority for vaccination. Finally, monitoring influenza-related mortality and surveillance data is imperative for early detection of epidemics or pandemics, which allows for rapid communication to the public and implementation of enhanced prevention activities. Therefore, the objective of this study is to characterize P&I mortality in Wisconsin from 1980 to 2003, including trend analysis, identification of populations at highest risk of P&I mortality, and assessment of Wisconsin's progress toward state and national goals for vaccination.

METHODS

Data Sources

De-identified mortality data from 1980 to 2003 for all Wisconsin residents who died in the state were obtained from the Wisconsin Department of Health and Family Services (DHFS) Bureau of Health Information & Policy. Deaths were included in this analysis if any of the follow-

ing International Classification of Disease (ICD) codes were listed as the Underlying Cause of Death: ICD-9 (1980-1998) 487 (influenza) and 480-486 (pneumonia), and ICD-10 (1999-2003) J10-11 (influenza) and J12-18 (pneumonia). These ICD codes are consistent with the published literature.^{2,8} Hospital discharge data, using the same ICD codes, were obtained from the Wisconsin Inquiry Tool for Healthcare Information (WITHIN).⁹ The CDC's Behavioral Risk Factor Surveillance System was used to obtain state-level pneumococcal and influenza vaccination rates in those aged ≥ 65 .¹⁰

Adjustment for ICD Version

Due to a change in ICD coding during the study period, mortality rates based on ICD-10 codes (1999-2003) were adjusted to the ICD-9 code (1980-1998) using the pneumonia and influenza comparability ratio (0.6982)⁻¹ to weight them.¹¹ In graphical displays of the number of deaths, the deaths corresponding to the 2 versions of ICD codes are plotted separately.

Rate Calculations and Age Adjustment

Population data for rate calculations were obtained

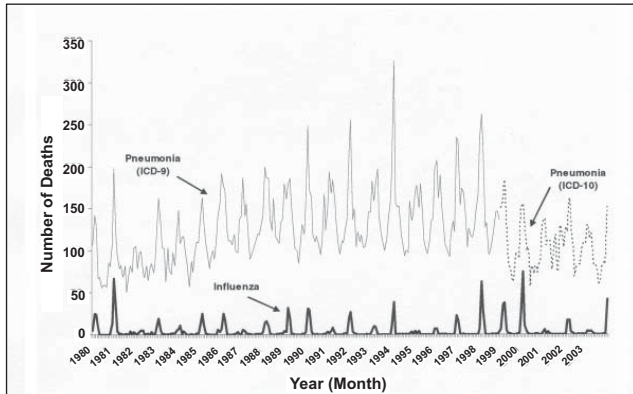


Figure 1. Number of pneumonia and influenza deaths by month, Wisconsin 1980-2003.

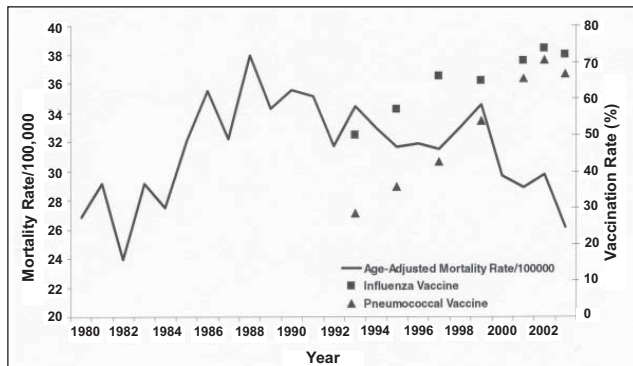


Figure 2. Pneumonia and influenza age-adjusted mortality* and vaccination rates,† Wisconsin 1980-2003.
*Mortality rate excludes 42 deaths when age was not specified.
†Vaccination rates in those ≥ 65 as reported in the Behavioral Risk Factor Surveillance System.¹⁰

