

9. Institute for Social Inquiry, University of Connecticut: Smoking in Connecticut. Storrs, CT, May 13, 1987.
10. Andrews, J. L.: Reducing smoking in the hospital: an effective model program. *Chest* 84: 206-209, August 1983.
11. Rosenstock, I. M., Stergachis, A., and Heaney, C.: Evaluation of a smoking prohibition policy in a health maintenance organization. *Am J Public Health* 76: 1014-1015, August 1986.
12. Schilling, R. F., Gilchrist, L. D., and Schinke, S. P.: Smoking in the workplace: review of critical issues. *Public Health Rep* 100: 473-479, September-October 1985.
13. Ericksen, M.: Pacific Northwest Telephone Company employee smoking study, Project No. 82-63. Pacific Bell, Corporate Research Division, Human Resources Department, San Francisco, CA, January 1983.
14. "Americans want smoke-free air at work," American Lung Association press release on findings of a survey of attitudes toward smoking, conducted by the Gallup Organizations, Inc., Princeton, NJ. American Lung Association, New York, NY, Dec. 5, 1985.
15. Workplace smoking survey: New York City. *MMWR* 35: 1-3, Dec. 5, 1986.

Assessing Trends in Mortality in 121 U.S. Cities, 1970-79, from All Causes and from Pneumonia and Influenza

ROY C. BARON, MD, MPH
 RICHARD C. DICKER, MD, MSC
 KELLY E. BUSSELL, MM
 JOY L. HERNDON, MS

All authors are with the Centers for Disease Control. Dr. Baron is Medical Epidemiologist with the Epidemiology program Office (EPO); through the Division of Field Services he is currently on assignment with the West Virginia Department of Health, where he is Acting Director for the Office of Epidemiology and Health Promotion.

Dr. Dicker is Assistant to the Director for Epidemiologic Development, EPO. Mr. Bussell is Computer Programmer Analyst, Statistical Services Branch (SSB), Division of Surveillance and Epidemiologic Studies (DSES), EPO. Ms. Herndon is Mathematical Statistician, SSB, DSES, EPO.

Tearsheet requests to Dr. Baron, Epidemiology Program Office, Centers for Disease Control, Atlanta, GA 30333.

Synopsis

The Centers for Disease Control receives weekly reports of mortality due to all causes and to pneumonia and influenza from 121 cities and

counties in the United States. To assess the epidemiologic applicability of these data, the trends of death rates based on data compiled by the Centers for Disease Control's mortality reporting system (CDC-MRS) from 1970 through 1979 were compared with trends derived from national mortality statistics compiled by the National Center for Health Statistics (NCHS).

In general, CDC-MRS trends in death rates from all causes and from pneumonia and influenza followed patterns similar to those shown by mortality statistics for the entire nation. CDC-MRS data were particularly sensitive to annual fluctuations in the nationwide rate of death from pneumonia and influenza among the elderly population. However, because of higher death rates among residents of the CDC-MRS reporting areas, in addition to other ascertainment biases, CDC-MRS death rates—from all causes and from pneumonia and influenza—consistently exceeded NCHS rates for the nation. Moreover, for each age group, trends based on CDC-MRS reflected an underestimate of the rate of decline in mortality observed over time according to NCHS data. It is concluded that despite its limitations, the CDC-MRS provides mortality data that are both timely and useful for epidemiologic purposes.

FOR MANY DISEASES and adverse health effects, mortality is an essential measure of incidence and long-term trends, and it is the basis for epidemiologic study. Although mortality statistics may be readily obtained at the local or State level, final mortality data do not become available at the national level—that is, from the National Center for Health Statistics (NCHS)—for at least 20 months after the close of the data year. Even

NCHS provisional mortality data, published monthly and based on a 10 percent national sample of death certificates, are not available for 3-4 months. Such delays limit the usefulness of the data by impeding the timely detection of acute changes in the incidence or distribution of diseases and adverse health effects.

As part of its national influenza surveillance effort, the Centers for Disease Control (CDC)

