Validity of Education Information on the Death Certificate

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We compared education as recorded on the death certificate with education ascertained before death from a household survey of 10,423 persons age 25 years or more who died in 1989. There was a tendency for the decedent's education to be reported at a higher level on the death certificate than at baseline. Of those who were reported as high school graduates on the death certificate, 38% reported that they had less than a high school education at baseline. The bias was more pronounced in older than younger decedents. (Epidemiology 1996;7:437–439)

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In 1989, the U.S. Standard Certificate of Death included, for the first time, provision for recording the decedent's education. The recommendation for the Standard Certificate was that the decedent's highest grade completed be recorded on the certificate. In 1989, 21 states achieved at least a 90% completion rate for this information.[1]

Since education level is a new and potentially difficult piece of information to obtain, it is important to evaluate the validity of this assessment. To this end, we examined data from the National Longitudinal Mortality Study (NLMS) for 10,433 persons age 25 years or more at baseline who had died in 1989. We compared the education level (highest grade completed) from the death certificate with the education from the baseline survey.

Methods

The NLMS is a prospective study of mortality occurring in combined samples of the noninstitutionalized U.S. population.* The samples are taken from selected Current Population Surveys (CPS) conducted by the Bureau of the Census. The Current Population Survey is a complex probability sample of households that are surveyed monthly to obtain demographic, economic, and social information about the U.S. population. Interviews are conducted by telephone and personal visit. The response rate is about 96%. For the current analysis, the NLMS has identified 12 Current Population Survey files in which persons were followed for mortality using the National Death Index (NDI). The surveys chosen were conducted in March 1973, February 1978, March 1979, April 1980, August 1980, December 1980, March 1981, March 1982, March 1983, March 1984, March 1985, and September 1985. Education was determined by the question "What is the highest grade or year of regular school [name] has ever attended? and "Did [name] complete that grade?"

We used the National Death Index to determine deaths occurring in the years 1979–1989 for those in the NLMS sample. The NDI is a computer file of all deaths in the United States since 1979 and is maintained and operated by the National Center for Health Statistics.[3] The NDI has been shown to be an effective and accurate means of ascertaining deaths using personal identifiers.[4–7] For the analyses in this paper, we have included only deaths occurring during 1989, since it was in this year that the education item was first included on the standard death certificate.

The information on the death certificate is usually recorded by the funeral director after questioning the next-of-kin or other informant. On the 1989 Standard Certificate, the National Center for Health Statistics suggested that education be recorded as highest grade completed and that the certificate have one recording box labeled "Elementary/Secondary (O-l 2)" and another labeled "College (l-4 or 5+)." In 1989, 21 states had a completion rate of at least 90% for education, and 5 states did not include education on the certificate for at least part of that year (see footnote to Table 2 for listing of states). Since most education is completed by age 25 years, we have assumed that there is little change in education between the time of the baseline assessment and the time of death in persons age 25 years or more.

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TABLE 1. Percentage Distribution of Education Recorded on the Death Certificate for Categories of Education at Baseline as Determined by the National Longitudinal Mortality Study

NLMS Education Level	Education on the Death Certificate*								Total		
	El 0-4	El 5-7	El 8	HS 1-3	HS 4	Col 1-3	Col 4	Col 5+	Unknown	Number	Column %†
El 0-4	35	24	29	12		3		9	22	572	5
El 5-7	2			7	14	—	—	—	20	1,188	11
El 8	1	7	43	11	18	1	—	—	18	1,462	14
HS 1-3	—	2	11	29	37	3	1	—	16	1,753	17
HS 4		1	3	56	6	11	2	—	12	2,512	24
Col 1-3	—	—	1	1	22	46	15	4	11	943	9
Col 4	—	—	—	—	4	11	58	13	11	505	5
Col 5+	—	8	13	11	33	3	2	2 6 1	10	322	3
Unknown	3					9		42	16	1,176	11
Total	3	6	14	10	33	9	6	3	15	10,433	100

* — = <0.5%; El = elementary; HS = high school; Col = college.
† Percentages may not add to 100 owing to rounding.

Results

Table 1 shows the percentage of persons in each baseline education category from the Current Populatiqn Survey who fell into each education category as reported on the death certificate. The death certificate shows the highest agreement with the baseline education of 4 years of high school. For baseline education levels less than 4 years of high school, the death certificate education tends to be recorded at a higher level of education than the baseline level.

Table 2 shows a summary of results for the 21 states with the 90% completion rate for education on the death certificate. In this table, we present sensitivity and specificity under the assumption that the Current Population Survey education is correct. Education levels are grouped as O-l 1 years, 12-15 years, and 16 years or more. This table shows very little difference in sensitivity and specificity between men and women. It indicates that levels of education below high school are often recorded as high school level on the certificate (lower sensitivity for 11 years or less of education, and lower specificity for 12-15 years of education).