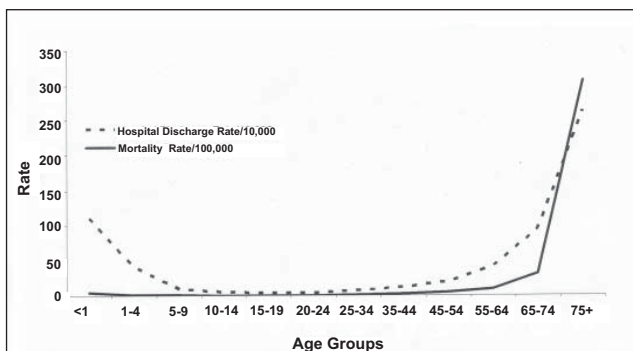


Figure 3. Pneumonia and influenza age-specific hospitalization and mortality rates, Wisconsin 2002.

from the CDC's Wide-ranging OnLine Data for Epidemiologic Research (WONDER) database for 1980-1988,¹² and the Wisconsin Interactive Statistics on Health (WISH) database for 1989-2003.¹³ Rate calculations that contain race are based on population data from WONDER from 1980-2000, and on projected

populations using linear regression from 2001-2003 (Microsoft Excel 8.0). Mortality rates were age-adjusted using the actual 2000 US population obtained from CDC's WONDER database as a standard. Some figures depict rates as 3- or 5-year moving averages to reduce the year-to-year variation. The trend analysis of annual P&I mortality rates was performed using Joinpoint 3.0, using the assumption of homoscedasticity. The best models, as selected by the program, are described in this paper.

RESULTS

In total, 36,490 residents of Wisconsin died with pneumonia or influenza listed as the underlying cause of death during 1980-2003. The absolute number of deaths increased during 1980-1998, with the lowest number of deaths in 1982 (1020 deaths) and the highest in 1998 (1943 deaths) (Table 1). With the change in ICD codes, the number of deaths was reduced to 1448 in 1999 and remained relatively stable through 2003. The mean and median ages at death during the study period were 81 (standard deviation 12.6 years) and 85, respectively. Overall, most of the influenza-related deaths were coded as pneumonia (97%), and the annual ratio of pneumonia to influenza deaths ranged from 9.6 to 106.9 with no observable trends.

The close association of pneumonia and influenza is seen in Figure 1. For each seasonal peak in influenza deaths, a corresponding peak was also seen in pneumonia deaths. Almost 50% of these deaths occurred between the months of December and March, emphasizing the seasonal nature of the disease.

The annual age-adjusted P&I mortality rate for Wisconsin increased from 1980 to 1988 (slope 1.27 deaths/100,000/year, $P < 0.001$), after which it gradually declined through 2003 (slope -0.467 deaths/100,000/year, $P < 0.001$) (Figure 2). The age-adjusted P&I mortality rate was 27/100,000 in 1980; it reached a peak of 38/100,000 in 1988, and decreased to 26/100,000 by 2003. The influenza vaccination rate among Wisconsin residents increased from 50% in 1993 to 72% in 2003 (Figure 2). The vaccination rate for pneumococcal diseases more than doubled in the same period, reaching 67% in 2003.

Deaths due to pneumonia and influenza are largely driven by age. The rates of infection, using hospital discharge rate as a proxy, were highest in those < 1 year of age and in those ≥ 65 (Figure 3). However, mortality was highest in those aged ≥ 65 . An examination of age-specific P&I mortality rates indicated an increased risk with increasing age (Table 1). Those

aged ≥ 85 were 9-12 times more likely to die from pneumonia or influenza than those aged 65-74. To better assess how the age-specific rates changed during the 24-year period, the annual P&I mortality rates for each age group (calculated as 3-year moving averages) were analyzed as a percentage of the 1980-1982 (baseline) average rate. Most age groups showed a trend similar to that of the overall P&I mortality rate (Figure 4). The most dramatic change occurred in the 0-4 age group; the mortality rate increased 100% from 1980 through 1988 and then dropped to sub-1980 rates during the next 3 years. While the 0-4 age group showed the largest percentage increase, the magnitude of the increase (17 deaths/100,000/year) was considerably smaller than the increase seen in the ≥ 85 age group (62.7 deaths/100,000/year). All age groups, except those ≥ 85 , had a lower mortality rate in 2001-2003 than in 1980-1982, with the largest percent decrease occurring among those 0-4 (64%), and the smallest among those 65-74 (5%). The mortality rate in those aged ≥ 85 was 27% higher in 2001-2003 than in 1980-1982.