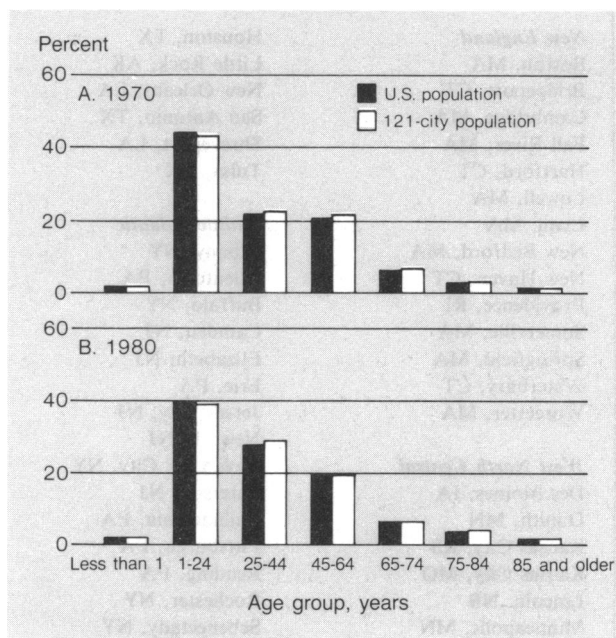
receives weekly reports of mortality from 121 cities and counties in the United States. Through the CDC mortality reporting system (CDC-MRS), approximately one-third of the deaths in the United States are ascertained, providing CDC epidemiologists with preliminary information that is used in estimating the impact of epidemic influenza on regional and national mortality (1). Most deaths are reported to CDC 2-3 weeks after they occur. The principal advantage of this system is that it bypasses the delays involved in obtaining mortality data from NCHS. On the other hand, the system does not measure mortality incidence, and it provides only an estimate of influenza activity because of several reasons. The population size and age distribution of the catchment areas of these 121 cities and counties have never been completely defined. Consequently, the rates of death from all causes or from pneumonia and influenza only have not been obtainable from these data, and whether data from the 121 cities can be generalized to reflect mortality for the nation has never been determined.

The purpose of this study was to assess the extent to which the CDC-MRS reflects mortality incidence and trends overall and for pneumonia and influenza in the United States and to identify potential sources of bias. Specifically, for 1970-79, we derived annual estimates of the population of the 121 reporting areas, calculated mortality rates from all causes and from pneumonia and influenza, and compared these annual rates and the 10-year trends with those derived from NCHS data.

Methods

The CDC-MRS. Since 1961, when the mortality reporting system was transferred from the National Office of Vital Statistics, CDC has collected mortality data that are reported voluntarily each week by selected cities and counties in the United States. In 1970, the CDC-MRS included 123 reporting areas. The number became 121 when Flint, MI, and Oklahoma City, OK, dropped out of the system in 1972. These 121 areas are located in 32 States and the District of Columbia and are listed by census division in table IV of the *Morbidity and Mortality Weekly Report* (see list, p. 122). Currently, 85 areas report deaths that occur within the city limits only, and 36 report all deaths that occur in the incorporating county. Two areas that report mortality data from the entire county—San Jose, CA, and Las Vegas, NV—reported only city data before January 1972.

Figure 1. Distribution of U.S. population and 121-city population by age group, 1970 and 1980



Each week a reporter in each of the 121 jurisdictions records the past week's mortality data on a postcard and mails it to CDC (see form, p. 123). The number of death certificates received in each area is reported in the aggregate, by age group, for all causes and for pneumonia and influenza. Generally, the reported numbers reflect all deaths that occurred in the catchment area; thus, they include deaths of persons who did not reside in the area and exclude deaths of area residents who died elsewhere. The cities are asked to report pneumonia when it appears in part I of the death certificate (either listed as the immediate cause of death on line A or as an underlying cause on line B or C), but not when it is listed in part II (other significant conditions contributing to death) (2). Cities are asked to report influenza when it appears anywhere on the death certificate. Compared with CDC-MRS, NCHS is more restrictive in its classification of pneumonia and influenza.

NCHS adheres to the World Health Organization's Nomenclature Regulations, which assign death to a single underlying cause on the basis of all the information contained on the death certificate (3). Because persons responsible for reporting to the CDC-MRS have little or no training in nosology, the more inclusive case definitions for pneumonia and influenza are simpler to apply and permit more uniformity in the data gathered.

The population of the CDC-MRS represented

List of 121 cities in the Centers for Disease Control Mortality Reporting System, by U.S. census division

New England

Boston, MA
 Bridgeport, CT
 Cambridge, MA
 Fall River, MA
 Hartford, CT
 Lowell, MA
 Lynn, MA
 New Bedford, MA
 New Haven, CT
 Providence, RI
 Somerville, MA
 Springfield, MA
 Waterbury, CT
 Worcester, MA

Houston, TX
 Little Rock, AK
 New Orleans, LA
 San Antonio, TX
 Shreveport, LA
 Tulsa, OK

Middle Atlantic

Albany, NY
 Allentown, PA
 Buffalo, NY
 Camden, NJ
 Elizabeth, NJ
 Erie, PA
 Jersey City, NJ
 Newark, NJ
 New York City, NY
 Paterson, NJ
 Philadelphia, PA
 Pittsburgh, PA
 Reading, PA
 Rochester, NY
 Schenectady, NY
 Scranton, PA
 Syracuse, NY
 Trenton, NJ
 Utica, NY
 Yonkers, NY

