18. US Department of Health and Human Services: The Surgeon General's Report on Nutrition and Health. Washington, DC: Govt Printing Office, 1988.
19. Leverett DH: Fluorides and the changing prevalence of dental caries. Science 1982; 217:26–30.
20. Driscoll WS, Horowitz HS, Meyers RJ: Prevalence of dental caries and dental fluorosis in areas with negligible, optimal, and above-optimal fluoride concentrations in drinking water. J Am Dent Assoc 1986; 113:29–33.
21. Kumar JV, Green EG, Wallace W, Carnahan T: Trends in dental fluorosis and dental caries prevalences in Newburgh and Kingston. Am J Public Health 1989; 79:565–569.
22. Hileman B: Fluoridation of water. Chem Engineer News 1988; 66:26–42.
23. Coloquhon J: New evidence on fluoridation. Soc Sci Med 1984; 19:1239–1246.
24. Diesendorf M: The mystery of declining tooth decay. Nature 1986:322–125–129.
25. Burt BA, Beltran ED: Water fluoridation: A response to critics in Australia and New Zealand. J Public Hlth Dent 1988; 48:214–219.

Stephen B. Corbin, DDS, MPH

Address reprint requests to Stephen B. Corbin, DDS, MPH, Disease Prevention Policy Analyst, National Institutes of Health, National Institute of Dental Research, Westwood Building, Room 538, 5333 Westbard Avenue, Bethesda, MD 20892.

Improving Cause-of-Death Statistics

Mortality statistics derived from information reported on death certificates are among the most widely used sources of health data at the national, state, and local levels. The strength of mortality data from the vital statistics system comes from several sources: 1) coverage is virtually universal, because State laws generally require death certificates for disposition of bodies, and because the certificates are often needed for legal purposes, including estate settlement; 2) considerable uniformity in content and format is achieved among the states through federal-state coordination[1]; and 3) standardization in processing and data presentation is promoted through a federal-state effort called the Vital Statistics Cooperative Program. These strengths have been noted by Zemach, Glasser, and others.[2,3] As a consequence, the vital statistics system (including births, deaths, and other reported vital events) is the principal source of health-related data comparable at the national, state, and local levels.

Considerable reliance is placed on mortality data from the vital statistics system to identify health problems and to monitor health programs, because for measuring morbidity essentially no data source exists that can be compared at the national, state, and local levels. As a consequence, many of the state and national initiatives in disease prevention and health promotion are being measured in terms of mortality data such as infant mortality and causes of death.[4]

The heavy use and visibility of mortality data for health measurement necessarily raise questions regarding reliability and validity of cause-of-death information from the death certificate. Numerous articles on the subject have appeared in this and other journals.[5–8] Special studies on the validity of cause-of-death information on the death certificate have been carried out using a variety of methodologies. A frequent finding is greater reliability for some causes of death, e.g., cancer, than for others, e.g., digestive diseases. However, few firm conclusions can be drawn because of differences among the studies in coverage, disease focus, and methodology and because of the absence of a "gold standard" against which to compare the reported causes of death on the death certificate. The need for periodic national assessments of the validity of cause-of-death reporting is being addressed by a pilot evaluation study currently being carried out by the National Center for Health Statistics (NCHS).[9,10]

While considerable attention has been devoted to the reliability and validity of cause-of-death data, fewer assessments have been made of ways in which to improve the quality and completeness of reporting cause of death on the death certificate. The article in this issue of the Journal by Hopkins, *et al*,[11] makes a valuable contribution in this area. The authors show that a systematic and fairly intensive state program of querying cause of death reported on the death certificate can have a major impact on what physicians report as the cause of death.

Querying means asking the physicians who completed the cause-of-death certification whether the particulars of their reports were complete and accurate. The records that are queried are not a random sample of deaths, but rather they represent medical conditions whose characterization on the death certificate may be imprecise (e.g., natural causes), non-specific (e.g., cancer without specification of primary site), suggestive of a public health problem (e.g., toxoplasmosis, suggesting HIV infection), or indicative of a public health problem (e.g., cholera). In Oregon, the queried records accounted for approximately one out of every 10 death certificates.

The authors show that physicians in Oregon are highly responsive to such queries, and that the impact on the cause-of-death certification of the questioned records can be considerable. As a result of this ongoing activity in Oregon, about half of the queried death certificates were changed. The changes often resulted in an increase in specificity of the underlying cause of death; for some broader categories, the changes resulted in measurable changes in the overall frequency of the causes of death.

The authors point out not only the beneficial consequences to the quality and completeness of the resulting data, but also the *educational* benefits of the process. Querying was an effective means of informing physicians as to what information was being sought on the death certificate with respect to cause of death, and how the death certificate should be completed. The authors note that the effectiveness of the educational process is reflected in better certifications and fewer needed changes over time. They also show that the process of querying physicians by the state vital statistics programs can be automated to a high degree.