Gender has also been identified as a determinant of P&I mortality. The same general trend was again observed in both males and females (Figure 5). While Figure 5 displays gender effects by race, the data on whites reflects the overall difference between males and females. The P&I mortality rate ratio (males:females) was 2.3 in 1980 and 1.4 in 2003. Almost the same gender gap exists among whites, but the variability among African Americans is larger and therefore more difficult to interpret (Figure 5). The P&I mortality rate ratio of African American males to African American females ranged from 3.3 to 1.4 during the study period.

Considering race independent of sex, the same trends described thus far were seen in whites and African Americans (Table 1). The rates were generally similar between whites and African Americans, between white and African American males, and between white and African American females (Table 1, Figure 5).

DISCUSSION

The P&I mortality rate in Wisconsin increased significantly from 1980 to 1988 and by 2003 had returned to the 1980 rate. In general, this trend was observed regardless of age, sex, or race. The period of decreasing mortality was temporally associated with increasing influenza and pneumococcal vaccination rates in those ≥ 65 years of age. While most age groups had a lower mortality rate in 2003 compared to 1980, the rate in those aged ≥ 85 was still elevated.

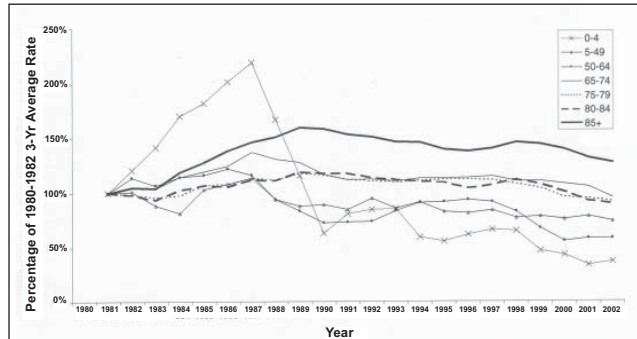


Figure 4. Age-specific pneumonia and influenza mortality rates,^{**†} as a percentage of the baseline rate, Wisconsin 1980-2003.

*Rates used to calculate the percentages were based on 3-year moving averages.

†Mortality rate excludes 42 deaths when age was not specified.

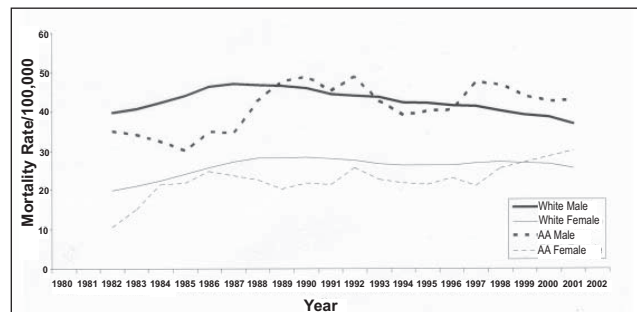


Figure 5. Age-adjusted pneumonia and influenza mortality rates^{**†} by sex and race, Wisconsin 1980-2003.

AA=African American.

*Rates are presented as 5-year moving averages.

†Mortality rate excludes 42 deaths when age was not specified, 33 deaths when sex was unknown, and 251 deaths in people of other or unknown races.