Norfolk, VA
 Richmond, VA
 Savannah, GA
 St. Petersburg, FL
 Tampa, FL
 Washington, DC
 Wilmington, DE

Mountain

Albuquerque, NM
 Colorado Springs, CO
 Denver, CO
 Las Vegas, NV
 Ogden, UT
 Phoenix, AZ
 Pueblo, CO
 Salt Lake City, UT
 Tucson, AZ

East North Central

Akron, OH
 Canton, OH
 Chicago, IL
 Cincinnati, OH
 Cleveland, OH
 Columbus, OH
 Dayton, OH
 Detroit, MI
 Evansville, IN
 Fort Wayne, IN
 Gary, IN
 Grand Rapids, MI
 Indianapolis, IN
 Madison, WI
 Milwaukee, WI

Peoria, IL
 Rockford, IL
 South Bend, IN
 Toledo, OH
 Youngstown, OH

East South Central

Birmingham, AL
 Chattanooga, TN
 Knoxville, TN
 Louisville, KY
 Memphis, TN
 Mobile, AL
 Montgomery, AL
 Nashville, TN

Pacific

Berkeley, CA
 Fresno, CA
 Glendale, CA
 Honolulu, HI
 Long Beach, CA
 Los Angeles, CA
 Oakland, CA
 Pasadena, CA
 Portland, OR
 Sacramento, CA
 San Diego, CA
 San Francisco, CA
 San Jose, CA
 Seattle, WA
 Spokane, WA
 Tacoma, WA

West North Central

Des Moines, IA
 Duluth, MN
 Kansas City, KS
 Kansas City, MO
 Lincoln, NB
 Minneapolis, MN
 Omaha, NB
 St. Louis, MO
 St. Paul, MN
 Wichita, KS

West South Central

Austin, TX
 Baton Rouge, LA
 Corpus Christi, TX
 Dallas, TX
 El Paso, TX
 Fort Worth, TX

South Atlantic

Atlanta, GA
 Baltimore, MD
 Charlotte, NC
 Jacksonville, FL
 Miami, FL

27.6 percent of the total U.S. population in 1970 and declined to 24.7 percent by 1980 (4,5). In both years, the distribution by age of residents within these areas was comparable with that of the entire United States (fig. 1). Changes in the age structure of the U.S. population between 1970 and 1980 (that is, relative declines in the age groups of younger than 1, 1-14, and 45-64 years and relative increases in the 15-to 44-year-old and 65-and-older groups) are reflected by similar changes in the age composition of the 121 reporting areas.

NCHS data. NCHS final mortality statistics are based on information coded by NCHS from copies of the original certificates received from State vital statistics offices, and for some States, based on data coded by the States according to NCHS specifications. The final data are published annually. In contrast, provisional cause-of-death data from NCHS are from a 10 percent systematic sample of death certificates drawn each month

after the certificates are counted in the State registration offices; the data are coded by NCHS from copies of the original certificates. While final data are available about 20 months after the close of a data year, provisional cause-of-death data from NCHS are published about 3 months after the month of death.

We obtained mortality statistics for all causes and for pneumonia and influenza for all U.S. residents for 1970-79 from NCHS computer tapes listing the underlying cause of death. For 1970-78, deaths from pneumonia and influenza compiled by NCHS were coded 480-486 (pneumonia) and 470-474 (influenza), according to the Eighth Revision, International Classification of Diseases, Adapted for Use in the United States (ICDA-8) (6). For 1979, they were coded according to the Ninth Revision (ICD-9), using the same codes for pneumonia and code 487 for influenza (7).

For comparison, we used NCHS mortality data for the years 1970 and 1979 only. Deaths reported

CDC 43.5 REV. 12-86
(Formerly 4.1566)

WEEKLY MORTALITY REPORT

FORM APPROVED
OMB NO. 0920-0014

Name of City _____

For Week Ended _____

Age	Total Deaths Including Pneumonia & Influenza	Pneumonia	Influenza
Under 28 Days			
28 Days to 1 Year			
1 - 14			
15 - 24			
25 - 44			
45 - 64			
65 - 74			
75 - 84			
85 And Over			
Unknown			
TOTAL			

SIGNED _____

DATE _____

THE REPORTING PERIOD is the seven-day week ending on Friday.

THE NUMBER OF DEATHS is the number of certificates received for filing by your office during the reporting period, regardless of date of death. The count includes all certificates of deaths occurring in your city regardless of the residence of the deceased. It does not include fetal deaths (stillbirths).

MAIL YOUR REPORT at the close of work Friday.