In Table 3, the data are tabulated using a slightly different, but commonly used, categorization of education levels. The denominator for the calculation is the number of deaths classified by level of education noted on the death certificate, so that the column percentages add to 100%. This table can be used to estimate the classification bias in the observed deaths. For example, for those deaths recorded as high school graduates on the death certificate, 38% should have been recorded as less than high school graduate, and 8% should have been recorded as greater than high school. The bias varies by both race (Table 3) and age (Table 4).

TABLE 2. Sensitivity* and Specificity? of Education on the Death Certificate, Using Level of Education as Determined by the National Longitudinal Mortality Study‡

Education (Years)	Men		Women	
	Sensitivity	Specificity	Sensitivity	Specificity
≤11	0.74	0.93	0.70	0.93
12–15	0.85	0.77	0.83	0.72
≥16	0.85	0.97	0.85	0.95

* Sensitivity; for example, among those with NLMS education 12–15 years, the proportion with death certificate stating 12–15 years is 0.85.
† Specificity; for example, among those with NLMS other than 12–15 years, the proportion with death certificate stating other than 12–15 years is 0.77.
‡ States: Arizona, California, Colorado, Delaware, Florida, Hawaii, Idaho, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Montana, New Hampshire, Oregon, South Carolina, Utah, Vermont, Wisconsin, and Wyoming.

Discussion

These results from the NLMS show that education as reported on the death certificate is biased in comparison with that recorded on a household interview survey. Using education from the death certificate may overestimate death rates for those at the high school level and may underestimate death rates for those with less than a high school education. Our results are similar to those found in a sample of deaths in New York and Utah in 1987 in which the death certificate overstated education level.[8]

When one calculates population death rates by education, the categorization of education in the source population must be consistent with the categorization from the death certificate. The data presented in this paper measures agreement using the Current Population Survey as the source. Population estimates, however,

TABLE 3. Percentage Distribution of Baseline Education from Interview for Categories of Education on the Death Certificate by Race Group

Base Education*	All Deaths†				White†				Black†			
	<HS	HS	>HS	Unknown	<HS	HS	>HS	Unknown	<HS	HS	>HS	Unknown
<HS	91	38	19	65	91	36	6	62	93	50	10	83
HS	8	54	75	21	8	55	19	23	6	42	20	13
>HS	100	8		14	1	8	76	15	1	8	70	4
Total %	3,097	100	100	100	100	100	100	100	100	100	100	100
Number		3,036	1,724	1,400	2,645	2,788	1,616	1,212	388	219	87	170

* <HS, between 0 and 11 grades completed; HS, 12 grades completed; >HS, 13 or more grades completed.
† Percentages may nor add to 100 owing to rounding.

TABLE 4. Percentage Distribution of Baseline Education from Interview for Categories of Education on the Death Certificate by Age Group

Base	Age 25-44 Years†				Age 45-64 Years†				Age ≥65 Years†			
Education*	<HS	HS	>HS	Unknown	<HS	HS	>HS	Unknown	<HS	HS	>HS	Unknown
<HS	86	22	17	39	90	31	4	55	93	47	8	72
HS	13	67	80	41	9	61	20	28	7	46	18	16
>HS	1	11		20	1	8	76	16	—	7	73	12
Total %	100	100	100	100	100	100	100	100	100	100	100	100
Number	139	334	218	83	960	1,243	620	449	1.99s	1,459	886	898

* <HS, between 0 and 11 grades completed: HS, 12 grades completed: >HS, 13 or more grades completed.
† Percentages mav not add co 100 owing co rounding — = <0.5%.

may be derived from the decennial census or some other source in which questions on education may vary from the Current Population Survey data collected in the 1980s. Our estimates of bias may not be applicable in those situations.

The collection of information for the death certificate by the funeral director is similar to the collection of proxy information in epidemiologic studies when the case individual is either deceased or incapacitated.' In a study of the validity of proxy responses, 80 wives were given a questionnaire similar to one given to their husbands, who were cases in a lung cancer study.[10] For the men who reported their education as less than high school, wives incorrectly reported their husbands' education 3 1% of the time, and for the men who reported education as greater than high school, the wives incorrectly reported their husbands' education 29% of the time. For both groups, the wife tended to report the education as completion of high school. In another proxy response validation study, the next-of-kin of cases and controls from a colon cancer study were queried." Exact agreement on education grade was around 80% if the proxy response was obtained by interview and around 70% if the response was by a self-administered questionnaire.

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