The reasons for the changing trends in mortality are not clear. Nationally, increased P&I mortality has been attributed to increased population density and an aging population.¹⁴ This may also be the case in Wisconsin; however, increased mortality was observed even with age-adjusted rates, which should control for the aging population. The cause of the recent decline in rates is also debatable. In a national sample, Simonsen et al found that P&I mortality began to decline shortly after the 1968 influenza pandemic and the decline was attributed to acquired immunity to influenza.¹⁵ The influenza vaccination rate began to increase much later, during the late 1980s, and was found to be unrelated to the decline in P&I mortality rates. While a temporal relationship does not imply causality, the temporal relationship between declining P&I mortality rates and influenza and pneumococcal vaccination rates is much stronger in the Wisconsin data than in the Simonsen article. Therefore,

increasing vaccination rates may play a role in the recent decline in P&I mortality in Wisconsin. These data suggest that further investigation is required to establish a definitive link between vaccination rates and mortality. Additional factors that may also have contributed to the decrease in mortality include increased vaccine awareness and prevention campaigns, and improvements in medical care.

Age is a significant predictor of P&I mortality. Those ≥ 65 years of age incur 90% of all pneumonia and influenza deaths nationally¹⁶ and in Wisconsin. However, those ≥ 85 years of age bear most of this burden, since they are highly susceptible to pneumonia and influenza due to existing comorbidities and already failing health.¹⁷ The increased risk in this age group has also been observed nationally.¹⁵ Some of the leading theories include reduced efficacy of the influenza vaccine in older age groups,^{15,18} a lack of vaccination among ill or elderly individuals, or a lack of vaccine efficacy in preventing mortality.¹⁵ Most influenza vaccine efficacy studies have been performed in younger or extremely high-risk cohorts where the vaccine is most likely to be effective. In addition, Simonsen et al cited reduced antibody response in those >65 following vaccination, and reduced efficacy of preventing illness in those >70 , as evidence for reduced efficacy in older age groups.¹⁵ Despite concluding that influenza vaccination rates were not associated with decreased P&I mortality, Simonsen et al also hypothesized that older ill adults may not receive an influenza vaccination if they are not expected to survive over the winter. However, vaccination of the elderly is recommended mainly to prevent complications of influenza rather than the disease itself.³ A recently published meta-analysis found that influenza vaccination was not significantly effective in preventing influenza and influenza-related illness among community dwelling elderly, but it was effective in preventing hospital admissions for both influenza and pneumonia.¹⁹ This report also highlighted the reduction in vaccine efficacy when the vaccine was not well-matched to the circulating strain. Despite some vaccine efficacy in older age groups, it may be that pneumonia and influenza have become competing causes of death as diagnosis and treatment of other chronic conditions have improved.

The effectiveness of pneumococcal vaccination is equally controversial. *Streptococcus pneumoniae*, which is the etiologic agent targeted by the pneumococcal vaccine, is responsible for an estimated 50,000 cases of invasive pneumonia, 500,000 cases of clinical pneumonia, and 40,000 deaths annually in the United

States.²⁰ This agent accounts for about 25%-35% of all cases of community-acquired bacterial pneumonia (CAP) in persons who require hospitalization, and, of these, 10%-25% develop invasive disease.²⁰ *S pneumoniae* has been implicated in up to 50% of all CAP, and is therefore the most common etiologic agent of pneumonia. The pneumococcal vaccine has demonstrated a wide range of efficacy (28%-81%) in observational studies against invasive disease,^{20,21} but has not demonstrated efficacy in randomized controlled trials against clinical pneumonia.²⁰ The evidence that the vaccine prevents mortality due to pneumonia is limited. However, a recently published article cited a reduction in mortality due to invasive disease in the elderly as a result of pneumococcal conjugate vaccine use in children.²²

Male gender is a well known risk factor for mortality and hospitalization due to pneumonia.^{17,23} In the early 1990s, men were less likely than women to have been vaccinated against both the pneumococcus and influenza; since then men have become more likely to receive an influenza vaccination than women.¹⁰ Since pneumonia has accounted for the majority of the deaths in this study, an improvement in pneumococcal vaccination or pneumococcal booster²⁰ among men may help to further reduce this disparity, as well as the overall P&I mortality rate.