This report is authorized by law (Public Health Service Act, 42 USC 241). While your response is voluntary, your cooperation is necessary for P & I surveillance.

to NCHS were categorized by whether or not the deceased had resided in one of the CDC-MRS reporting areas. To evaluate potential biases, we (a) compared the number of CDC-MRS-reported deaths from all causes with the number recorded by NCHS for residents of the CDC-MRS reporting areas in 1970 and 1979 and (b) defined the differences as the net capture by the CDC-MRS of nonarea-resident deaths. In addition, for 1970 and 1979, we determined the number of deaths for which pneumonia and influenza were listed anywhere on the certificate from NCHS multiple-cause tapes and compared that number with the number of U.S. residents' deaths for which pneumonia and influenza were recorded as the underlying cause.

Denominators, rates, and trends. The age-specific population of the United States was obtained from the 1970 and 1980 census figures (4,5). We estimated the population during intervening years by linear interpolation. Similarly, we estimated the 1970-79 age-specific population for the CDC-MRS reporting areas alone, after adjusting for the dropout of two cities and the conversion of two

other reporting areas from city- to county-based mortality reporting.

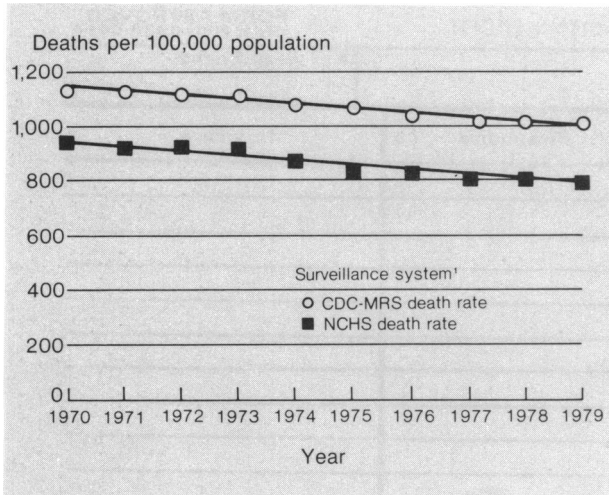
We calculated the age-specific death rates from all causes and from pneumonia and influenza for 1970-79 from both the mortality reported to CDC-MRS and the nationwide mortality recorded by NCHS. For summary rates, we standardized to the 1970 U.S. population to adjust for temporal and regional differences in age structure. Using 1970 and 1979 NCHS death statistics, we calculated separate mortality rates for residents and for nonresidents of the reporting areas.

Mortality trends were approximated by regression of all 10 points in each set of data. The percentage change (reduction or increase) over the 10-year period was estimated from the 1970 and 1979 rates that fit the model.

Results

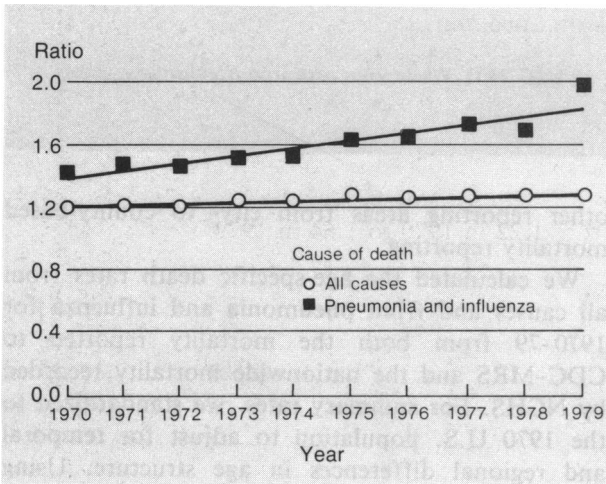
Deaths from all causes. Between 1970 and 1979, both the CDC-MRS data and the NCHS data for the entire United States showed a decline in age-adjusted mortality from all causes (fig. 2);

Figure 2. Regression estimates of age-adjusted incidence of death from all causes, by surveillance system and year, United States, 1970-79



¹CDC-MRS = Centers for Disease Control Mortality Reporting System; NCHS = National Center for Health Statistics.

Figure 3. Regression estimates of the ratio of CDC-MRS:NCHS¹ age-adjusted death rates reported by cause and year, United States, 1970-79



¹CDC-MRS = Centers for Disease Control Mortality Reporting System; NCHS = National Center for Health Statistics.

downward trends were evident in every age group (not shown). CDC-MRS mortality rates were consistently higher than the national rates calculated from NCHS data. The disparity, as measured by the ratio of the two rates, increased from 1.2 in 1970 to 1.3 in 1979 (fig. 3). Linear trend models fitted to each set of summary rates showed a 17.3 percent decline in overall mortality for the United States on the basis of NCHS data and an 11.6 percent decline in mortality on the basis of CDC-MRS data. Calculations based on CDC-MRS data, therefore, resulted in an underestimate

of the NCHS-based rate of decline by 33 percent. NCHS data for 1970 and 1979 showed that death rates from all causes were higher among residents of the CDC-MRS reporting areas than they were among persons who lived outside the reporting areas (table 1). At the same time, more deaths from all causes were reported by the 121 CDC-MRS reporting areas than were recorded by NCHS for residents of these areas. Consequently, rates calculated from the CDC-MRS data exceeded the NCHS rates both for area residents only and for the nation as a whole.