To improve the quality of cause-of-death information a variety of approaches, including querying, have been suggested.[10] These include educating physicians at various stages in their training—including at medical school, in residency, and in continuing education—on the way to complete death certificates. State vital statistics programs and NCHS have implemented a number of activities to inform physicians about completing cause-of-death information on the death certificate:

- the latest version of the US Standard Certificate of Death (recommended to the states for implementation beginning with deaths in 1989) includes more detailed

instructions, examples of properly completed cause-of-death certifications, and a two-part certification to allow more time to establish and report the medical facts of death[1];

- the NCHS has made available to the states video cassettes and an audio tape cassette, and handbooks, describing proper completion of vital records including the death certificate; and
- NCHS is encouraging states to incorporate cause-of-death querying as an integral aspect of their vital statistics programs, using the querying manual developed by NCHS.[12] This manual, in an adapted and expanded form, is used in the Oregon querying program described in the article by Hopkins and his colleagues.[11] As the authors point out, many states have such querying programs. Not all states have them, however, and not all the extant programs are as extensive and intensive as that of Oregon.

The article by Hopkins and his colleagues[11] demonstrates both the value and the feasibility of implementing state querying programs for identifying and correcting deficiencies in cause-of-death certifications suspected of being inadequate or erroneous. For Oregon, querying resulted in changing about 5 per cent of the certifications, mainly increasing their specificity; querying a random sample of non-problem records might result in some additional changes. The Hopkins study, along with many of the validation studies previously cited, suggest that for the broad purposes of identifying major health problems, setting priorities, and monitoring progress, mortality statistics are still a valid, and probably the best available, source of information. However, efforts should be strenuously pursued to improve the quality of cause-of-death on the death certificate. These efforts should include training physicians, improving reporting forms, disseminating educational materials, and implementing cause-of-death querying programs.

REFERENCES

1. Freedman MA, Gay GA, Brockert JE, Potrzebowski PW, Rothwell CJ: The 1989 revision of the US standard certificates of live birth and death and the US standard report of fetal death. Am J Public Health 1988; 78: 168–172.
2. Zemach R: What the vital statistics system can and cannot do. (editorial) Am J Public Health 1984; 74:756–758.
3. Glasser JH: The quality and utility of death certificate data. (editorial) Am J Public Health 1981; 71:231–233.
4. National Center for Health Statistics: Health, US 1986 and Prevention Profile. DHHS Pub. No. (PHS) 87-1232. Hyattsville, MD: NCHS, December 1986.
5. Percy C, Stanek E, Gloeckler LC: Accuracy of cancer death certificates and its effect on cancer mortality statistics. Am J Public Health 1981; 71: 242–250.
6. National Center for Health Statistics, Gittelsohn A, Royston P: Annotated bibliography of cause-of-death validation studies, 1958–80. Vital and Health Statistics, Series 2 No. 89, DHHS Pub. No. (PHS) 82-1363. Washington, DC: Govt Printing Office, September 1982.
7. Kircher T, Nelson J, Burdo H: The autopsy as a measure of accuracy of the death certificate. N Engl J Med 1985; 313:1263–1269.
8. Feinstein AR: Scientific standards in epidemiologic studies of the menace of daily life. Science 1988; 242:1257–1263.
9. Sirken MG, Rosenberg HM, Chevarley FM, Curtin LR: The quality of cause-of-death statistics. (editorial) Am J Public Health 1987; 77:137–139.
10. National Center for Health Statistics, Moriyama IM: Evaluation of Medical Certification of Causes of Death: Review and Critique of Alternative Approaches for a National Program. Unpublished report. Hyattsville, MD. NCHS, December 1980.
11. Hopkins, DD, Grant-Worley JA, Bollinger TL: Survey of cause-of-death query criteria used by state vital statistics programs in the US and the efficacy of the criteria used by the Oregon vital statistics program. Am J Public Health 1989; 79:570–574.
12. National Center for Health Statistics: Cause of Death Querying. Instruction Manual, Part 20. Hyattsville, MD: NCHS, 1985.

HARRY M. ROSENBERG, PHD

Harry Rosenberg is Chief, Mortality Statistics Branch, Division of Vital Statistics, National Center for Health Statistics, 3700 East-West Highway, Center Building, Room 144, Hyattsville, MD 20782.

Surgeon General's Report on Nutrition and Health Aspects

The Public Health Service of the Department of Health and Human Services has released a report on the relationship of diet and disease. *The Surgeon-General's Report on Nutrition and Health* presents the scientific evidence linking diet to the chronic diseases that are major public health problems in the United States today, including coronary heart disease, certain types of cancer, diabetes, and stroke. The report shows that for the two out of three Americans who do not smoke or drink excessively, choice of diet can influence long-term health more than any other action. It emphasizes modifications in eating habits, including a shift away from alcohol and foods high in fat (especially saturated fat), cholesterol, sugar and salt, toward vegetables, fruits and whole grain products.

The 727-page report, stock number 017-001-00465-1, is available for $22. Copies of the *Summary and Recommendations,* stock number 017-001-00466-9, are available for $2.75. To order send prepayment to Dept. 36-CC, Superintendent of Documents, Washington, DC 20402-0325; or contact (202) 783-3238 to use VISA or MasterCard.