Nationally, race is also a predictor of P&I mortality. In an American Lung Association analysis, in 2001 African Americans were 26% more likely to die from pneumonia or influenza compared to whites, despite similar incidence of disease in both races.⁸ In Wisconsin, rates were similar between whites and African Americans. This inconsistency with national trends may be real, or it may be an artifact due to the small number of influenza-related deaths among African Americans in this dataset.

The numbers presented in this analysis are subject to some limitations. While we believe it is appropriate to adjust the ICD-10 codes to the ICD-9 codes, it is possible that this adjustment may distort any real changes in the number of pneumonia or influenza deaths starting in 1999. Therefore, a secondary trend analysis was performed in which the ICD-9 years (1980-1998) were analyzed separately from the ICD-10 years (1999-2003). In this analysis, there was still an increase in P&I mortality from 1980 to 1988, but then the rate remained steady through 1998. The rate then declined significantly from 1999-2003, indicating that these years are driving the decline in rates in the primary analysis. As additional data using the ICD-

10 codes become available, we will be better able to evaluate the true decline in P&I mortality. Mortality rates based on ICD codes likely underestimate the true rate of influenza-related mortality, since influenza is not usually confirmed virologically, and many deaths occur from secondary complications after influenza has cleared.^{2,15} Since age-adjusted mortality data analyzed in this paper were only on whites and African Americans, the results may not be generalizable to other racial/ethnic groups.

Despite the controversy surrounding efficacy and the ability to prevent mortality, influenza and pneumococcal vaccination is still recommended for those ≥ 65 years of age, and an effort should be made to meet existing vaccination goals. Even with the recent increases in vaccination, Wisconsin, like all other states,¹⁰ has not yet met the goals set forth by the national *Healthy People 2010*, nor those in *Healthiest Wisconsin 2010*. The national goal is 90% of all adults ≥ 65 years receive the pneumococcal vaccine and annual influenza vaccination (Objectives 14-20 a, b),⁵ while Wisconsin's goal is that 90% of adults age ≥ 65 and individuals with chronic health conditions "will be fully immunized in accordance with current Advisory Committee on Immunization Practices (ACIP) recommendations" (Objective 2c, Existing, Emerging and Re-Emerging Communicable Disease).⁶ Although Wisconsin has not yet met the health plans' goals, the upward trend is encouraging.

Despite increasing P&I mortality in the 1980s, the rate has steadily decreased during the past 15 years. Improved vaccination rates are one possible explanation for the reduction in mortality rates, although continued improvements will be necessary to further reduce rates, to reduce the rates specifically in men, and to meet state and national vaccination goals. In particular, mortality among those aged ≥ 85 should be monitored closely for change, and should receive special attention for prevention programs. Continued surveillance and epidemiologic assessments will be necessary to guide pneumonia and influenza interventions, aid clinicians in identifying high-risk patients, and influence policies regarding vaccination.