The difference between the number of deaths reported to the CDC-MRS and the number recorded by NCHS for the CDC-MRS reporting areas increased over time for every age group. Between 1970 and 1979, the increase in the ratio of all deaths reported through the CDC-MRS to all deaths recorded by NCHS for area residents was greatest among the younger age groups:

Age, years	1970	1979
Less than 1	1.33	1.63
1-14	1.35	1.46
15-24	1.14	1.19
25-44	1.12	1.18
45-64	1.16	1.24
65 and older	1.06	1.11

Deaths from pneumonia and influenza. Between 1970 and 1979, both the CDC-MRS data and the NCHS underlying cause data showed an irregular but generally downward pattern in the age-adjusted mortality rates for pneumonia and influenza (fig. 4). The CDC-MRS death rates for pneumonia and influenza for the 121 reporting areas were consistently higher than the NCHS rates for the total United States. As measured by the CDC-MRS:NCHS mortality rate ratio, the disparity between the pneumonia and influenza rates was greater than that observed between the rates of death from all causes, and it increased by a larger magnitude over the 10-year period (fig. 3). Based on a linear regression model over the 10-year period, the age-adjusted pneumonia and influenza death rate from the CDC-MRS declined by 12.3 percent, and the national NCHS rate declined by 32.2 percent.

For each age group under 65 years, the pneumonia and influenza death rates from the CDC-MRS declined over the 10-year period, but more slowly than those shown by the NCHS's underlying cause data. The closest concordance between the CDC-MRS trend and the NCHS trend was an 8 percent underestimate observed among children 1 year old or younger—the age group that showed

Table 1. Deaths from all causes and crude death rates per 100,000, by surveillance system and by population base, United States, 1970 and 1979

Surveillance system ¹	Population base ²	1970		1979	
		Deaths	Rate	Deaths	Rate
CDC-MRS.....	CDC-MRS reporting areas	666,571	1,188.5	615,684	1,100.5
NCHS.....	CDC-MRS reporting areas	601,296	1,072.1	530,255	947.8
NCHS.....	Other areas	1,319,735	897.0	1,383,586	822.3
NCHS.....	All areas	1,921,031	945.3	1,913,841	853.6

¹ CDC-MRS = Centers for Disease Control mortality reporting system; NCHS = National Center for Health Statistics.

² CDC-MRS reports deaths by place of occurrence; NCHS records deaths by

place of residence. Deaths reported to NCHS were categorized by whether or not the deceased had resided in one of the CDC-MRS reporting areas.

Table 2. Deaths from pneumonia and influenza and crude death rates per 100,000 population, by surveillance system and by population base, United States, 1970 and 1979

Surveillance system ¹	Population base ²	1970		1979	
		Deaths	Rate	Deaths	Rate
CDC-MRS.....	CDC-MRS reporting areas.....	25,684	45.8	22,182	39.6
NCHS (U).....	CDC-MRS reporting areas.....	21,039	37.5	13,554	24.2
NCHS (U).....	Other areas.....	41,700	28.3	31,476	18.7
NCHS (U).....	All areas.....	62,739	30.8	45,030	20.8
NCHS (A).....	All areas.....	206,865	101.6	148,377	68.5

¹ CDC-MRS = Centers for Disease Control mortality reporting system; NCHS = National Center for Health Statistics; U = recorded as underlying cause of death; A = listed anywhere on the death certificate.

² CDC-MRS reports deaths by place of occurrence; NCHS records deaths by place of residence. Deaths reported to NCHS were categorized by whether or not the deceased had resided in one of the CDC-MRS reporting areas.

the greatest reduction in deaths from pneumonia and influenza (fig. 5). Among persons 65 years of age and older, the trend of the pneumonia and influenza mortality rates based on CDC-MRS data was slightly up (4 percent increase from 1970 through 1979). In contrast, NCHS-based pneumonia and influenza mortality rates for persons 65 years of age and older declined by 17 percent from 1970 through 1979 (fig. 6). This age group had the highest incidence of deaths from pneumonia and influenza and showed considerably more year-to-year variability in those rates than younger age groups. Nonetheless, the direction of the year-to-year fluctuations among the elderly, as reflected by the CDC-MRS, consistently corresponded with the direction of the year-to-year fluctuations among the total U.S. population, as reflected by the NCHS data.

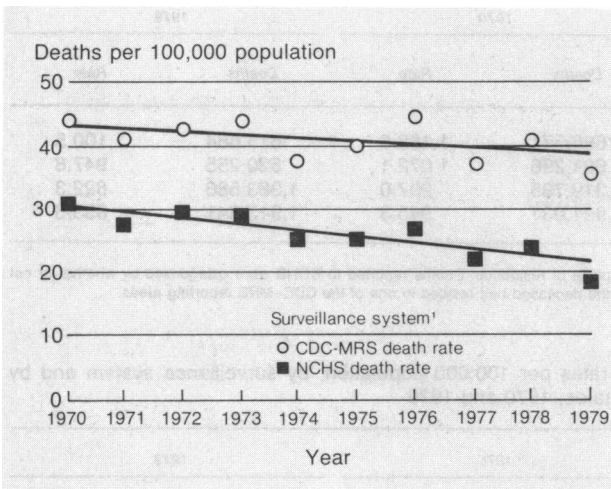
Based on the single underlying cause of death, NCHS death rates from pneumonia and influenza were higher for residents of the CDC-MRS reporting areas than for nonresidents (table 2). Furthermore, in every age group, the numbers of deaths from pneumonia and influenza that were reported through the CDC-MRS exceeded the

numbers recorded as the underlying cause by NCHS for these areas, the overall ratio increasing from 1.22 in 1970 to 1.64 in 1979:

Age, years	1970	1979
Less than 1.....	0.96	1.44
1-14.....	1.19	1.81
15-24.....	1.07	1.81
25-44.....	1.12	1.43
45-64.....	1.30	1.90
65 and older.....	1.20	1.61
All.....	1.22	1.64

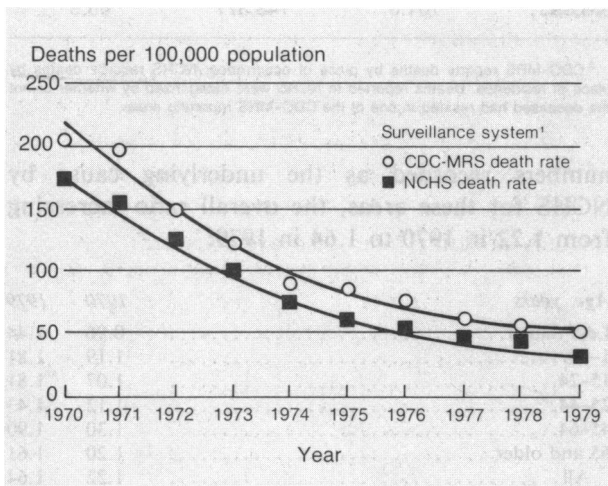
From NCHS multiple-cause-of-death data for deaths among all U.S. residents in 1970 and 1979, the terms "pneumonia" or "influenza", or both, appeared on death certificates 3.3 times more often than pneumonia and influenza were assigned as the single underlying cause of death (table 2). This figure would represent the upper limit of the CDC-MRS:NCHS reporting ratio if the CDC-MRS reporters classified every death as a death from pneumonia and influenza if the diagnosis of either appeared anywhere on the death certificate. Our observed ratios of 1.22 in 1970 and 1.64 in 1979 were only 37 percent and 50 percent, respectively, of this possible limit.

Figure 4. Regression estimates of age-adjusted incidence of death from pneumonia and influenza by surveillance system and year, United States, 1970-79



¹CDC-MRS = Centers for Disease Control Mortality Reporting System; NCHS = National Center for Health Statistics.

Figure 5. Regression estimates of death rates from pneumonia and influenza for children less than 1 year old by surveillance system and year, United States, 1970-79



¹CDC-MRS = Centers for Disease Control Mortality Reporting System; NCHS = National Center for Health Statistics.

Discussion

Analysis of the CDC-MRS data for 1970-79 shows that the system is useful in estimating overall U.S. mortality trends and is sensitive to yearly fluctuations in the incidence of deaths from pneumonia and influenza among the elderly. In two respects, however, the CDC-MRS does not accurately reflect mortality nationwide.

Annual national rates. The first limitation of the CDC-MRS is that the annual U.S. mortality rates

based on this system are consistently overestimated, as determined from final NCHS statistics based on the underlying cause of death. One factor that accounts for this is the urban representation of the CDC-MRS reporting districts, 85 of which report city mortality and 36 of which report city and county mortality. Because death rates from all causes and from pneumonia and influenza among residents of these areas are higher than the rates in the general U.S. population, the biased sample favors overestimation of the national rates.