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REFERENCES

1. Anderson RN, Smith BL. Deaths: leading causes for 2002. *Natl Vital Stat Rep*. 2005;53(17).
2. Thompson WW, Shay DK, Weintraub E, et al. Mortality associated with influenza and respiratory syncytial virus in the United States. *JAMA*. 2003;289:179-186.
3. Centers for Disease Control and Prevention. Recommendations of the Advisory Committee on Immunization Practices (ACIP): prevention and control of influenza. *MMWR Morb Mortal Wkly Rep*. 2001;50(RR-4):1-44.
4. Treanor JJ. Influenza virus. In: Mandell GL, Bennett JE, Dolin R, eds. *Mandell, Douglas, and Bennett's Principles and Practice of Infectious Disease*. 6th ed. Philadelphia: Elsevier; 2005:2060-2063.
5. US Department of Health and Human Services. November 2000. *Healthy People 2010: Understanding and Improving Health*. 2nd ed. Available at www.healthypeople.gov/document/pdf/uih/2010uih.pdf. Accessed January 10, 2006
6. Wisconsin Division of Health. 2000. *Healthiest Wisconsin 2010: A Partnership Plan to Improve the Health of the Public*. Available at <http://dhfs.wisconsin.gov/statehealth-plan/shp-pdf/PPH0276-PHIP.pdf>. Accessed January 10, 2006.
7. Centers for Disease Control and Prevention. Updated interim influenza vaccination recommendations—2004-05 influenza season. *MMWR Morb Mortal Wkly Rep*. 2003;53(50):1183-1184.
8. American Lung Association. August 2004. Trends in pneumonia and influenza morbidity and mortality. Available at: www.lungusa.org/atf/cf/{7A8D42C2-FCCA-4604-8ADE-7F5D5E762256}/PI1.PDF. Accessed January 10, 2006
9. Wisconsin Department of Health and Family Services, Wisconsin Bureau of Health Information and Policy. Wisconsin Inquiry Tool for Healthcare. Available at: <http://dhfs.wisconsin.gov/healthcareinfo/qsmain.htm>. Accessed January 10, 2006.
10. Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Available at: www.cdc.gov/brfss/. Accessed January 10, 2006.
11. Anderson RN, Minino AM, Hoyert DL, et al. Comparability of cause of death between ICD-9 and ICD-10: preliminary estimates. *Natl Vital Stat Rep*. 2001;49(2).
12. Centers for Disease Control and Prevention (CDC). Wide-ranging OnLine Data for Epidemiologic Research. Available at: <http://wonder.cdc.gov/>. Accessed January 10, 2006
13. Wisconsin Department of Health and Family Services, Wisconsin Bureau of Health Information and Policy. Wisconsin Interactive Statistics on Health (WISH). Available from: <http://www.dhfs.state.wi.us/wish/>. Accessed January 10, 2006
14. Glazen WP. Influenza viruses. In: Feigin RD, Cherry JD, Demmler GJ, Kaplan SL, eds. *Textbook of Pediatric Infectious Diseases*. 5th ed. Philadelphia: WB Saunders; 2004:2252.
15. Simonsen L, Reichert TA, Viboud C, et al. Impact of influenza vaccination on seasonal mortality in the US elderly population. *Arch Intern Med*. 2005;165:265-272.
16. Simonsen L, Clarke MJ, Schonberger LB, et al. Pandemic versus epidemic influenza mortality: a pattern of changing age distribution. *J Infect Dis*. 1998;178:53-60.

17. Callahan CM, Wolinsky FD. Hospitalization for pneumonia among older adults. *J Gerontol.* 1996;51A(6):M276-M282.
18. Voordouw BCG, van der Linden PD, Simonian S, et al. Influenza vaccination in community-dwelling elderly. impact on mortality and influenza-associated morbidity. *Arch Int Med.* 2003;163:1089-1094.
19. Jefferson T, Rivette D, Rivette A, et al. Efficacy and effectiveness of influenza vaccines in the elderly people: a systematic review. *Lancet.* 2005;366:1165-1174.
20. Centers for Disease Control and Prevention. Prevention of pneumococcal disease: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Morb Mortal Wkly Rep.* 1997;46(No. RR-8):11-13.
21. Conaty S, Watson L, Dinnes J, et al. The effectiveness of pneumococcal polysaccharide vaccines in adults: a systematic review of observational studies and comparison with results from randomized controlled trials. *Vaccine.* 2004;22:3214-3224.
22. Lexau CA, Lynfield R, Danila R, et al. Changing epidemiology of invasive pneumococcal disease among older adults in the era of pediatric pneumococcal conjugate vaccine. *JAMA.* 2005;294:2043-2051.
23. LaCroix AZ, Lipson S, Miles TP, White L. Prospective study of pneumonia hospitalizations and mortality of US older people: the role of chronic conditions, health behaviors, and nutritional status. *Public Health Rep.* 1989;104(4):350.

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