Another factor is the use of the area-resident population as the denominator for the CDC-MRS rates. This population underrepresents the actual catchment area of the reporting districts, because more deaths are reported for every age group through the CDC-MRS than can be accounted for by area-resident deaths alone. In the absence of information specifying the residence of persons whose deaths are reported through the CDC-MRS, we cannot verify the sources of this reporting artifact. Reasons for the capture by the CDC-MRS of nonarea-resident deaths may be that nonarea residents seek primary or referral medical treatment in urban centers, or that some reporting areas may routinely count death certificates from rounding metropolitan areas. We are evaluating the latter possibility. Although death rates for pneumonia and influenza are probably also biased by the capture of nonarea-resident deaths, this bias cannot be quantified, because CDC-MRS and NCHS classify pneumonia and influenza differently.

Although the more liberal reporting of pneumonia and influenza by CDC-MRS contributes to the disparity between the CDC-MRS and the NCHS death rates from pneumonia and influenza, the difference is in the direction of a more comprehensive count of pneumonia and influenza mortality in the United States. The finding nationwide that pneumonia and influenza are mentioned on death certificates 3.3 times more often than they are listed by NCHS as the underlying cause is consistent with findings of a previously published study (8). According to that study, compliance with the rules for reporting pneumonia and influenza to the Morbidity and Mortality Weekly Report still results in an underestimate of the role of pneumonia and influenza in mortality but yields more than 2.5 times as many deaths from pneumonia and influenza than counted by NCHS (6). In contrast, pneumonia and influenza deaths reported through the CDC-MRS exceed NCHS-recorded deaths from pneumonia and influenza by only 22 percent in 1970 and by 64 percent in 1979. Even without

discounting nonarea-resident deaths that may have been captured by the CDC-MRS, these findings suggest that the reporting areas do not report all instances in which pneumonia or influenza or both are mentioned on death certificates.

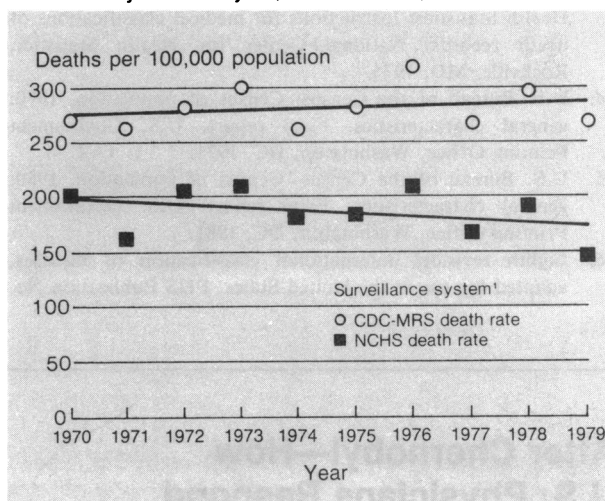
National mortality trends. The second limitation of the CDC-MRS is that the magnitude of the declining NCHS-measured national mortality trends is underestimated. Either an increased use by nonresidents of medical services in the reporting areas or an increased reporting of deaths from the surrounding metropolitan areas has resulted in an increase in the proportion of nonarea-resident deaths captured by the CDC-MRS for 1970-79. Because this ascertainment bias increased over time, the CDC-MRS reflected an underestimate of the decline in the national trend. Similar observations of differences in the percentage reduction in death rates for pneumonia and influenza between the CDC-MRS and NCHS data may be due to increased capture or more complete reporting, or both, of pneumonia and influenza by the CDC-MRS over time.

Although mortality trends based on the CDC-MRS and the NCHS data differed quantitatively, the trends were in the same direction in each age group for overall mortality and in each age group below age 65 for pneumonia and influenza mortality. Among persons 65 years of age and older, the CDC-MRS and NCHS trends in pneumonia and influenza mortality diverged. However, compared with the decline based on NCHS data of only 17 percent, the slight rise based on CDC-MRS data may be explained by biases already discussed. The age distribution of persons 65 years and older in the CDC-MRS areas is similar to that of the total U.S. population (4,5); therefore, this factor would not explain the difference.

Despite its failure to detect the long-term national decline in pneumonia and influenza mortality rates among the elderly, the CDC-MRS consistently indicated the direction of yearly deflections in pneumonia and influenza mortality among this high-risk population. In fact, the upturns within the overall trend correspond to years when influenza was widespread (9).

The ability of the CDC-MRS to reflect overall long-term trends and, more importantly, to reflect short-term changes in the incidence of deaths from pneumonia and influenza in the group at highest risk has important public health implications. Although the data are biased by both urban

Figure 6. Regression estimates of death rates from pneumonia and influenza for persons 65 years of age and older by surveillance system and year, United States, 1970-79



¹CDC-MRS = Centers for Disease Control Mortality Reporting System; NCHS = National Center for Health Statistics.

representation and the capture of nonarea-resident deaths, the CDC-MRS is the only national surveillance system in which mortality statistics are compiled within 3 weeks of death. If correction factors can be applied to compensate for the discrepancies revealed by this analysis, the CDC-MRS may provide indices of mortality that not only are timely but also are accurate.

Furthermore, the CDC-MRS may have potential beyond its traditional role of monitoring the impact of epidemic influenza. In the past, the system has reflected excess all-cause mortality during a heat wave, and excess pneumonia and influenza mortality among young men that was later linked to acquired immune deficiency syndrome (AIDS). Recently, in response to anecdotal reports of an increased number of deaths attributed to asthma, one participating city has begun to enumerate asthma-related deaths in its weekly report. Efforts are currently underway to evaluate the system's capacity and usefulness in monitoring other diseases and conditions, including infant mortality, suicide, AIDS, and motor vehicle injuries.

References.....

1. Choi, K., and Thacker, S. B.: An evaluation of influenza mortality surveillance, 1962-1979: I. Time series forecasts of expected pneumonia and influenza deaths. *Am J Epidemiol* 113: 215-216 (1981).

2. Centers for Disease Control: Influenza—United States. MMWR 27: 472-474, Nov; 24, 1978.
3. Health Resources Administration, National Center for Health Statistics: Instructions for medical classifications of death records. National Center for Health Statistics, Rockville, MD, 1975.
4. U.S. Bureau of the Census: Census of population, 1970: general characteristics. Final report. U.S. Government Printing Office, Washington, DC, 1971.
5. U.S. Bureau of the Census: Census of population, 1980: general characteristics. Final report. U.S. Government Printing Office, Washington, DC, 1981.
6. Eighth revision, international classification of diseases, adapted for use in the United States. PHS Publication No. 1693. U.S. Government Printing Office, Washington, DC, 1968.
7. International classification of diseases, ninth revision. Manual of the international statistical classification of diseases, injuries, and causes of death. World Health Organization, Geneva, 1977.
8. Barker, W. H., and Mullooly, J. P.: Underestimation of the role of pneumonia and influenza in causing excess mortality. Am J Public Health 71: 643-645 (1981).
9. Centers for Disease Control: Influenza report no. 93, January 1983.

After Chernobyl—How U.S. Physicians Respond to Radioactive Fallout

ALVIN E. WINDER, PhD, MPH
 MARY ANNE STANITIS, RN, CS, EdD
 ANNE M. STODDARD, ScD

The authors are with the School of Health Sciences, University of Massachusetts. Dr. Winder is Professor of Public Health, and Dr. Stoddard is Assistant Professor of Public Health in the Division of Public Health. Dr. Stanitis is Assistant Professor of Nursing in the Division of Nursing. Tearsheet requests to Dr. Winder at the university, Amherst, MA 01003.

This study was funded by the Pioneer Valley Chapter for Social Responsibility. Murray Watnick, MD, Director of Radiology at Noble Hospital in Westfield, MA, and Assistant Professor of Radiology at the University of Massachusetts Medical School in Worcester, facilitated the research by assisting with the design of the questionnaire.

Synopsis

On April 26, 1986, a reactor unit at the Soviet Union's Chernobyl Power Station exploded, and substantial amounts of radioactive material were released. Fallout from this incident was deposited in the United States and elsewhere.

Radioactive fallout is a major concern for obstetricians and pediatricians; their patients are the most vulnerable to the adverse effects of radiation. This study addresses the question: What are these physicians' perceptions and beliefs about fallout and its effects on their patients?

A questionnaire was developed to measure these perceptions and beliefs. This instrument was mailed in November 1986 to all obstetricians and pediatricians listed in the telephone directory for western Massachusetts. A factor analysis of the physicians' responses yielded five factors: concern for patients, management of risk, effect of fallout, physicians' role in prevention, and guidance on advising patients. The physicians' responses to patients' inquiries were categorized as giving information, reassurance, and prescription.

The authors recommend that the study be replicated with a more representative sample, that professional medical groups provide reliable information to members, and that physicians ask their professional organizations to address the issue of physician participation in the national planning process relevant to their concerns about radioactive fallout.

A REACTOR UNIT of the RBMK type ignited following an explosion at the Chernobyl Power Station, April 26, 1986. Soviet authorities officially announced that the reactor fire had ended on May 5 and the reaction had stopped.

During the episode, substantial amounts of radioactive materials, basically fission products, were released into the atmosphere. Because air temperatures were high during the release, a great plume rose and radioactive materials reached high